PROCEEDINGS OF THE INHOUSE REVIEW

RESOURCE MANAGEMENT PROGRAM

(ICRISAT CENTER AND ISC)

I C R I S A T

International Crops Research Institute for the Semi Arid Tropics

Patancheru 502 324, Andhra Pradesh, India.

JUNE 1986

P R E F A C E

Inhouse Review is an important event for the research programs, as it enables them to benefit from interdiscipline and intradiscipline interactions and to make a critical assessment of the accomplishments and short comings of the research program. It is a joint effort by the scientific community of the Institute to improve the quality of research, establish priorities and relevance, sharply focus the goals and fix the time schedule for their achievements.

The present review is intended to look to the progress made in each of the project and to incorporate in work plans suggestions emerging during discussions.

The proceedings briefly summarise the progress made during the last year, publications, work plans for next year, discussion, discussion highlights, and recommendations.

The detailed discussion reports prepared by the Rapporteurs were reviewed by Dr.M.S.S.Reddy and Dr.M.Singh, concerned Group Leaders and Program Director and myself.

I wish to thank Dr.M.von Oppen and his colleague scientists of the Resource Management Program from ICRISAT and ISC for preparing the project reports, the Participants for contribution to discussion, the rapporteurs for the preparation of discussion reports, Dr.M.S.S. Reddy and Dr.M. Singh for co-ordination, and help in editing, ahd Mr.C.P. Jaiswal of Statistics Unit and Mr.K.Sampth Kumar for typing the final report and making it suitable for computerisation.

J.S. KANWAR
DEPUTY DIRECTOR GENERAL

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3	FS-103(84)IC	Water use--yield relation-ships of chickpea	Continue	10
4	FS-104(84)IC	Characterisation of the moisture environment of SAT.	Improve work plan	11
5	FS-105(83)IC	Long term effects of cropping	Improve work plan	13
6	FS-106(84)IC	Factors affecting crop-weed balance	Terminate	14
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9	FS-109(85)IC	Alternate agriculture land use systems	Club with FS-110	17
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14	FS-114(74)IN	Pest monitoring by light traps	Conclude in 1987	24
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16	FS-116(85)IC	Studies on Heliothis armigera migration using radar	Revise	26
17	FS-117(85)IC	Agroforestry ex-ante analysis and field research	Conclude in 1987	27
18	FS-118(84)IC	Long term experiments to determine potassium and phosphorus fertilization strategies for an Alfisol	Revise	28
19	FS-119(80)IC	Fate and efficiency of nitrogenous fertilizers in the SAT	club with FS-111	29
20	FS-120(82)IC	Turnover of organic matter in SAT soils (GTZ)	Conclude in 1987	30
21	FS-121(82)IC	Nutrient-water-soil-crop interactions in Vertisols and Alfisols.	Conclude in 1987	31

22	FS-122(84)IC	Nutrient accumulation and redistributions (subproject within the interdisciplinary area: Alternative land use management systems)	club with FS-110	32
23	FS-123(84)IC	Characterisation of chemical and biological properties of selected SAT vertisols and Alfisols	Improve work plan	33
24	FS-124(85)IC	Design and development of farm equipment suited to small SAT farmers.	Improve work plan	34
25	FS-125(85)IC	Effect of fertilizer placement on germination, emergence and growth of plants in Vertisol and Alfisol	Conclude	35
26	FS-126(85)IC	Development and testing of low and ultra low volume sprayers and a duster for insecticide application.	Club with FS-124	36
27	FS-127(85)IC	Farm machinery design transfer to small industries for commercial production.	Club with FS-124	37
28	FS-128(85)IN	Multilocation testing of improved bullock drawn implements	Continue	38
29	FS-129(85)IC	Potential for sustained water resource, development and efficient use for supplemental irrigation	Conclude in 1987	39
30	FS-130(85)IC	Evaluation of land management alternative for shallow vertic soils	Continue	40
31	FS-131(85)IC	Hydrologic modelling and simulation alternative approaches to runoff modeling for SAT soils	Conclude in 1987	41

32	FS-132(84)IC	Quantifying inherent site characteristics predicting and controlling soil erosion by water in the SAT	Continue	43
33	FS-133(84)IC	Optimised land management practices for Alfisols	Improve work plan	44
34	FS-134(84)IC	Simulated rainfall studies of alternative methods to reduce	Improve work plan	46
35	FS-135(84)IC	Primary tillage intensity and soil structural modifications of improved productivity	Continue	47
36	FS-136(85)IN	To determine the efficiency of different inter-terrance land treatments and evaluation of improved farm machinery in Vertisols in Akola (Gunj Watershed), Maharashtra State	Modify work plan	48
37	FS-137(85)IN	Evaluation of land management and appropriate cropping systems for Vertisols in Bhopal region - Madhya Pradesh (Phoda farm watershed	Modify work plan	50
38	FS-138(85)IN	On-farm evaluation of improved implements and crop production and plan protection studies in Vertisols of Medak District, Andhra Pradesh (Chevella Watershed)	Modify work plan	51
39	FS-139(85)IC	Cooperative project on a Benchmark Soils Network for Agrotechnology Transfer	Conclude	52
40	FS-140(85)IC	Assessment of atmospheric pollutants at ICRISAT Center, and their implications for crop growth	Continue	53
41	FS-141(86)	Nitrogen management in drylands (Cooperative project with ICRU	Recommended	54

42	FS-142(86)IC	Behaviour of phosphorus in soils	Recommended	55
43	EC-101(82)IC	Economics of prospective technologies	Conclude in 1987	56
44	EC-102(82)IC	Credit markets, credit institutions and differential access to credit in rural SAT India.	Conclude in 1987	58
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46	EC-104(85)IC	Risk perceptions and risk management through new technologies and public sector policies	Conclude in 1987	61
47	EC-105(85)IC	Ex-ante analysis of the impact of new technologies for ICRISAT	Conclude	62
48	EC-106(82)IC	Marketing of groundnuts	Conclude Dec. 1986	63
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54	EC-112(84)IC	Consequences of land fragmentation and prospects for consolidation in SAT India.	Conclude	69

55	EC-113(85)IC	Composite watershed management on Alfisol watersheds	Conclude in 1987	70
56	EC-114(84)IC	Agricultural investment, rural credit facilities and socio-economic mobility	Conclude in 1987	71
57	EC-115(85)IC	Studies of household economics	Conclude in 1987	72
58	EC-116(84)IC	Economic evaluation of technology and policy options through whole-farm household modeling.	Conclude	73
59	Ec-117(85)IC	Assessing facility in farmers fields and evaluating component fertilizer practices in the SAT	Conclude in 1987	74
60	EC-118(85)IC	Economics of agroforestry systems in India's SAT	Merge with FS-117	75
61	EC-119(85)IC	Pest management decision rules	Conclude in 1987	76
62	EC-120(85)IC	Technology assessment system comprising microcomputer, standard application software, and representative farm models for major agroclimatic zones of SAT in India	Conclude in 1987	77
63	EC-121(85)IC	Compendium containing quantitative characterization and interpretation of farming systems in major agroclimatic zones of SAT India	Conclude in 1987	78
64	EC-122(85)IC	Technology needs and environmental and structural characteristics of farms in SAT India: Testing with LP-models the reliability of recommendation domains defined in terms of environmental and structural characteristics of farms.	Club with EC-120	79

III.B. ICRISAT Sahelian Center - Project discussions and Recommendations

Project No.	Project title	Page Nos.
Project Review: Characterisation of Resources:ISC		80-81
EC-1(81)WAP(HV)	Study of resource use patterns, productivity, and factor constraints in current farming systems in three agroclimatic regions of Burkina Faso.	
EC-1(82)WAP(NE)	Studies of farm resource use and productivity in four villages of Western Niger.	
EC2(81)WAP(HV)	Study of commercial exchanges of farming inputs,crops outputs livestock, and labor among farmers in three agroclimatic regions of Burkina Faso.	
EC-3(82)WAP(NE)	Cereal straw use in four villages of western Niger	
EC-4(81)WAP(HV)	Pattern of labor availability and its impact on agriculture.	
EC-5(82)WAP(NE)	Baseline agricultural and economic study of farming in the area of Cinzana Agricultural Research station, Cinzana, Mali	
EC-5(82)WAP(HV)	Patterns of food consumption and assessment of the nutritional status of the community.	
EC-6(81)WAP(HV)	Effects of farmers' capital resources, management and skills on farmer decision-making in crop production.	
EC-6(82)WAP(NE)	Incidence of wild millets (Shibras) in four villages of western Niger.	

EC-7(82)WAP(HV)	Changing farmer-herder relations and their impact on agricultural production.
EC-7(82)WAP(NE)	Studies of returns to different methods of weeding in 16 villages of Nigerian, Voltaic, and Malian semi-arid tropics.
EC-9(81)WAP(HV)	Land tenure and inheritance and its relationship to agricultural production.

Project Review: Characterization of Resources: ISC 82-85

FS-10(83)WAP(ISC)	Water balance study and sandy soils at ISC
FS-11(83)WAP(ISC)	Soil temperature and moisture profiles in association with climatic conditions on a sandy soil (Alfisol) at ISC.
FS-12(83)WAP(ISC)	Spatial variabiity of soil physical and chemical properties
FS-15(84)WAP(ISC)	Effects of cultivation on physical and hydrological characteristics of sandy soils
FS-16(84)WAP(ISC)	Evaluation of factors influencing plant establishment
FS-4(80)WAP(ML)	Soil and classification Cinzana Semi-Arid Zone Research Station
FS-4(82)WAP(ISC)	Critical level of phosphorus and their relationship of soil test value.
FS-5(82)WAP(ISC)	Phosphorous, nitrogen and potassium proportionality constant C and Cl for millet and sorghum.

Project Review: Utilisation of Reosurces Components Res.-ISC 86-88

EC-4(82)WAP(NE)	Is seed availability a constraint to high density planting of cowpeas?

FS-1(82)WAP(NE)	Nitrogen management for food crop production and N balance using 15N.
FS-13(83)WAP(ISC)	Forest rejuvenation in shallow, crusted, barren forest soils
FS-17(84)WAP(ISC)	Cowpea
FS-2(82)WAP(ISC)	Comparative study of phosphorous efficiency from partially acidulated rock phosphate for millet, cowpea intercropping system.
FS-3(82)WAP(ISC)	Use of phosphorous sorption isotherm for evaluating phosphorus requirements of millet, sorghum, cowpea and peanut.
FS-9(83)WAP(ISC)	Effect of sand fighter use on soil physical properties and crop production in the Sahel.

Project Review: Utilisation of Resources, Systems Research:ISC 89-90

FS-1(79)WAP(ML)	Investigations of genotype, density, fertility, soil and other ecological relationships in sorghum/millets and other relevant species.
FS-14(84)WAP(ISC)	Effects of soil management practices on soil and water conservation.
FS-2(79)WAP(ML)	The agronomy of sorghum/millet based intercroping systems.
FS-3(81)WAP(ML)	Farm equipment systems development for improved farmer efficiency
FS-7(84)WAP(ISC)	Research on agropastoral systems in semi-arid zones: Studies on animal productivity.
FS-8(84)WAP(ISC)	Effects of animal traction on cropping practices.

Project Review: Assessment and transfer of technology:ISC 91

EC-2(82)WAP(NE)	Farmers tests of improved technologies

EC-3(80)WAP(HV)	Evaluation of new technologies on farmers' fields under (i) research, (ii) farmer management
EC-8(82)WAP(HV)	Assessment of farmers' experience of field ridges
EC-8(82)WAP(NE)	A statistical model of farmers' planting decisions served by the ICRISAT Sahelian Center
FS-5(80)WAP(ML)	Water resources evaluation
FS-6(82)WAP(ISC)	Agronomic and economic evaluation of different sources of phosphorus

IV. General discussions 92-93

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Session - 3

Session - 5

V. Program Outlook: New Research Areas and Research Plans 94-101

A. Production Agronomy group - S.M. Virmani

B. Engineering group - K.B. Laryea

C. Economics group - T.S. Walker

D. ICRISAT Sahelian Center - C. Renard
M.V.K. Sivakumar

Inhouse Review - Resource Management Program

A g e n d a

Monday, 5 May, 1986

0900-1100	**Session 1: General discussion of issues on organisation, planning and research policies regarding ICRISAT and mandate and mission of the Resource Management Program**	
	Chairman:	J.S. Kanwar
	Rapporteurs:	S.M. Virmani and K.B. Laryea
0900-0915	L.D. Swindale	: ICRISAT's organisation; the role of RMP in India and Africa
0915-0930	J.S. Kanwar	: Importance of research planning and coordination, purpose of 10 Year Plan, objective of research projects and Inhouse Reviews
0930-0950	M. von Oppen	: Program Overview: Resource Management Research at ICRISAT Center
0950-1010	C. Renard	: Program Overview: Resource Management Research at ICRISAT Sahelian Center
1400-1645	**Session 2: Project Review: Characterization of Resources**	
	Chairman	: J.S. Kanwar
	Co-chairman	: F.R. Bidinger
	Rapporteurs	: R.J. Van den Beldt and Piara Singh
1400-1410	N.S. Jodha	: EC-102(85)IC and EC-103(85)IC
1410-1430	T.S. Walker	: EC-104(85)IC, EC-110(85)IC, EC-112(85)IC, EC-115(85)IC.
1430-1435	R.P. Singh	: EC-114(85)IC
1435-1445	RAE Mueller	: EC-121(85)IC, EC-122(86)IC
1445-1515	C. Renard	: EC1(81)WAP(HV), EC1(82) WAP(NE), EC2(81)WAP (HV), EC3(82)WAP (NE), EC4(81)WAP (HV), EC5(81) WAP(NE), EC5(82) WAP (HV), EC6(81) WAP (HV), EC6(82) WAP (NE), EC7(82) WAP (HV), EC7(82) WAP (NE), EC9 (81) WAP(HV).

1530-1545 Discussions

1545-1550 S.M. Virmani : FS-104(85)IC

1550-1600 K.L. Sahrawat : FS-123(84)IC, FS-142(85)IC

1600-1605 J.R. Burford : FS-140(85)IC

1605-1615 C.S. Pawar : FS-114(74)IN, FS-116(85)IC

1615-1625 R.C. Sachan : FS-131(85)IC
Sardar Singh : FS-132(84)IC

1625-1645 Discussions

Tuesday, 6 May, 1986

0830-1000 Session 2 (contd): Characterization of resources

Chairman : J.S. Kanwar

Co-chairman : J.M. Peacock

Rapporteurs : A.S.K. Huda/P. Pathak

0830-0910 MVK Sivakumar : FS-10(83)WAP(ISC), FS-11(83)WAP(ISC), FS-12(83)WAP(ISC), FS-15(84)WAP(ISC), FS-16(84)WAP(ISC), FS-4(80)WAP(ML), FS-4(82)WAP (ISC), FS-5(82)WAP(ISC).

0910-1000 Disussion

1030-1630 Session 3: Project Review: Utilization of Resources, Component Research

Chairman : J.S. Kanwar

Co-chairman : C. Johansen

Rapporteurs : Sardar Singh/R.P. Singh

1030-1115 C. Renard : EC-4(82)WAP) (NE), FS-1(82)WAP (NE), FS-13(83)WAP (ISC), FS-17(84) WAP (ISC), FS-2(82) WAP(ISC), FS-3(82)WAP (ISC), FS-9(83) WAP (ISC).

1115-1200 Discussion

1330-1340 A.K.S. Huda : FS-101(84)IC, FS-102(84)IC
Piara Singh : FS-103(84)IC

1340-1350 C.K. Ong : FS-111(85)IC, FS-112(85)IC

1350-1355 C.W. Hong : FS-119(85)IC

1355-1405	K.L. Sahrawat :	FS-120(82)IC, FS-121(82)IC.
1405-1415	R.K. Bansal :	FS-124(85)IC, FS-125(85)IC, FS-127(85)IC, FS-128(85)IN.
1415-1425	C.S. Pawar :	FS-115(84)IN
	T.Takenaga :	FS-126(85)IC
1425-1430	RAE Mueller :	EC-119(85)IC
1430-1440	M.von Oppen :	EC-106(82)IC, EC-107(85)IC
1440-1500	Discussions	
1515-1525	R.C. Sachan :	FS-129(84)IC
	KL. Srivastava:	FS-130(85)IC
1525-1545	P. Pathak :	FS-133(84)IC, FS-135(84)IC
	Sardar Singh :	FS-134(84)IC
1545-1600	M.R. Rao :	FS-106(84)IC, FS-107(84)IC, FS-108(85)IC
1600-1630	Discussions	

Wednesday, 7 May, 1986

0900-1200	Session 4: Project Review: Utilization of Resources systems research	
	Chairman :	J.S. Kanwar
	Co-chairman :	S.B. King
	Rapporteurs :	K.L. Srivastava/R.C. Sachan
0900-0905	J.R. Burford :	FS-141(85)IN
0905-0915	T.J. Rego :	FS-105(83)IC, FS-118(84)IC
0915-0920	K.A. Dvorak :	EC-117(85)IC
0920-0935	M.R. Rao :	FS-109(85)IC, FS-110(84)IC
	J.R.Burford :	FS-122(84)IC
0935-0950	RJ Van Den Beldt :	FS-117(85)IC, EC-118(85)IC
0950-0955	C.K. Ong :	FS-113(85)IC
0955-1020	M. von Oppen :	EC-111(82)IC, EC-113(85) IC, EC-105(85)IC
1020-1045	Discussion	

1100-1130	C. Renard	:	FS-1(79)WAP(ML), FS-14(84)WAP(ISC), FS-2(79)WAP(ML), FS-3(81)WAP (ML), FS-7(84)WAP (ISC), FS-8(84 WAP(ISC).
1130-1200	Discussions		
1330-1630	Session 5: Project Review: Assessment of Transfer of Technologies		
	Chairman	:	J.S. Kanwar
	Co-chairman	:	M. H. Mengesha
	Rapporteurs	:	K.L. Sahrawat/P. Pathak
1330-1345	RAE Mueller	:	EC-120(85)IC, EC-116(84)IC
1345-1400	T.S. Walker	:	EC-101(82)IC, EC-108(82)IC, EC-109(82)IC
1400-1420	Sardar Singh	:	FS-136(85)IN
	KL Srivastava	:	FS-137(85)IN, FS-138(85)IN
1420-1430	Sardar Singh	:	FS-139(82)IC
1430-1500	Discussion		
1515-1545	C. Renard	:	EC-2(82)WAP(NE), EC-3(80)WAP(HV), EC-8(82)WAP(HV), EC-8(82)WAP(NE), FS-5(80)WAP(ML), FS-6(82)WAP(ISC).
1545-1630	Discussion		

Thursday, 8 May, 1986

0900-1200	Session 6: Program Outlook : New Research Areas and Research Plans		
	Chairman	:	J.S. Kanwar
	Co-chairman	:	Y.L. Nene
	Rapporteurs	:	R.K. Bansal/A.K.S. Huda
0900-0920	S.M. Virmani	:	Agronomy group
0920-0940	K.B. Laryea	:	Engineering group
0940-1000	T.S. Walker	:	Economics group
1000-1030	C. Renard	:	ISC group
	MVK Sivakumar	:	
1040-1200	Discussion and closure of WP Inhouse Review		

Project Review: General discussion of issues on organisation, planning and research policies regarding ICRISAT and mandate and mission of the Resource Management Program.

A) ICRISAT's ORGANISATION: THE ROLE OF RMP IN INDIA AND AFRICA.

Dr.LD.Swindale in his opening remarks mentioned that RMP's goals are improvement of human welfare through increased but sustainable agricultural productivity. It should provide a scientific approach to problem identification and technology development. He gave information on reorganisation of administration of ICRISAT viz., Dy. Director General, Assistant Director Generals and Program Directors. The present program reviews would help program Directors in chalking out multidisciplinary research projects and for administering and better integration of Principal and National scientists.

Dr.Swindale viewed that the present projects are small and discipline oriented and therefore, need to be terminated by the end of 1987 to pave way for large multidisciplinary projects. Weaknesses to be removed and improvements made in technology designs and to reflect on resource management research emphasis. These changes are infact in relation to the CGIAR thinking. For improvement of projects he said that recommendations of External Review Panel and recent workshop on Farming System Research be taken into account. For example, deep Vertisol technology needs to be tried outside India, and Ethiopia may be a place. The International Benchmark sites are important and should be developed. We have very good projects and useful ones with ICAR system.

We have been imparting training to staff from various countries including Thailand we need to establish linkages with all these countries through these trainees for our collaborative research work. Dr.Swindale suggested that each scientist present few projects to be effective and Dr.J.L.Monteith be involved in the discussions for improvement of projects.

B) Importance of Research planning and coordination, objectives of research projects and inhouse review.

Dr.J.S.Kanwar expressed that though term Resource Management adopted now for the program this has been in use in Annual Reports, EPR panel discussions and ten year plan document. There has been a feeling that Farming Systems program is an Indian program and Farming Systems is only vertisol technology of broad bed furrow system wedded to tropicultor. The function of Economics program was questioned. Now that the Farming Systems program and Economics program are integrated. The workshop on Farming Systems Research of February 1986 gave the right thinking as to what is Resource Management. Good comments emerged at this workshop and indicated necessary shifts for the future work on farming systems.

Dr.Kanwar further opined that certain degree of adaptive research is essential and International Institutes need to pace sett and have a

catalytic job while national programs to take more location specific research work. These guidelines were presented at the workshop.

Dr.Kanvar drew the attention on ten year plan of RMP and mentioned that Board members feel that still Farming Systems and Economics program are presented as straight and parallel lines. There is urgent need for integration not only at ICRISAT Centre but also at Sahelian Center. The future projects from RMP should be multidisciplinary and to have clear, well defined objectives.

Dr.Kanvar while mentioning about inhouse reviews said that a project is a sharply defined area of research where a team of scientists work towards the set goal. Team work is essential as individuals cannot excel. Resource Management Program is a conceptual development program which need to be tested by the National Programs for their adoption. He suggested for avoidance of similar work in RMP and crop programs and to formulate projects at the Institutional level from Inhouse Review discussions. He reminded that even though ICRISAT is physically located in India, conceptually it operates all over the SAT region and that our thinking/planning and development of all our programs should reflect the needs of global SAT.

C) Program Overview : Resource Management Research at ICRISAT Center

Dr. M. von Oppen, gave an abbreviated overview of resource management program at ICRISAT Center. He gave the objectives of the RMP, its organisational structure to fulfil its objectives in characterisation, utilisation, and evaluation of resources with their emphasis in Agronomy, Engineering and Economics research groups. He also enlisted the existing research projects under this set up to show imbalances and possible gaps in the research program. On research priorities, Dr. von Oppen indicated that priority identification would include regional priority assessment in India on (a) Vertic soils under low to high rainfall, (b) shallow Alfisols under low rainfall and (c) deep Vertisols under low rainfall and in Africa on sandy Alfisols under low to medium rainfall regimes. He discussed the constraints requiring technological solutions like soil moisture, soil fertility, pests, diseases, genotypes, cultivars, labor, and machinery and those requiring institutional attention e.g., behaviour, welfare and infrastructure, trend in changes of constraints e.g. population growth, decrease in food availability, tilt in ecological balances. He also discussed the probability of success in areas of comparative advantage to ICRISAT vis-a-vis national institutions, personal traits of individual scientists with regard to consolidation and visualization of research approaches, donor support and availability of funds.

Dr.von Oppen presented an outlook on consolidation of existing research findings, visualisation of new systems and team work. Further he discussed the concept of the Task Team and proposed two cases for task teams, one on watershed management at Chevella and another for identification and planning of research on Vertisols in West and East Africa, particularly Sudan and Ethiopia.

D) Comments from an outsider with inside commitment:

Dr.J.L.Monteith mentioned that presently at Nottingham interdisciplinary research is being carried out. He visualised that in any institute in the beginning there would be a large number of small projects but with experience these would be integrated and fewer interdisciplinary projects are drawn. He emphasised that ICRISAT has come to a stage where in interdisciplinery projects need to be formulated.

Discussion:

Sardar Singh : Dr.M.von Oppen in your handout an abbreviated overview on RMP sharp objectives would have been described.

R.A.E.Mueller : The list of objectives presented are the same as of Farming Systems program. However the fourth point is missing.

S.M.Virmani : Suggest that mandate for RMP be drawn from the Institute.

J.S.Kanwar : All these points would be covered in the four broader objectives. Infact IARC's discussed this at length.

N.S.Jodha : Dr. Swindale's suggestion that existing projects should be phased out by 1987 may be difficult to implement due to past investment and the current stage of ongoing research work. Hence we may have to phase them out slowly and introduce interdisciplinary projects as "elite" projects to induce scientists.

J.S.Kanwar : There is the need to have a cut-off point. Most of these projects were started in 1984 and would be 3 years old by 1987. Merger of small existing projects with major interdisciplinary projects can be worked out.

C.Johansen : How best would RMP interact with Crop Improvement Programs in view of several common interests like genotypes, water, fertility?

M.von Oppen: It is hoped that scientists from Crop Improvement Programs would participate in some of the Task Teams which would be multidisciplinary and would have a specific budget allocation. This approach, however, will take some time to develop.

J.S.Kanwar : Let us look at conceptually, the groups can be across program and other areas. In case of pigeonpea, intercropping studies with any other crop, environment, sorghum, millet, groundnut scientists are involved. Fix up responsibility for such interdisciplinary projects.

D.G.Faris : In view of (a) the similarity in agriculture in many of the countries in Asia with semi-arid areas, it is suggested that Asian countries besides India and Africa should receive a mention in the regional priority assessment listing. Dr.Swindale has mentioned about

utilisation of trainees. Myself and Dr.Osvalt are making a survey of trainees and this would be available shortly.

M.von Oppen: Yes, Asia should be included even though it would receive a lover priority to India and Africa.

S.B.King : Suggest that areas in each country be mentioned rather than names of countries.

M.von Oppen : Instead of India, Indian subcontinent is prefered.

S.M.Virmani : Dr.Svindale mentioned that by 1987 ve should be in a position to develop large interdisciplinary projects on Alfisol and Vertisol technology and ve would not work for finished products. Whether focus changing?

J.S.Kanvar : Technology to be developed for high and lov rainfall areas for Alfisols of West Africa, Central America vhere future of sorghum is much greater. Environment to be looked into and analysed, constraints identified and research carried to remove these constraints. We need to work vith National programs for finding broader adoption, and small details to be left for the Nationals programs to work out. Concept building should be able to sell.

C.W.Hong : The mandate of RMP under the objectives appear to be just the pulling together of the mandate statements of Farming Systems Research and the Economics Programs. This has led to some confusion. Can ve not have a set of vell defined objectives vhich are more sharply focussed?

M.von Oppen The objectives as stated provide a good general basis for the Program. Eventually vhen broad project areas have been defined, it may be necessary to sharpen the definition of objective by focussing on specific areas. The mandate should read as stated for the next two years. Some changes may be considered afterwards.

T.S.Walker : We need base data analysis to see hov Farming Systems Research has evolved in the tropics. Nev farming systems development activity vill have limited application and vill ultimately fail.

S.M.Virmani : The nev farming systems development activity may have only limited success because of socio-economic constraints and location specificity of practices. We should therefore emphasize development of methodology for classification of recommendation domains, diagnostic research and design of technological packages for a given recommendation domain. These methodologies could be quite useful for the programs of national institutions e.g. Dryland vatershed projects.

M.S.Jodha : For better adaptation of nev technology availability of inputs is essential.

J.S.Kanvar : We are looking into complexity of problems. In India the ICAR has already offered to transfer the technology through the vatersheds. ICRISAT's participation in fev of these vhatersheds

strengthens collaboration. ICAR is willing to cooperate to work on shallow Alfisols. We must departure from the past and take lessons from the past experience on deep Verstisol. We need to assess the socio-economic constraints of a given technology before we offer for adoption. Any technological change which has not passed a socio-economic analysis will not be accepted by farmers. Suitability of a particular technology to a specific environment needs to be known. The farmers of Zimbabve are prepared to absorb the technology. Identification of sustainable resource technology more time consuming than technology based on seeds. TAC has emphasized the management of resources and deterioration of environment which even though is important is not being researched by many institutions.

In Asia there is scope for multiple cropping and diversification of agriculture. Any system based on cereal/legume and improvement of soil in terms of erosion prevention is very important. We should keep this in view when we are considering our research strategy.

T.S.Walker : Proper involvement of scientists in watersheds is required. Presently these watersheds are looked from the point of views of transfer of technology. What we need is to have collaborative research which will ultimately result in identification of sustainable packages of technology for the watersheds.

J.S.Kanvar: We should consider bottlenecks in our research, that is, factors that inhibit transfer of research in watersheds. With regard to having research stations outside the center, this is not likely to be approved. We should evolve a framework with CRIDA in these watersheds. There should be long term commitment of staff for watershed collaborative research work.

K.B.Laryea: How far will ICRISAT be prepared to commit resources both financial and manpower to work in these watersheds. Can ICRISAT support our working in all nine or even 5 watersheds?

J.S.Kanvar The watershed related work at the ICRISAT Center needs to be deemphasized, this would release some resources which would enable us to support these new watersheds.

K.B.Laryea : Is it being suggested that we leave the ICRISAT Center watershed?

J.S.Kanvar : Yes, more particularly vertisol watersheds.

C.S.Pavar : Technology should be optional for the adoption of individual farmers.

J.S.Kanvar : The technology in relation to farming systems and insect management need a change due to the present short duration dwarf cultivars in pigeonpea and sorghum. Farmers are willing to adopt such technology which gives economic returns.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-101(84)IC

2. Project Title : Studies on crop-weather modeling of pearl millet.

3. Project Scientist(s) : A.K.S.Huda
Piara Singh.
G.Alagarasvamy

4. Period covered by report : January 1984 - January 1986

5. Discussion :

J.L. Monteith : It would be interesting to have your comments on i) allocation of dry matter to root systems and implications for water and nutrient uptake; ii) interaction between temperature and daylength on development in cereals; iii) interaction of growth and development in presence of stress; iv) the effect of soil physical conditions on pegging/podding in groundnut-possibly the main source of variation of harvest index.

J.M. Peacock: The SORGF model was first developed in 1976. At the recent Australian Sorghum Conference the 5th version was discussed. In 10 years a lot of resources were spent on this model. My question is what use have the sorghum scientists at ICRISAT or else where made of this model?

My second point relates to the comments of J.L. Monteith on the lack of information on roots, effects of stress and temperature, daylength interactions. These data are vital; do the physiologists have these data which would help improve these models and make them saleable?

A.K.S. Huda: Dr. N. Seetharama has been using the model for his post-rainy season sorghum project. The other users include Bureau of Economics and Statistics of A.P.; Indian Agricultural Statistics Research Institute, New Delhi; State Planning Board of MP.

The model was used for IIASA (Vienna) in assessing the impact of climate on agriculture, Bonka Research Station, Mogadishu, Somalia; Mount Makulu Research Station, Republic of Zambia. The revised model was sent to the following organisation on their request: CABO and the Econometric Institute of Netherlands; Department of Primary Industries, Queensland, Australia; National Environment of Human Settlement Secretariat, Kenya.

R.A.E. Mueller: Which strategy should we follow in our modeling activities? Are we going to have large models requiring big computers for service job? or should we have small models that can easily work on microcomputers.

A.K.S. Huda: The models we have developed can be used on microcomputer. Texas A & M is using this model on micros.

We plan to study the effect of daylength and temperature on root systems.

S.M. Virmani : The aim of using these models is not to develop new models but to see what factors in different stages of growth affect yield. This may help in transfer of technology.

T.S. Walker: Has there been any study to compare results from crop growth models with simple rainfall model? There is a need for simpler models.

A.K.S. Huda: This has been done but depends upon the availability of information at various locations.

M.V.K. Sivakumar : I agree with Dr. Walker's suggestion of the need to consider developing simple regression models in addition to the dynamic simulation modeling work. This becomes even more necessary in those developing countries where national programs do not have the necessary tools to employ the dynamic simulation models for problem solving. Simple regression models do not need large computing facilities which is currently the case with dynamic models.

Also I suggest that the two cooperating institutes mentioned by you i.e., University of Michigan and Florida State University, who have the expertise in modeling be asked to suggest areas where more experiments are needed to plug the gaps. This may be an effective means of selecting field experiments that are relevant to the ongoing modeling work.

A.K.S. Huda: We have already developed and published simple regression models in predicting sorghum grain yields. For the locations where input data for running the SORGF model are not available, we use these regression models.

J.S.Kanwar : We have been working on this model for the last 10 years. How far has this been helpful to national programs? The goal should be to develop simpler models closer to reality rather than wasting time on developing complex models.

6. Discussion Highlights :

o To have better impact of these models information on roots, effects of stress, temperature and daylength interactions essential.

o The models developed should be usable on microcomputers also.

o Crop growth models be compared with simple rainfall models by collecting rainfall data from many locations.

o Considerable time is spent in developing models. These should be useful to national programs and to the actual farming conditions.

7. Recommendations :

The work plan should be improved in the light of discussion highlights. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT

1. Project Number : FS-102(84)IC

2. Project Title : Studies on crop-weather modeling of groundnut

3. Project Scientist(s) : A.K.S.Huda
R.C.N.Rao

4. Period covered by report : January 1985 - January 1986

5. Discussion :

A.K.S.Huda presented the project progress report. This project was discussed along with FS-101(84)IC. Details on page numbers 6 and 7.

6. Discussion Highlights :

Details please see page 8.

7. Recommendations :

The work plans should be improved in the light of discussion highlights.

ICRISAT

1. Project Number : PS-103(84)IC

2. Project Title : Water use -- yield relationships of chickpea

3. Project Scientist(s) : Piara Singh
K.L.Sahrawat

4. Period covered by report : Noveber 1984 - March 1986

5. Discussion :

Piara Singh presented the project progress report.

6. Discussion Highlights : Nil

Work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-104(84)IC

2. Project Title : Characterisation of the moisture environment of SAT.

3. Project Scientist(s) : S.M.Virmani
M.V.K.Sivakumar
Piara Singh
A.K.S.Huda

4. Period covered by report : September 1984 - February 1986

5. Discussion :

S.M.Virmani presented the project progress report.

N.S.Jodha : Are the data on length of growing season available for more locations or districts?

S.M.Virmani : Yes, we have this information for 220 locations and this will be produced in a 50-page booklet.

Sardar Singh: We are using several terms such as "assured rainfall" and "dependable rainfall" areas. Are there standard definitions of these terms?

S.M.Virmani : Yes. Generally we use the definitions of Hargreaves.

J.L.Monteith : It is becoming increasingly clear that saturation vapor pressure deficit is a climatic variable of major importance in determining the relation between rainfall and dry matter production. For example, in monsoon climates, one-third of the precipitation goes to humidification of the air. Would it be possible to include this in characterizing the moisture environment?

S.M.Virmani : These data are not presently available with us at the center. They are available in ledgers with the India Meteorological Department, and are obtainable only with expenditure of manpower and funds.

C.V. Hong: I wonder whether soil characteristics are taken into account in defining drought? With any given amount of rainfall, the degree of droughtiness varies remarkably between soil types.

S.M.Virmani : We have used the latest soil maps in arriving at droughtiness in conjunction with rainfall.

J.S.Kanwar : Several agencies and institutes have climatic data available with them and have done similar work for several areas. For example, French have done lot of such work in Senegal. We must take account of all the work already done and begin analysis. Let us now concentrate on African countries.

M.V.K.Sivakumar : In my recent meeting with climatologists, it was proposed that a common data base system at a single location such as FAO be established. The data that exist with several institutes/agencies and needs to be compiled.

S.M.Virmani : We have some data from Malawi, Botswana and Ethiopia We still be publishing the analysis shortly. Data from Sudan is fragmented and it has to be copied from the original files.

J.R. Burford : Data on rainfall on monthly basis is not useful. It should be at least weekly to be useful.

6. Discussion Highlights :

o It is desirable to take account of saturation of vapor pressure deficit in characterising moisture environment in relation to rainfall and drymatter production.

o Climatic data for several areas has been collected by various agencies, these be compiled.

o Data on rainfall should be at least on weekly basis to be useful

o There is need for concentration in African countries.

7. Recommendations :

The work plans should be improved in view of the discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-105(83)IC

2. Project Title : Long term effects of cropping systems rotations on crop productivity and soil fertility in the assured rainfall areas.

3. Project Scientist(s) : M.Natarajan
T.J.Rego
K.L.Sahrawat
Sardar Singh

4. Period covered by report : Jan 1985 - April 1986.

5. Discussion :

Dr. T.J. Rego presented the project progress report

J.S.Kanwar : The long-term work presented by Dr. Rego is excellent. National programs could have done this work but they have not done it. Let's not hurry to conclude these projects. The objectives of long-term crop rotation experiments can be achieved only if the moisture and nutrients are monitored adequately.

M.S. Jodha: The VLS data indicate that farmers know the rationale of rotation, but often fail to carry out correct sequences of rotations as it is obstructed by the moisture situation, rainfall timings etc. Secondly, we also found lower use of FYM in intercrop (involving legume as one of the crops) than in sole crops.

M.V.K.Sivakumar : Dr. Rego has shown excellent results from the long term rotation experiments and these will provide quite useful tips to the scientists at ISC who are now starting long term rotation experiments. I encourage him to measure moisture and nutrients more thoroughly.

6. Discussion Highlights :

o In long term crop rotation experiment, adequate monitoring of moisture and nutrients is essential. Monitoring of striga is useful

The data on long term experiments from IC should form as guidelines for the experiments at ISC.

7. Recommendations :

The work plans improved in the light of discussion highlights.

ICRISAT

1. Project Number : PS-106(84)IC

2. Project Title : Factors affecting crop-weed balance

3. Project Scientist(s) : M.R.Rao

4. Period covered by report : June 1985 - March 1986

5. Discussion

M.R.Rao reported that the work was not carried out.

6. Discussion Highlights Nil

7.

The project may be terminated.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-107(84)IC

2. Project Title : Development of integrated weed management practices

3. Project Scientist(s) : M.R.Rao
R.K.Bansal

4. Period covered by report : June 1984 - March 1986

5. Discussion :

M.R.Rao presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

o The results obtained on evaluation of alternate weed management practices in improved cropping systems analysed and presented.

o The experiment on evaluation of mechanical interrow cultivation implements continued.

o Project may be terminated and the work planned may be clubbed with PS-108(85)IC.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-108(85)IC

2. Project Title : Management of perennial weeds

3. Project Scientist(s) : M.R.Rao

4. Period covered by report : June 1984 - February 1986

5. Discussion :

M.R.Rao presented the project progress report.

J.S.Kanwar : Who is to continue the weed science work?

C.K.Ong : Since M.R. Rao is leaving we are trying to appoint someone to continue this work.

J.S.Kanwar : In this project even a post doctoral fellow may be useful.

6. Discussion Highlights : Nil

7. Recommendations :

Post doctoral fellow may be useful to carryout the work planned. Dr. C.K. Ong, Mr. R.K. Bansal and Dr.R.P. Singh may be included as project scientists. Work planned in project PS-107(85)IC may be clubbed with this project and project title suitably modified.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

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

2. Project Title : Alternate agricultural land use systems

3. Project Scientist(s) : M.R.Rao
M.Natarajan
P.Pathak
T.J.Rego
Sardar Singh
K.L.Sahrawat

4. Period covered by report : June 1984 - February 1986

5. Discussion :

M.R.Rao presented the project progress report and proposed for the merger of this project with PS-110(84)IC.

C.K.Ong : We are looking for an indirect method for monitoring soil moisture in agroforestry experiments where plant roots can go 3-4 m deep.

Sardar Singh: I agree with Dr. Ong. The neutron probes are not suitable for agroforestry systems in very shallow soils.

6. Discussion Highlights : Nil

The project is also helpful in monitoring soil moisture from deeper layers.

7. Recommendations :

o The work planned in this project be clubbed with project PS-110(84)IC.

o Dr.C.K. Ong to be included as project scientist to replace M.R.Rao.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-110(84)IC

2. Project Title : Systematic designs for determining plant population spacing responses in systems involving perennial and annual species.

3. Project Scientist(s) : M.R.Rao

4. Period covered by report : June 1984 - February 1986

5. Discussion :

Dr. M.R. Rao presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

o The work planned be continued.

o The project PS-109(85)IC and PS-122(84)IC be clubbed with this project and project title suitably modified as crop tree interactions in agroforestry systems.

o Drs.T.S.Walker and C.K.Ong be included as project scientists, and Drs.T.J.Rego and K.L.Sahravat to continue.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-111(85)IC

2. Project Title : Crop productivity and pattern of rainfall

3. Project Scientist(s) : C.K.Ong
M.Natarajan
P.Singh

4. Period covered by report : June 1985 - March 1986

5. Discussion :

C.K.Ong presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

Work planned in this project be carried out.

Project FS-119(80)IC be clubbed with this project.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-112(85)IC

2. Project Title : Microclimatology of plant communities.

3. Project Scientist(s) : C.K.Ong
M.S.Reddy (on sabbatic leave)
R.J.Van Den Beldt
P.Subramanyam
S.D.Singh
A.K.S.Huda
V.M.Ramraj

4. Period covered by report : June 1985 - March 1986

5. Discussion :

C.K. Ong presented the project progress project.

S.B. King : What lessons have ve learned from this project? How will it improve our practical knovledge? Can ve not obtain all this information by field experiments?

C.K.Ong : In some years there are large differences in disease infestation in intercrops compared to sole crops but it is not clear why these differences occur. Planting cereals close to legumes for reducing disease is a common practice but no information about the effects of variable spacing of cereals and pulses is available.

K. Leuschner: If ve are going to be able to fit cropping systems or crops to different environments then it is essential that ve measure the climate or microclimate. I strongly endorse the need to make these detailed measurements not only in intercrops but also in the sole crop situation.

Sardar Singh: It would be useful also to analyse the macroclimatic data comparing seasons in which 'inter' and sole groundnut had 'no difference' and 'good difference' in foliar diseases.

J.S.Kanvar : Intercropping is a strategy for growing plants under stress conditions and our focus should be to see whether yield can be increased under stress. What is your focus? In Mali just by changing date of planting in groundnut and sorghum intercrop increased yield by 60%.

C.K.Ong : This can be obtained under high moisture but ve are trying to grov under moisture stress and do not irrigate the crop.

J.L.Monteith : In order to generalize the results there is a need for better intercropping model for different environment.

J.S.Kanwar : In Africa yield from intercrop is low because even groundnut being a cash crop do not get priority, when the first rain comes farmers plant cereals.

6. Discussion Highlights :

o Measurement of microclimate is essential both in intercrops and sole crops in different seasons to relate the diseases, insects and yield.

o Intercropping to be researched to get better yields under stress conditions.

o It is desirable to have a intercropping model for different environments.

7. Recommendations :

The work plans may be improved based on discussion highlights.

ICRISAT

1. Project Number : FS-113(85)IC

2. Project Title : Rice based cropping syst

3. Project Scientist(s) : M.S.Reddy
M.Natarajan

4. Period covered by report : June 1985 - April 1986

5. Discussion :

C.K.Ong presented the project progress report.

M.von Oppen : The project is important for ICRISAT's mandate area. Growing rice with well irrigation in Alfisol watersheds during the rainy season could be justified hydrologically, however growing irrigated rice in the post-rainy season is not justifiable neither economically or hydrologically. In the latter case, we need alternatives and this project will help to identify them.

C. Johansen: There is scope for an interprogram project in this area. We are increasingly working to include chickpea and pigeonpea in the rice based cropping systems as part of Asian Grain Legume Project and in collaboration with Lam and Bapatla farms on Andhra Coast.

C.K.Ong : Your comment is an excellent one because we are barely scratching the surface of the problem and we require a group's effort to be more effective.

O.P. Rupela: During my visits to your trials at Rajendranagar and at ICRISAT Center, I felt that pH and salts in these fields could be high. The nodulation was poor at least in case of chickpea inspite of the fact that rhizobia inoculation was done.

C.W. Hong : We should learn from Taiwan on rice based systems.

C.K. Ong : This project should receive contributions from several disciplines. We need efficient implements and soil management practices.

6. Discussion Highlights :

o Data on well irrigation in Alfisol watersheds for postrainy season crops, compared to rice would be very useful.

o Knowledge from Taiwan on rice based cropping systems would be useful.

o Multidisciplinary scientists involvement is essential in this project.

7.

The work plan be improved in the light of discussion highlights

Dr.C.K.Ong to be included as project scientist.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-114(74)IN

2. Project Title : Pest monitoring by light traps

3. Project Scientist(s) : C.S.Pavar

4. Period covered by report : March 1985 - January 1986

5. Discussion :

C.S.Pavar presented the project progress report.

S. Sithanantham: You have stated that there are no correlations between the number of insects found in traps and the number found in crops. Is it worth to continue this project?

J.S.Kanwar : These projects should be closed soon, as the analysis is complete and nothing has come out of it.

R.A.E. Mueller : It is more valuable to do analysis of the data as a time series rather than simple correlations.

6. Discussion Highlights :

o There are no correlations between insects in traps and those on the crops.

o Project needs to be closed soon as useful results are not forthcoming.

o It is desirable to collect data as a time series.

7. tions

The work plans should be revised to generate useful data. The project be concluded in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-115(84)IN

2. Project Title : Impact of improved farming systems on insects pests and their natural enemies and the management of the pest problems

3. Project Scientist(s) : C.S.Pavar

4. Period covered by report : March 1985 - April 1986

5. Discussion :

C.S.Pavar presented the project progress report.

S. Sithanantham : In this project, we need more emphasis on selecting intercrop combinations which are less prone to pest damage. The statement on pod damage in different maturity groups of pigeonpea need further verification, since it is contrary to our long term results.

6. Discussion Highlights :

o Emphasis on selection of intercrops which are less prone to pest damage required.

o Pod damage in different maturity groups of pigeonpea need further verification.

7. Recommendations :

The work plans be improved based on discussion highlights. The project to conclude in 1988.

ICRISAT

1. Project Number : PS-116(85)IC

2. Project Title : Studies on Helicothis armigera migration using radar

3. Project Scientist(s) : J.R.Riley
A.B.S.King
V.

4. Period covered by report : April 1984 - March 1986

5. Discussion

C.S.Pawar presented the project progress report for Dr.A.B.S.King.

6. Di sion Highlights : Nil

7.

The bulk of the project is concluded hence the results vritt up and data published. However, for new experiments proposal e for extension.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-117(85)IC

2. Project Title : Agroforestry ex-ante analysis and field research

3. Project Scientist(s) : R.J.Van Den Beldt
T.S.Walker (ex-ante analysis)
C.K.Ong
P.Remanandan
B.Gilliver (Field Trials)

4. Period covered by report : March 1985 - March 1986

5. Discussion :

R.J.Van Den Beldt presented the project progress report.

S.M.Virmani : We have to consider how far ICRISAT should go in the area of agroforestry. I think ICRISAT should not perform a coordinating role which logically belongs to ICRAF. Also, we should focus only on the SAT environment and should not include arid environments in our studies.

R.J.Van Den Beldt : I agree.

C. Renard : Very little work on Agroforestry has been done in West Africa. Only foresters have worked in this area. ICRISAT should take up more comprehensive research in Agroforestry in West Africa.

J.S.Kanwar : We should consider relevant trees for ISC.

6. Discussion Highlights

o Focus required only on the SAT enviornment and avoid arid environments

o ICRISAT should have comprehensive research in Agroforestry in West Africa.

o Trees relevant to ISC should only be tried.

7. Recommendations :

The work plans improved based on discussion highlights. The project EC-118(85)IC be clubbed with this project. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-118(84)IC

2. Project Title : Long term experiments to determine potassium and phosphorus fertilization strategies for an Alfisol

3. Project Scientist(s) : T.J. Rego
K.L.Sahravat

4. Period covered by report : June 1985 - April 1986

5. Discussion :

T.J.Rego presented the project progress report.

J.S.Kanvar : The long-term work presented by Dr. Rego is excellent. National programs could have done this work but they have not done it. Let's not hurry to conclude these projects.

J.R.Burford : I agree, very much, with Dr. Kanvar's suggestion that we should continue with long term potassium experiment, both because of its uniqueness in the SAT for potassium research and for its associated N fertility information.

But I am doubtful whether continuance of long term phosphorus experiment is justified. There is difficulty in establishing differences between rock phosphate and single superphosphate effects, due to increasing errors, and because of striga.

J.S.Kanvar : Striga should also be monitored.

6. Discussion Highlights :

o Long term experimets on potassium to continue.

o Striga to be monitored in phosphorus experiments.

7. Recommendations :

The work plans suitably modified and new phosphorus project proposal sent.

ICRISAT RESEARCH PROJECT

1. Project : PS-119(80)IC

2. Project Title : Rate and efficiency of nitrogenous fertilisers in the SAT

3. Project Scientist(s) : C.V. Hong
K.P.R. Vittal

4. Period covered by report : May 1982 - February 1986

5. Discussion :

C.V.Hong presented the project progress report.

K.B.Laryea : What are the differences between your project and that of C.K. Ong ?

C.V.Hong : In my project the behaviour of nitrogen application was studied but rainfall was also collected as side information. We emphasized the complexities of water X nitrogen interactions. In Dr. Ong's experiment determination of the effect of the rainfall pattern was the main objective.

J.L.Monteith : Nitrogen expands leaf area. Nitrogen and water effects vary with population and intercrop.

M.V.K.Sivakumar : Dr. Hong has a good data set on time series of nutrient responses. I suggest that these excellent data form the basis of creating a data base to which other nutrient responses over the coming years could be added for further analysis later.

6. Discussion Highlights

o Nitrogen and water effects vary with population and intercrop.

o The time series data on nutrient responses of nitrogen can form a data base for future use.

7. Recommendations :

This projects be clubbed with Project PS-111(85)IC, while taking account of discussion highlights.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-120(82)IC

2. Project Title : Turnover of organic matter in SAT soils (GTZ)

3. Project Scientist(s) : H. Mantler (GTZ)
A. Schutt (GTZ)
K.L. Sahravat (ICRISAT)

4. Period covered by report : January 1985 - December 1985

5. Discussion :

K.L.Sahravat presented the project progress report. This project was discussed along with PS-121(82)IC. Details please see page 31.

6. Discussion Highlights :

Please see Page No. 31

7. Recommendations :

The work plans improved based on discussion highlights. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-121(82)IC

2. Project Title : Nutrient-water-soil-crop interactions in Vertisols and Alfisols

3. Project Scientist(s) : T.J. Rego
K.L.Sahravat
Sardar Singh
C.V.Hong
J.R. Burford

4. Period covered by report : June 1985 - April 1986

5. Discussion :

K.L.Sahravat presented the project progress report.

J.L.Monteith : Recent work on cereals at Nottingham has shown that the primary effect of nitrogen application is to increase leaf growth and longivity rather than photosynthesis rate per unit leaf area. Water stress affects both leaf growth and photosynthesis. Since growth and yield depend strongly on intercepted radiation, it follows that studies of fertilizer/water interactions on isolated plants in the laboratory may be a poor guide to what happens in the field.

J.S. Kanwar : Sahravat should assemble the available information on soil analysis instead of conducting new experiments. The results should be interpreted taking the rainfall into account. Some moisture data may also be available.

J.R. Burford I shall be working on such a data set during my sabbatic.

6. Discussion Highlights

o Studies on fertilizer/water interactions in isolated plants in the laboratory may be a poor guide to what happens in the field in relation to application of nitrogen, water stress and radiation.

o It is desirable to assemble information on soil analysis rather conducting new experiments.

o Results be interpreted taking rainfall data into account.

7.

Improve work plans. The project to conclude in 1987

ICRISAT

1. Project : FS-122(84)IC

2. Project Title : Nutrient accumulation and redistributions (subproject within the interdisciplinary area: Alternative land use management systems)

3. Project Scientist(s) : T.J. Rego
K.L. Sahrawat

4. Period covered by report : June 1984 - April 1986

5. Di ion :

J.R.Burford presented the project progress report.

6. Discussion Highlights :

It was proposed for the merger of this project with FS-110 (84)IC.

7. ti

The project work plan be merged with FS-110(84)IC.

ICRISAT

1. Project : FS-123(84)IC

2. Project Title : Characterisation of chemical and biological properties of selected SAT Vertisols and Alfisols.

3. Project Scientist(s) : K.L. Sahravat

4. Period covered by report : January 1985 - December 1985

5. Discussion :

K.L.Sahravat presented the project progress report.

M.J.Van Den Beldt: Given the apparent adequate levels of total P in these Vertisols and their lack of response to P fertilisers, definitely there is a fixation mechanism. Could you not conclude that fixation is due to the high Ca content of these soils?

K.L. Sahravat : Most of the Vertisols are calcarious. Since montmorillonite is non-fixing, the only other possiblilty is the quality of calcium carbonate, amorphous or crystalline. Amorphous calcium carbonate fixes the most P.

C.Johansen : Users of soil tests, such as breeders and agronomists, would like your recommendation of the appropriate soil phosphorus test for characterizing experimental sites. In view of the poor relation between Olsen P tests and plant response, is any other test recommended, for example, the adsorption isotherm method of Fox?

J.R.Burford : At this stage we cannot really recommend a particular test. More basic studies are needed on phosphorus chemistry, particularly Vertisols, to come up with appropriate tests. In the Indian literature there are no reports on relationships between plant response to P fertilizer and soil P tests.

6. Discussion Highlights :

o More basic studies are needed on phosphorus chemistry to suggest appropriate tests for use by breeders and agronomists.

7. Recommendations :

The work plan to also include reliability of appropriate tests for use of breeders and agronomists.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-124(85)IC

2. Project Title : Design and development of farm equipment suited to small SAT farmers.

3. Project Scientist(s) : R.K.Bansal

4. Period covered by report : March 1984 - April 1986

5. Discussion :

R.K.Bansal presented the project progress report.

J.S.Kanwar : I suggest we combine all machinery projects into one major project. While developing a machine, price and cost of construction should be considered.

R.K.Bansal : We will merge these projects. Besides cost, multipurpose utility and efficiency are also important.

R.A.E.Mueller : ICRISAT machines are quite complex. I suggest that we develop machines which are acceptable to farmers. We should keep in mind the EPR recommendation in the machinery projects.

6. Discussion Highlights :

o It is desirable to combine all machinery projects.

o While developing a machine, price and cost considerations made.

o Multipurpose utility and efficiency are desirable.

o Machines should be acceptable to farmers.

7. Recommendations :

Improve the work plans based on discussion highlights.

Projects FS-126(85)IC and FS-127(85)IC to be merged with this project. It would be reviewed in 1988.

ICRISAT RESEARCH PROJECT

1. Project Number : PS-125(85)IC

2. Project Title : Effect of fertiliser placement on germination, emergence and growth of plants in Vertisol and Alfisol.

3. Project Scientist(s) : R.K.Bansal
C.V.Hong

4. Period covered by report : June 1983 - March 1986

5. Discussion

R.K. Bansal presented the project progress report.

6. Discussion Highlights : Nil

7.

As the project is to be concluded the report prepared and results published.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : FS-126(85)IC

2. **Project Title** : Development and testing of lov and ultra lov volume sprayers and a duster for insecticide application.

3. **Project Scientist(s)** : T. Takenaga
C.S.Pavar
N.K.Avadhval

4. **Period covered by report** : October 1984 - April 1986

5. **Discussion** :

T.Takenaga presented the project progress report.

R.K.Bansal :I am seriously concerned about farmers not using protective clothing. Perhaps equipment sellers should be advised to provide necessary protective clothing along with protection equipment.

6. **Discussion Highlights** :

o Farmers are not using protective clothing.

7. **Recommendations** :

The work planned be merged with Project FS-124(85)IC. At the time of design transfer, need for protective clothing should be stressed.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-127(85)IC

2. Project Title : Farm machinery design transfer to small industries for commercial production

3. Project Scientist(s) : R.K.Bansal

4. Period covered by report : March 1984 - April 1986

5. Discussion :

R.K.Bansal presented the project progress report. This project was discussed along with FS-124(85)IC. Details on page number 34.

6. Discussion Highlights :

o Page number 34.

7. Recommendations :

This project be clubbed with project FS-124(85)IC.

[redacted]

1. Project Number : FS-128(85)EM

2. Project Title : Multilocation testing of improved bullock drawn implements

3. Project Scientist(s) : R.K. Bansal
D.S. Rajput(CIAE)
C.Sriram (CRIDA)
N.C. Shrivastava
(ORP Indore)

4. Period covered by report : March 1985 - April 1986

5. Discussion :

R.K.Bansal presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : FS-129(84)IC

2. **Project Title** : Potential for sustained water resource, development and efficient use for supplemental irrigation

3. **Project Scientist(s)** : R.C. Sachan

4. **Period covered by report** : Jan 1984 - Mar 1986

5. **Discussion** :

R.C.Sachan presented the project progress report.

M. von Oppen : How much supplemental irrigation is available for which crop and where? This needs to be investigated.

6. **Discussion Highlights** :

o Availability of supplemental irrigation for crops needs to be investigated.

7. **Recommendations** :

The work plans need be improved from the point of discussion highlights. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : PS-130(85)IC

2. **Project Title** : Evaluation of land management alternatives for shallow vertic soils

3. **Project Scientist(s)** : K.L. Srivastava
M.R. Rao
Sardar Singh
R.C. Sachan

4. **Period covered by report** : January 1985 - January 1986

5. **Discussion** :

K.L.Srivastava presented the project progress report.

6. **Discussion Highlights** : Nil

7. **Recommendations** :

Work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-131(85)IC

2. Project Title : Hydrologic modelling and simulation alternative approaches to runoff modeling for SAT soils

3. Project Scientist(s) : R.C. Sachan
K.L.Srivastava
P.Pathak

4. Period covered by report : Jan 1984 - March 1986

5. Discussion :

R.C.Sachan presented the project progress report.

L.D. Swindale : Although I think runoff modeling is an interesting project, I believe that empirical testing is not our task. We should entrust to JNKVV or CRIDA or other national agencies to do this.

R.C. Sachan : Agreed.

J.S.Kanwar : You indicated that reservoirs are viable for giving preemergence irrigation to wheat. But there are not many reservoirs in the Phanda area.

R.C. Sachan : Mr. Pandey (Research Scholar) did this work. According to him, tanks are feasible if the seepage rates in black soils are less than 20mm/day. But we observed seepage rates of greater than 20 mm/day.

M.von Oppen : We still appear not to know answers to basic questions like what is the seepage rates in black soils.

S.M. Virmani : The geology at Phanda is different than what we have at ICRISAT. In Peninsular India the substrata is basaltic and seepage rates are low. At Phanda it is granitic and has a higher seepage rate.

H. Singh : Have you considered the use of stochastic models instead of deterministic ones? In 'RUNMOD', I get the impression that some parameters which would reflect location changes are not incorporated.

R.C. Sachan: Logically stochastic modeling will be the next phase of model development. It involves not only parameters due to soil heterogenity but also spatial and temporal variations of weather. 'RUNMOD' needs calibration to estimate those parameters which are lumped. It has to be calibrated at each location.

J.S.Kanwar: You must qualify that this model for basaltic or granitic soils. Mr. Panday's model has many qualifiers which need to be checked before it is used. For how long will this project continue? What is your cooperation with the national program, particularly Dr. Dhruvanarayana? The project should be time framed. It is desirable to study all types of storms. There is need for relating erosion with productivity.

R.C. Sachan: We will need a few more years of data to test the model. We have some difficulty in exchange of data with Dr. Dhruvanaranayana as he feels we should test the model at another location.

6. Discussion Highlights :

o It is desirable that runoff modelling studies are pursued by national programs.

o We need to collect basic data on seepage rates in black soils

o The models on seepage need to be qualified as to the substrata.

o National cooperation should be taken in study of such models

o The project needs to be time framed.

7. Recommendations :

The work plans improved based on discussion highlights. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-132(84)IC

2. Project Title : Quantifying inherent site characteristics predicting and controlling soil erosion by water in the SAT

3. Project Scientist(s) : Sardar Singh
P.Pathak

4. Period covered by report : June 1984 - February 1986.

5. Discussion :

Sardar Singh presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The work planned be continued with emphasis on erosion as it effects soil productivity.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-133(84)IC

2. Project Title : Optimised land management practices for Alfisols

3. Project Scientist(s) : P.Pathak

4. Period covered by report : January 1983 - March 1986

5. Discussion :

P.Pathak presented the project progress report.

J.S.Kanwar: In Alfisols, flat on grade is our recommendation. How does it compare with CRIDA technology? Even on West African sandy soil narrow ridges are better. What are our recommendations? This should be clearly brought out after discussion with CRIDA next week.

P. Pathak: On Alfisols less than 1.5% slope flat on grade is most appropriate. For slopes greater than 1.5% a gated outlet contour bund system is effective. When supplementary irrigation is given, ridges are better. In LID (Limited Irrigation Dryland) also, ridges are required to enable irrigation water to be applied.

N.van Oppen: How much supplemental irrigation is available for which crop and where? This needs to be investigated.

J.S.Kanwar: In Alfisols, broad bed and furrows were found not useful. Narrow ridging is better. Integration of slopes and ridge and furrow system with irrigation will be useful. In Burkina Faso ridging and tied ridging is better.

K.L. Srivastava: Use of 10 t/ha phosphogypsum was harmful on Alfisols. Could you expand on this?

Sardar Singh: We noticed that the nutrient imbalance was caused by the amendment. The exchange equilibrium was responsible for flushing out of Mg and K cations and they were replaced by Ca which disturbed the Mg/Ca and K/Ca ratio.

6. Discussion Highlights :

o Uniform recommendations on land management practices should be brought out for Alfisol in consultation with CRIDA.

o Data on availability of supplemental irrigation to various crops need be investigated

o Integration of slopes and ridges and furrow systems with irrigation will be useful.

7. Recommendations :

Initiate research on shallow Alfisols. Work on medium to deep Alfisols to be concluded by 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-134(84)IC

2. Project Title : Simulated rainfall studies of alternative methods to reduce Alfisols surface sealing/crusting and enhance structural stability

3. Project Scientist(s) : Sardar Singh
N.K.Awadhwal
P.Pathak
K.L.Sahrawat
C.V.Bong

4. Period covered by report : June 1984 - February 1986

5. Discussion :

Sardar Singh presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The project in the present form should be closed. The rainfall simulator shold be used for projects designed to study structural stability, crusting, sealing and related crop establishment problems in the postrainy season.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-135(84)IC

2. Project Title : Primary tillage intensity and soil structural modifications for improved productivity.

3. Project Scientist(s) : P. Pathak
K.L. Srivastava
N.K. Awadhwal
R.C. Sachan
Sardar Singh

4. Period covered by report : Jan 1983 - Mar 1986

5. Discussion :

P.Pathak presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

Work planned be carried out.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-136(85)IN

2. Project Title : To determine the efficiency of different inter-terrance land treatments and evaluation of improved farm machinery in Vertisols in Akola (Gunj Watershed), Maharashtra State

3. Project Scientist(s) : K.L. Srivastava
Sardar Singh
R.K. Bansal

4. Period covered by report : May 1985 - April 1986

5. Discussion :

Sardar Singh presented the project progress report.

T.S.Walker : What are the differences between the projects at Gunj and Kanzara ?

M.van Oppen : Broad beds and furrows has been found to be advantageous for cotton, pigeonpea and maize but a consistent advantage has not been obtained with soybean.

N.S.Jodha :This past year was a poor year, and many experiments failed. The tendency is to throw out the data and wait for a better year. However, farmers always face the risk of a bad year, and these data reflect that risk. Experimental failures give important information also.

J.S.Kanwar : I am concerned that your data shows an empirical relationship between cultivars and yield, even through there is no physiological basis for this. We should strive to learn how a particular management system behaves physiologically.

C.K. Ong : Rainfall probability to be worked out.

N.V.K. Sivakumar : We should list constraints from thes experiments for crop production.

6. Discussion Highlights :

o We should strive to learn how a particular management system behaves physiologically.

o Rainfall probability to be worked out for these watershed areas.

o Listing of constraints from these experiments for crop production desirable.

7. Recommendations :

The work plans be improved based on discussion highlights.

All the projects on watersheds should be formed into an umbrella project with identify for each watershed.

Projects PS-136(85)IC, PS-137(85)IC and PS-138(85)IC be merged into one umbrella project.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : FS-137(85)IN

2. Project Title : Evaluation of land management and appropriate cropping systems for Vertisols in Bhopal region - Madhya Pradesh (Phanda Para watershed)

3. Project Scientist(s) : K.L.Srivastava
D.Sharma

4. Period covered by report : Jan 1985 - Jan 1986

5. Discussion :

K.L.Srivastava presented the project progress report. This project was discussed along with FS-136(85)IC. Details on page number 48.

6. Discussion Highlights :

Page number 49.

7. Recommendations :

o The work plans be improved based on discussion highlights.

o All the projects on watersheds should be formed into an umbrella project with identify for each watershed.

o Projects FS-136(85)IC, FS-137(85)IC and FS-138(85)IC be merged into one umbrella project.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : PS-138(85)IN

2. **Project Title** : On-farm evaluation of improved implements and crop production and plant protection studies in Vertisols of Medak Dist. Andhra Pradesh (Chevella watershed)

3. **Project Scientist(s)** : S.K.Das
C.S.Pavar
P.Pathak
R.K.Bansal
C.Sriram

4. **Period covered by report** : March 1985 -April 1986.

5. **Discussion** :

R.L.Srivastava reported that the work on improved implements at Chevella is presented under PS-128(85)IC.

This project was discussed along with PS-136(85)IC. Details on page number 48.

6. **Discussion Highlights** :

Page number 49.

7. **Recommendations** :

The work plans be improved based on discussion highlights.

All the projects on watersheds should be formed into an umbrella project with identify for each watershed.

Projects PS-136(85)IC, PS-137(85)IC and PS-138(85)IC be merged into one umbrella project.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : PS-139(82)IC

2. Project Title : Cooperative project on a Benchmark soils network for agrotechnology transfer

3. Project Scientist(s) : J.C.Bhattacharjee
R.D.Ghodake
S.T.Gaikwad

4. Period covered by report : April 1982 -April 1986

5. Discussion :

Sardar Singh prsented the project progress report.

S.M.Virmani : Soil and crop factors should be considered. Policy makers cannot decide in isolation.

R.P.Singh : We can correlate the VLS work with the soil classification in this project.

T.S.Walker : Statistical issues should be considered.

N.S. Jodha: Over 70% of the farmes are unable to use these technologies because they lack necessary resources.

6. Discussion Highlights :

o Soil and crop factors should be considered simultaneously.

o VLS data can be correlated with the soil classification

o Statistical issues should be considered.

7. Recommendations :

o The reports written up early and scientific papers published, while taking account of discussion highlights.

ICRISAT RESEARCH PROGRESS REPORT

1. Project Number : PS-140 (85) IC

2. Project Title : Assessment of atmospheric pollutants at ICRISAT Center, and their implications for crop growth.

3. Project Scientists : J.R. Burford
C.K. Ong
J.A. Wightman
K.L. Sahrawat
Piara Singh
J. Colls

4. Period covered by report : December 1985 - April 1986

5. Discussion :

J.R.Burford presented the project progress report.

S.N.Virmani : Why did this project not include pollution of sub-surface water?

J.R. Burford : For three reasons: first, it is expensive and more difficult; second, it is difficult to trace the pollution back to the source; third, there may be political ramifications that go far beyond our fences if an industry is found to be polluting water used by people. Certainly there are guilty parties, notably the tanning works which releases chromate effluent.

M.S. Jodha: Are you also concerned with the extent of pollution caused by regular use of pesticides and other chemicals in our experiments?

J.R. Burford : No, right now we are concerned with the industrial pollution affecting ICRISAT.

C.K.Ong : Our cropping entomology group is examining the interaction between the amount of pesticide used and the number of insects trapped.

6. Discussion Highlights

o Project concerned with the nearby industries pollution affecting ICRISAT

7. tions

The work planned be carried out

ICRISAT RESEARCH

1. Project : PS-141(86) (New project)

2. Project Title : Nitrogen management in drylands (Cooperative Project with ICAR).

3. Project Scientist
   Co-ordination : S.K. Das (CRIDA), J.R. Burford (ICRISAT)

   Co-researchers : - S.K. Das,
   CRIDA - V. Balasubramanian
   - J. Venkateswarlu

   ICRISAT - J.R. Burford
   - K.L. Sahrawat
   - T.J. Rego
   - C.V. Hong
   - M. Natarajan
   - C. Johansen

4. Period covered by report : June 1985 - May 1986

5. Discussion :

J.R.Burford presented the project progress report

6. Discussion Highlights Nil

7. ti

Work planned be continued. The project may be put on the Project Outline proforma for formal approval.

ICRISAT RESEARCH PROJECT PROPOSAL

1. Project Number : PS-142(86)IC (New Project)

2. Project Title : Behaviour of
in soils

3. Project Scientist(s) : R.L.Sahravat
T.J.Rego

4. Date of start : June 1986

5. Discussion :

R.L.Sahravat informed that the project is to be initiated 1986.

6. Discussion Highlights : Nil

7. Recommendations :

The program planned be initiated. The project may be put Project Outline proforma for formal approval.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : BC-101(82)IC

2. Project Title : Economics of prospective

3. Project Scientist(s) : T.S. Walker
K.G.Kshirsagar

4. Period covered by report : September 1984 - May 1985

5. Discussion :

T.S.Walker presented the project progress report.

S.N.Virmani : Why do farmers prefer sole soybean over the soybean/pigeonpea intercrop in Bhopal, even through the intercrop is more remunerative?

N.von Oppen : Farmers want a wheat crop after the first soybean crop. The soybean/pigeonpea intercrop delays wheat planting.

K.L.Sahravat : Also, once soybean and pigeonpea are grown together, farmers do not plant pigeonpea the following year to avoid wilt.

C.S.Pavar : What is the marginal rate of return in relation to cost?

T.S.Walker : Total cost and incremental cost are taken into consideration.

J.S.Kanwar : You have made two significant comments - first, that simpler models are better, and second, that the bored bed and furrow system in Bengumganj is disappearing as is dry farming practices.

T.S.Walker : We need a synthesis of information on dry sowing in the SAT in order to bring out a bulletin.

J.S.Kanwar : Dry sowing cannot be done for all crops. It is good for sorghum but not for others like soybean, which loses its viability at high temperature before it can germinate.

6. Discussion Highlights

o While developing technologies local farming systems should be taken into consideration.

o Technology should also indicate cost benefit ratios.

o Dry sowing cannot be advocated for all crops.

o Information on dryland technology need be collected on dry sowing in SAT for bringing out a bulletin.

o It is desirable to look to the data of CRIDA prior to publication of such a bulletin.

7. Recommendations :

The work planned be continued while taking into account of discussion highlights. Project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS

1. Project Number : BC-102(82)IC

2. Project Title : Credit markets, credit institutions, and differential access to credit in rural SAT India

3. Project Scientist(s) : N.S Jodha
R.D. Ghodake (on sabbatical l

4. Period covered by report : January 1985 - April 1986

5. Discussion :

N.S.Jodha presented the project progress report.

6. Discussion Highlights : Nil

7.

Consultants report be obtained early and relevant information on to bankers, policy makers etc. Proposals for extension of project upto 1987 be sent to DDG for approval.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-103(82)IC

2. Project Title : Role of common property resources in farming systems in SAT India

3. Project Scientist(s) : N.S. Jodha

4. Period covered by report : January 1984 - April 1986

5. Discussion

N.S.Jodha presented the project progress report.

S.M.Virmani : Village CPR lands include cultivable and non-cultivable portions. Decreasing production of CPRs has implications for future demand of wheeled tool carriers and may have contributed to the general decline in bullock population.

J.S.Kanvar : Waste areas are far larger than cultivable areas. What methodology have you adopted to collect and verify data on CPRs?

N.S.Jodha : Most of the data were collected by maintining diaries on specific issues. Village teachers and students were helpful in collection of data.

J.S. Kanvar: What was the procedure adopted for verification?

N.S. Jodha: Land data was verified with the help of village records. Verification of village-level price data was done physically.

J.S.Kanvar : What are the possible solutions to improve CPRs?

N.S.Jodha : Improving commons will mean only that others will invade and use the improved resources at even greater rates. Solution will depend upon the CPR and the nature of the intervention. But management rather than technology appears to be the primary need for developing CPRs.

J.S.Kanvar : In Jodhpur one of the CPR is auctioned to a higher bidder and another is managed by a cooperative, but in both the cases it is unproductive.

N.S.Jodha : There is infiltration in general. Fish ponds might help. Fencing may be another solution. We need to work out economics of each alternative.

6. Discussion Highlights

- Account of cultivable and non-cultivable waste lands is desirable.

- Management rather than technology appears to be the primary need for developing CPRs.

- It is desirable to identify alternative management practices for CPRs, along with economics of each practice.

7. Recommendations

While making use of discussion highlights, analysis of data be soon completed and results published/utilised in relevant projects. Proposals for extension of project upto 1987 be sent to DDG for approval.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-104(85)IC

2. Project Title : Risk perceptions and risk management through new technologies and public sector policies

3. Project Scientist(s) : T.S. Walker/N.S.Jodha

4. Period covered by report : January 1985 - April 1986

5. Discussion :

T.S.Walker presented the project progress report.

K.L. Sahravat : You mentioned about the rainfall insurance. I wonder how you take into account the amount and distribution of rainfall in your analysis.

T.S. Walker : There are two ways: one is through rainfall insurance which is similar to classical crop insurance. If rainfall falls below a certain threshold level similar to insured yield, the farmer who participates in the program receives an indemnity. The other is a rainfall lottery, where farmers are free to bet on rainfall intervals. We think that rainfall insurance could be effective in those areas where covariate sources of risk such as drought is high.

J.S.Kanwar : Could the paper on land consolidation and crop insurance be written up so that recommendations could be made to policy makers?

T.S. Walker : Yes, we will do that.

6. Discussion Highlights :

o Rainfall insurance could be effective in those areas where covariate sources of risk such as drought is high.

o Paper on crop insurance be written up for the use of policy makers.

7. Recommendations :

o For the completed subprojects reports written up for the benefit of the policy makers.

o Subprojects on risk attributes of new technologies be resubmitted as new research project.

o Subproject on understanding farmer's risk perception be sent with suggested work plan for extension of time upto 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : EC-105(85)IC

2. Project Title : Ex ante analysis of the impact of new technologies from ICRISAT

3. Project Scientist(s) : H. von Oppen

4. Period covered by report : 1982-1985

5. Discussion :

H.von Oppen presented the prject progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The project be concluded.

ICRISAT RESEARCH PROJECT PROGRES REPORT

1. Project Number : BC 106(82 I

2. Proje t Title : M rketin f gr undnuts

3. Project Scien ist(s) : N.V. N a aha (P stdoctoral f lov)
M von
P.Parth a thy Rao

4. Period covered by report : June 1 85 March 1986

5. Discussion :

M.von Oppen presented the project ogr s r port.

6. Discussion Highlights :

7. Recommendat'ons :

The project details analysed qu y and nte preted to be of re practical value Pro ect to be onc uded by December 1986.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : EC-107(85)IC

2. **Project Title** : Markets for commercial inputs (seeds, fertilizer, pesticides) as a constraint to adoption

3. **Project Scientist(s)** : M. von Oppen
Hetty Verhagen
P.Parthasarathy Rao

4. **Period covered by report** : June 1985 - December 1985

5. **Discussion** :

M.von Oppen presented the project progress report.

S.M.Virmani : The pesticides are highly subsidised.

M.von Oppen : There is no subsidy on pesticides.

C.S. Pavar : Subsidies on pesticides are quite high particularly for small and marginal farmers.

M.von Oppen : I am not sure about this information.

6. **Discussion Highlights** :

Subsidies are available on pesticides.

7. **Recommendations** :

The project be concluded. The final report prepared and relevant information published.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-108(82)IC

2. Project Title : Late adoption of HYV cultivars and early acceptance of improved technologies.

3. Project Scientist(s) : B.Jansen (Research Scholar)
T.S. Walker
Murari Singh

4. Period covered by report : Sept. 1984-May 1986

5. Discussion :

T.S.Walker presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

Proposals for extension of project upto 1987 be sent to DDG for approval.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-109(82)IC

2. Project Title : Preparation of monograph on the village level studies in India

3. Project Scientist(s) : T.S. Walker
J.G.Ryan
R.P.Singh
M.S.Jodha
H.P.Binswanger

4. Period covered by report : September 1984 - May 1985

5. Discussion :

T.S.Walker presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The project be concluded and results published soon

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : EC-110(82)IC

2. Project Title : Technology, food production, family structure, and population

3. Project Scientist(s) : J.R.Behrman (Consultant)
A.B.Deolalikar (Consultant)
T.S.Walker

4. Period covered by report : June 1985 - March 1986

5. Discussion :

T.S.Walker presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

Project be terminated after discussions with collaborators and results published.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-111(82)IC

2. Project Title : Crop choice and irrigation decision rules for optimizing water harvesting and supplementary irrigation of upland crops

3. Project Scientist(s) : S.Pandey (Research Scholar)
N.von Oppen
T.S.Walker

4. Period covered by report : June 1984 - March 1986

5. Discussion :

N.von Oppen presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

The project may be concluded and results published. New proposals sent for any additional experiments.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project : BC-112(84)IC

2. Project Title : Consequences of land fragmentation and prospects for consolidation in SAT India.

3. Project Scientist(s) : V.Ballabh (Postdoctrol fellow)
T.S. Walker

4. Period covered by report : January 1984 - March 1986

5. Discussion :

T.S.Walker presented the project progress report.

J.S.Kanwar : Could the paper on land consolidation and crop insurance be vritten up so that recommendations could be made to policy makers?

T.S.Walker : Yes, ve will do that.

6. Discussion Highlights

o Paper on land consolidation be vritten for the benefit of policy makers.

The project be concluded. Information published and recommendations passed on to policy makers.

ICRISAT RESEARCH PROGRESS REPORT

1. **Project Number** : BC-113(85)IC

2. **Project Title** : Composite Watershed Management on Alfisol Watersheds.

3. **Project Scientist(s)** : M. von Oppen,
R.A.E. Mueller,
R.N. Athavale,
R.C.Sachan

4. **Period covered by report** : February 1984 - April 1986

5. **Discussion** :

M.von Oppen presented the project progress report.

J.L.Monteith : Cost benefit ratio should also be studied. ODA might help in this direction.

S.M.Virmani : Relationship between water management and crop production to be shown.

K.L.Sahrawat : Cooperation of surface hydrologist required.

J.S.Kanwar : This project be concluded by June 1987.

6. **Discussion Highlights** :

o All the points presented in discussion

7. **Recommendations** :

The work plan to take care of points in discussion. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. Project Number : BC-114(84)IC

2. Project Title : Agricultural investment, rural credit facilities and socioeconomic mobility

3. Project Scientist(s) : R.P. Singh
T.S. Walker
H.P. Binswanger
Mark Rosenzweig

4. Period covered by report : Jan 1985 - April 1986

5. Discussion :

R.P.Singh presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations :

Proposals for extension of project upto end of 1987 be made to DDG for approval.

ICRISAT RESEARCH PROJECT PROGRESS REPORT

1. **Project Number** : EC-115(85)IC

2. **Project Title** : Studies of household economics

3. **Project Scientist(s)** : K.C.Sharma (Research Scholar)
T.S. Walker
A.B. Deolalikar
A.J. Dalal

4. **Period covered by report** : June 1985 - March 1986

5. **Discussion** :

T.S.Walker presented the project progress report.

R.K. Bansal : Your data base is from three villages namely Aurepally, Kanzara and Sholapur. How far can the results of this study be generalized and given to the policy makers at the national level?

T.S. Walker : These simulations, albeit in only 3 villages, have provided five conditions that have to be fulfilled if crop insurance is to be effective in reducing household income variability. When we overlay those conditions on a map of the SAT, we would find that very little area or few households would fall into the intersecting set.

6. **Discussion Highlights** :

o Data base could have been from more villages for deriving useful results.

7. **Recommendations**

Proposals be sent for extending the project period upto 1987 to DDG for approval.

ICRISAT RESEARCH PROJECT

1. Project Number : EC-116(84)IC

2. Project Title : Economic evaluation of technology and policy options through whole-farm household modeling

3. Project Scientist(s) : R.D. Ghodake (on leave)

4. Period covered by report : March 1985 - Oct 1985 (completed)

5. Discussion :

R.A.E.Mueller informed that the project is terminated

6. Discussion Highlights Nil

7. Recommendations

The project be concluded and findings properly utilised in other experiments.

ICRISAT RESEARCH PROJECT PROGRESS

1. Project : RC-117(85)IC

2. Project Title : Assessing fertility in farmers fields and evaluating component fertiliser practices in the SAT

3. Project Scientist(s) : R.A. Dvorak (Rockefeller Postdoctoral fellow)
J.R. Burford
T.S. Walker
M. von Oppen

4. Period covered by report : January 1985 - March 1986

5. Discussion :

K.A.Dvorak presented the project progress report.

C.V.Hong : I wonder whether variety M-35-1 was a correct choice for this study. In rice, we know that traditional varieties do not respond to fertilization.

K.A. Dvorak : Research station results show that M-35-1 does respond to fertilization.

K.L. Sahrawat: Phosphorus is very low in the soils where you worked. You should have mentioned this. This may provide explanation for your observations.

J.S.Kanwar : You mentioned 85 kg N for Rabi Sorghum (M-35-1). That is too high for a Kharif fallow - Rabi sorghum situation. In such cases, the soil already has some mineralized nitrogen.

K.A. Dvorak : This is a recommendation of the Sholapur research station.

6. Discussion Highlights

o The soils of the area under study have low phosphorus, this should be considered.

7.

The work planned be carried out while taking account of the point in discussion highlights. Proposal for extension of time upto 1987 be sent to DDG for approval.

ICRISAT

1. Project Number : EC-118(85)IC

2. Project Title : Economics of agroforestry systems in India's SAT

3. Project Scientist(s) : Post-doc fellow (to be appointed)
T.S. Walker
R.J. van Den Beldt

4. Period covered by report : September 1984 - May 1986

5. Discussion :

R.J.Van Den Beldt presented the project progress report.

6. Discussion Highlights : Nil

7. Recommendations

The work planned be merged with project FS-117(85)IC.

ICRISAT

1. Project Number : EC-119(85)IC

2. Project Title : Pest management decision rules.

3. Project Scientist(s) : R.A.E. Mueller

4. Period covered by report : May 1985 - April 1986

5. Discussion :

R.A.E.Mueller presented the project progress report.

J.S.Ka : The project needs revision to be of more practical value.

6. Discussion Highlights :

Project be revised.

7.

Make the project more practical and generate data which can be communicable to farmers. The project to conclude in 1987.

ICRISAT RESEARCH PROJECT

1. Project : BC-120(85)IC

2. Project Title : Technology as t system comprising microcomputer, standard application software, and representative farm models for major agroclimatic zones of SAT India

3. Project Scientist(s) : R.A.E.Mueller
R.P.Singh

4. Period covered by report : May 1985 - April 1986

5. Discussion :

R.A.E.Mueller presented the project progress report.

M.V.K.Sivakumar. : Are the IBPM Computer requirements for the model simple?

R.A.E.Mueller Yes.

6. Discussion Highlights : Nil

7. tions

The work planned be carried out. The project to conclude in 1987.

ICRISAT

1. Project : BC-121(85)IC

2. Project Title : Compendium containing quantitative characterization and interpretation of farming systems in major agro-climatic zones of SAT India.

3. Project Scientist(s) : R.A.E. Mueller
R.P. Singh

4. Period covered by report : May 1985 - April 1986

5. Discussion :

R.A.E.Mueller presented the project progress report.

J.S.Kanwar : What are the income trends in villages?

R.A.E.Mueller : Real income in all the three villages (Aurepally, Kanzara and Shirapur) has increased over time during 1975 to 1983, due mostly to increased agricultural productivity and vages. The increase is substantial in those villages where modern inputs has been accepted and where the level of income in the base year vas high. It vas less in villages with unstable environments and lov resources bases.

R.K. Bansal : Baseline information available from these villages is important, but I wonder whether ve can start collecting similar data from villages vhere CRIDA vatersheds are located and ve are beginning to collaborate.

R.A.E.Mueller : It would be useful to collect baseline data from the collaborative vork vith CRIDA.

6. Discussion Highlights :

o Real income has increased over time mostly due to increased agricultural productivity and vages.

o It would be useful to collect baseline data from the collaborative vork vith CRIDA

7. ti

The vork planned be carried out. Send proposal for extension of period upto 1987 to DDG for approval.

It is desirable to collect baseline data from the collaborative vork with CRIDA

ICRISAT

1. Project : EC-122(85)IC

2. Project Title : Technology needs and environmental and structural characteristics of farms in SAT India: Testing with LP-models the reliability of recommendation domains defined in terms of environmental and structural characteristics of farms.

3. Project Scientist(s) : R.A.E.Mueller
R.P.Singh

4. Period covered by report : May 1985 - April 1986

5. Discussion

R.A.E.Mueller mentioned that this project will remain dormant as long as EC-120(85)IC and EC-121(85)IC are not completed.

6. Discussion Highlights Nil

7.

This project should form a part of the project EC-120(85)IC.

PROJECT REVIEW: CHARACTERIZATION OF RESOURCES-SAHELIAN CENTRE

BC-1(81)VAP(HV) - Study of resource use patterns, productivity, and factor constraints in current farming systems in three agroclimatic regions of Burkina Faso.

BC-1(82)VAP(NE) - Studies of farm resource use and productivity in four villages of Western Niger.

BC2(81)VAP(HV) - Study of commercial exchanges of farming inputs, crops outputs livestock, and labor among farmers in three agroclimatic regions of Burkina Faso.

BC-3(82)VAP(NE)- Cereal straw use in four villages of western Niger

BC-4(81)VAP(HV)- Pattern of labor availability and its impact on agriculture.

BC-5(82)VAP(NE)- Baseline agricultural and economic study of farming in the area of Cinzana Agricultural Research station, Cinzana, Mali

BC-5(82)VAP(HV)- Patterns of food consumption and assessment of the nutritional status of the community.

BC-6(81)VAP(HV)- Effects of farmers' capital resources, management and skills on farmer decision-making in crop production.

BC-6(82)VAP(NE)- Incidence of wild millets (Shibras) in four villages of western Niger.

BC-7(82)VAP(HV)- Changing farmer-herder relations and their impact on agricultural production.

BC-7(82)VAP(NE)- Studies of returns to different methods of weeding in 16 villages of Nigerian,Voltaic, and Malian semi-arid tropics.

BC-9(81)VAP(HV)- Land tenure and inheritance and its relationship to agricultural production.

Discussion

C. Renard presented the progress on these projects and mentioned that most of the projects are completed and the data is under analysis.

C.V. Hong: Why has groundnut disappeared in the cropping systems in the southern Sahelian Zone?

C. Renard: It is mainly due to drought and disease.

M.V.K. Sivakumar: Average rainfall in this zone is 560 mm. But during the last decade it has been low and undependable. Farmers have lost confidence in growing groundnut in such low rainfall situations when their neighbours are growing millet successfully in low rainfall years.

J.S. Kanwar: If intercropping of covpea with millet gives more production and income, then why has our group at Niamey st: millet as a sole crop?

C.Renard: Covpea is sold locally or even smuggled into Nigeria as hay to feed cattle. The price of millet is going down. Farmers are preferring sole crops of covpea. However, covpea/millet can provide both feed for animal and food for people and is superior in this regard.

J.S. Kanwar: Farmers preference is for long duration and fodder type covpeas. Why our group is emphasising work on short duration covpeas?

C. Renard: We want to work on a dual purpose covpea i.e., which can give both food and feed and we want to operationalize it.

M. Singh: Why have you used per farm basis for reporting crop income instead of per farmer or household or hectare?

C. Renard: By farm we infer a family or a household.

T. Takenega: What minimum tillage tool is used?

C. Renard: A handled dibble--the dhaba-- is used for making plant hills.

J.S. Kanwar: What happened to the economic studies in Western Niger

T.S. Walker: Village studies are almost analysed and cost of cultivation data needs to be analysed.

J.S. Kanwar: Will it be possible to bring together all the information for a layman to follow rather than an economist?

T.S. Walker: Yes it would be possible.

The project work plans be improved taking advantage of the relevant points from discussion. The new/revised project proposals be entered in new project outlines and sent for numbering and approval of Deputy Director General.

FS-10(83)WAP(ISC) - Water balance study and sandy soils at ISC

FS-11(83)WAP(ISC) - Soil temperature and moisture profiles in association with climatic conditions on a sandy soil (Alfisol) at ISC.

FS-12(83)WAP(ISC) - Spatial variability of soil physical and chemical properties

FS-15(84)WAP(ISC) - Effects of cultivation on physical and hydrological characteristics of sandy soils

FS-16(84)WAP(ISC) - Evaluation of factors influencing plant establishment

FS-4(80)WAP(ML) - Soil and classification Cinzana Semi-Arid Zone Research station.

FS-4(82)WAP(ISC) - Critical level of phosphorus and their relationship of soil test value.

FS-5(82)WAP(ISC) - Phosphorous, nitrogen and potassium proportinality constant C and C1 for millet and sorghum.

Discussions

M.V.K. Sivakumar presented the progress of these project and suggested that FS - 10, 11, 12 be closed as R. Chase has moved to USAID in Mali. FS - 15, 16 and FS - 4, 5 should be continued.

L.D. Swindale: The project FS-12 dealing with spatial variability of soil physical and chemical properties should be continued, as other scientists e.g., Klaij has been associated with this project.

J.L.Monteith: How much has been done to relate measurements of high soil temperature to germination and establishment using techniques developed by Dr. Soman?

J.S.Kanwar: Al toxicity was observed in the first year, and second year results were related to micro-nutrients. Joint projects should be developed and standard techniques used from statistical point of view. Dr. Fussell is trying to relate germination and productivity.

K.L. Sahravat: The soils at ISC are very fragile and have very low buffering capacity with CEC values as low as 1 and 2 m.e./ 100 g soil. When we apply ammonium fertilizer to such soils its nitrification can create acidity and may further aggravate acidity and Al toxicity. Liming of such soils unjudiciously may raise the pH very high and may create disorders in Zn and Fe nutrition. It is thus important to see the nutrient balance in terms of deficiency and toxicity in these soils. Perhaps use of organic matter or residues should be a better strategy to lesson imbalance of nutrients in these soils.

C.K. Ong: There is need for putting together projects on plant establishment.

M.V.K. Sivakumar: I agree with this proposal

S.M.Virmani: Why are the yields in 1985, a year of good rainfall, from well managed experiments at ISC still less than 1.2 t/ha ? Shouldn't agroforestry systems get priority? If we accept agroforestry as basic system, then yields of other crop could be reported with reference to the system.

M.V.K.Sivakumar : Average yield in farmers' fields is 400 - 500 kg/ha. Thus by obtaining 1.2 t/ha we increase yield by 250%. Harvest index for the cultivars used is low. CIVT gives TDM of 6 t/ha. They are looking cowpea as fodder. Socio-economic considerations and farmers needs should not be ignored. Agroforestry could have a place.

J.S.Kanwar : Crop yields of millet without irrigation at Patancheru are similar to ISC. A genotype change is required. In relation to a agroforestry, legume/cereals intercrops are common. This may aggravate bird problems and moisture competition. Our first concern it remain food.

C. Renard: We need agroforestry as part of the overall system.

N.S.Jodha : Niger conditions are similar to that of Rajasthan. Possibility of inter-regionally transfer of technology should be examined. Other crops such as mothbean and guar may be suitable.

R.C. Sachan: It was mentioned that tillage in traditional system does not exist. At the same time there are some projects on ploving and ridging. What is the relevance of such projects?

M.V.K.Sivakumar : We get a 40 - 50% increase in yield due to tillage.

C. Renard: National programs are willing to improve their research ability but do not have facilities.

J.S.Kanwar : Regarding our global research thrusts, could there be one joint project on characterization of moisture environment ? Economics project should be small with a clear objective and may be of even one year duration. At Sahelian region characterization of soil resources required, responsibilities assigned.

M.von Oppen : The groups presented were done arbitrarily. We would try to have small projects and also integrated projects both at Patancheru and Sahelian Center. The present projects at ISC are in their early stages.

J.M. Peacock: In intial phase characterization of edaphic factors in Africa is very important. Precise data of the enviornment (soil moisture, temperature) for the screening of material, data on environment should be made available to crop improvement programs at ICRISAT Center, Patancheru.

S.M.Virmani: Characterization is a continuous process. As technology develops, techniques in charaterization get refined.

C.K.Ong : I suggest that an umbrella project on plant establi be formed to cover various projects e.g., FS 11, 12, 16 are concerned primarily with plant establishment.

J.L.Monteith : Temperature and pests are not resources, but restraints. This could be reflected in the title of the program.

N.S. Jodha: Capital and credit should be considered as resources.

J.S.Kanwar : The basic resources are soil, climate (rainfall), and human. We should identify 7 or 8 regions; in each region all scientists should group and characterise the sites. Soil scientists/climatologists/economists unite and work. First we can start from our own research station; Patancheru soils are well characterized. At ISC a detailed soil survey was done. We should select a few representative sites and minimum data sets should be collected for interpretation of results.

M.V.K.Sivakumar : There are 3 zones e.g., Sahelian, Sudanian, and Guinean. Length of growing season was superimposed on the FAO soil map. We identified 12 regions. Information is in bits and pieces; they need to be compiled. J.L. Monteith and others can discuss and prepare reports on what data need to be collected.

T.S. Walker: Characterization needs to be done as quickly as possible and infact benchmark survey takes care of this to a considerable extent.

N.S.Jodha : Totality of the project is related to the nature of work; resource characterization is much wider than site characterization.

J.R. Burford: National programs have soil maps.

C.V. Hong : Minimum data set sometimes become too maximum; in soil survey work sometimes we collect too much data. They are not relevant to agronomic characterisation. Daily rainfall data and soil type is enough for agronomist. Measuring soil moisture by extension workers is difficult. Within the knowledge available we must make some conclusions.

J.S.Kanwar : We at Patancheru should have worked more on Vertic soils which represent larger areas than on Vertisols. Color is not the criteria. We need not commit similar mistakes, thus joint effort should be made from the beginning at ISC. Let's identify areas based on soils/climatic data published by FAO. Identify research centers representing these areas and collect minimum data sets. Farmers' can help identify what data need to be collected for site characterization. Analyse their problems and develop technology to suit these situations.

K.B. Laryea: Correlation needs to be established among different systems used in soil mapping work e.g., French system; FAO classification and USDA classification.

J.S.Kanwar : This has been done by FAO. We have to make best use of the available information?

S.M.Virmani: We have thermic/hygric maps of SAT but do not have soil maps on a unified scale. Some correlation can be made.

J.M. Peacock: What is the role of stability in yield in ISC, SADCC, and East Africa?

T.S. Walker: These issues are complicated. They will be discussed in seminars at the end of the year.

J.S.Kanwar : I suggest M.von Oppen, S.M.Virmani, J.L.Monteith and C. Renard to work together in a committee for characterization of the resources and grouping of projects.

The project work plans be improved taking advantage of the relevant points from discussion. The new/revised project proposals be entered in new project outlines and sent for numbering and approval of Deputy Director General.

PROJECT REVIEW: UTILIZATION OF RESOURCES COMPONENTS RESEARCH-SAHELIAN CENTRE

RS-4(82)WAP(ME) - Is seed availability a constraint to high density planting of cowpea?

PS-1(82)WAP(ME) - Nitrogen management for food crop production and N balance using 15N.

PS-13(83)WAP(ISC) - Forest rejuvenation in shallow, crusted, barren forest soils

PS-17(84)WAP(ISC) - Cowpea

PS-2(82)WAP(ISC) - Comparative study of phosphorous efficiency from partially acidulated rock phosphate for millet, cowpea intercropping system.

PS-3(82)WAP(ISC) - Use of phosphorous sorption isotherm for evaluating phosphorus requirements of millet, sorghum, cowpea and peanut.

PS-9(83)WAP(ISC) - Effect of sand fighter use on soil physical properties and crop production in the Sahel.

Discussion

Dr. C. Renard has presented the project progress report and mentioned that no work has been done on PS-3(82)WAP(ISC).

C.K.Ong : You mentioned there seemed to be no nodules in cowpea. Could it be due to the high soil temperatures?

C. Renard: Yes. This could be and is being looked into.

S.B. King: What is the involvement of the IITA entomology group in the cowpea project at a location other than ISC?

M.V.K.Sivakumar : Dr. B.R. Ntare, a scientist from IITA is involved in screening of the cultivars under low and high level of insecticide spraying pressure at ISC.

C. Johansen: Is there any collaboration with IITA regarding germplasm exchange ?

C. Renard: Yes. There is an exchange of material.

J.S.Kanwar : The total productivity of biomass of local and improved varieties is the same, about 3500 kg/ha.

C.S. Pawar: If insects are a major problem in the production of cowpea, is there any work going on 'Raghuva'. How can ICRISAT Center help in pest management of this crop?

J.L.Monteith : The EPR emphasized to giving more emphasis on microclimatic studies of intercropping. Are these data being collected?

C. Renard: Yes, information is being collected on light interception, soil and air temperatures and it will be extended to measure moisture use efficiency also.

C. Johansen: Can something be done to find methods for characterization of phosphorus? The experience in India shows that results are different on different soils.

J.S.Kanwar : Experiments should be conducted on all parameters at the same site instead of concentrating on one parameter. Data should be consolidated and the results interpreted and correlated with yield, soil and other factors.

C.W.Rees : Soil chemistry should be studied. The thermodynamics of calcium phosphate should be examined before looking at the method and application of phosphorus.

J.S.Kanwar : At ISC nitrogen use efficiency for millet was 21% in comparison to 45% at IC. Why is response of N on millet so low at Niamey and P response good? Were there losses due to leaching or volatilization?

C.W.Rees : In sandy soils when urea is used, losses due to ammonia volatilization can be great. Ammonium sulphate should be used as fertilizer.

J.S.Kanwar : What are the reasons for such large differences and low response to phosphorus compared to nitrogen? Is it possible to add P to compost or Farm yard manure, etc. to reduce losses?

C.W.Rees : Are there possibilities of using organic matter to reduce the losses? Do we have enough organic matter to apply in the soil?

C. Renard: Organic manures are used mostly during the off season for vegetable crops only. For millet no manure is used.

K.B. Laryea: Volatalization losses cannot account for total N loss.

J.S.Kanwar : Deep seepage should also be investigated.

T.J. Bego: Percentage N recovered should be used instead of percentage N uptake in Fig. 12 on P.23 of the yellow book.

J.S.Kanvar : Nitrogen response occurs only when P is not limiting. Physiologists should look at the nitrogen utilisation at both IC and ISC. Regarding FS-9 ridging seems to be better in reducing wind erosion at ISC.

R.J.Van Den Beldt: FS-13 is a collaborative project with Texas A & M. When the present scientist leaves the project, will data continue to be taken on the forest rejuvenation trial?

C. Renard: Yes, we do have collaboration with the national program. I will visit the site during the rainy season to observe the vegetative growth.

J.M. Peacock: What plans are there for examining the soil temperature and moisture utilization with the important crops in the Sahelian zone?

M.V.K.Sivakumar : Next year, the effect of mulching on soil temperature and soil moisture will be studied at ISC.

K.L. Srivastava: Under the USAID programs neem trees are used as shelter belts. What is the scope of wind breaks?

M.V.K.Sivakumar : It would be useful to have the USAID information.

J.S.Kanvar : Millet stalks and phosphorous should be tried as a fertility source. This will not only increase the yield but the requirement of P for next crop will be less.

The project work plans be improved taking advantage of the relevant points from discussion. The new/revised project proposals be entered in new project outlines and sent for numbering and approval of Deputy Director General.

PROJECT REVIEW: UTILISATION OF RESOURCES, SYSTEMS RESEARCH- SAHELIAN CENTRE

PS-1(79)WAP(ML) - Investigations of genotype, density, fertility, soil and other ecological relationships in sorghum/millets and other relevant species.

PS-14(84)WAP(ISC) - Effects of soil management practices on soil and water conservation.

PS-2(79)WAP(ML) - The agronomy of sorghum/millet based intercroping systems.

PS-3(81)WAP(ML) - Farm equipment systems development for improved farmer efficiency

PS-7(84)WAP(ISC) - Research on agropastoral systems in semi-arid zones: Studies on animal productivity.

PS-8(84)WAP(ISC) - Effects of animal traction on cropping practices.

Discussions

C. Renard presented the progress of these projects.

R.K. Bansal: I learned from Dr. Niangado, at his recent visit to ICRISAT, that at Cinzana they have found equipment supplied from here and those developed in Mali very useful. They have started giving demonstrations to farmers. We shall be very much interested to see any report they bring out about it. In Niamey there is a possibility for trying Indian traditional implements as they are inexpensive, being mostly made of wood. Do you think it is worth while doing that?

M.V.K.Sivakumar : I feel that agricultural implements is one area where ICRISAT Center could effectively assist Sahelian Center. The work that Mr. Bansal did in Mali with Mr. Serafini is quite useful. We plan to start using some of these implements at Niamey in the coming cropping season.

N.S. Jodha: I think that the results of studies on animal traction versus hand tools in West Africa should be reconsidered. The effect of animal traction on crop productivity may not be visible in just one or two years. Normally it takes some time to improve the fields which have been cultivated by hand tools for long.

R.A.E. Mueller: Do we have right design criteria for developing implements for West African conditions?

C. Renard: There are several projects on animal traction in West Africa. The use of animals - particularly cattle for traction is spreading very fast in Niger. But we need very light implements adapted to cattle and suitable for sandy soils. Also, we need implements for weeding.

In this connection, experience of India, Ethiopia and North Africa may be quite useful to West Africa.

S.M.Virmani : In our collaborative work with ILCA, we need the expertise of ILCA scientists in the area of animal nutrition and management. I was wondering why they are conducting agronomic experiments such as cropping systems and agropastoral systems.

C. Renard: ILCA scientists are now concentrating only on animal management and nutrition aspects.

The project work plans be improved taking advantage of the relevant points from discussion. The new/revised project proposals be entered in new project outlines and sent for numbering and approval of Deputy Director General.

PROJECT REVIEW: ASSESSMENT AND TRANSFER OF TECHNOLOGY-SAHELIAN

EC-2(82)VAP(NE)- Farmers tests of improved technologies

EC-3(80)VAP(NV)- Evaluation of new technologies on farmers' fields (i) research, (ii) farmer management

EC-8(82)VAP(NV)- Assessment of farmers' experience of tied ridges

EC8(82)VAP(NE)- A statistical model of farmers' planting decisions served by the ICRISAT Sahelian Center

PS5(80)VAP(ML)- Water resources evaluation

PS6(82)VAP(ISC)- Agronomic and economic evaluation of different sources of phosphorus.

Discussion

Dr. C. Renard presented the progress on these projects.

M.H. Mengesha: We know that P fertilizer gives results to crop yield. Why should this work be continued?

C. Renard: Most P in Niger is smuggled from Nigeria. Our trials compare local sources of P, that is, partially acidulated rock phosphate. National programs would like to collaborate in these experiments. Phosphorus is subsidised. It has impact on the farmer and policy of the Government.

J.S. Kanwar: We don't notice much residual effect of P at Niamey, and therefore should apply P to each crop in measured doses for maximum efficiency. Your field trials are very complicated experiments on farmers' fields and have only one replication. Fertilizer doses tried seems to be high and uneconomical.

T.S. Walker: Usually, each farmer field is considered as one replication. This has confounding effects, but this is not unusual for on-farm trials.

The project work plans be improved taking advantage of the relevant points from discussion. The new/revised project proposals be entered in new project outlines and sent for numbering and approval of Deputy Director General.

GENERAL DISCUSSION:

S E S S I O N - 2

1. Larger vs smaller projects.

J.S.Kanvar pointed out that it is better to consolidate small projects, provided it is convenient to do so. There should be accountability of the projects with scientist. Shorter-term projects are preferred, as they can be concluded after two years or so.

2. Characterisation of regions vs. sites.

J.S.Kanvar stated that the main resources to be characterized are soils, climate and human. Therefore all the scientists who study these resources should work together at a few sites. We have good site characterization of ICRISAT Center and reports of national programs are good enough for regional characterization. Such data on site characterization should be made available to other scientists.

S E S S I O N - 3

J.S.Kanvar : Many projects are completed. The results should be known to all to avoid duplication of work. This year should be fully devoted in analysing the data and for integrating projects. Common principles which are emerging should be brought out clearly.

M.von Oppen : In agronomy, component work is fully accomplished and we would like to integrate projects in the engineering unit.

C. Renard: Work in Burkina Faso will be terminated and new projects will be developed.

J.S.Kanvar : We need to conclude work on Alfisols and start work on shallow Alfisols.

M.von Oppen : Suggest that a bulletin on Alfisols be prepared.

J.S.Kanvar : Fulfilled objectives should be dropped and remaining ones brought under one umbrella project. Problems should be properly understood and priorities should be clearly defined. Dr. Hong's work should be summarized and the project closed, as he is leaving the ICRISAT.

S E S S I O N - 5

M. von Oppen: We need to evaluate and assess the types of technology. For this we must agree on a uniform data collection system. Analytical methods should be utilized to interpret the data as a time series. We have to address constraints such as weeds.

M.M. Mengesha: As mentioned by Dr. Swindale and Dr. Monteith, we shoud consolidate results.

R.A.E. Mueller: We should reduce the activity which has low priority.

J.S. Kanwar: Group leaders should have a second review of projects to cut them to a manageable number. Concept building should be oriented to problem solving.

M.M. Mengesha: It would be a good idea to have a consultant for deciding priorities and consolidation.

J.L. Monteith: The scope of research in the RMP is very wide.

R.A.E. Mueller: Should our research be too much demand driven by a particular country?

J.S. Kanwar: National scientists are our clients. They should feel that what we do is relevant to them. Although the ultimate target group is farmers, we can reach them only through national programs. Thus, we must sell only worthwhile technology.

M.M. Mengesha: I suggest a committee should be constituted to form a common descriptor as we have done for germplasm in GRU.

M. von Oppen: Economic analysis of the transfer of technology project will not be worthwhile.

J.S. Kanwar: Reliability of data on research managed plots cannot be compared with farm level collected data.

J.R. Burford: The project did not have the objective to compete with the economics subprogram on data collection. Agricultural use of soil series was derived from data collected from the top 30 farmers. Areas suitable for double cropping were mapped on the basis of assured rainfall, water holding capacity >1m, and trafficability. We had a training exercise for soil survey officers.

M.S. Jodha: Our focus on research at present is better than our commitment at the start of ICRISAT. Focus should be addressed to specific issues.

J.S. Kanwar: What Dr. Jodha says is correct. The objective of this project is to prepare a map for survey data. Reliable data on rainfall probability at the district level should be available. Both soils may be Vertisols but one may have 20mm seepage and the other 200mm.

C.W. Hong: Impact-oriented research is emphasized by international centers but can it be achieved by keeping scientists away from farms? We simply do not have much contact with farmers.

PROGRAM OUTLOOK: NEW RESEARCH AREAS AND RESEARCH PLANS

S.M. Virmani, K.B. Laryea, T.S. Walker and C. Renard presented the consolidated report for the respective groups.

A) AGRONOMY GROUP S. M. Virmani

Agronomy Group deals with resource characterisation, utilisation, and evaluation. It includes the former disciplines of Agroclimatology, Cropping Systems, and Soil Fertility/Chemistry. A consensus report, an outcome of discussion with Drs. J.R. Burford and C.K. Ong is presented here.

Agroclimatology:

o Assessment of agroclimatic data will be continued in cooperation with national programs with emphasis in Southern Africa. Emphasis would be made for collection of uniform data by installation of equipment.

o Modeling work on sorghum has been already completed and it will continue for groundnut and millet.

o Water use of cropping systems to be continued.

Cropping Systems:

o Cropping systems assessed in different agroecological systems. Short and long-term diagnostic experiments are to be continued.

o Intercropping will have less emphasis

o Agroforestry will receive greater emphasis at ICRISAT and the work will be done in cooperation with national programs.

o Weed research will be done with improved cropping systems.

Cropping Systems Entomology:

o Work on light traps will be deemphasized. There will be a review of cropping systems entomology in 1987.

o Research on pests, integrated and biological control is important in the context of RMP.

o Rice based cropping systems will be studied in cooperation with Asian grain legumes project. Soil constraints will be studied in cooperation with IRRI.

Soil Fertility/Chemistry:

o Water received big emphasis earlier; soil nutrients should now get equal emphasis; current research has been mostly on N which will continue but less attention will be given to fertilizer N and more to

the biological component.

o Long term experiments on rotation will continue with less emphasis on Vertisols and more emphasis on Vertic soils and Alfisols.

o Long term experiment on P and K terminated and new work started for residual studies. For collaboration with ISC, similarity of approaches/ methodologies is important.

o C/N turnover work will end within a year or so. At that time we will review and decide how to integrate with long term experiments.

o Benchmark soils work will continue for 2 more years where we have on-farm research. Then it will merge with other interdisciplinary projects.

Areas of future emphasis:

o Low rainfall areas, and shallow black soils will get more emphasis.

o It will link up strongly with ISC. ISC represents low rainfall, sandy soils so technology developed there could be transferred to similar environments in India and vice versa.

o We will transfer resources to other representative locations in India.

o We have cooperation with CRIDA in the following areas:

o Agroclimatology

o Soil Fertility

o Agroforestry

o Cropping Systems Entomology

o Rice based Cropping Systems

There is need for strengthening these areas and would be discussed in the forthcoming meeting with CRIDA.

Discussion :

N.S. Jodha: Dr. Virmani suggested that we will have greater emphasis on poor environment areas (e.g., low rainfall areas); we should be clear about its implications in terms of waiting period, low pay off etc., which may affect the donors' attitude who always search for quick results.

S.M.Virmani: Working in less stable environment is difficult in initial years. For example in the beginning it was thought Vertisols were difficult and challenging.

R.A.E. Mueller: Cooperation within the institute should receive sufficient attention. We should avoid at all cost RMP becoming a sub-center within ICRISAT. For example, crop improvement entomologists should be involved in the review of the cropping systems entomology research program.

C. Johansen: I am concerned about lack of cooperation of RMP with crop improvement programs. For example lack of agroclimatology input for chickpea and pigeonpea which is vital for breeders to understand genotype x environment interactions particularly for pigeonpea. We are trying to identify persons outside the institute to do this. Also, we need cooperative work with soil fertility group.

J.R. Burford: Formal and informal collaboration with crop improvement programs exists.

Y. L. Nene: Because of the importance of insects, an entomologist was appointed in RMP. I suggest that a pathologist should study the diseases in cropping systems research. While reorganising the Improvement Programs, one pathologist could be allowed to work on this.

C.K.Ong : Cooperation was lacking not only between programs but between the former Economics and FSR Programs.

J.S.Kanwar : I see other manifestations of this, notably the lack of interest from other programs in In-house reviews. Also interaction between groups within RMP is not visible.

Our institute has given emphasis on stability and productivity. For credibility we have to work to show improved productivity.

B) ENGINEERING GROUP: K. B. Laryea

Initially seven and later four watersheds have been proposed for collaborative work as the emphasis is now shifting to vertic inceptisols and shallow Alfisols our emphasis would be:

o We shall work actively with other scientists of RMP with broad areas of management of vertic Inceptisols at Chevella on:

- Assessment of inherent characteristics of the watershed (basic data) under variable climates. Hydrology (surface subsoil), runoff, soil loss and soil fertility with the cooperation of Agronomy group.

- Collection of baseline data, evaluation of management alternatives, groundwater for supplementary irrigation (recharge, recycling) with the cooperation of Economics Group.

- Testing of improved machinery by engineering group.

o For shallow Alfisols we shall work at ICRISAT center on land management alternatives. Cropping Systems people could be involved.

o We will quantify erosion parameters and study the effect of erosion on productivity by contour bunding etc. in the watershed.

o Farm equipment development, design transfer and multilocation testing projects FS-124(85)IC, FS-127(85)I and FS-128(85)IN to be merged.

o Surface configuration and tillage studies will be discussed with the Australian group in May.

o Cooperation with ISC -- A position of soil physicist/conservationist is desirable at ISC. Water balance studies in cooperation with M.V.K.Sivakumar will continue.

Discussion :

R.K. Bansal: Development and adoption of Farm Power & Equipment in cooperation with ISC for West African conditions will be taken up.

T. Takenaga: FP&E are going to research the LV, ULV sprayer and Duster Unit on pigeonpea. Also, we have a plan to study application equipment for controlling nematodes.

T. S. Walker: We need a small separate in-house review of FP&E in light of the emerging needs from ISC. A proposal made by Mr. Bansal on networking with national programs of West African countries is good.

K. L. Sahravat: I would like to support the comments of Dr. Laryea that for cooperation with CRIDA on watershed management, there should be a team consisting of physical, biological and social scientists. This activity should not be left only to Engineering group which consists only of physical scientists.

J.S.Kanvar : Vertic Inceptisols, Shallow Alfisols were mentioned by K.B.Laryea--what about other Watersheds e.g., Gunj.

K.B. Laryea: Gunj has vertic Inceptisols but there is a logistic problem. If we have to work for all watersheds we might not make an impact. We should work initially in Chevella (vertic Inceptisols), then Hittemari (Alfisols)

J.S.Kanvar : What about work on irrigation?

K.B. Laryea: We won't do any work on water lifting devices. Some work, however, will continue on supplementary irrigation.

S.M.Virmani : For cooperation with CRIDA we should find out what CRIDA needs. What is expected of us?

K.B. Laryea: We are research organization. The national programs should do extension work.

C) ECONOMICS GROUP: T. S. Walker

o Economics is in a flexible position. 50% of the projects are already terminated; others to be terminated by the end of 1987.

o A project on comparative evaluation of household decision making with ISC/ICRISAT as discussed with Spencer will be started.

o For the rest of the year we want to concentrate on data analysis.

o We will conclude the ex-ante analysis of the economics of agroforestry.

Adoption Research

o Economics of biotic, abiotic stress (what levels of resistance needed, alternative control measures). Concerned crop improvement scientists will be associated to develop production function.

o Behavioral research will be concluded.

o Fertilizer (phosphate) policy and phosphate use in Africa.

o Supportive economic research such as economics of crop rotation, plant protection, tillage etc.

o Inter-disciplinary research e.g., agroforestry, supplemental irrigation, soil erosion. These experiments need to be planned from the beginning in association with economics.

We start with 2 watersheds and will work start as co-workers not as advisers. We will have to post our staff in the watershed; we need an off-center site for FS adaptive research.

o In Chevella we need a firm committment from ICAR; biggest constraint is sorghum cultivar (hybrids rejected).

o Technology Assessment with Peter Matlon's arrival, we will switch over our on-farm activity to diagnostic research.

o We need to follow-up training activities and network with the trainees.

o New FS development:

- Networking in Ethiopia/Sudan on principles/ methodologies.

- Extra-early pigeonpea (cropping systems).

- Not sure about our committment in SADDC and East Africa.

Discussion :

R.K. Bansal: Nov there are some specific requests for type of farm equipments needed for West African situations such as in Sahel. We are proposing to 'networking' with national programs. Involvement of Economist will be important right from beginning.

K.L. Sahravat: One Economics investigator could be posted in Jogipet (Chevella) as CRIDA did.

C.S. Pawar: Entomology work cannot be confined to watersheds only.

M.S. Jodha: EPR and ICAR prevents us going out of station. We are to emphasize watersheds but many things are needed there. We have not done enough so what impact can we make?

L.D. Swindale: Our choice of resource area should be convergent with crop mandate. Agroforestry is becoming very much part of other 5 crops. We need not talk about arid areas. Choose a few areas (based on soil and climate) and concentrate. We must work cooperatively with national programs and not compete with them. Watersheds provide indeed good opportunity. CRIDA has been asked to use these watersheds for demonstration purpose. So we should try to say that we will work in these watersheds as long as we can do research -- i.e., comparing treatments and statistical involvement. We have capacity for good research and cooperation with national programs. Exploit research scholars/ post-doctorals, and senior Research Associates. With these resources, we can do a lot. Models are good research tools; we should continue working on models.

D) **ICRISAT SAHELIAN CENTER:** C. Renard and M.V.K. Sivakumar

o RMP in West Africa is problem oriented and we identify solutions to these problems.

o Most research in Africa is based on rainfall. Three climatic zones are identified. Studies on beginning and ending of rains are carried for determining average length of growing seasons probable rainy days and periods of drought stress.

o Soil-climatic zones of West Africa (Sahelian Zone) are studied. FAO data would also be consulted in zonation.

o Emphasis would be made on data analysis for chemical and physical characterisation of soils.

o Research on phosphate fertilizer use will continue.

o Cereals/Legumes combination to maintain and improve soil fertility will continue. Cereals/forage legumes work would be included.

o Evaluation of crop management factors (population, moisture use) continuing.

o There would be emphasis on Agroforestry

o There is need for emphasis on nutritional values of crop residues of covpea, sorghum, millet etc. including effects on these values after storage.

o Animal traction -- more emphasis on implements not on animal management. Design may not be so much important as the adoption of existing knowledge.

o Aspect of networking is important.

o Operational scale research will be deemphasized.

o Need input from Millet Progras, hovever, they are somevhat involved; Scientists of crop Improvement Program are members of our vorking group, and vill finalize the research projects after discussion in later part of this year.

o Studies on alternate steps of legume vill be continued. Atleast there will be 3 projects (1 in Agroforestry, 2 in Soil Physics).

Discussion :

K.L. Sahravat: As vind erosion is a serious problem in the Sahelian zone, I vas vondering vhether any systematic vork on quantification and control of vind erosion is being taken up. Some of the vork in the Great Plains of the USA may provide a model for your work.

M.V.K.Sivakumar : Vind erosion -- measuring vind speed is done -- hov much soil is carried avay vith vind is most difficult to measure.

M.von Oppen : A team should be formed to formulate a project on Vertisol management in East Africa.

J.S.Kanvar : Lot of importance in cropping systems, Millet/ Covpea is talked about; can ve consider other crops in millet system e.g., guar, castor, mungbean etc.

C. Renard: There is scope, but not in the near future.

J.S.Kanvar : Some of the vork on pigeonpea in Burkina Faso, Mali seems promising -- this needs to be examined.

K.B. Laryea: Methods of cooking and use are different for covpea and pigeonpea. When nev crops are introduced in those countries, cooking and usage aspects need to be studied.

S.B. King: Would you elaborate on the involvement of crop improvement research vith resource management research at ISC?

C. Renard: Soil management is related to crop establishment. Thus scientists of crop Improvement Programs are part of our vorking group.

M.von Oppen : Presented a list of priorities and constraints; soil and crop aspects for India, Africa and Asia.

J.L.Monteith : Briefly highlighted the improper distribution of resource and suggested areas requiring linkages and strengthening.

N. van Oppen: We will have internal discussion for formulation and follow up.

J.S.Kanwar : We discussed 103 projects over 4 days. This discussion was primarily related in understanding what we are doing, where we reached, and where we are going. Let's treat this year as a year of consolidation i.e., analysing existing data, accumulated over years and report. Certain projects need to be concluded and results published even those with negative results. for consolidation of projects, identify which could be grouped and which cannot be grouped. Interaction within RMP groups and crop improvement programs to be continued. This review is the beginning of discussion. Take the help of Statistician right at the time of project planning. I am happy that discussions were held in cordial atmosphere and project scientists are agreeable on a number of suggestions that emerged.