RP 22483

ICRISAT

Legumes Program

In-House Review
Project Reports

For

15 April 1987 (only)

ICRISAT Research Project Outline

1. Project Number: G-103(85)IC

2. Old Project Number: G-Brd-3(85)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Pat / Brd / Phy / Ent / Cyt

5. Project Title: Biology and management of groundnut diseases caused by soil fungi, bacteria and nematodes

6. Project Locations:

Patancheru AICORPO APAU

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

D. McDonald	(DMcD)
R.W. Gibbons	(RWG)
J.H. Williams	(JHW)
J.A. Wightman	(JAW)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
V.K. Mehan	(VKM)	0.40
M.J.V. Rao	(MJVR)	0.10
R.C.N. Rao	(RCNR)	0.05
P.W. Amin	(PWA)	0.05
V.M. Ramraj	(VMR)	0.05

(c) Cooperating Scientist Names:

A.K. Singh	(AKS)
J.C. Wynne	(JCW)
D.D.R. Reddy	(DDR)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1988

9. Objectives and Scope:

1. To establish the aetiology, epidemiology and ecology of diseases caused by soil inhabiting fungi, bacteria and nematodes. Emphasis will be on the pod rot complex and collar rots. 2. To determine crop losses (pod rots, collar rot and 'Kalahasti' malady) and establish economics of the diseases. 3. To identify and evaluate resistance to the diseases, and to develop more effective screening procedures, particularly for pod rots and collar rots.

10. Keywords:

Soil-borne diseases
Pod rots
Bacterial wilt
Nematode diseases

11. Technique in brief (Methodology):

1. Use of standard techniques for isolation and pathogenicity tests. Manipulation of environmental factors (biotic and abiotic) to determine their effects upon initiation and development of the diseases. 2. Disease surveys and crop loss assessments. Field trials with pesticides for control of the diseases. 3. Field and laboratory screening of germplasm to identify resistance to the diseases; search for disese hot spots and development of sick plots. 4. Standard hybridization and breeding methods will be employed to exploit resistances when they are identified.

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	3.00	3.00	3.00
(b) Travel	7.00	7.00	7.00
(c) POL	5.00	5.00	5.00
(d) Supplies	5.00	5.00	5.00
TOTAL	4.80	4.80	4.80
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)			
Location			
Patancheru	5.00	5.00	5.00

15. Review of past background and present status:

Damage to below ground parts of the plant by soil fungi and nematodes can cause significant losses in yield. Attack by soil insects and millipedes, drought stress and nutrient stress encourage pod rot. At ICRISAT we have identified a pod rot disease complex of which Fusarium spp. are dominant. Some 3000 genotypes have been screened for resistance under natural (irregular) disease pressure and six were found to have resistance. Pod rots were severe in crops that were irrigated following late season drought stress. This effect is being investigated with a view to developing a field screening method for pod rot resistance. A new pod disease caused by Tylenchorhynchus brevilineatus was recently identified in India. Pesticides are being screened for control of T. brevilineatus. Germplasm lines are being field screened in natural hot spots for resistance to this nematode.

16. Existing linkage with other centers or research projects:

Cooperative research with scientists of Andhra Pradesh Agricultural University and Punjab Agricultural University, India. The International Meloidogyne Project (USA) is currently screening our material for resistance to M. arenaria and M. hapla

17. Likely future course of development:

Surveys will be organised in different parts of the SAT to determine the occurrence and importance of pod rots and nematode diseases. Effects of drought and other environmental factors on pod rot will be studied. Disease scoring the resistance screening methods will be improved. A resistance breeding program will be started. Screening for resistance to collar rot will be expanded to more locations. Genotypes reported resistant to bacterial wilt will be tested for multiple disease resistance. Screening to be intiated on Vertisols at ICRISAT Center.

18. Availability of training facility:

Training can be organised if required

Approval Date: 15-JUL-1985

Form "A"

COLLABORATIVE PROJECTS

Project No. : Co-G- (87), Linked with Proj. No.G-103(85)IC

Protect Title : Studies on bacterial wilt of groundnut

Name of the Collaborative Institute(s):

1. A.C.I.A.R.,; 2. MARIF & BORIF, Indonesia;
3. People's Republic of China CAAS

Name of scientists responsible for the project:

(a) Collaborative Institute(s)

1. K. Middleton 2. C. Hayword,
3. Sun Darong.

(b) ICRISAT

1. V.K. Mehan, 2. D. McDonald

Duration:

(a) Date of start : 1987
(b) Date of completion : 1989

Objectives:

To collect and screen genotypes for resistance to bacterial wilt.

Source of funds:

Progress so far:

Some germplasm collected.

Remarks:

Recommended in 10 year plan.

ICRISAT Research Project Outline

1. **Project Number:** G-104(85)IC

2. **Old Project Number:** G.Path.1,6 and 7

3. **Program:** Groundnut

4. **Discipline(s)/Subprogram(s):** Pat / Ent / Brd / Cyt

5. **Project Title:** Biology and management of groundnut diseases caused by viruses, prokaryotes and viroids

6. **Project Locations:**

Patancheru AICORPO APAU

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

D. McDonald	(DMcD)
J.A. Wightman	(JAW)
R.W. Gibbons	(RWG)
J.P. Moss	(JPM)

(b) Project Scientist Names:

		Scientist-Years
D.V.R. Reddy	(DVRR)	1.00
P.W. Amin	(PWA)	0.30
A.K. Singh	(AKS)	0.05
L.J. Reddy	(LJR)	0.20
S.L. Dwivedi	(SLD)	0.20

(c) Cooperating Scientist Names:

K.R. Bock	(KRB)
S.N. Nigam	(SNN)
J.P. Moss	(JPM)

(d) Supporting Staff:

Research Associate(s)	3.00
Field Assistant(s)	1.00
Field Attendant(s)	2.00

8. (a) **Date of Start:** 1985

(b) **Years Revised:**

(c) **Year of Completion:** 1990

9. Objectives and Scope:

To characterize casual agents of yellow spot, cowpea mild mottle, chlorotic streak, witches broom, and vein banding; to investigate the epidemiology of diseases caused by viruses, prokaryotes and viroids with emphasis on clump, tomato spotted wilt, mottle, and rosette, to identify and evaluate resistance to tomato spotted wilt, clump, mottle and rosette; to incorporate genetic resistance and to the diseases mentioned above and test its stability; to develop integrated control measures.

10. Keywords:

Groundnut virus diseases
Mycoplasma like organisms
Viroids
Detection of viruses
Characterization of viruses
Management of virus diseases

11. Technique in brief (Methodology):

Characterization by employing standard serological and physico-chemical techniques in conjunction with electron microscopy, host range and vector transmission. Epidemiology by investigating vector, virus-vector relationship, various environmental factors (biotic and abiotic); screening of germplasm by mass scale inoculation techniques, by vector feeding, by utilising disease hot spots, and by developing sick plots. Standard hybridization and breeding methods to eploit resistance identified.

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	3.00	3.00	3.00
(b) Travel	15.00	15.00	15.00
(c) POL	5.00	5.00	5.00
(d) Supplies	11.00	11.00	11.00
TOTAL	9.00	9.00	9.00
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)			
Location			
Patancheru	2.00	2.00	2.00

15. Review of past background and present status:

Prior to 1976 several reports have appeared in India on the occurrence of virus diseases. However, none of the casual viruses were precisely characterized on interrelatinships to similar viruses occurring in other countries determined. Reliable detection methods were not available and agents transmitting the viruses were not identified. Genetic resistance was not exploited by reliable methods for any of the groundnut virus diseases. Similar situations existed in other countries in the SAT. From ICRISAT several reports have been published on the characterisation and diagnosis of groundnut viruses, which include tomato spotted wilt virus, peanut mottle virus, peanut clump virus and groundnut rosette viruses. Minor virus diseases such as cowpea mild mottle virus, yellow spot virus and chlorotic streak virus have been partially characterized. Vectors of economically important virus diseases have been identified and virus-vector relationships determined. Over 700 germplasm lines have been screened for tomato spotted wilt virus. Using cultural practices and field tolerant cultivars it is now possible to manage bud necrosis. A method for mass scale inoculation of peanut mottle virus has been devised. Tolerant and non-seed transmission sources have been identified for mottle.

16. Existing linkage with other centers or research projects:

Cooperative research with scientists of Andhra Pradesh Agricultural University; Sri Venkateswara University; Punjab Agricultural University and the University of Agricultural Sciencies, Bangalore

17. Likely future course of development:

Surveys will be organised in the SAT to determine the occurrence and importance of virus diseases. Virus will be characterised and methods for their detection developed. Purification methods will be devised and antisera produced. Interrelationships with similar viruses occurring in other countries will be determined. Disease scoring and resistance screening methods will be improved. Data from epidemiological studies and resistant cultivars will be used to integrated disease management.

18. Availability of training facility:

Training can be provided in the characterisation, detection, and purification of viruses. Training can also be provided in the handling of insect vectors, and their utilisation in the transmission of viruses.

Approval Date: 09-JUL-1985

ICRISAT RESEARCH PROJECT OUTLINE - TRAINING

1 **Submitted by :** DVR Reddy/D McDonald **Date :** 18 February 1986

2a. **Project No.** : TY-G-2(86)

b Linked Project : G-104(85)IC

3 **Program (s)** : Groundnut Improvement Program

4 **Discipline(s)/Subprogram(s)** : Virology/Groundnut Pathology

5 **Project Title :** Characterisation of virus causing veinal-chlorosis of groundnut; initiation of screening in hot spots; development of C-DNA for detecting peanut clump virus.

6 **Project Location :** ICRISAT Center

7 **Objective and Scope:** In our disease surveys, a disease causing veinal-chlorosis was observed in several locations in Andhra Pradesh and Karnataka. The disease cause severe yield reduction, and in several locations incidence exceeded 20%. Although th disease was observed in 1977 and subsequently in our surveys, it was not investigated because of its low incidence. Since the disease has now assumed economic importance, is essential to characterise the causal agent. The work will be done in collaboratio with scientists in the Directorate of Oil Seeds (AICORPO).
Peanut clump has recently been observed in Maharashtra. Since the virus occurs in several serologically distinct isolates, detection by serological methods is unreliab We have earlier shown a single C-DNA probe can detect all PCV-isolates. We would lik to develop especially non-radioactive probes utilising biotin.

8 **Expected contribution of this project to ongoing approved research :**

Provide quick and reliable detection methods for screening. Would help us immensely in detecting veinal chlorosis, in studying its epidemiology and the vector transmitting the disease.

9 **Scientific Staff names :**

(a) **Project Scientist :** DVR Reddy

(b) **Scholar or Fellow : Indicate Level (MSc, PhD, PostDoc) :Name(s)**

PostDoc

(c) **Cooperating Scientist names :**

Dr. K.S. Sastry, DOR, Rajendranagar, Hyd/Dr. V. Muniyappa, UAS, Bangalore.

(d) **Support staff :** **Man-years**

Research Associate (s)	0.1
Field Assistant(s)	0.2
Field Attendent(s)	

(a) Date to start : June 1986

(b) Date of completion : May 1988

1 Anticipated Supervisor(s): D.V.R. Reddy

J.A. Wightman/P.W. Amin

2 Recommendation of Project Scientist: Priority(1,2,3,4,5,6,7,8,9)

Priority 1

Signature/date 16/12/1986

3 Recommendation of subprogram/group leader: Priority(1,2,3,4,5,6,7,8,9)

Priority 1

Signature/date 17/12/1986

4 Recommendation of Program Leader: Priority(1,2,3,4,5,6,7,8,9)

High Low

Priority 1

for R.W. Gibbons

Signature/date 17/12/1986

5 Recommendation of Director of Research :

Signature/date 19.12.86

6 Received by Training Officer :

Signature/date

ACTION :

ICRISAT RESEARCH PROJECT OUTLINE - TRAINING

1 Submitted by : E.N.C. ARONS Date : 27/2/86

2a. Project No. : TN-G-4 (86)
b. Linked Prgm. : G-104 (85) IC & G-109 (85) IC

3 Program (s) : GROUNDNUT

4 Discipline(s)/Subprogram(s) : BREEDING / VIROLOGY / ENTOMOLOGY / PATHOLOGY

5 Project Title : GENETIC RESISTANCE TO RUD NECROTIC DISEASE AND ITS VECTOR

6 Project Location : ICRISAT Center, Hyderabad

7 Objective and Scope: We have resistance to the Kenya isolate of RUD but less done on work on for the genetics of resistance to Kenya. We also have resistance to the vector on which Rosette spreads. We need to know more about the genetics of resistance to the vector and the virus. This is to be achieved by the study of landrace populations already generated by the breeding and entomologists.

8 Expected contribution of this project to ongoing approved research :

To expand our knowledge of the genetics of resistance to the vector of RUD and the causal virus.

9 Scientific Staff names :

(a) Project Scientist :
S.L. DWIVEDI, DVR REDDY, PW AMIN

(b) Scholar or Fellow : Indicate Level (MSc, PhD, PostDoc): Name(s)
APPRENTICE (OWN FUNDS)

(c) Cooperating Scientist names :
D. MCDONALD, MJV RAO, JP MOSS, AK SINGH

(d) Support staff : Man-years

Research Associate (s)	—
Field Assistant(s)	—
Field Attendent(s)	—

10 (a) Date to start : June - July 1986

(b) Date of completion : Dec. 1986

11 Anticipated Supervisor(s): S.D. Dreé, P.J.P.

12 Recommendation of Project Scientist: Priority (1),2,3,4,5,6,7,8,9)

Signature/date

13 Recommendation of subprogram/group leader: Priority (1),2,3,4,5,6,7,8,9)

Signature/date

14 Recommendation of Program Leader: Priority (1),2,3,4,5,6,7,8,9)
High Low

Signature/date

15 Recommendation of Director of Research :

Signature/date

16 Received by Training Officer :

Signature/date

ACTION :

COLLABORATIVE PROJECT

Project No. : Co-G.17(86), Linked with Proj. No.G104(85)IC

Project title : Cloning of peanut chlorotic streak virus(PCSV) DNA and utilisation of specific segments for gene transfer.

Name of the Collaborative Institute(S):

University of Kentucky

Name of Scientists responsible for the project:

a) Collaborative Institute

R.J. Shepherd

b) ICRISAT

D.V.R. Reddy

Duration:

a) Date of Start : 1986
b) Date of Completion : 1988

Objectives:

To prepare restriction endonuclease fragments of viral DNA, cloning, ligation with desired genes and introduction into protoplasts through electroporation.

Source of funds: Work will be done in the University of Kentucky and the only funds required are travel, if necessary.

Progress so far:

Purification of the PCSV, identification that it is a caulimo virus, limited cloning of viral DNA done in the University of Columbia with Dr. Guntaka's help.

Remarks:

A communication from Dr. Shepherd clearly states the potential of utilising PCSV for eukaryotic gene transfer. PCSV appears to be the only caulimo virus with wide host range and adapated to multiplication at high temperatures.

This collaboration will give us an opportunity to get acquainted with cloning, and exposure to techniques currently being used in biotechnology for transferring eurkaryotic genes. We rather pleased that a groundnut virus has the potential for application in biotechnology. We will be privileged to collaborate with Dr. Shepherd who is an outstanding virologists.

Form "A"

COLLABORATIVE PROJECTS

Project No. : Co-G-15 (87), linked to Proj. G-104(85)IC

Project title : Studies on virus diseases of groundnut in Africa.

Name of the collaborative Institute(s):

1. Scottish Crop Research Institute, U.K. 2. Peanut CRSP USA, 3. CIRAD, Montpellier, France.

Name of Scientists responsible for the project:

(a) Collaborative Institute(s):

1. B.D. Harrison, 2. J.W. Demski, 3. M. Dollet; 4. J. Dubern

(b) ICRISAT

1. K.R. Bock, 2. D.V.R. Reddy, 3. P. Subrahmanyam, 4. D. McDonald, 5. Y.L. Nene.

Duration

(a) Date of start: April 1987
(b) Date of completion: Continuing

Objectives:

1. To characterize the important groundnut virus diseases in Africa.

2. To purify the viruses, produce antisera and develop diagnostic methods.

3. To assist in developing screening methods and breeding of resistant varieties.

4. To study vector ecology and epidemiology of the diseases.

5. To detect viruses in seed lots in quarantine.

6. To organize meetings to coordinate research and provide training.

Source of funds: ICRISAT Centre, ISC & SADCC/GIN Regional Centres; Peanut CRSP, ODA.

Progress so far:

The viruses causing rosette diseases have been identified and diagnostic methods developed. Field screening methods have been developed in the SADCC/GIN unit and rosette resistant cultivars are being bred. Limited surveys have been made in Southern and W. Africa. Considerable research has been done on several groundnut viruses by French scientists in W. Africa.

Remarks:

The project on groundnut rosette has been successful in that research efforts have been coordinated by holding regular meetings and by intechange of data and staff. Important data on the causal viruses have been obtained. Screening and resistance breeding is being successfully pursued in ICRISAT's Regional Groundnut Program for Southern Africa. At the last meeting in Lilongwe, Malawi, in March 1987, participants recommended widening the project to include all important groundnut viruses in Africa.

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-10 (82), Linked with Proj. Nos.G-104(85)IC and G-102(85)IC

Project Title : Peanut Collaborative Research Support Program (CRSP)

Name of the Collaborative Institute(s):

Peanut CRSP
University of Georgia
Experiment Station
USA

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

1. D. Cummins, 2. T. Nakayama

(b) ICRISAT

1. D. McDonald, 2. Y.L. Nene

Duration:

Date of Start : 1982
Date of Completion : Continuing

Objectives

To strengthen collaborative research and to ensure complementarity between the programs to avoid duplication of effort. To assist in the dissemination of information and genetic materials. To hold joint workshops. To cooperate in training.

Source of funds: Peanut CRSP (US Title XII program), ICRISAT

Progress so far:

Dr. D.V.R. Reddy did a virus survey in SE Asia. Peanut CRSP will be supplying W. African rosette isolates for our cooperative work on rosette in SCRI. ICRISAT will continue to provide antisera and other diagnostic acids for peanut CRSP projects on viruses. Dr. D. Choopanya and Mrs. Surapea from Thailand were sponsored by Peanut CRSP to undergo training in techniques for virus detection and purification.

Remarks:

The project has strengthened ICRISAT's contacts with Thailand, Philippines and Senegal. We are Coordinating research on groundnut Rosette Virus with Peanut CRSP, and entering cultivars in their multilocational trial.

Form "A"

COLLABORATIVE PROJECTS

Project No. : Co-G (87), Linked with Proj. No.G-104(85)IC

Project title : Studies on virus diseases of groundnut in Asia.

Name of the Collaborative Institute(s):

1. Chinese Academy of Agricultural Sciences, People's Republic of China; 2. Khon Kaen University and Dept. of Agriculture, Thailand; 3. BORIF & MARIF, Indonesia; Peanut CRSP, USA; 5. ACIAR Australia.

Name of Scientists responsible for the project:

(a) Collaborative Institute(s):

1. X. Zeyong, 2. S. Wong Kaew, 3. D.M. Tantera, 4. J.W. Demski, 5. K. Middleton

(b) ICRISAT

D.V.R. Reddy, D. McDonald, Y.L. Nene

Duration

(a) Date of Start : April, 1987
(b) Date of completion : Continuing

Objectives:

1. To characterize economically important groundnut viruses in Asia, especially in the People's Republic of China, Thailand and Indonesia.

2. To purify the viruses, produce antisera and develop diagnostic methods.

3. To assist in development of screening procedures, and to breed resistant varieties.

4. To detect viruses in seed lots in quarantine.

5. To organise meetings to coordinate research and to provide training.

Source of funds: ICRISAT Center, Peanut CRSP, ACIAR.

Progress so far:

Surveys carried out by ICRISAT in cooperation with ACIAR and Peanut CRSP have shown that Peanut stripe virus is widely distributed in East Asia. Peanut mottle and cowpea mild mottle viruses are also widely distributed. Tomato spotted wilt virus appears to be economically important in a few places in Thailand and in the People's Republic of China. Antisera to several of these viruses have been supplied to scientists in the region and specialist training has been provided to scientists from People's Republic of China, Indonesia, Thailand, and the Philippines.

Remarks:

We are already involved in the collaborative work described above. This project will put this work on a formal basis and facilitate planning and funding of research and training.

ICRISAT Research Project Report

1. Project Number: G-109(85)IC

2. Project title : Identification and utilization of host plant resistance to insect pests and associated organisms.

3. Project Scientists: P.W. Amin (PWA)
S.L. Dwivedi (SLD)
A.K. Singh (AKS)

Cooperating Scientists: L.J. Reddy (LJR)
M.J. Vasudeva Rao (MJVR)
V.K. Mehan (VKM)
V.R. Rao (VRR)

5. Period covered by this report (month/year) January - December 1986

Date of start : 1985

Year of completion : 1990 Year revised: 1986

6. Summary of progress report:

Sources of resistance:

Jassid: We have identified 33 new sources of resistance, making a total of 70 resistant genotypes identified so far.

Leafminer: Eight genotypes found resistant at ICRISAT Center maintained their resistance at other locations in India. ICG 1697 and ICG 2271 showed high level of resistance.

Tobacco Caterpillar: ICGV 86031 (GBPRS 312) showed promise against tobacco caterpillar under both laboratory and field conditions. It was also resistant to another species Spodoptera exigua.

Podborer: In the preliminary screening large differences were observed for pod borer damage in 281 germplasm and breeding lines.

Aphid: We identified ICG 5240 as resistant to aphid Aphis craccivora.

Multiple pest resistance: We have so far identified 8 genotypes which have resistance to 3 to 5 pest species.

Mechanism of resistance:

Jassid: **We found that the presence of long hair on the lower leaf surface significantly contributes to the resistance to jassids. Further studies showed that the lamina long hair are more important than the midrib hair and their density rather than angle contributes to the resistance.**

Aphid: **The resistance of ICG 5240 to aphid appears to be due to strong antibiosis. Aphids reared on this genotype took longer to develop into adults and they died sooner than when reared on susceptible genotype TMV 2. The survivors remained small, became sickly, and were less fecund.**

Rearing technique:

Thrips: Addition of anthers to the leaf diet increased the survival and fecundity of Frankliniella shultzei and Scirtothrips dorsalis. However, this effect was more pronounced in F. shultzei where females of the species produced six times more progeny on this improved diet.

Breeding for resistance:

Sources resistant to leaf miner and aphid have been crossed extensively with high yielding thrips and jassid resistant breeding lines to breed multiple pest resistant populations. We made 220 bulk selections for resistance to jassid damage in 1169 F_2-F_7 populations.

Yield trials: Several jassid resistant breeding lines produced 3000-3900 kg dry pods ha-1 as against 2000 kg of kadiri-3 (Robut 33-1) under natural pest infestation in high input unsprayed environment at ICRISAT Center. At Hisar two breeding lines, ICGV 86353 and ICGV 86405 produced pod yields in excess of 5000 kg ha-1 as compared to 3700 kg of control Kadiri-3 (Robut 33-1).

Cooperation with national programs:

ICGV 87153 (ICGPPS 92) and germplasm line ICG 2271 were promoted to the CVT and NET in the AICORPO. We also contributed seven new pest resistant selections for rainy season evaluation. ICGV 87153 has also performed well in Bangladesh and the USA.

7. Publications:

1. Amin, P.W. 1987. Insect pests of groundnut in India and their management. 219-233. In Plant Protection in Field Crops. M.V. Rao and S. Sithanantham eds. Plant Protection Association of India, Rajendranagar, Hyderabad 500 030, India.

2. Amin, P.W. Recent advances in research on resistance to insect pests and vectors of virus diseases of groundnut in India. In Proceedings of The National Conference on Key Pests of Agricultural Crops. 21-23 December 1985, Kanpur, India.

3. Amin, P.W. and R.N. Singh. Low incidence of bud necrosis disease in groundnut genotypes resulting from their resistance to vector, Frankliniella schultzei Tryfom) (Thysanoptera: Thripidae) (In Press - Plant Pathology, UK).

4. Dwivedi, S.L., P.W. Amin, Rasheedunisa, S.N. Nigam, G.V.S. Nagabhushanam, and R.W. Gibbons. 1986. Genetic analysis of trichome characters associated with resistance to jassid (Empoasca kerri Pruthi) in peanut. Peanut Science 13:15-18.

Work plan for next year:

1. We will initiate screening for resistance to white grub, a serious pest of groundnut in North India, at a suitable site in collaboration with Hisar Agricultural University.

2. We will screen Spodoptera resistant variety ICGV 86031 (GBPRS 312) for resistance to other defoliators, Heliothis and Amsacta.

3. In collaboration with A.P. Agricultural University, we will screen Spodoptera resistant genotypes in Bapatla.

4. We will continue to utilize new sources of resistance to breed varieties with multiple pest resistance. Emphasis will be placed on breeding early maturing pest resistant lines.

5. We will continue to evaluate pest resistant breeding lines in multilocation trials.

6. We will continue with the studies on the mechanism and inheritance of host plant resistance.

Form "A"

COLLABORATIVE PROJECTS

Project No. : Co-G- (87), Linked with Proj. G-109(85)IC

Project Title : Identification and utilization of host plant resistance to insect pests.

Name of the Collaborative Institute(s):

T.D.R.I., London, U.K.

Name of the Scientists responsible for the project:

(a) Collaborative Institute(s)

Sue Woodhead

(b) ICRISAT

P.W. Amin

Duration:

(a) Date of Start : 1987 (latter half)
(b) Date of completion : 1990

Objective:

To find the chemical basis of resistance in genotypes resistant to sucking pests. With particular emphasis on the aphid, Aphis craccivora and jassid Empoasca [illegible]

Sources of funds: TDRI 99%, ICRISAT 1% in the form of lab space, seeds, some chemicals etc.

Progress so far:

Remarks:

The project should be reviewed in 1988 and after considering the progress made, it can be expanded to include more pest species, e.g. leafminer.

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-11(84), Linked with Proj. No.G-109(85)IC

Project Title : Identification and utilization of host plant resistance to insect pests.

Name of the Collaborative Institute(s):

TDRI, Storage Department, London, U.K.

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

P. Prevett

(b) ICRISAT

P.W. Amin

Duration:

a. Date of Start : 1984
b. Date of Completion : 1986

Objectives:

To screen groundnut pods for genetic resistance to Caryedon serratus.

Source of funds: TDRI, No special funds required.

Progress so far:

Twenty genotypes were screened for resistance. There were differences in the biology of C. serratus on pods of different genotypes.

Remarks:

It was proposed to TDRI that the work should be extended to cover a larger number of genotypes. No reply has been received. We should carry on this work at ICRISAT under Project G110(85)IC. This collaborative Project should be terminated.

[I]CRISAT RESEARCH PROJECT OUTLINE - TRAINING

Submitted by : J A Wightman **Date :** 2/12/86

a. **Project No. :** Tv-G-9(86)
b. Linked Proj No : G-109(85)IC & G-112(86)IC
Program (s) : Groundnut

Discipline(s)/Subprogram(s) : ~~[illegible]~~ Entomology

Project Title : ~~[illegible]~~ Utilization of host plant resistance / control of termites in groundnut

Project Location : IC

Objective and Scope: This apprentice will help with the conduct of field trials and collection of [illegible] [illegible] [illegible]. [illegible] [illegible]. The [illegible] of [illegible] [illegible] [illegible] be [illegible] the chemical basis of host plant resistance to groundnut pests under the guidance of Dr S Woodhead, TDRI London.

Expected contribution of this project to ongoing approved research :

[illegible] Termite control is of high priority for crop protection programs for groundnut throughout the SAT. The presence of the apprentice will relieve the burden on program staff during [illegible] [illegible]. It is very important for us to know why some genotypes are resistant to pests. The identification of the chemicals involved will facilitate the screening process in the future.

Scientific Staff names :

(a) Project Scientist :

J A Wightman, P W Amin

(b) Scholar or Fellow : Indicate Level (MSc, PhD, PostDoc) :Name(s)

Pilkington Scholar / Apprentice: Timothy Robinson.

(c) Cooperating Scientist names :

G V Ranga Rao

(d) Support staff : **Man-years**

Research Associate (s)	0
Field Assistant(s)	0
Field Attendent(s)	0

26

10 (a) Date to start : September 1986

(b) Date of completion : August 1987

11 Anticipated Supervisor(s): J A Whitman

12 Recommendation of Project Scientist: Priority (1) 2,3,4,5,6,7,8,9)

Whitman 21/3/86
Signature/date

13 Recommendation of subprogram/group leader: Priority (1) 2,3,4,5,6,7,8,9)

Whitman 21/3/86
Signature/date

14 Recommendation of Program Leader: Priority (1, 2, 3, 4, 5, 6, 7, 8, 9)
High — Low

3

21/3/86
Signature/date

15 Recommendation of Director of Research :

Project being of low priority (3) cannot be supported out of 1986/87 budget.
However ... acceptance of ... financial ...
Signature/date

16 Received by Training Officer : 10/7/86

DLC assured me that an outside agency will meet all expenses

Signature/date

ACTION :

ICRISAT Research Project Outline

1. **Project Number: G-110185)IC**

2. **Old Project Number:**

3. **Program: Groundnut**

4. **Discipline(s)/Subprogram(s): Ent / Pat / Brd**

5. **Project Title: Biology and management of pests of stored groundnuts**

6. **Project Locations:**

Patancheru AICORPO

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.A. Wightman	(JAW)
D. McDonald	(DMcD)
R.W. Gibbons	(RWG)

(b) Project Scientist Names:

		Scientist-Years
K.M. Dick	(KMD)	1.00

(c) Cooperating Scientist Names:

V.K. Mehan	(VKM)
P.W. Amin	(PWA)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1987

9. Objectives and Scope:

1. To develop methods for the evaluation of the nature and extent of pest problems of stored groundnuts. 2. To develop methods and screen germplasm for resistance to storage pests. 3. To collect samples of pest-damaged groundnuts to determine possible linkages with aflatoxin contamination.

10. Keywords:

Pests
Harvested groundnuts
Resistance
Losses
Aflatoxin

11. Technique in brief (Methodology):

1. To monitor insect infestations from tissue of harvest to the end of the storage period. 2. Regular sampling of local markets and/or mills over an extended period to assess storage losses caused by pests.

12. **Source of Funds: Core 100.00**

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	1.00	1.00	
(b) Travel	1.00	1.00	
(c) POL	1.00	1.00	
(d) Supplies	3.00	3.00	
TOTAL	2.00	2.00	
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	

15. Review of past background and present status:

Preliminary research and observations at ICRISAT by Dr. P.W. Amin has indicated that some genotypes possess resistance to seed damage by Tribolium sp.

16. Existing linkage with other centers or research projects:

Cooperative linkage has been established with the pest infestion laboratory and TDRI in the U.K.

17. Likely future course of development:

It is hoped that the major causes of insect related losses in harvested groundnuts in India can be ascertained. Sources of resistance to storage pests should be identified and used in resistance breeding.

18. Availability of training facility:

Can be arranged

Approval Date: 15-JUL-1985

ICRISAT Research Project Outline

1. **Project Number:** G-111(85)IC

2. **Old Project Number:** G-Brd-10(85)

3. **Program:** Groundnut

4. **Discipline(s)/Subprogram(s):** Ent

5. **Project Title:** Integrated pest management with emphasis on Spodoptera litura and groundnut leaf miner (GNLM)

6. **Project Locations:**

Patancheru

7. **Scientific Staff Names:**

(a) Discipline/Subprogram Leader Names:

J.A. Wightman	(JAW)

(b) Project Scientist Names:

		Scientist-Years
J.A. Wightman	(JAW)	0.50
G.V. Panga Rao	(GVRR)	0.50

(c) Cooperating Scientist Names:

P.W. Amin	(PWA)
R.W. Gibbons	(RWG)
J.H. Williams	(JHW)
R.A.E. Mueller	(RAEM)
A.B.S. King	(ABSK)

(d) Supporting Staff:

Research Associate(s)	1.00
Field Assistant(s)	1.50
Field Attendant(s)	2.50

8. (a) **Date of Start:** 1984

(b) **Years Revised:**

(c) **Year of Completion:** 1987

9. Objectives and Scope:

1. To determine the economic significance of the major groundnut pests in the SAT expecially the groundnut leafminer (GNLM) and Spodoptera litura. 2. To evaluate methods of controlling the major pests of groundnuts that do not involve host resistance directly or the use of broad spectrum insecticides.

10. Keywords:

Integrated Pest Management
Groundnut leafminer
Spodoptera Lithura
Broad spectrum insecticides
Resistances

11. Technique in brief (Methodology):

1. Field trials using insecticides to regulate pest numbers in a differential manner. 2. Laboratory studies of insect growth rates and consumption. 3. Field studies of parasites and predators of pests. 4. Evaluation of formulations and procedures for machine applied viruses. 5. Computer simulation of the life systems of pests. 6. Determination of economic threshold. 7. Evaluation of farmers' needs.

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	5.00	5.00	5.00
(b) Travel	10.00	10.00	10.00
(c) POL	3.00	3.00	3.00
(d) Supplies	9.00	9.00	9.00
TOTAL	7.90	7.90	7.90
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location			
Patancheru (Rabi)	2.00	2.00	2.00
Patancheru (Kharif)	2.00	2.00	2.00

15. Review of past background and present status:

Observations on a one hectare block have commenced. Past investigations on the biology and resistance available have been assessed and published in annual reports and progress reports.

16. Existing linkage with other centers or research projects:

1. TDRI, UK on S. litura phermones. 2. Southampton University, UK, on GNLM pheromones

17. Likely future course of development:

Integrated pest management systems will be developed. Joint projects with the University of Southampton, University of Harare (Zimbabwe), ICIPE (Nairobi, Kenya) and Peanut CRSP will be developed.

18. Availability of training facility:

A full training program for all groundnut entomology projects will be developed by 1986.

Approval Date: 15-JUL-1985

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-8(82), Linked with Proj. No.G.111(85)IC

Project Title : Biology and ecology of the groundnut leafminer

Name of the Collaborative Institute(s):

Department of Chemistry, Southampton University, U.K.

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

R. Baker

(b) ICRISAT

J.A. Wightman

Duration:

a. Date of Start : 1982
b. Date of Completion : 1986

Objectives:

To isolate and identify the sex pheromone of the groundnut leafminer.

Source of funds: It is a small project and ICRISAT has no financial commitments.

Progress so far:

The presence of a pheromone has been demonstrated. The pheromone has been isolated and identified as C 13 dienol.

Remarks:

As Dr. Baker has resigned, the work is in abeyance. The project should be terminated.

ICRISAT Research Project Outline

1. **Project Number:** G-112(85)IC

2. **Old Project Number:**

3. **Program:** Groundnut

4. **Discipline(s)/Subprogram(s):** Ent

5. **Project Title:** Termite control in groundnuts

6. **Project Locations:**

Patancheru AICORPO Hisar Bangalore

7. **Scientific Staff Names:**

(a) Discipline/Subprogram Leader Names:

J.A. Wightman (JAW)

(b) Project Scientist Names:

		Scientist-Years
J.A. Wightman	(JAW)	0.10
G.V. Ranga Rao	(GVRR)	0.50
P.W. Amin	(PWA)	0.05

(c) Cooperating Scientist Names:

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1989

9. Objectives and Scope:

1. To test and establish new techniques involving baits treated with insecticides and fungicides in India. 2. To test and improve the techniques under African conditions.

10. Keywords:

Termites
Groundnuts
Insecticides
Fungicides

11. Technique in brief (Methodology):

Standard applied entomological procedures using newly developed techniques and pesticides.

12. Source of Funds: Core 70.00 TDRI 30.00

13. Cost Estimates: (Direct)	1985	1986	1987
Operational (recurring)			
(a) Labor	2.00		
(b) Travel	2.00		
(c) POL	0.50		
(d) Supplies			
TOTAL	0.90		
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location

15. Review of past background and present status:

Termites cause severe damage to groundnuts in many areas of the SAT. By tunneling in roots and stems they cause wilting and death of plants; some species cut through branches (common in Malawi and other countries of Southern Africa); some species scarify and penetrate shells exposing seeds to invasion by soil fungi including A. flavus. Studies in Nigeria have shown yield loss of up to 20% from termite damage to roots. Some species can be partially controlled by cultivation and a limited success has been achieved by use of insecticides and fungicides, the latter being effective through damage to the fungal gardens cultivated by the termites.

16. Existing linkage with other centers or research projects:

No linkage at present, but this could be developed with COPR, British Museum, UK, who have considerable expertise in the field of termite research.

17. Likely future course of development:

If successful this project will lead to the replacement of treating the soil in groundnut beds with persistant cyclodiene insecticides with a cheap, effective, and safe method of termite control.

18. Availability of training facility:

None at present.

Approval Date:

ICRISAT Research Project Outline

1. **Project Number:** G-106(85)IC

2. **Old Project Number:** G-Phy-Path-Ent-6(85)

3. **Program:** Groundnut

4. **Discipline(s)/Subprogram(s):** Phy / Pat / Ent

5. **Project Title:** Water stress effects on groundnut.

6. **Project Location:**

Patancheru Anantapur Bangalore

7. **Scientific Staff Names:**

(a) Discipline/Subprogram Leader Names:

J.H. Williams	(JHW)
D. McDonald	(DMcD)
J.A. Wightman	(JAW)

(b) Project Scientist Names:

		Scientist-Years
R.C.N. Rao	(RCNR)	0.80
V.K. Mehan	(VKM)	0.05
V.M. Ramraj	(VMR)	0.05
P.T.C. Nambiar	(PTCN)	0.05
K.R. Krishna	(KRK)	0.10

(c) Cooperating Scientist Names:

V.R. Rao	(VRR)
R.W. Gibbons	(RWG)

(d) Supporting Staff:

Research Associate(s)	1.00
Field Assistant(s)	
Field Attendant(s)	

8. (a) **Date of Start:** 1985

(b) **Years Revised:**

(c) **Year of Completion:** 1990

9. Objectives and Scope:

Identification of germplasm able to perform better in droughts. To understand the mechanisms underlying drought tolerance and susceptibility in selected genotypes. To study the effects of abiotic and biotic factors influencing yields and quality under drought conditions. To identify and improve cultivars for specific and general drought tolerance/resistance.

10. Keywords:

Drought
Germplasm
Drought tolerance
Abiotic factors
Biotic factors
Yield
Quality

11. Technique in brief (Methodology):

Drought stress will be manipulated at different growth stages. Germplasm grouped according to maturity will be screened. Selection for drought tolerance or susceptibility. Detailed physiological studies of lines selected as tolerant/susceptible to establish the mechanisms responsible. Studies of the effects of management,abiotic and biotic factors influencing yield and quality under drought. Improvement of screening methods to identify water use efficient plants and those with superior recovery from mid-season drought. Detailed studies on crop physical environments as influenced by agronomic practices.

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)

	1985	1986	1987
Operational (recurring)			
(a) Labor	15.00	15.00	15.00
(b) Travel	7.00	7.00	7.00
(c) POL	15.00	15.00	15.00
(d) Supplies	10.00	10.00	10.00
TOTAL	10.80	10.80	10.80
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	4.50

15. Review of past background and present status:

Screening germplasm using the line source sprinkler system is established. Twelve lines have been identified with superior performance. Cultivars with varied recovery responses from mid-season drought have been identified. Experiments done so far established genotype difference in water use efficiency and dry matter partitioning in drought. Progress reports Nos. 1, 2, 3 and 6 are available on screening methodology and results.

16. Existing linkage with other centers or research projects:

Prof. J.L. Monteith, ODA. Microclimatology Unit, School of Agriculture, University of Nottingham. Crop Physiology Division, Univ. Agricultural Sciences, Bangalore. AICORPO, Peanut CRSP and American Universities.

17. Likely future course of development:

To establish the impact that intercropping may have on the resistance or susceptibility of material identified in sole crop screening. Studies will be conducted on the interaction of drought with pests, and diseases (including soilborne diseases). To initiate breeding programs once suitable material becomes available.

18. Availability of training facility:

Opporunities exist for graduates and post-graduate research projects.

Approval Date: 15-JUL-1985

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-5 (81) Linked with Proj. No.G-106(85)IC

Project Title : Studies on drought physiology of groundnuts.

Name of the Collaborative Institute(s):

Department of Physiology and Envirol. Studies
University of Nottingham, UK

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

1. J.L. Monteith

(b) ICRISAT

1. J.H. Williams

Duration:

a. Date of Start 1981
b. Date of Completion 1986

Objectives:

1. To study the genotype x environment interactions in groundnuts in drought conditions.

2. To examine the mechanism underlying drought tolerance or susceptibility in selected genotypes.

Source of funds: ODA supported Univ. Nottingham for U.K. work and travel. ICRISAT supplied funds for local support during the rabi season when joint experiments were done at ICRISAT.

Progress so far:

The influence of plant population on crop water use in groundnuts was studied. Genotypic differences in water use efficiency in droughts were established. Genotypes with different responses to recovery from midseason stress were also identified. Six papers have been prepared on this work.

Remarks:

This has been an extremely useful collaboration, but work has been completed and the project should be terminated.

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-13 (84), Linked with Proj No.8-105(85)IC

Project Title : Use of C-13 discrimination methods to screen for photosynthetic differences in drought, different temperature conditions, and between varieties in "normal" conditions.

Name of the Collaborative Institute(s):

Australian National University

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

1. Graham, 2. Farquhar

(b) ICRISAT

J.H. Williams

Duration:

a. Date of Start : 1984
b. Date of Completion : Continuing

Objectives:

To examine the use of C-13 discrimination methods to measure differences in photosynthesis between varieties in normal and drought conditions. To examine the possibility of using the method as a technique to screen for high photosynthetic efficiency.

Source of funds: ACIAR for analysis

Progress so far:

ANU has demonstrated a good correlation between C-13 discrimination and water use efficiency of cultivars grown in the greenhouse. ICRISAT provided field grown samples but data from these have not been as well correlated to observed responses, and research continues to establish whey these differences occur. This project is making slow progress. ICRISAT's contribution is very limited in that it only provides samples.

Remarks:

There is a need to continue this work and the reason for conflict between greenhouse and field data should be determined.

From "A"

COLLABORATIVE PROJECT

Project No. : Co-G-16 (85), Linked with Proj No.G.106(85)IC

Project Title : Root respiration of groundnut cultivars as related to nitrogen fixation and drought resistance.

Name of the Collaborative Institute(s):

University of Bonn, Federal Republic of Germany

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

F. Lenz

(b) ICRISAT

I. J.H. Williams, 2. J. Watterott (R.S.)

Duration:

a. Date of Start : 1985
b. Date of Completion : 1988

Objectives:

To study the factors influencing root respiration of groundnuts.

Source of funds: BMZ/GTZ $81,000

Progress so far:

J. Watterott joined in 1986 and equipment necessary for the study has been ordered. Preliminary investigations in progress.

Remarks:

We shall measure respiration of drought tolerant and drought susceptible genotypes and relate this to other root attributes.

ICRISAT Research Project Outline

1. Project Number: G-107(85)IC

2. Old Project Number: G-Phy-Brd-Path-7(84)

3. Program: Groundnut

4. Discipline(s)/Subprogram(s): Phy / Brd / Pat

5. Project Title: To investigate nutrient stresses and to exploit rhizobium and mycorrhizae to increase groundnut

6. Project Locations:

Patancheru AICORPO

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

P.W. Gibbons	(RWG)
D. McDonald	(DMcD)
J.H. Williams	(JHW)

(b) Project Scientist Names:

		Scientist-Years
K.R. Krishna	(KRK)	0.20
P.T.C. Nambiar	(PTCN)	0.90
V.M. Ramraj	(VMR)	0.50
M.J.V. Rao	(MJVR)	0.05
V.K. Mehan	(VKM)	0.05

(c) Cooperating Scientist Names

K.L. Sahrawat	(KLS)
T.J. Rego	(TRJ)
V.P. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)	2.00
Field Assistant(s)	
Field Attendant(s)	

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1990

9. Objectives and Scope:

1. To identify efficient strains of bacteria and factors which influence the use of these strains. To manipulate the host and rhizobium to increase productivity. To improve methods of inoculation for small farmers. 2. To establish the role of mycorrhizal fungi and establish what scope exists to exploit these. 3. To establish the physiological basis for crop responses to nutrition and inoculants. 4. To improve the potential of groundnut cultivars in circumstances of nutritional limitations to yield. 5. To establish the interactions of nutrition and disease development.

10. Keywords:

Rhizobia
Mycorrhiza
Nitrogen
Phosphorus
Calcium
Iron
Nutrition

11. Technique in brief (Methodology)

1. Collection identification, maintenance and evaluation of microorganisms using laboratory, glasshouse and field experiments and procedures. 2. Manipulation of host plant, agronomic practice and environment to allow study of the factors which control nutrient acquisition. 3 Study of the basic process of infection, nutrient acquisition using serological, biochemical, plant and crop physiological techniques. 4. Study of the efficiency of nutrient utilization within the plant

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct)

	1985	1986	1987
Operational (recurring)			
(a) Labor	5.00		
(b) Travel	4.00		
(c) POL	5.00		
(d) Supplies	12.00		
TOTAL	8.40		
Capital (non-recurring			
Indirect Costs			

14. Land Requirements (ha)

Location	
Patancheru	2.00

15. Review of past background and present status:

Research at ICRISAT has identified NC 92 as being able to increase yields on specific cultivars in many circumstances. Methods of rhizobium inoculation have been investigated to a limited extent. The basis for this yield increase is not well established. Non-nodulating lines have been found and are being used in N balance studies. The genetics of non-nodulation have been workd out and isogenic lines are being produced. Mycorrhiza are implicated in P nutrition and have increased yields in reported experiments. Calcium nutrition is a major problem in S.E . Asia and Africa while iron deficiency is identified as a major problem in Indian conditions. Both nutrients interact with water supply. Nitrogen fixation research has progressed well but the basis for physiological responses to strains, management of these in the field and screening methodology needs to be improved. Mycorrhiza need investigation to establish the extent of infection, the role of mycorrhiza and the effect of environment on these. Ca and Fe nutrition have not received much attention although genetic differences in nutritional efficiency have been observed. The basis for a screening method was to be established before breeding can proceed.

16. Existing linkage with other centers or research projects:

Dr. Hartzook, Israel, Peanut CRSP (Dr. J. Elkan and Dr. J.C. Wynne, NCSU).

17. Likely future course of development:

In nitrogen fixation the basis for increased yields by successful bacteria will be established. Factors which influence the survival of introduced bacteria will be studied. Improved screening methods will be developed to allow effective breeding technologies to be applied. Other nutrient research is at a preliminary stage and some basic research on the topic will be conducted. We will intensify breeding work on improving BNF fixation by manipulation of the host and the bacteria.

18. Availability of training facility:

All aspects of microbiology, including maintenance of strains, ELISA techniques, etc. Line source techniques for interaction of stress and nutrient effects for Ca and Fe are being refined.

Approval Date: 15-JUL-1985

ICRISAT Research Project Outline

1. **Project Number:** G-116(85)IC

2. **Old Project Number:** G-Phy-Brd-Pat-7(85)

3. **Program:** Groundnut

4. **Discipline(s)/Subprogram(s):** Phy / Brd / Mic

5. Project Title: Breeding for enhanced nitrogen fixation in groundnut - some preliminary investigations

6. Project Locations:

Patancheru

7. Scientific Staff Names:

(a) Discipline/Subprogram Leader Names:

J.H. Williams	(JHW)

(b) Project Scientist Names:

		Scientist-Years
Res.FellowM.Dutta	(MD)	1.00

(c) Cooperating Scientist Names:

P.T.C. Nambiar	(PTCN)
S.L. Dwivedi	(SLD)
M.J.V. Rao	(MJVR)
K.L. Sahrawat	(KLS)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1983

(b) Years Revised:

(c) Year of Completion: 1985

9. Objectives and Scope:

Examining genotypic difference for N2-fixation with respect to physiological attributes like light interception and leaf area index. The effect of source manipulation on N2-fixation and yield and possibility of amendment through N2 addition at two critical stages of plant growth. Combining high yield with better N2-fixation utilising potential lines. To study the nature of gene action and combining ability for N2 fixing traits. Identification of genotypes with high potential for N2-fixation in nitrogen stressed and N2 rich conditions through suitable breeding methods.Studying the compounds of variance due to host,rhizobium and host x rhizobium interaction in field conditions and compare with glasshouse condition.

10. Keywords:

Nitrogen fixation
Genotypic potential
Light interception
Host-rhizobium interaction
Combining ability
Gene action
Groundnut Breeding

11. Technique in brief (Methodology)

Acetylene reduction assay for measuring nitrogen fixation is used for evaluating stable cultivar. For segregating generations indirect method like total N content and/or biomass will be used. Line quantum sensor is used for light interception measurement. Line x test mating design will be followed for assessing combining ability and nature of gene action. Single seed descent method is being followed for advancing segregating generations. ELISA will be used for identifying nodules formed by a particular Rhizobium strain. For growth and physiological parameters standard methods will be followed (Kelt et al. 1971).

12. Source of Funds: Core 100.00

13. Cost Estimates: (Direct) 1985 1986 1987

Operational (recurring)

(a) Labor

(b) Travel

(c) POL

(d) Supplies

TOTAL

Capital (non-recurring

Indirect Costs

14. Land Requirements (ha)

Location

Patancheru

15. Review of past background and present status:

Though genotypic differences have been shown to exist the potential in different agronomic situations is not clear. NCAC 2821 has consistently shown high nitrogen fixing ability in wide rows over the seasons. A few derivative lines from it have given high yields in breeders trials. The effect of nitrogen fixation on this yield improvement is not known. Though NCAC 2821 has been identified as a good general combiner also further studies are required to confirm this and to utilize this cultivar in a systematic breeding program. Breeding efforts in the past in general, were restricted to selection in a uniform low N conditions. The possibility of descending genotypes in early generations having for greater potential in N rich condition was high. Our study explores this, though ultimate result will be known later. Most of the studies reported high host x rhizobium interaction in glasshouse but in field conditions this becomes obscured. It is necessary to understand the relative importance of each component in glasshouse and field.

16. Existing linkage with other centers or research projects:

G-Phy-Brd-7

17. Likely future course of development:

This is a limited duration training project. If further research is initiated a new project will be proposed.

18. Availability of training facility:

This is a training project.

Approval Date: 15-JUL-1985

An das
Bundesministerium fur
Wirtschaftliche Zusammenarbeit
Karl-Marx-Str. 4C
53 Bonn 1
U.K.

55

1. Prof. Dr. F. Lenz etc.
Institut fur Obstbau und Gemusebau der Universitt Bonn
Auf dem Hugel 6
5300 Bonn 1
West Germany

Dr. J.H. Williams etc.
ICRISAT
PATANCHERU - 502 324
Andhra Pradesh
India.

J.B. Nduguru
ICRISAT Sahelian Centre
B.R. 12.404
Niamey - Niger

2. Title of research proposal
The role of morphology in adapting groundnuts to stress environments.

3.1. Short description of research proposal :

The collaborative project between University of Bonn and ICRISAT has concentrated its efforts on factors which influence the success of breeding operations in improving the adaptation of groundnuts to various environments. With the expansion of our efforts to W.Africa a new aspect of adaptation has become important. The traditional groundnut soils are commonly deficient of Calcium but it is possible that this problem may be minimized by very simply determined plant attributes. In high input environments the groundnut type usually grown has a bunch habit. However, thismorphological type requires that the farmer applies calcium as a nutrient to the pod zone, because all the pods are concentrated into a small volume of soil and the soils inability to provide this many pods with Ca may result in yield loss. In soils such as are found in the Sahel of Africa it seems that dispersing the pods by having runner groundnuts seems a likely strategy to achieve the greatest supply od Ca.

However, the two contrasting morphologies also vary in their canopy structure with consequences to drought responses and soil temperatures. These may offset gains bynutrition as benefits of dispersing the pods

The research proposed for funding is intended to :

Monitor the effects of morphology and canopy on thepod environment, in well watered and droughted conditions. By doing this, it is hoped that the breeders may be provided with a clear understanding of the types necessary in various situations of nutrient and water supply.

The experiments would

1. Measure the environmental interactions between pod, canopy environments at ICRISAT Centre (India)

2. Confirm these results at ICRISAT Centre in Niger

3.2 The project has the objective of determining those environments where the runner and bunch types are best adapted.

3.3. a) The University of Bonn.

The Institute fur Obstbau und Gemusebau will identify a predoctoral studen' whose details will be sent to ICRISAT training program as soon as possible. The Institute will provide laboratory facilities for detailed measurements under controlled environments should this be necessary.

b) ICRISAT will provide field and laboratory facilities for research in both India and W.Africa.

4. Budget for the required contribution from the German side :

4.1 Salary costs for one doctoral student for 36 months. He will have status, terms and salary of a research scholar at IARC. This salary will be administired by University of Bonn.

4.2 Nil

4.3 Budget requirements

1 To University of Bonn :

The contract will be placed with University of Bonn who will

a) arrange purchase and shipping for the equipment where they have special experience.

b) provide to ICRISAT funds for other equipment and activities at the centers.

A. **Salaries and administrative costs associated with 3.3**

B. **Air travel :**

1. 1 x Bonn-Hyderabad, India and return for scholar
2. 1 x Bonn-Niamey-Niger, and return for scholar
3. 1 x Bonn-Niamey-Niger, and return for German Supervisor

C.	Environmental recording equipment To ICRISAT	US $ 14.000
	Labour	US $ 2.000
	Chemicals, sundry supplies	US $ 2.000
	Travel within Niger	US $ 3.000
	Computers	US $ 4.000
	15% Administrative overhead	US $ 3.000

ICRISAT Research Project Report

1. **Project Number: G-105(85)IC**

2. **Project Title: Adaptation to specific environments and requirements**

3 **Project Scientists:** **S.L. Dwivedi (SLD)**
M.J.V. Rao (MJVR)
V.M. Ramraj (VMR)

4. **Cooperating Scientists:** **L.J. Reddy (LJR)**
V.R. Rao (VRR)

5. Period covered by this report: January - December 1986 (month/year)

Date of start : 1985 Year revised: 1986

Year of completion: 1990

6. Summary of progress report:

Breeding for specific adaptation:

Early varieties: We modified the "staggered harvesting" approach by reducing the number of harvests to two and increasing the plot size for each harvest. We evaluated 396 breeding lines using the modified approach and retained 126 lines for further evaluation. We analysed the oil content of the SMK obtained in staggered harvests and found that selected early maturing lines had normal oil content even in the 75-day harvest (G-113(85)IC). We identified two new sources of earliness, ICG 147 and ICG 3754, a red and a white seeded line which matured in 90 days at Patancheru in rainy season under high input conditions.

We contributed six early maturing varieties to the AICORPO evaluation program of a special trial on earliness in India. From the previous trial ICGV 86055 (ICGS(E)21) has been retained for further evaluation.

We distributed the International Early Groundnut Varietal Trial to 17 locations in the semi-arid tropics. Results received in 1986 of the similar trials sent in 1985 indicated that selected lines did well in Haiti, the Philippines, Zaire, Sri Lanka, and Thailand.

In the Philippines, ICGV 86077 (ICGS(E)85) produced 1.5 t ha-1 pod yield compared to 0.9 t/ha of the local control. In Haiti, ICGV 86061 (ICGS(E)27) recorded 51% more seed yield and matured seven days earlier compared to the local (1.8 t ha-1.

Medium and late varieties: We made 478 new bulk selections from 305 F2-F9 populations. In addition to 126 advanced breeding lines which were evaluated at ICRISAT Center under low and high input conditions, we tested other 102 lines in multilocation trials conducted at ICRISAT and sub-centers in India. Several lines, in particular, ICGV 86236, ICGV 86294, and ICGV 86347, performed well in these trials.

We contributed six new varieties to the AICORPO evaluation program. Twenty-three other lines are in various stages of testing. These include ICGV 87120 (ICGS 4), ICGV 87122 (ICGS 6), ICGV 87125 (ICGS 26), ICGV 87128 (ICGS 44), ICGV 87129 (ICGS 47), and ICGV 87151 (ICGS 51) in the rainy season and ICGV 87187 (ICGS 37) in the postrainy season National Elite Trials.

ICGV 87119 (ICGS 1), ICGV 87121 (ICGS 5), and ICGV 87123 (ICGS 11), earlier identified for rainy season adaptive trials in the north zone, are still awaiting testing. ICGV 87128 (ICGS 44) is currently being tested in the postrainy season adaptive trials in Gujarat (west zone).

Several ICGS lines have performed better than local controls in Bangladesh, Pakistan, Surinam, Thailand , and Sudan. Four lines, ICGV 87778 (ICGS 34), ICGV 87187 (ICGS 37), ICGV 87777 (ICGS 33), and ICGV 87128 (ICGS 44) in Pakistan produced 3.5 t pods ha-1 as against 2.2 t of local variety Banki. Three lines, ICGV 87122 (ICGS 6), ICGV 87128 (ICGS 44), and ICGV 87141 (ICGS 76) in Bangladesh produced 3 t pods ha-1 as against 2 t of local variety, Dacca-1. ICGV 86234 (ICGS 85) produced 6.8 t pods ha-1 in Egypt.

Confectionery varieties: Seventeen confectionery groundnut varieties are presently under test in the AICORPO Hand Picked Selection Varietal Trial (HPSVT) in India.

We have analysed data of International Trial (ICGVT 85) received from nine countries. Variety ICGV 86573 (ICG(CG)S 25) showed promise against local controls and maintained higher seed mass (> 70 g per 100 seed mass) in Gabon, Burkina Faso, Sudan, Senegal, Cyprus, and USA. Several selections from this trial showed location specific adaptation to yield and seed mass. However, in China, Taiwan, and Zambia, none of these selections could maintain their higher seed mass. Further, we sent another International trial of confectionery lines to 26 countries in 1986. Trial data received from 6 countries have been analysed. Selection ICGV 86564 (ICG(CG)S 49) produced 7 t pods ha-1 and showed superiority for seed mass (100 g/100 seed compared to 84 g of the local). It is currently under multiplication for possible release in Cyprus. It has also done well in Pakistan by outyielding the local by 60%.

We studied inheritance of fruit and seed characters in an 8 x 8 diallel cross F1 progenies. Predominant additive genetic variance was observed for various fruit and seed traits. A breeding line ICGV 86564 (ICG(CG)S 49) was the best general combiner for fruit and seed characters.

Photoperiod effects on adaptation:

Over the past year we have investigated the interaction of photoperiod with foliar diseases and resistances to these. This research has shown that foliar disease progress curves vary on the same genotype in different photoperiods. Chemical analysis of leaves shows that sucrose concentrations are higher in long days (G-115(85)IC Tr) and sucrose has been nominated as the carbon skeleton for the phytoalexins involved in resistance (CO-G-XX(87).

Fundamental studies on the effect of photoperiod on plant physiology have shown that photoperiod effects can be duplicated or reversed by manipulation of growth regulators [G-115(85)IC Tr, (GO-G-9(82)]. These studies have also shown photoperiod modifying root:shoot ratios with the obvious implications to drought responses. This is being investigated at present.

. Work plan for next year:

The project is being proposed for a major revision. In the revised scheme, if approved, the input on breeding for 'no stress' environment will be reduced considerably. Multiple stress factors resistance breeding will be accorded high priority to generate material adapted to different agroecological zones of the groundnut growing countries.

Basic research investigating role of photoperiod on the adaptation of genotypes will concentrate on the following:

1. Further investigation of the role of photoperiod in influencing foliar disease and drought responses.

2. Development of growth regulator measurement capability and measurement of growth regulator levels in different photoperiods.

3. Trials across a wide spectrum of photoperiods to evaluate the role of photoperiod sensitivity in influencing adaptation (dependent on capital equipment).

Revised Proposal, 1987 - For Discussion

ICRISAT Research Project Outline

1. **Project Number: G-105 (85) IC**

2. **Old Project Number: G-Brd-Phy-5 (85)**

3. **Program: Legumes**

4. **Discipline(s)/Subprogram(s): BRD/PHY/PATH/ENT/BM/CL**

5. Project Title: Adaptation to specific environments and requirements

6. Project Locations:

   ICRISAT Center and Sub-centers

7. Scientific Staff Names:

   (a) Discipline/Sub-Program Leader Names:

S.N. Nigam	(SNN)
J.H. Williams	(JHW)
D. McDonald	(DMcD)
J.A. Wightman	(JAW)
R. Jambunathan	(RJ)
S.M. Virmani	(SMV)

   (b) Project Scientist Names: **Scientist-Years**

S.N. Nigam	(SNN)
S.L. Dwivedi	(SLD)
M.J.V. Rao	(MJVR)
L.J. Reddy	(LJR)
D. McDonald	(DMcD)
V.M. Ramraj	(VMR)
P.W. Amin	(PWA)
Farid Waliyar	(FW)
V.K. Mehan	(VKM)
D.V.R. Reddy	(DVRR)
R.C. Nageswara Rao	(RCNR)
R. Jambunathan	(RJ)
S.M. Virmani	(SMV)

   (c) Cooperating Scientist Names

J.P. Moss	(JPM)
A.K. Singh	(AKS)
R.A.E. Mueller	(RAEM)
C.K. Ong	(CKO)
V.R. Rao	(VRR)

(d) Supporting Staff:

Research Associate(s)	1.5
Field Assistant(s)	4.0
Field Attendant(s)	4.0

8. (a) Date of Start (mo/yr): xx/1985

(b) Years Revised: 1986 1987

(c) Date of completion (mo/yr): xx/1997

9. Objectives and Scope: (10 lines maximum)

To breed varieties for specific environments and requirements incorporating resistance to various stress factors operating in different agroecological zones.

10. Keywords: (Maximum 7)

Groundnut
Adaptation
Breeding
Confectionery
Early varieties
Medium and late varieties
Multiple stress factors

11. Technique in brief (Methodology): (15 lines maximum)

1. Identification of "complex of stress factors" operating in different zones utilizing agroclimatic and biotic and abiotic stress factors data base.

2. Established crop breeding techniques using identified sources with desirable characteristics.

3. Screening for resistance to various biotic and abiotic stress factors.

4. Regional and international yield trials for adaptation and stability of performance.

5. Research on photoperiod as a factor influence adaptation.

15. Review of past background and present status: (20 lines max.)

Excellent progress has been made in breeding improved varieties resistant to single factor stresses. Occasionally some of these varieties have been observed to possess resistance to other

stress factors also. In the past emphasis has been on individual problem areas. However, derived lines were monitored for other stresses, whenever source parent had multiple resistance.

It is now strongly felt that concerted breeding efforts should be made to breed varieties which will be adapted to specific environments encompassing resistance to major stress factors operating in different zones, thus leading to the stabilized and increased production.

16. Existing linkage with other centers or research projects: (8 lines maximum)

ISC, ICRISAT SADCC, National Programs

G-101(85)IC, G-102(85)IC, G-103(85)IC, G-104(85)IC, G-109(85)IC,

G-106(85)IC, G-107(85)IC, G-108(85)IC, G-113(85)IC, GR-115(85)IC

17. Likely future course of development: (8 lines maximum)

Regional yield trials with material having desired combination of resistances leading to stabilized and enhanced production.

18. Availability of training facility: (4 lines maximum)

In hybridization, breeding procedures, field experimentation, screening techniques.

Project Scientist Discipline Head Program Director

APPROVED

DATE:

Deputy Director General

ICRISAT Research Project Outline

1. **Project Number:** G-115(85)IC
2. **Old Project Number:** G-Brd-Phy-5(85)
3. **Program:** Groundnut
4. **Discipline(s)/Subprogram(s):** Brd / Phy
5. **Project Title:** Photoperiod effects in groundnut
6. **Project Locations:**

Patancheru W. Germany

7. **Scientific Staff Names:**

(a) Discipline/Subprogram Leader Names:

J.H. Williams (JHW)

(b) Project Scientist Names: Scientist-Years

Training M.L.Flohr (MLF) 1.00

(c) Cooperating Scientist Names:

V.N. Ramraj (VNR)

(d) Supporting Staff:

Research Associate(s)
Field Assistant(s)
Field Attendant(s)

8. (a) Date of Start: 1985

(b) Years Revised:

(c) Year of Completion: 1987

9. Objectives and Scope:

To investigate the physiology of photoperiod effects on the yield of groundnuts and if possible identify most likely methods for screening breeders' lines and GRU accessions to identify their optimal photoperiod.

10. Keywords:

Photoperiod
Translocation
Growth regulators
Adaptation
Yield
Respiration
Groundnut

11. Technique in brief (Methodology):

Photoperiod will be manipulated in the field and glasshouses and the changes in levels of growth regulators, translocation patterns and primary plant functions investigated using suitable growth,chemical and biochemical analysis methods.

12. Source of Funds: Core 70.00 GTZ 30.00

13. Cost Estimates: (Direct) 1985 1986 1987

Operational (recurring)

(a) Labor

(b) Travel

(c) POL

(d) Supplies

TOTAL

Capital (non-recurring

Indirect Costs

14. Land Requirements (ha)

Location

Patancheru

15. Review of past background and present status:

Although groundnuts were originally reported to photoperiod insensitive later work has shown that although morphogenesis does not alter the yield may be greatly modified. Earlier work at ICRISAT has shown that photoperiod has a large role to play in adaptation by influencing the yields achieved. University of Bonn funded by GTZ provides graduate students to work on the problem with the ultimate objective of establishing a bettr understanding of the response and a screening technique. Photoperiod sensitive and insensitive genotypes have been identified.

16. Existing linkage with other centers or research projects:

Prof. F. Lenz, University of Bonn. GN-Phy-Brd-5(85)

17. Likely future course of development:

Fundamental studies of the changes in growth processes and regulation in response to changed photoperiod will be conducted in photoperiod sensitive and insensitive genotypes.

18. Availability of training facility:

Training project.

Approval Date: 15-JUL-1985

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-9(82), Linked with Proj No.G-115(85)IC

Project Title : Photoperiodic studies in groundnuts

Name of the Collaborative Institute(s):

Institute of Fruit & Vegetable Production
Univ. of Bonn, West Germany

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

F. Lenz

(b) ICRISAT

1. J.H. Williams, 2. H. Wiremberger (R.S. 1983-85)
3. M.L. Flohr (R.S. 1984-87)

Duration:

a. Date of Start : 1982
b. Date of completion : 1987

Objectives

To establish (a) practical importance of photoperiod effects (b) screening procedure to identify day neutral types.

Source of funds: 1. GTZ $50,000 for current work.
2. Land and research support - ICRISAT

Progress so far:

This project has demonstrated the major importance of photoperiod as a factor in the adaptation of groundnuts to different regions of the world. A ten-fold change in yield can result from inappropriate photoperiod. Long days promote shoot and root growth.

Form "A"

COLLABORATIVE PROJECT

Project No. : Co-G-2 (78), Linked with Proj. No.8-105(85)IC

Project Title : Fundamental genetic studies for enhancing productivity in groundnut.

Name of the Collaborative Institute(s):

1. ICAR-National Project for Creation of Chairs of Excellence.
2. IARI Regional Station, Rajendranagar, India.

Name of Scientists responsible for the project:

(a) Collaborative Institute(s)

V. Arunachalam

(b) *ICRISAT*

1. R.W. Gibbons, 2. S.N. Nigam, 3. L.J. Reddy, 4. S.L. Dwivedi

Duration:

a. Date of Start : 1978
b. Date of Completion : 1986

Objectives

To develop new breeding strategies and to undertake fundamental genetical studies for the improvement of the groundnut crop.

Source of funds: ICAR - All staff funding costs.

Progress so far:

Several papers have been published.

Arunachalam, V., A. Bandyopadhyay, S.N. Nigam and R.W. Gibbons. 1980. Some basic results of applied value in groundnut breeding. Proceedings of the National Seminar on the Application of Genetics to the Improvement of Groundnut, July 16-17, 1980. Tamil Nadu Agricultural University, Coimbatore, India.

Arunachalam V., G.D. Pungle, M. Dutta, P.T.C. Nambiar and P.J. Dart. 1984. Efficiency of nitrogenase activity and nodule mass in predicting the relative performance of genotypes assessed by a number of characters in groundnut (Arachis hypogaea L.) Experimental Agriculture 20: 303-309.

Remarks:

The project will improve the efficiency of the breeding programs and allow for wider adaptation of ICRISAT lines across seasons and latitudes. One paper has been published and the second one is in preparation.

New Project Proposal, 1987

ICRISAT Research Project Outline

1. Project Number: IG-xxx(87)IC

2. Old Project Number: None

3. Program: Legumes

4. Discipline(s)/Subprogram(s): Brd/

5. Project Title: Computerization of breeding documents

6. Project Locations:

   ICRISAT Center

7. Scientific Staff Names:

   (a) Discipline/Sub-Program Leader Names:

S.N. Nigam	(SNN)

   (b) Project Scientist Names:

		Scientist-Years
S.N. Nigam	(SNN)	0.15

   (c) Cooperating Scientist Names:

J.R. Witcombe	(JRW)
J.H. Williams	(JHW)

   (d) Supporting Staff:

Research Associate(s)	0.75
Field Assistant(s)	-
Field Attendant(s)	-

8. (a) Date of Start (mo/yr): xx/1987
   (b) Years Revised: xx/xxxx
   (c) Date of completion (mo/yr): xx/1990

9. Objectives and Scope: (10 lines maximum)

To computerise groundnut breeding records and consolidate scattered information using :

(a) ICGV Number Database
(b) Hybridization Database
(c) Pedigree Management Database
(d) Seed Despatch Database and other Databases as required

10. Keywords: (Maximum 7)

Groundnut
Breeding
Computerization
Database

11. Technique in brief (Methodology): (15 lines maximum)

1. System 1032
2. GENSTAT
3. dBASE III

14. Land requirements (ha): Nil

15. Review of past background and present status: (20 lines max)

At present available information is scattered in various files. It needs standardization and consolidation for efficient data retrieval and reporting.

16. Existing linkage with other centers or research projects: (8 lines maximum)

G-105(85)IC	G-106(85)IC
G-101(85)IC	G-107(85)IC
G-102(85)IC	G-108(85)IC
G-103(85)IC	G-109(85)IC
G-104(85)IC	G-113(85)IC

17. Likely future course of development: (8 lines maximum)

It will lead to the consolidation of information in various databases and in efficient retrieval of information whenever required.

18. Availability of training facility: (4 lines maximum)

Nil

Project Scientist Discipline Head Program Director

APPROVED

DATE: DEPUTY DIRECTOR GENERAL

New Project Proposal, 1987

ICRISAT Research Project Outline

1. **Project Number:** G-XXX(87)IC

2. **Old Project Number:** None

3. **Program:** Legumes

4. **Discipline(s)/Subprogram(s):** Brd/

5. **Project Title:** International Cooperative activities

6. **Project Locations:**

   ICRISAT Center

7. **Scientific Staff Names:**

   (a) Discipline/Sub-Program Leader Names:

S.N. Nigam	(SNN)

   (b) Project Scientist Names:

		Scientist-Years
S.N. Nigam	(SNN)	-----
L.J. Reddy	(LJR)	-----
S.L. Dwivedi	(SLD)	-----
M.J.V. Rao	(MJVR)	-----

   (c) Cooperating Scientist Names:

D. McDonald	(DMcD)	-----
J.H. Williams	(JHW)	-----
J.A. Wightman	(JAW)	-----
J.P. Moss	(JPM)	-----
D.G. Faris	(DGP)	-----
ICRISAT Regional Program Breeders		-----

   (d) Supporting Staff:

Research Associate(s)	-----
Field Assistant(s)	-----
Field Attendant(s)	-----

8. (a) Date of Start (mo/yr): XX/1987

   (b) Years Revised: XXX

   (c) Date of completion (mo/yr): XX/1997

9. **Objectives and Scope: (10 lines maximum)**

   1. **To organize and coordinate international evaluation of breeding material.**

   2. **To initiate and develope proposals for strengthening national programs.**

10. **Keywords: (Maximum 7)**

   International cooperation
   Breeding
   G x E effects
   National programs

11. Technique in brief (Methodology): (15 lines maximum)

   1. International adaptation trials

   2. Supply of specific genotypes to national evaluation network.

   3. Contract hybridization and supply of segregating populations to national programs.

15. Review of past background and present status: (20 lines max)

Large number of individual genotypes have been supplied to breeders in various countries over the last many years. More recently uniform trials have been sent out comprising sets of genotypes having desirable attributes - confectionery qualities, foliar diseases resistance, pests resistance, and short, medium, and late duration:

Now more and more material is becoming available.

16. Existing linkage with other Centers or research projects: (8 lines maximum)

   AICORPO and other national programs

   ACIAR, Peanut CRSP, ICRISAT Regional Programs/ [illegible]

G-105(85)IC	G-106(85)IC
G-102(85)IC	G-107(85)IC
G-103(85)IC	G-108(85)IC
G-104(85)IC	G-109(85)IC

17. Likely future course of development: (8 lines maximum)

    1. It will lead to better coordination and documentation of information.

    2. It will help accumulate data to study G x E effects which will be used to identify stable and adapted genotypes for the next cycle of crossing.

18. Availability of training facility: (4 lines maximum)

Nil

Project Scientist Discipline Head Program Director

APPROVED

DATE:_____ DEPUTY DIRECTOR GENERAL