インドネシア農業研究協力
第2回巡回指導調査 及び
エバリュエーション調査
報告書

昭和61年2月

国際協力事業団
同農業開発協力部

（農林）50-96

インドネシア農業研究協力
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I. 序

本計画は，昭和４５年１０月２３日に締結された協定に基づき，インドネシア中央農業研究所における植物病害，及び生理障害に関する研究を共同で実施するものであり，昭和４６年３月，日本専門家チームが渡イし，実働を開始した。

爾来，現在に至る５ケ年の間専門家の派遣，試験研究に必要な資機材の供与及び研修員の受入れ等に対し，日本側から約３億円が投ぜられ，また，インドネシア側からも施設の整備拡充カウンターパートの増員等に相応の投資があって，発足当初古い建物と少数の研究者のみで，"くもの巣城"といわれた中央農業研究所も今では施設はもとより，質的にも東南アジア第１線の水準に達しつつある。

本事業は，プロジェクト方式による農業研究協力の草分けであり，この意図するところは，従来の協力方式における問題，即ち，わが国農業技術の開発途上国に対する移転と当該対象地域の条件との不整合問題を現地条件下での研究及び技術組立てによって解消するところにあった。インドネシア中央農業研究所には同様の意図をもって，オランダ（害虫部門）及びアメリカ（Agronomy）が協力を実施しているが，それぞれの協力方式には若干の内容的差異があり，さながら研究協力の国際競争的様相を呈するとともに方式の異なりによる効果の差が注目されるところであった。

幸い本プロジェクトについては，関係各位の努力によりインドネシア関係当局の高い評価を得るとともに，本方式による協力分野の拡大を要望されるに至っている。

当事業団では，昭和４９年１１月３日から２１日間，農林省植物ウィルス研究所長桜井芳郎氏を団長とする巡回指導調査団を派遣し，過去５カ年間の事業実績を整理分析するとともに本事業の将来方向について予備的検討を行った。さらに，昭和５０年６月８日から１４日間，農業技術研究所生理第１科長平野寿助氏を団長とするエヴァリュエィション調査団を派遣し，前回調査を補完するとともに本年１０月２２日をもって期限が終了する計画の取り扱い等について検討を行った。

本報告書は，両調査を一括してとりまとめたものであり，今後の農業研究プロジェクト運営効率化の資としたいと考えている。

終りに，両調査の実施にあたり，種々ご指導ご協力いただいた農林省，在イ日本大使館，派遣専門家及びインドネシア政府当局者等関係各位に感謝の意を表する次第である。

昭和５０年７月

国際協力事業団
農業開発協力部長

Ⅱ. プロジェクトの実施経過

インドネシア農業は，多大の人口をかかえながらも，不効率な土地利用，地力収奪型生産方式等により，生産性はきわめて低く，また天候変化及び病虫害発生等による生産の不安定性があって，食糧自給に大きな問題があり民生安定にも影響を与えていた。

このため政府は，BIMAS等食糧増産計画を樹て，多収性品種の導入普及，資機材投入等による土地生産性の向上と増産に力を入れたが，その基礎となる生産システム，病虫害対策等技術的問題がネックとなり所期の目的を充分達成することが困難であった。

このような背景のもとに，インドネシア政府は，農業試験研究体制の再編整備による技術水準の向上に目を向け，各国の協力援助を要請した。

これらを受けて協力を実施したのが，本協力であり，わが国の他，オランダ，アメリカ（USAID，フォード財団），IRRI，オーストラリア等もわが国と前後して協力を開始している。

中央農業研究所には，わが国の他オランダ（S43～害虫科及び生態科），アメリカ（S46～作物部）が入り，それぞれ4名，5名の専門家を派遣している。

本協力の実施は1969年9月予備調査，1970年2月実施調査による計画策定を経て，1970年10月23日の協定締結により発効し，昭和46年3月の専門家着任，同年5月供与機材の到着により実際のプロジェクト運営が開始された。

協力の内容は次のとおりである。

① 協力場所

ジャカルタの南約40kmに位置するボーゴル市に設置されている中央農業研究所に専門家チームを配属している。

中央農業研究所は，主に基礎的農業研究を担当する機関であり，研究部門では作物部（栽培科，育種科），病理昆虫部（病理科，昆虫科）及び生理部（生態科，栄養科）の3部6科をもって構成されている。このうち協力対象は，病理昆虫部病理科及び生理部栄養科である。

なお，中央農業研究所には24の試験圃場（地域別）があり，このうち4カ所において，本協力のための現地試験を行っている。

② 研究テーマ

協力は作物保護部門で，協定によりa．主要病害の生態防除，b．主要病害の発生予察及びウィルス媒介昆虫，c．生理障害及び主要病害の生理の3大テーマを設定して行っているが，実際にはチームリーダーと中央農研所長との間で協議のうえこの3テーマを44の小テーマに細分化して実行している。

なお，対象作物は米，大豆，マングビーン，キャッサバ等である。

③ 協力は，②の研究テーマ遂行に必要な資機材の供与，資料，標本，情報等の交換及び関係するインドネシア研究者の日本での教育訓練を内容として行われる。

また，インドネシア国内の農場で発生する病虫害に対する現地調査及びその対策のための助言指

導並びにボゴール農科大学等病虫害に関係する学生へのゼミナー開催等も併せて行っている。

なお，現在までの主な実績は次のとおりである。

① 専門家等派遣

昭和４６年２月にチームリーダーが派遣され，実質発足して以来現在に至るまで協定に基づく専門家及び短期研究顧問として延１８名が派遣された。その内訳は，リーダー１名，植物病理５名（うち１名短期），植物生理３名（うち１名短期），植物ウィルス２名及び機材据付操作指導７名（網室６名，電子顕微鏡１名）である。

また，本協力対象機関であるインドネシア中央農業研究所には，農林省熱帯農業研究センターからも研究者（病理及び作物）が延３名派遣されており，これら研究者は熱研究長と旧OTCA 理事長との覚書交換により，本チームリーダーの傘下において，業務を遂行し，相互の協調を図ることが位置づけられている。

なお，現時点における専門家数は，４名（リーダー，病理，生理，ウィルス）であり，この他に熱帯ベースで作物１名が派遣されている。

② 機材供与実績

昭和４９年度まで累計１５９，７８２千円が供与され，５０年度は６０，０００千円の予算で執行手続中である。

③ カウンターパート研修受入実績

本年９月までに延１５名（病理５，生理８，ウィルス２）を受入れた。受入期間はおおむね６カ月であり，農林省農業技術研究所を主体に植物ウィルス研究所，農事試験場及び地域農試等において研修にあたっている。

表－1　本プロジェクトに関連する事項の流れ

年　月　日	昭　年	内　　容
1817. 5. 18	江	The Botanic Gardens（ボゴール植物園）創立農業研究開始
1905.	明38	稲及び食用作物研究所設立
1912.	大　1	病虫害研究所設立
1918.	7	農業総合研究所設立
1963.	昭38	DEMAS（改良稲作展示運動）開始
1964.	39	オランダ「対インドネシア農業協力協定」調印（実施は'68から）
1965.	40	BIMAS，INMAS計画開始（食糧増産計画）
		高収量品種IR系（5，8）の導入普及始まる
1966.	41	中央農研究所設立（6研究所の統合）
1966.	〃	フィリピン，インドネシア農業関係試験研究事情調査団派遣さる
1967.	42	新BIMAS計画
		※IR系統品種の普及に併う技術的問題（病虫害対策，施肥技術etc）の顕在化→試験研究体制の強化必要
1968. 3～4	44	ネシア政府「The Joint Agriculture Research Survey Team」（農業関係試験研究機関再編成のための調査）を日本他7カ国に派遣
1968. 5	44	第1次経済開発5カ年計画開始（米　4.65%増産）
1968. 9. 16～	44	「インドネシア農業研究協力予備調査団」派遣さる
10. 14		星出団長（技会審理官），篠田（OTCA），松永（農林国協），土屋（熱研）
		※農業総局との間に合意メモ交換
1970. 2. 26～	45	「実施調査団」派遣
3. 25		岩田団長（農研・病理），畑井（農研・昆虫），西沢（九農試・病理）
		木内（農研・栄養生理），篠田（OTCA），田中（技会・病理）
		※細部計画を検討し，3. 24 R/D署名（Sadikin総局長）
1970. 10. 23	45	※ジャカルタに於て「インドネシアとの食用作物共同研究計画の実施協定」（略称）に署名
1971. 3. 2	46	岩田団長他専門家2名ボゴールに着任　プロジェクト開始さる
1971. 5～6	〃	45年度供与機材到着
6	〃	Progress Report No.1（イネ白葉枯病品種抵抗性）
		現地調査及び現地試験（チヘア地区）開始

年　月　日	昭　年	内　　容
1971 8. 25～	46	NRRP(National Rice Research Program)会議
26		外国関係者9名を含む34名参加の下に'72～'73研究テーマ検討
10. 26	〃	熱研より御子柴専門家着任，中央農研病理部においてcornのべと病について研究開始
10～	〃	Muara，Tjihea，Djokjakarta，Ngale，Bondobiliにおいて圃場試験開始
1972. 1～3	47	○病理用網室（4棟11,000千円）建設　4月中旬完成
		○生理部Mr．Lukmanの研修受入れ（農技研　1．15～6カ月）
4～6	〃	○熱研より生理・病理各1名の専門家派遣
		○熱研とOTCAの覚書「OTCAのインドネシア農業研究協力と熱研ベースとの協調について」を交換（5月17日付け）
7. 31～	〃	○インドネシア農業技術協力プロジェクト会議開催（杉本書記官杉山所長）
8. 2		○定期的な開催を要望
7～9	〃	○Dr．Beachell他4名のアメリカ研究協力チームボゴール到着 5カ年間計画で研究協力を行う。これで中央農研には3カ国が入る。 1．日　本：Pathologist 3(1)，Virologist，Physiologist 2(1)，Agronomist 1(1)　計7(3) ※(　)内は熱研派遣で内数 2．オランダ：Entomologist 3，Physiologist 1　計4 3．アメリカ：Rice Breeder，Rice Agronomist，Other major crops Breeder，Other major crops Agro.，Statistician－Economist，各1　計5
		○研修員4名受入れ　（病理1，生理3）
10～12	〃	○中央農研所長　新優良品種育成を最優先課題としてとりあげる。
1973. 1～3	48	○1／25～29　於ボゴール　プロジェクトリーダー会議開催（第2回）
		○1／31～2／16　巡回指導調査団派遣 明日山団長（前ウィルス研所長），桜井（北海道農試・昆虫），木内（農研作物栄養），高沢（技会），粕谷（OTCA）
		○専門家交替　西沢→梶原（3／20　着任） 矢沢→三宅（5／18　〃　） 里見→岩木（4／29　〃　）
		○'72より南スラウェシ北部ランラン地方にTungro virusが大発生 1／8　中央農研で対策会議，3／中　岩田視察

年　月　日	昭　年	内　　容
4～6	48	○イ政府本プロジェクト関係研究室増設予算として105百万RPを割当
		○4／23～27　岩田於IRRI国際稲作研究会議に出席
7～9	48	○第2回Joint Meeting開催　於ジャカルタPasar Minggu，（8／1） 日側第1回Meeting以降の経過報告 ネシア側General problemとして，Expert，Equipment Trainingについて提案
		○8／30南スラウェシMarosにLPPRS開所（アメリカ，オランダ援助） 団長招待され日本の病理専門家の派遣を要請さる（所長代理より）
1974. 1. 21～25	49	○第3回プロジェクトリーダー会議　於New Dehli岩田出席
2	〃	○短期専門家2名着任　4～5月帰国
3	〃	○オランダ研究協力協定3カ年間延長　（'69～）
4	〃	○第2次経済開発5カ年計画開始
		○4／22～25　於IRRI　国際稲研究会議開催　岩田出席
8	〃	○8／12　アルミ合金網室2棟完成
11	〃	○11／13～11／27　巡回指導調査団派遣　（ブレエバ） 桜井団長（植物ウィルス研所長），山口（農研），吉野（農研） 高沢（技会），坂井（JICA）
		○インドネシア中央農研から巡回指導調査団に対し，本協力の分野拡大及び期間延長について要請が出される。
1975. 4	50	○専門家交替（病理） 梶原→小林
5	〃	○専門家一時帰国 三宅 岩木
6	〃	○エバリュエーション調査団 平野団長（農研），藤井（農研），井ノ子（農研），宮坂（農事試），高沢（技会），坂井（JICA）
9	〃	○短期専門家（機械・据付）2名着任　（1週間）

表－2　年度別事業費

単位：千円

費目＼年度	44	45	46	47	48	49	計
調査団	5,268	224	－	2,940	－	3,507	11,939
専門家	－	3,307	16,870	15,981	21,368	21,238	78,764
実施計画	－	357	76	365	450	327	1,575
現地業務	－	54	655	3,061	1,063	3,840	14,112
現地研究	－	216	2,405		2,218		
供与機材	－	33,192	30,948	29,242	25,000	41,400	159,782
計	5,268	37,350	50,954	51,589	50,699	70,312	266,172

表－３　専門家派遣実績

部門	長短	氏名	任期	派遣時身分	生年月日	最終学歴	備考
病理	L	岩田吉人	46. 2. 28～50. 10. 22	植防協会	M43.1.1	東大大学院S14.	団長
	〃	西沢正洋	46. 2. 28～48. 3. 30	九州農試	T8.1.8	九州大学S18.	
	〃	梶原敏宏	48. 3. 20～50. 4. 15	農技研	S4.3.10	〃 S27	
	S	富永時任	49. 2. 20～49. 5. 19	〃	T7.10.10	東大 S17	
生理	L	矢沢文雄	46. 2. 28～48. 3. 30	〃	S2.6.7	盛岡農専S28	
	〃	三宅正紀	48. 5. 18～50. 10. 22	北海道農試	S3.7.18	北大 S28.	
	S	速水和彦	49. 2. 20～49. 4. 29	〃	S6.8.3	府立浪速大S29	
ウィルス	L	里見緯生	46. 5. 12～48. 5. 11	九州農試	S7.6.22	京大・大学院S32.	
	〃	岩木満朗	48. 4. 26～50. 10. 22	ウィルス研	S14.8.30	三重大S38.	
網室	S	長瀬清澄	47 3. 2～47 4. 15	シマノ工業㈱	M40.7.7		
	〃	小川昭治	〃	〃	S9.8.18		
	〃	藤本征夫	〃 49. 7. 5～49. 8. 18	〃	S18.7.19		2回派遣
	〃	西川 真	〃	〃	T12.3.28		
	〃	桜井軍治	〃	〃	S9.12.30		
電顕	〃	三輪 学	49. 11. ～10日間	日製産業	S23.9.13		
病理	L	小林尚志	50. 4. 10～2ケ年間	熱研			
		延17名					

表－4　研修員受入実績

部　門	氏　名	期　間	受入機関
生　理	Lukman Nol Hakin	47.1.16～7.15	農研化学部
〃	Paransih Isbagijo	47.9.16～10.14	〃　（研究旅行）
病　理	Muhammad Macimud	47.9.18～48.3.17	農研病理昆虫部
生　理	M. Ismunadji	47.9.30～47.12.13	〃　化学部
〃	Iskandar Zulkornaini	48.2.1～48.7.31	〃　〃，農事試
病　理（ウィルス）	Roechan	48.7.23～49.1.22	ウィルス研，中国農試
〃	Dewa Made Tantera	49.1～49.3	〃
生　理	Sismijati	48.7.23～49.1.22	農研生理遺伝部
〃	Ratna Hasan	48.5～48.10	〃
病　理	Sudjadi	49.3.20～9.19	農研，中国農試
生　理	Fathurochim	〃	〃　〃
病　理	Nunung	49.9.16～50.3.15	〃
〃	Hartini	〃	〃
生　理	Hidajat	50.3.15～50.9.14	〃
病　理	Mukeral	50.3.15～50.9.14	〃

表－5　研究課題の細目

I	植物病理学的並びに生物学的研究
I－1	食用作物の病害発生に関する調査
I－2	イネの病害に関する研究
I－2－1	イネ白葉枯病に関する研究
I－2－1－1	イネ白葉枯病に対する品種抵抗性に関する研究
I－2－1－2	X. Oryzae（イネ白葉枯病菌）の毒性の変異に関する研究
I－2－1－3	X. Oryzae（イネ白葉枯病菌）のバクテリオファージに関する研究
I－2－1－4	イネ白葉枯病防除に対する薬剤に関する研究
I－2－2	イネ紋枯病並びにイネ小粒菌核病に関する研究
I－2－2－1	イネ紋枯病に対する品種抵抗性に関する研究
I－2－2－2	イネ紋枯病並びにイネ小粒菌核病に対する薬剤に関する研究
I－2－3	イネいもち病に関する研究
I－2－3－1	系統の同定並びに分布
I－2－3－2	薬剤防除
I－2－4	イネ条斑細菌病に関する研究
I－2－4－1	品種抵抗性に関する研究
I－2－4－2	毒性の差異に関する研究
I－2－4－3	バクテリオファージに関する研究
I－2－4－4	薬剤防除に関する研究
I－2－5	イネのウィルス病並びにその媒介昆虫に関する研究
I－2－5－1	ウィルス病の同定
I－2－5－2	水田におけるヨコバイ並びにウンカの季節的変動
I－2－5－3	ウィルス病の発生並びにその媒介昆虫に関するイネの品種間差
I－2－5－4	走向に対するインドネシア種の品種抵抗性
I－3	トウモロコシの病害に関する研究

Ⅰ－3－1	トウモロコシベト病に関する研究
Ⅰ－3－1－1	疫学に関する研究
Ⅰ－3－1－2	品種抵抗性に関する研究
Ⅰ－3－1－3	伝染経路に関する研究
Ⅰ－3－1－4	薬剤防除
Ⅰ－3－2	トウモロコシのウィルス病に関する研究
Ⅰ－4	マメ科植物の病害に関する研究
1－4－1	マングビーンのそうか病に関する研究
Ⅰ－4－1－1	同定
Ⅰ－4－1－2	薬剤防除
Ⅰ－4－2	マメ科植物のウィルス病並びにマイコプラズマに関する研究
1－4－2－1	マメ科植物のてんぐす病
1－4－2－2	マメ科植物に関するウィルスの同定
Ⅰ－4－2－3	品種抵抗性
Ⅱ	植物生理学的研究
Ⅱ－1	イネの生理障害に関する調査並びに研究
Ⅱ－1－1	チヘア（地名）におけるイネの生理病
Ⅱ－1－2	イネ幼苗の生育に対する尿素中のbiuretの毒性（$NH_2CONHCONH_2$）
Ⅱ－1－3	根の活性に関する品種間差
Ⅱ－1－4	イオウ欠乏
Ⅱ－1－5	Jakenan土壌における栄養障害
Ⅱ－2	水稲における燐酸肥料の効果

Ⅱ－２－１	ラトソル土壌並びにメディタレニアン土壌
Ⅱ－２－２	ポドゾル土壌
Ⅱ－２－３	グラモゾル
Ⅱ－３	チッ素養分とイネの収量
Ⅱ－３－１	水稲の生育における肥効並びにチッ素養分並びにHelminthosporium 斑点病の発生（小球菌核菌）
Ⅱ－３－２	施肥効果に関するイネ品種間差
Ⅱ－３－３	イネ収量に対するチッ素肥料試験
Ⅱ－４	水稲の生育に及ぼす稲わら施用の影響並びに栄養状態
Ⅱ－５	植物の生産力並びに作物収量に及ぼす旱魃と低温の影響に関する研究
Ⅱ－５－１	稔実性に及ぼす低温の影響に関する研究
Ⅱ－５－２	収量に及ぼす旱魃の影響に対するイネの品種間差
Ⅱ－６	食用作物の栄養学的研究
Ⅱ－６－１	トウモロコシ
Ⅱ－６－２	マメ科植物
Ⅱ－６－３	いも類

表－５－２　本プロジェクトで実施されている研究課題（英文）

The theme of the research

I Plant pathological and virological research

I-1 Survey on the occurence of food crop diseases

I-2 Study on the diseases of rice

I-2-1 Study on bacterial leaf blight of rice

I-2-1-1 Study on varietal resistance of rice to bacterial leaf blight

I-2-1-2 Study on variation in virulence of X.oryzae

I-2-1-3 Study on bacteriophaze of X.oryzae

I-2-1-4 Study on chemicals for controlling bacterial leaf blight

I-2-2 Study on sheath blight and stem rot

I-2-2-1 Study on varietal resistance of rice to sheath blight

1-2-2-2 Study on chemicals for controlling sheath blight and stem rot

1-2-3 Study on rice blast

1-2-3-1 Race indentification and distribution

1-2-3-2 Chemical control

I-2-4 Study on bacterial leaf streak of rice

1-2-4-1 Study on varietal resistance

1-2-4-2 Study on variation of virulence

1-2-4-3 Study on bacteriophaze

1-2-4-4 Study on chemical control

I-2-5 Study on the virus diseases of rice and their vectors

1-2-5-1 Identification of virus diseases

1-2-5-2 Seasonal prevalence of leaf hoppers and plant hoppers in the rice field

1-2-5-3 Varietal difference to the occurrence of rice virus diseases and their vectors among some rice varieties

1-2-5-4 Varietal resistance of Indonesian rice to stripe

I-3 Study on the diseases of maize

I-3-1 Study on downy mildew of maize

1-3-1-1 Study on epidemiology

1-3-1-2 Study on varietal resistance

1-3-1-3 Study on infection mechanism

1-3-1-4 Chemical control

I-3-2 Study on virus diseases of maize

I-4 Study on the diseases of legume plants

I-4-1 Study on the scab disease of mungbean

I-4-1-1 Identification

I-4-1-2 Chemical control

I-4-2 Study on virus/mycoplasma diseases of legume plants

1-4-2-1 Witches' broom of legume plants

I-4-2-2 Identification of virus on legume plants

I-4-2-3 Varietal resistance

II Plant physiological research

II-1 Surveys and studies on the physiological disorders of rice plant

II-1-1 Physiological disease of rice in Cihea

II-1-2 Toxic action of biuret in urea on growth of rice seedlings

II-1-3 Root activity of rice varieties

II-1-4 Sulphur deficiency

II-1-5 Nutritional disoder in Jakenan soil

II-2 Effect of phosphtic fertilizer on lowland rice

II-2-1 Latosol and Medeterranean soil

II-2-2 Podsolic soil

II-2-3 Grumusol

II-3 Nitrogen nutrition and rice yield

II-3-1 The effect of fertilization on growth, nitrogen nutrition and the occurrence of Helminthosporium leaf spot in lowland rice

II-3-2 Fertilizer utilization efficiency of some rice varieties

II-3-3 Nitrogenous fertilizer experiments on rice yield

II-4 The effect of straw incorporation on growth and nutrient status of lowland rice

II-5 Studies on the effect of drought and cool temperatures on plant performance

and crop yield

II-5-1 Effect of low temperature on the grain fertility of rice varieties

II-5-2 Effect of drought on the yield of rice varieties

II-6 Nutritional studies of food crops

II-6-1 Maize

II-6-2 Legumes

II-6-3 Tuber crops

Ⅲ. 調査の目的及び方法

1. 調査団派遣に至るプロセス

昭和４６年３月，専門家チームが着任し，プロジェクトが実働を開始して以来，時間の経過とともに，プロジェクトの運営内容も順次充実された。

プロジェクトの運営が完全に軌道にのった昭和４７年度には第１回巡回指導チーム（東大名誉教授明日山秀文団長他４名）が派遣され，発足以来のプロジェクト実績検討並びに評価を行うとともに，その後の運用方向についての助言指導がなされた。

本チームは，専門的観点から共同研究の実施方法，内容等を詳細に分析検討するとともに，供与機材の有効利用，研修の方法等にも有益な提言を行ない，これに基づく日イ両当局の改善努力に大きな契機を与えたといえよう。

本報告に係る２件の調査は，上述調査に引き続き実施されたものであり，昭和４９年１１月実施は第２回巡回指導調査，昭和５０年６月実施はエヴァリュエーション調査である。

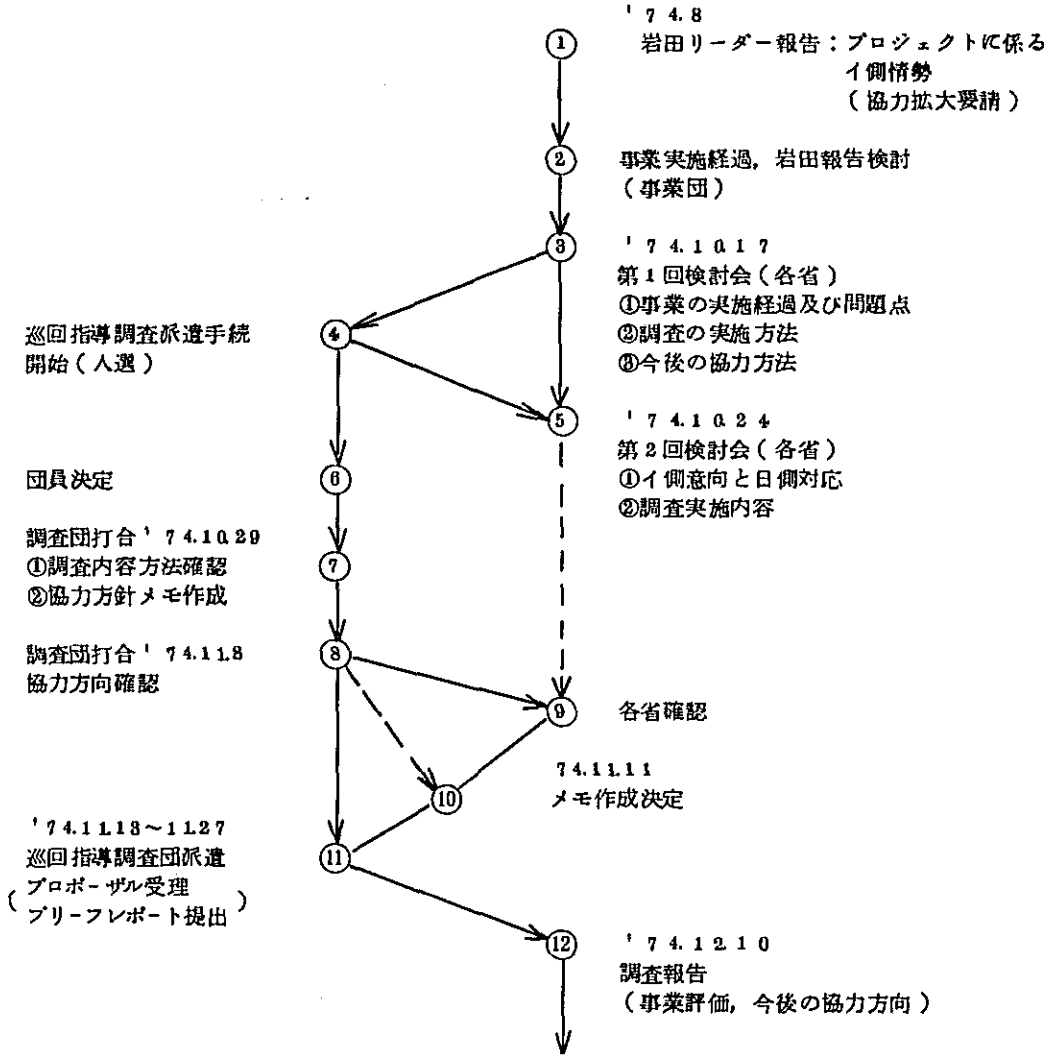
昭和４９年初め頃からインドネシア関係当局とくに中央農業研究所においては，本プロジェクトが発足以来約４カ年を経過したこと，昭和５０年１０月をもって，協定の期限が終了すること等を勘案のうえ，プロジェクトの事後処理の検討がなされた。

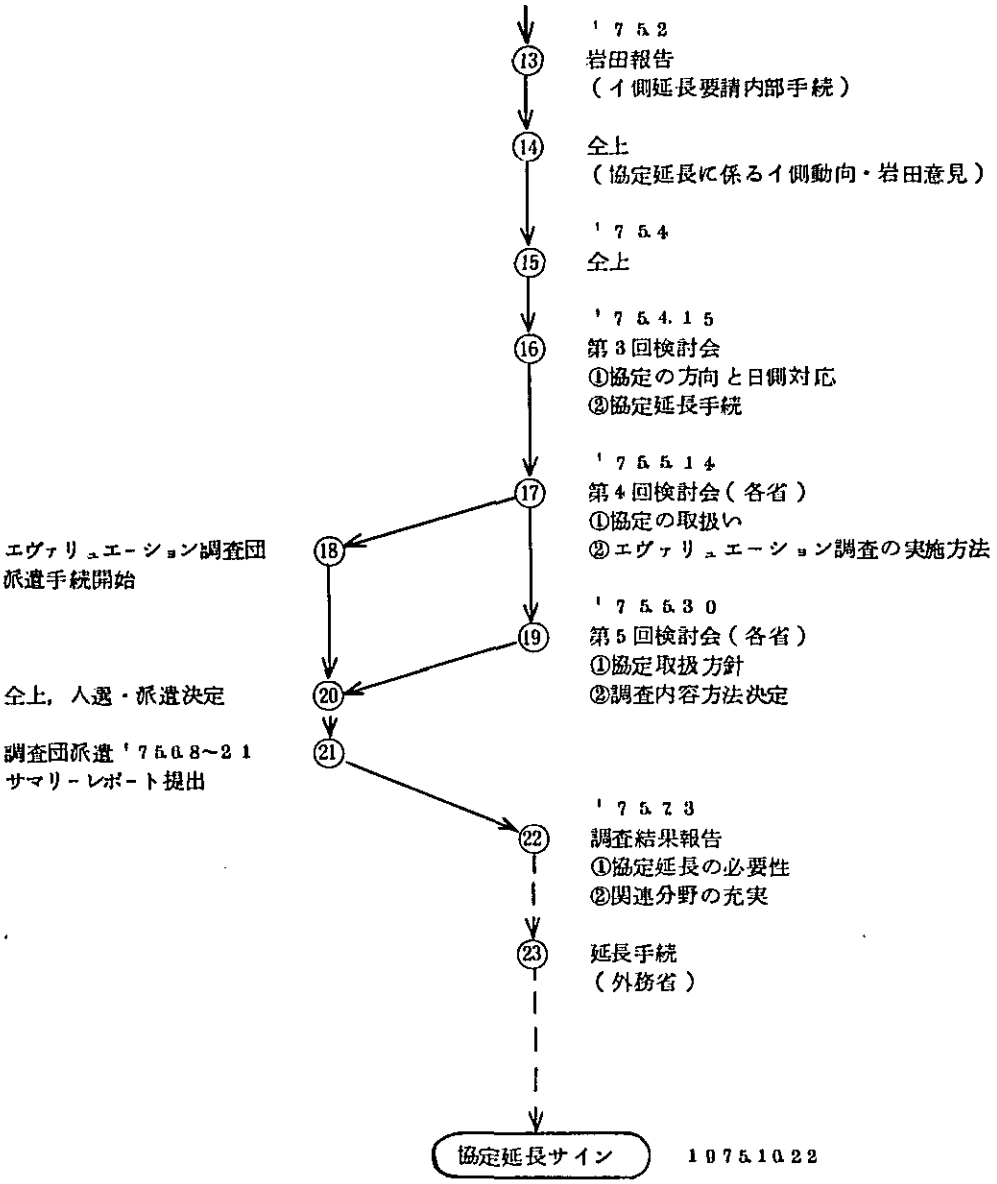
これらの検討結果は，専門家チーム岩田リーダーより事業団に報告されたが，その内容は，これまでの協力対象である植物病理，ウィルス及び植物生理分野においては，人的にも物的にもかなりの水準向上がみられ，協力の実施効果が著しい反面非協力分野，例えば，作物，害虫等との水準格差が拡大し，中央農研全体としての研究遂行バランスがくずれつつあること，従って，協力対象分野を全研究所的に拡充する必要があるということである。

このような事前情報があって，第２回巡回指導調査の内容は，過去４カ年間の事業実績の検討評価及び協定期限後の取扱いの予備的検討を主眼にした。

本件２調査に係る検討のプロセスは次のとおりである。

図－１　調査検討のプロセス




'75.2
⑬
岩田報告
（イ側延長要請内部手続）
⑭
仝上
（協定延長に係るイ側動向・岩田意見）
'75.4
⑮
仝上
'75.4.15
⑯
第3回検討会
①協定の方向と日側対応
②協定延長手続
'75.5.14
⑰
第4回検討会（各省）
①協定の取扱い
②エヴァリュエーション調査の実施方法
エヴァリュエーション調査団
派遣手続開始
⑱
'75.5.30
⑲
第5回検討会（各省）
①協定取扱方針
②調査内容方法決定
仝上，人選・派遣決定
⑳
調査団派遣 '75.6.8～21
サマリーレポート提出
㉑
'75.7.3
㉒
調査結果報告
①協定延長の必要性
②関連分野の充実
㉓
延長手続
（外務省）
協定延長サイン
1975.10.22

2. 調査内容及び方法

2.1 巡回指導調査

前述のとおり本プロジェクトは，発足以来約4カ年を経過し，残りの1カ年をもって協定の期限が切れること，また，これに対しインドネシア側も，その後の取扱いを検討を進め，本協力の延長ないし拡大に対する意向を強めている旨の情報が岩田リーダーより寄せられたこと等を勘案し，本調査の内容については，①プロジェクトの過去4カ年における運営実績の把握及びその検討評価，②協定期限後のプロジェクト取扱いに対するインドネシア側意向の把握とその必要性の検討，の2点を主体とし，これに③プロジェクト運営上の問題点把握とこれに対する助言指導を行うことを付加することとした。

また，①については，実質的にプロジェクトのエヴァリュエーションであるが，従来の定性的なエヴァリュエーション方法では，全体の体系的な分析が困難であることを勘案し，できうる限り定量的分析にアプローチすることを考慮した。

その内容は次のとおりである。

① 調査方法に関する基本的考え方

(1) プロジェクトの目標

熱帯における農業技術体系確立のための基礎的事項の研究

※組立て応用分野etcには入らない。

(2) 協力対象分野：作物保護

a. 植物病理

b. ウィルス媒介昆虫

c. 植物生理病

(3) Evaluation項目の分類

a. 機材に関する事項（品目，金額，利用状況，不足，その他問題点）

(a) 供与機材

(b) 携行機材

b. 研修員に関する事項（部門別受入実績，質的事項etc）

c. 派遣専門家に関する事項（派遣実績，業務遂行状況etc）

d. 研究課題に関する事項（遂行状況，他分野との関連etc）

(4) Evaluation方法

可能な限り定量化する。

② 調査内容の概要

(1) 機材に関する事項

a. テーマ別供与品目及び利用状況（含携行機材）

b. 供与金額（テーマ別・スライドアップ）

c. 未利用品目，故障利用不能品目及び金額（スライド）

d. 供与機材有効利用率の算定

e．不足品目（含スペアパーツ，故障品目）リストアップ及び金額

f．不足率の算定

g．目標達率の検討

(2) 研修員受入れに関する事項

a．受入れ実績（年次別，テーマ別，経費（スライド））

b．カウンターパート（テーマ別，年次別実績，イ側計画，必要数）

c．能力向上評価（5 Rank）

d．カウンターパート研修率　$a \times c / b_1, b_2$（必要数）

e．要研修員数，残研修員数の算定

f．目標達成率の検討

(3) 派遣専門家に関する事項

a．派遣実績（年次別，テーマ別，経費）

b．専門家必要数（テーマ別）

c．目標達成の検討　ex $r = a \times b / c$

(4) 研修課題に関する事項

a．テーマの細分化（20数区分）

b．細目の内容と質的分類（含，他分野関連ex Agro.）

c．進捗度評価（5 Rank）

d．カウンターパート単独走行性評価（5 Rank）

e．目標達成率検討

f．テーマ残存量と所要年数（単独）

g．理想計画と残存年数（カウンターパート数，研修受入，他分野との関連etcを拡充した場合の所要年数etc）

2.2　エヴァリュエーション調査

本調査は，前回の巡回指導調査を補完し，協定延長に係る必要性及び妥当性を確認することを目的とし，次の内容を設定した。

① 協定延長必要期間の把握とその裏付けの明確化

現プロジェクトの運用状況を定量的に検討した結果は一応前回調査により出されているので，今回は，定性的な理由づけを考慮することとし，研究協力の性格，目標設定の考え方，新規プロジェクト設立との関連，インドネシア側内部事情等を総合的に検討する。

② 昭和49年11月に提示されたインドネシア側プロポーザルの詳細把握と日本側の対応可能性検討

③ 既存分野における関連分野の位置づけ及び目標設定

④ アグロノミー分野プロジェクト化に係る前予備的検討

⑤ インドネシアにおける第3回の研究協力

巡回指導調査

Ⅳ 調 査 結 果

1. 調査団の構成及び現地スケジュール

① 派 遣 期 間

昭和４９年１１月１３日～１１月２７日 （１５日間）

② 調査団員構成

担当業務	氏 名	所 属	級	備 考
団 長	桜井義郎	植物ウィルス研究所々長	1	S46 Dr
生 理	吉野實	農業技術研究所作物栄養第２研究室長	1	S37 Dr
病 理	山口富夫	〃 糸状菌病第２研究室長	1	S37 Dr
研究管理	高沢寛	農林水産技術会議事務局総務課技術協力係長	3	
企画調整	坂井清	国際協力事業団農業開発協力部農業技術協力課	4	

③ 調 査 行 程

月	日	行　　程	泊　地
1	11.13	東京→Jakarta	Jakarta
2	14	大使館，JICA事務所表敬打合，農業総局表敬	
		午後Bogorへ	Bogor
3	15	中央農研所長に表敬，Division of Agronomy，Pest & Diseases と打合せ及び施設々備視察	
		午後：専門家との打合せ（リーダーからの経過説明及調査説明）	〃
4	16	Division of Physiologyと打合せ，Muara視察	
		（坂井団員はJakarta事務所へ）	
		午後：evaluation調査打合せ	〃
5	17	Bogor植物園視察	
		午後：専門家との打合せ	〃
6	18	於中央農研会議室　専門家との打合せ（Proposal，etc）	
		午後：専門分野別打合せ，団長招待夕食	〃
7	19	中央農研所長（次長）及びStaffsと打合せ	〃
8	20	Bogor → Jakarta → Surabaya → Malang東部ジャワ試験地視察打合せ	Malang
9	21	Malang → Surabaya → Jakarta	Jakarta
10	22	農業総局との打合せ	
		Jakarta → Bogor	Bogor
11	23	調査結果とりまとめReport作成	〃
12	24	〃	〃
13	25	〃	〃
14	26	中央農研，農業総局，大使館及びJICA事務所へReport提示	Jakarta
15	27	Jakarta → Tokyo	

2. 総　　論

調査は，前述の調査方法にそったデータ整理の後，日本専門家チーム，中央農業研究所長以下関係スタッフ及び農業総局当局者との意見交換による本プロジェクトの検討評価を行うという方式により実施された。

なお，調査の開始にあたって，中央農業研究所長 Dr．Satari から本プロジェクトに関するプロポーザルが提示され，それに沿ったプロジェクトの拡充並びに延長（５カ年間）が要請された。

したがって調査団としては，本プロポーザルの内容についての詳細な説明を聴取するとともに，プロジェクトの目的に対する合致性並びに日本における研究体制からみた対応可能性等についても併せて検討した。

これらの調査検討結果は，調査団のブリーフレポートとしてまとめられ，Dr． Satari，農業総局々長補佐官 Dr．Rahardja 他インドネシア当局者及び在ジャカルタ日本大使館に提示された。

2.1　中央農業研究所の役割と研究協力

インドネシアにおける農業は，国の経済の基礎をなすものであり，そのシェアは，就業人口で約７５％，国民総生産で５５％を占めている。このため，インドネシアの経済発展にとって農業の改善は欠くことのできない要素であり，経済開発５カ年計画においては，農業に第１の優先順位が与えられている。

農業生産の安定的かつ効率的な増大は，農業及び関連産業に対する近代的な科学技術の適用によってもたらされるものであるが，これら技術の適用にあたっては，自然的，社会経済的要因の変化に対する農家レベルでの対応が考慮される必要があり，しかも，新技術は，開発されたものが充分テストされたうえで速やかに農家に提供されねばならない。この意味で，農業の試験研究部面が重要なポイントとなる。

中央農業研究所は，２支場（スカマンディ，マロス），４支所（セントラルジャワ，東部ジャワ，南カリマンタン及び西部スマトラ）及び２２分場をもつ機関であり，農業研究の全国的調整管理とともに各系統機関におけるスタッフの技術及び知識改善のための啓蒙，訓練を担当している。また，中央農研の内部組織は，作物部（アグロノミー科，育種科），病理昆虫部（病理科，害虫科）及び植物生理部（生態科，栄養科）で構成され，他の機関と較べれば，物的，人的に整備されているが，国におけるメインステーションとしての役割からすれば，その体制はかなり不備といわざるを得ず，当局としては，研究発展のプロセスを早める有効な手段として外国との技術協力を位置づけ，その積極的な導入を図ってきた。この結果，わが国の他にUSAID（１９７１年～現在，１，８４０千ドル），フォード財団（'６７～'７４年，６２５千ドル），オランダ（'７４～'７７年，９３５千ドル）及び世銀（'７２～'７７年，１，６００千ドル）等の協力が行われているが，前述のように目的意識がかなり明確なこともあって，協力の物的・質的効果に対する評価には，きわめて厳しいものがあり，これにより協力援助を取捨選択していこうとする意向を強く有しているようである。

2.2　本プロジェクトに対する中央農研の評価

上述の背景のもとに，中央農研が行った本プロジェクトに対する評価をみると，他の国の協力援助に対するそれと較べてかなり高い評価を受けている。

その原因として最も大きいものは，わが国の協力方式である。即ち，わが国の協力方式は，いわば物的費用と人的費用のバランスのとれた協力方式であるということであり，これは，物的・人的両面において体制の不備な中央農研の発展向上には欠くことのできない条件であり，インドネシア側の協力需要とわが方式がマッチした結果といえよう。これに比し，USAID及びオランダ等の協力は費用的にみて，９０％以上が人的なものであり，特定のカウンターパートに対するかなり大きな恩恵はあっても，中央農研全体ないしある部門の平均したレベルアップに対する効果が小さいという評価を受けている。

本プロジェクトに対する財政的措置をみると，日本側から約２億７千万円が投入されたが，このうち，１億６千万円が資機材の供与費に当てられた。これは，従来の中央農研における施設の資機材収容能力をオーバーするとか，電力，水道の改善を余儀なくさせる等の附帯条件を派生させ，インドネシア側費用で施設々備の改善拡充をせざるをえないという誘発効果をもたらし，結果的に中央農研の改善テンポを速めることとなったのである。（これらの具体的内容については，附属資料に詳述されている。）

本プロジェクトに対するイ側の高い評価は協力方式のみではない。勿論，わが国からの派遣専門家の資質に対する評価もきわめて高い。これまで派遣された専門家は，延９名であるが，研究者としていづれもわが国一流の水準にある。しかも，年令的にも４０才前後が大部分で，行動力及び人的弾力性のある油ののりきったものばかりであった。専門家に対する評価は，研究指導業務だけではなく，人格的にも高いものがあるが，これには，日常の人的接触態度の良さのほか，東洋人同志としての観念的相合性もあるようである。オランダ，USAIDの場合は，対称的に接触の面でも厳しい評価がなされている。

また，研究業務の面では，１９７０年プロジェクト開始当初５名（病理２名，生理３名）であったカウンターパートが現在では，病理関係が１４名（研究者９名，助手レベル５名），生理関係１８名（研究者８名，薬剤師４名，助手レベル６名）合計３２名と飛躍的に増加するとともに，専門家の現地指導及び日本国内の研究機関における研修等によって，その能力も大巾にレベルアップし，高度な試験研究実施への道が拓かれつつあることに対する評価，さらには，専門家によるボゴール農科大学生に対するセミナー等の指導による研究予備軍の育成に対する貢献等も認められている。また，所長・部長等ラインの視察旅行等による日本農業の理解は，ネシア農業の日本農業に対する類似性の理解に結びつき，わが国との技術協力に大きな意義を見い出すとともに，わが国への援助依存意向をより強める結果をもたらしている。なお，本協力による共同研究成果は中央農研のコントウリビューション（日報）及び年報により現在まで２７レポートが公表され，質的にも高く評価されている。

3　研究業務の遂行状況

研究課題は，協定に掲げられている３つの大課題をもとに，専門家リーダーと中央農研所長との協議により４４の細目（作業課題）にブレイクダウンされている。

それぞれの細目についての研究実施状況は，表－６のとおりであり，現在までの進捗度は，単純平均で植物病理部門４５％，植物生理部門６５％，全体で５３％となっている。また，これらを１００％完了するための今後の所要年数は，植物病理３８年，植物生理２年，全体で３１年となっているが，今後６年以上も要する課題もある。

なお，この調査結果は，もともと本質的にこのような定量的計測の無理なものであるが，前述しているとおり，一応の目安として調査し，計測したものであり，この結果をそのまま研究業務の進捗ないし，評価に結びつけることは危険である。また，研究の進捗度が低い数値となってあらわれているのは，研究協力の実施過程において，インドネシア各地の農場で新たな問題が生じ，これに対応するための研究課題を新たに設定することが必要になったこと，あるいは，ある課題の研究プロセスにおいて関連する課題の設定が必要になったこと等が影響していると考えられる。

協力両部門における研究成果及び今後の問題点は次のとおりである。

3.1　植物病理部門

1）稲の病害

(1) 紋　枯　病

短稈・多げつ品種の普及と施肥量の増加によって本病はインドネシアだけでなく，東南アジア全域で問題になっている。約３００品種を供試して本病に対する品種間差異の検定が圃場および温室内で行われたが，日本と同様に真性抵抗性を示す品種はなく，圃場抵抗性に品種間差異が認められた。日本では栽培時期をおくらせ，熟期の遅い品種を利用して本病の多発を回避する生態防除も可能であるが，高温，多湿の気候条件が続くインドネシアでは発生生態を利用した防除は困難と見られる。品種および生態的防除が困難となれば，将来は薬剤防除の必要があるが，幸いバリダマイシン，ポリオキシン等はインドネシアにおいても十分な効果が認められた。全国から菌株を収集しているが，その形態，生理的性質，病原性等は今後究明する必要がある。

(2) 白　葉　枯　病

苗の浸漬接種，成稲に対する針接種による品種抵抗性試験が１９８３年以降も引続いて実施され，抵抗性品種の選抜が行なわれつつある。さらに全国から菌株を収集し，病原性を検定したが，日本に多いⅠ，Ⅱ群菌だけでなく，Rantai Emas 品種群を侵す強病原性のⅢ群菌，早稲愛国品種群を侵すもっとも病原性の強いⅣ群菌が全国的に分布することを確認した。またバリ島からは強い抵抗性を持つ早稲愛国群品種を侵すにも拘らず，それより抵抗性が弱いと見られる黄玉，Rantai Emas 品種群を侵すことが出来ないⅤ群菌が発見された。このような菌型の同定はインドネシアだけでなく，東南アジアでは始めて

の成果であり，抵抗性品種の育成，利用上きわめて重要な発見と考えられる。バクテリオファージの研究はまだほとんど行なわれていないが，将来薬剤防除が行なわれるとすれば，予察の基礎課題として早急に取り上げる必要がある。

(3) 条斑細菌病

全国的に発生が増加しており，圃場における品種抵抗性の検定を現在実施中である。本菌の生理的性質，発生生態は不明の点が多いので，今後明らかにする必要がある。

(4) ウィルスおよびマイコプラズマ病

Penyakit Habang は南スラウェシ，南カリマンタンに発生が多いウィルス病である。病徴，伝搬様式は東南アジアに広く分布するTungroに似ているが，ウィルス粒子はTungroの球型と異なり，bacillioformであることがわかった。西部ジャワに発生する黄萎症状は日本の黄萎病と同じくマイコプラズマによると考えられ，またgrassy stunt はトビイロウンカによって媒介され，病徴，伝搬様式からマイコプラズマによるものと推定される。ウィルスおよびマイコプラズマ病に対する抵抗性品種を検索するため温室，網室において幼苗検定が実施され，成果を挙げつつある。

(5) その他の病害

いもち病は平地では発生が少ないが，増産計画が進み，肥料が施用されるようになれば将来多発が予想される。まだほとんど研究が行なわれていないので，まず菌型の同定，分布，品種抵抗性の検定等から研究を開始する必要がある。出穂後の穂に感いもちのほか，穂枯れ症状が見られる。イネの葉・葉鞘にはごま葉枯病，すじ葉枯病，褐色葉枯病，小粒菌核病が発生しているので，日本と同様これら4菌が主たる病原菌と推定されるが，その他東ジャワの山間部では葉鞘腐敗病によると思われるものがあり，この菌による穂クビ，ミゴの変色，それに伴なう稔実障害の激しい圃場があった。現地研究者の説明ではこのような症状がしばしば観察されるということである。葉鞘腐敗病は日本ではほとんど問題になっていないので興味ある研究課題である。これら穂枯れ性病害は，薬剤散布が行なわれていないので，日本以上に発生が激しく，予想外の菌類が関与している可能性があり，今後十分な研究が必要であろう。

2) トウモロコシの病害

(1) べ と 病

本病はトウモロコシ栽培を脅やかす最大の病害である。病原菌はSclerospora 属菌によるが，フィリッピン，インド等で発生するS.philippinensis，S.graminicola，S.sorghi等は卵胞子があるが，インドネシアに発生するS.maydis にはまだ卵胞子が発見されていない点が他のべと病菌と著るしく異なっている。すでに接種法が確立され，感染，発病の経過も明らかにされた。圃場において品種抵抗性の検定が行なわれ，抵抗性品種もあるが，収量，品質の点でまだ十分ではない。従って防除対策としては，卵胞子がなく，生存期間が短かいことを利用して，輪作，休耕による生態的防除を研究する

必要がある。また効果のある薬剤を検索，開発して，発芽，幼苗時に薬剤を利用出来るよう試験を実施中である。

(2) ウィルスおよびマイコプラズマ病

現在　縮症状のみ発見されており，このウィルスはSugar cane mosaic virusの1系統であった。キュウリモザイクの系統は発見されていない。その他にもウィルスが存在すると思われるが，まだ究明されていない。

3）豆類の病害

(1) 菌類および細菌病

ダイズでは細菌性斑点病の被害が最も大きく，抵抗性品種の検索が行なわれている。ナンキンマメでは黒渋病，褐斑病，白絹病，青枯病などが発生している。西部ジャワで発生が多いmungbean 斑痂病の病原菌はElsinoe phaseoli と同定した。豆類の病害はまだ発生状況の調査，病原菌同定の段階で，防除対策に関する研究は今後の課題である。

(2) ウィルスおよびマイコプラズマ病

大豆に発生するモザイク症状は，日本にも発生が多いbean mosaic と同定した。萎縮症状のものは日本の北海道で発見された矮化病と似た病徴で，しかも媒介様式はアブラムシによる永続伝染型である。しかし媒介昆虫は矮化病がジャガイモヒゲナガアブラムシであるのに対し，インドネシアの萎縮症状はダイズアブラムシによるという大きな相異点があり，興味深い。mungbean に発生するモザイクは日本にも発生するAzuki bean mosaicと同一と思われるが，まだ種子伝染が確認されていない。ナンキンマメに発生するウィルスとして，mottle およびring spotの2症状を認めている。またwitches' broom はマイコプラズマによると考えられ，ヨコバイによる永続伝搬を行なう。その他leaf curlの病徴を示すものがあるが，まだ接木伝染しか成功していない。日本ではタバコのウィルス病でコナジラミによって媒介されると推定されるものがあるが，まだ確認されていない。インドネシアにはコナジラミが多いので，これによって媒介されるウィルスの存在が予想されるが，まだ未発見である。豆類のウィルスはかなり種類が多いようであるが，現在は同定が行なわれている段階である。今後は発生生態を究明する必要がある。

病理部門は1969年には2名の研究員に過ぎなかったが，現在9名の研究員と5名の研究助手が採用され，活発な研究が行なわれている。実験器械は充実して来たが，まだ電圧不安定で，十分に性能が発揮出来ない器械もあるようである。またカウンターパートも自由に器械を使いこなすほど熟達していないようである。他部門から実験器械の使用希望が強いにも拘らず，管理上自由な使用が行なわれていないのは止むを得ないことであるが，他部門も含めたインドネシア側研究員の実験器械の使用研修が必要であろう。インドネシアではウィルス・マイコプラズマ病研究の重要性が高いので，今後電子顕微鏡およびその関連器材の整備は不可欠である。しかしそのためには，電力，水道等の設備がもっと改善される必要がある。また研究の方向に関連して，従来東南アジアでは病害防除対策として，

専ら品種抵抗性に依存して来たが，多収性，良質に重点を置いた育種目標に変りつつあり，また施肥の普及，病原菌々型の変化によって，抵抗性のみに頼る防除対策では困難になって来ている。将来は薬剤防除の導入が必須と考えられるので，それに対応した発生予察および薬剤の効率的使用法に関する研究を取り入れて行く必要があると考えられる。

3 2　植物生理部門

1）研究態勢と経過の概要

生理部は作物生長科と作物栄養科から構成されている。前者はMerdeka の庁舎において水稲を主体とした食用作物の生育ならびに収量に及ぼす諸環境要因の影響の解析に関する研究を実施しており，後者はSindang Barangの新庁舎において窒素，燐酸，加里の三要素をはじめカルシウム，マグネシウム，亜鉛等の欠乏ならびに鉄，マンガンの過剰に関する生理病の研究が実施されている。とくにSindang Brang における化学実験室，ガラス室および原子吸光光度計，炎光光度計等の最新の精密分析機器類の拡充は驚くべきものがある。また，これと並行してガス，水道が補修整備され，着々と研究が推進されている。上述のように研究室における研究活動とともに，生理的障害の現地調査，各種土壌の分布の実態調査が意欲的に行なわれ，生理病の防除ならびに施肥法の改善に対して大きな貢献を与えている。

2）研究内容と成果

現在，終了ならびに実施中の研究課題数は１７にも及ぶが，主要な研究についてその概要を述べれば次のとおりである。

a．Cihea における水稲の生理病

本地域は土壌的にはgrumusol 属し，インドネシアにおける最も破壊的な病気の一つとされているMentek の発生地帯である。その病徴は生育不良のため草丈が低く，下葉が橙黄から褐色に変じて枯れ上がるのが特色である。発生の原因については１８５９年から研究が始められ，土壌の異常還元，亜鉛欠乏等によるものと推定されていた。

その後，本病は加里欠乏に基づくもので，稲体のマンガン含量が高く，しばしば鉄過剰による場合もみられることが明らかにされた。その具体的な対策として，塩化加里または燐酸加里の施用が生育収量を著しく向上させることを認めた。

b．Yogyakarta の Grumusol 地帯における肥料試験

この地域は新しい火山灰を含むGrumusol で，水稲葉身に著しいゴマハガレ病斑が生ずる。本病に対して珪酸資材（ slag ）を施用したが全く効果がみられなかった。その理由は，土壌および灌漑水中に珪酸が十分に含まれているためであることを明らかにした。一方，本病の対策としては，窒素を徐々に吸収させることが必要であることを明らかにするとともに，窒素の団子肥料がきわめて効果的であることを圃場試験によって実証した。

c．代表的なジャワ土壌の生産性に関する研究

Muara , Pusakanegara , Ngale , Mojasari , Gentengの５カ所において窒素

の用量試験を行ない，いずれも日本における窒素の吸収率より低い値がえられた。各地の窒素吸収率は，Mojasari ＞ Genteng ＞ Pusakanegara ＞ Ngale ＞ Muara の順で，Majosariが最高値の４８％，Muara が最低値の２９％を示し，収量においても同様の結果がえられた。

一方，インドネシアに広く分布しているLatosal，Grumusol，Podozolic およびMediter rane an soilにおける水稲の燐酸欠乏症の発現と燐酸質肥料の施用効果に関する試験研究を重要課題としてかかげ，室内実験および圃場試験を実施中である。

d．ジャワ各地土壌における水稲の硫黄欠乏症

ガラス室内で厳密な無硫黄区を設けて土耕栽培試験を行なった結果，典型的な硫黄欠乏症状が認められた。症状は窒素欠乏症と酷似しており，草丈の伸長が悪く，葉は黄色を呈する。また，稲体の硫黄含有率は０１％をはるかに下回った。Ngale，Jakenan において硫安の施用効果がきわめて大きいことが認められたが，その他の地域についても調査中である。

e．水稲の低温抵抗性に関する研究

本研究は低温抵抗性品種の選抜が目的である。ガラス室内で土壌恒温槽を用いて実験を行ない，水温１５℃が水稲生育に対する冷害発現温度であるという結果をえた。

f．水稲の干ばつ抵抗性に関する研究

ジャワ在来種の中から干ばつ抵抗性品種を見出そうとするものである。本研究はポットによる土耕栽培で，各生育時期別に干ばつの影響を比較検討中である。

g．トウモロコシ，大豆，落花生，さつまいも等の食用作物の要素欠乏症について

上記の各種食用作物をガラス室内で水耕または砂耕栽培し，各種無機要素の欠乏症のカラー写真を作製し，生理病の診断および土壌の栄養状態の評価に利用している。

3）今後の研究方向と問題点

いずれの生理病も，培地としての土壌条件ときわめて密接な関連を有する。したがって，インドネシア全域にわたる広範な土壌調査が行なわれ，その調査研究と並行して生理病の究明とその対策が推進されるべきものと考えられる。

表－6　研　究　実　施　状　況

テーマNo	1971	1972	1973	1974	進捗度	残存所要年数
I 1 1	←	←	←	←→	30(%)	6～(年)
I 2						
I 2 1						
I 2 1 1 2	←	←	←	←	80	3～5
2 3		←	←	←	80	1～2
3 4		←→		←	20	3
4 5	←	←	←	←	50	3～5
I 2 2 1 6	←	←	←	←	50	3～5
2 7	←	←	←	←	50	3～5
I 2 3 1 8				←	10	3～5
2 9			←	←	30	3～5
I 2 4 1 10			←	←	20	3～5
2 11			←	←	20	6
3 12					0	6
4 13			←	←	20	3～5
I 2 5 1 14	←	←	←	←	70	1～2
2 15	←	←	←	←	40	6
3 16	←	←	←	←	40	6
4 17			←→		100	
I 3 1 1 18		←―			60	3～5
2 19		←	←	←	20	6
3 20			←	←	80	1～2
4 21				←	30	3～5
I 3 2 22			←	←	30	3～5
I 4 1 1 23			←	←	90	1
2 24				←	10	2
I 4 2 1 25			←	←	60	1～2
2 26			←	←	60	3～5
3 27			←	←	20	6

○ 研 究 実 施 状 況

テーマ No.	1971	1972	1973	1974	進捗度	残存所要年数
Ⅱ						
Ⅱ 1						
Ⅱ 1 1 28	←	—	—	→	100	
Ⅱ 1 2 29		←	—	→	100	
Ⅱ 1 3 30	←	—	—	→	100	
Ⅱ 1 4 31			←	→	100	
Ⅱ 1 5 32				←	75	1～2
Ⅱ 2						
Ⅱ 2 1 33				←	75	1～2
Ⅱ 2 2 34				←	75	1～2
Ⅱ 2 3 35				←	75	1～2
Ⅱ 3						
Ⅱ 3 1 36	←	—	→		100	
Ⅱ 3 2 37	←	—	—	—	25	3～5
Ⅱ 3 3 38				←	50	3～5
Ⅱ 4 39	←	—	—	→	100	
Ⅱ 5						
Ⅱ 5 1 40				←	25	3～5
Ⅱ 5 2 41			←	—	25	3～5
Ⅱ 6						
Ⅱ 6 1 42				←	25	3～5
Ⅱ 6 2 43		←	—	—	25	3～5
Ⅱ 6 3 44				←	25	3～5

4. カウンターパート及び研修

表－7 及び表－8 に掲げたとおり，カウンターパートの数は，インドネシア側の措置により年を追って増加しており，また，質的にもわが国研究機関での研修効果及び現地における指導訓練の効果があらわれている。研修（6カ月）を受けたカウンターパートの大部分は，能力水準もわが国研究者の一般水準に達しており，また，他のカウンターパートも新しい研究に対する独自の処理研究能力がかなり引き上げられた結果となっている。しかし，現在実施されている研究課題に対するカウンターパートの数は未だ充分とはいえず，今後さらに中央農研の人容を拡充する必要があろう。

表－7　カウンターパート

（注）
評価 I，単独走行性
II，受講力
III，現在水準

テーマ	氏名	性別	年令	学歴	年度 45	46	47	48	49	評価 I	II	III	能力判定	必要数	充足率	備考 大学卒業年次と経験年数
I 1	Nunung-H.A	女	34	大		○	○	○	○	4	2	4		2		大学，1971年（経）'71～74
I 2																
I 2 1																
I 2 1 1	Hartini R.H	女	33	大		○	○	○	○	4	2	4		3		大学，1969年（経）'71～74
	Machmud	男	29	大				○	○	3	2	3				
2	〃									〃	〃	〃		〃		大学，1969年（経）'70～74
3	〃									〃	〃	〃		〃		
4	〃									〃	〃	〃		〃		
I 2 2 1	Machmud	男	29	大		○	○			3	2	3		1		
	Kosim.K	男	29	大				○	○	2	1	1				
2	〃	〃								2	1	1		1		大学　1973年（経）'1.5
I 2 3 1	Muklar	男	35	大					○	3	2	3		1		大学　1969年（経）'70～74　（5年）
2	Sudjadi	男	30			○	○	○		3	2	3		1		大学　1970年（経）'70～74
I 2 4 1	Nunung H.A.	女	34	大						3	2	4		1		
2	〃	〃									〃			〃		
3	〃	〃									〃			〃		
4	〃	〃									〃			〃		
I 2 5 1	Tantera	男	35			○	○	○	○	1	2	2				
	Roechan	男	32							2	2	2		2		
2	Tantera	男	35							1	2	2		2		Academy　1964, Private Unv. 1967,（経）10年
3	〃	〃	〃							1	2	2		2		
4	Roechan	〃	32					○		2	2	2		0		大学　1970年（経）'70～74　（5年）
I 3 1 1	Sudjadi	〃	30			○	○	○	○	2	3	2		2		
2	〃	〃								2	2	2		1		
3	—													1		
4	Sudjadi	男	30						○	2	2	1		1		
I 3 2	Tantera	〃	35				○			1	2	2		1		
I 4 1 1														0		
2	Muklar	男		大					○	3	1	2		1		

カウンターパート

テーマ	氏名	性別	年令	学歴	年度 45	46	47	48	49	評価 I	II	III	能力判定	必要数	充足率	備考 大学卒業年次と経験年数
I 4 2 1	Roechan	男						←	○	2	2	2		1		
2	〃	〃						←		2	2	2		1		
3	〃	〃						←		2	2	2		1		
	Dr.D.M.Tantera	男														科長
	F.N.Oka	男														部長（現在アメリカ留学中，１９７２．９～１）

カ ウ ン タ ー パ ー ト

テーマ		氏名	性別	年令	学歴	年度 45	46	47	48	49	評価 I	II	III	能力判定	必要数	充足率	備考 大学卒業年次と経験年数
II	1	1	M. Ismunadji	男	47	2／	○	○	○	○	○	1	1	1		2		科長
		2	〃									1	1	1		1		
		3	Ratna Hasan	女	27	2／		○	○		○	3	2	3		1		
		4	Lukman N.Hakim	男	41	3／				○	○	2	1	2		2		
		5	A.Hidayat	男	24	3／					○	3	2	3		2		
	2	1	I.Zulkarnaini	男	41	3／				□	○	2	1	1		1		
		2	Sismiyati	女	27	2／				○	○	3	2	2		1		
		3	I.Zulkarnaini									2	1	1		1		
	3	1	M.Ismunadji					○				1	1	1		2		
		2	I.Zulkarnaini				○	○	○			2	1	1		2		
		3	Sismiyati									3	2	2		1		
	4		B.Surono	男	24	3／	○	○	○		○	3	3	3		1		
	5	1	I.Zulkarnaini									2	1	1		2		
		2	Paransih Isbagio	女	39	2／				○	○	1	1	1		2		部長
	6	1	M.Damanik	女	24	2／					○	3	2	3		2		
		2	Siti Nigrum	女	24	2／					○	3	2	3		2		
		3	M.Ismunadji									1	1	1		1		

表－8　研　修　員　表

学歴 注 1. Dr.　2. 大卒　3. 専卒　4. 高卒

評価 注 Ⅰ. 研修前の水準　Ⅱ. 語学力　Ⅲ. 研修後の水準

※評価欄の項目は expert，受入機関 counterpert 部門を共用

テーマ	氏名	受入機関	期間	研修内容	性別	年令	学歴／経験	評価 Ⅰ	Ⅱ	Ⅲ	判定
Ⅲ	Lukman Nol Hakin	農技研 化学部	6	化学分析	男		3／	2	1	1	
Ⅲ	Paransih Isbagijo	〃 〃	1	視察	女		2／	—	—	—	
Ⅰ	Muhamamad Machmud	〃 病昆部									
Ⅲ	M. Ismunadji	〃 化学部	3・1	植物生理・視察	男		2／	1	1	1	
Ⅲ	I. Zulkarmaini	〃 化学部・農事試	6	植物生理	男		2／	2	2	1	
Ⅱ	Roechan										
Ⅱ	D.M. Tantera										
Ⅲ	Sismijati	農技研	6	植物生理	女		2／	3	3	1	
Ⅲ	M. Fathurochim	農技研・中国農試	6	植物生理	男		2／	3	3	1	
Ⅰ	Sudjadi										
Ⅰ	Nunung										
Ⅰ	Hartini										
Ⅲ	（Hidajat来年3月～6ケ月）										
Ⅲ	Lukman Nol Hakin	農研 化学部	47 1. 16～7 15								
Ⅲ	Paransih Isbagijo	〃	47 8 16～10 14	研究旅行							
Ⅰ	Muhamamad Machmud	〃 病昆部	47 8 18～48. 3 17		男	29	2／	1	2	3	
Ⅲ	M. Ismunadji	〃 化学部									
Ⅲ	I. Zulkarmaini	〃 化学部・農事試	48. 2 1～7 31								
Ⅱ	Roechan	ウィルス研・中国農試	48. 7 23～49 1. 22		男	32	2／	2	2	2	
Ⅱ	D.M. Tantera	農研・ウィルス研・中国	49 1～49 3	研究旅行	男	35	1／	2	1	1	
Ⅲ	Sismijati	農研・生理遺伝部	48. 7 23～49 1. 22								
Ⅰ	Sudjadi	〃 病昆部・中国農試	49 3 20～9 19		男	30	2／	3	2	1	
Ⅰ	Nunung	〃 九州	49 8 16～50 3 15		女	34	2／	3	3		
Ⅰ	Hartini	〃 〃	〃		女	33	2／	2	3		

5　供与機材の利用状況

供与機材の有効な利用がなされているかをチェックするため，昭和４５年度から４８年度までの供与機材について未利用品目，故障不利用及び廃棄品目をリストアップし，これらを物価スライドした額で，それぞれの比率を算出検討した。

この結果は，表－９に示すとおりであり，実質４カ年間で１７６，１６０千円（名目,108,822千円）の供与額に対し，未利用品目が５２％，故障及び廃棄品目が２８％であり，有効利用率は９２％であった。故障廃棄品目の大部分は，電気関係機材であり，電圧の不安定が原因となったものである。また未利用品目は，仕様の異るもの，アタッチメントが不充分なもの，今後の研究進捗に応じて使用されるもの等が含まれており，前２者については，今後購送に注意すべきであろう。なお，電気関係については，現在ほぼ改善されたので，今後は減少するものと考えられる。

表－９　供与機材の利用状況

単位：千円，％

部門	年次	スライド係数	供与額 名目	供与額 実績	未利用 名目	未利用 実績	故障及廃棄 名目	故障及廃棄 実績	利用額 実績	利用率（有効）
病理	４５	1.80	17281	31,106	307 (10)	553	250 (1)	450	30,103	96.8
	４６	1.70	15,060	25,602	70 (6)	119	—	—	25,483	99.5
	４７	1.59	14,492	23,042	3,266 (18)	5,193	2,000 (3)	3,180	14,669	63.7
	４８	1.32	14,583	19,250	293 (5)	387	609 (2)	804	18,059	93.8
	計	(1.61)	61,416	99,000	3,936	6,252	2,859	4,434	88,314	89.2
生理	４５	1.80	13,260	23,868	256 (2)	461	250 (1)	450	22,957	96.2
	４６	1.70	12,798	21,757	947 (1)	1,610	—	—	20,147	92.6
	４７	1.59	12,481	19,765	484 (1)	770	—	—	18,995	96.1
	４８	1.32	8,917	11,770	—	—	—	—	11,770	100.0
	計	(1.63)	47,406	77,160	1,687	2,841	250	450	73,869	95.7
計	４５	1.80	30,541	54,974						
	４６	1.70	27,849	47,343						
	４７	1.59	26,923	42,808						
	４８	1.32	23,500	31,020						
	計	(1.62)	108,822	176,160	5,623	9,093	3,109	4,884	162,183	92.1

（ ）は品目数

6. プロジェクトの延長について

本調査の結果，本プロジェクトの実施効果は，かなり大なるものと判断され，中央農研における協力2分野の水準は，わが国水準にあと一歩のレベルまで引き上げられたといえよう。しかしながら，一方では，中央農研を構成する部科それぞれの水準をみると，わがプロジェクトにのった分野とその他の分野の水準格差が拡大し，中央農研全体としてのバランスを欠き，研究業務の遂行にブレーキをかける結果をもたらすとともに，協力分野自体の研究遂行の効率化をも阻害することとなっている。

農業研究は，ある分野自体で単独（個々）に成立する性格のものではなく，各分野が有機的に結合しているものであり，農業研究のレベルアップのためには，それを構成する各分野のバランスのとれたレベルアップが必要である。この意味から，今後，協力効果の完結を図るとすれば，現在対象としている植物病理及び生理に関連する分野のレベルアップが必要不可欠の条件となると考えられる。

さらに，農業研究はそれ自体きわめて長期的な性格を有するものであり，一朝一夕に完了するものではない。技術進歩につれて，あるいは，実際の農業の発展及び条件変化に対応する研究需要が極端にいうならば，未来永ごう生じてくる。したがってこのような性格を有する農業研究に対する技術協力のあり方としては，農業研究にたづさわる研究者の能力が，単独で新たな発生研究需要に対応しうる水準までアップされることを目標とすべきであろう。

これらのことを勘案し，調査団は，本年10月22日協定期限のくる本プロジェクトを，さらに，3カ年延長し，既協力分野のカウンターパートの研究単独実施能力の引き上げを図るとともに関連する分野の研究をとり入れ，その充実強化を図ることにより研究遂行のバランスを考慮する必要があると考える。また，中央農研全体のバランスを考慮し，本プロジェクトの延長に併せ，今後，作物関係に主体を置く新規プロジェクトの発足を目途に，必要な調査検討が関係当局によって進められることが適当であろう。

エバリュエイション調査

1. 調査団の構成及び現地スケジュール

① 派遣期間　昭和５０年６月８日～６月２１日（１４日間）

② 調査団員構成

担当業務	氏　名	所　属
団　長	平野寿助	農業技術研究所生理第２科長
病　理	藤井　博	〃　細菌病第２室長
生　理	井ノ子昭夫	〃　土壌化学第１室長
作　物	宮坂　昭	農事試験場作物第６室長
協力企画	森　安良	農林省国際協力課海外技術協力官
研究管理	高沢　寛	農林省農林水産技術会議総務課技術協力係長
業務運営	坂井　清	ＪＩＣＡ　農業技術協力課

⑧ 調 査 行 程

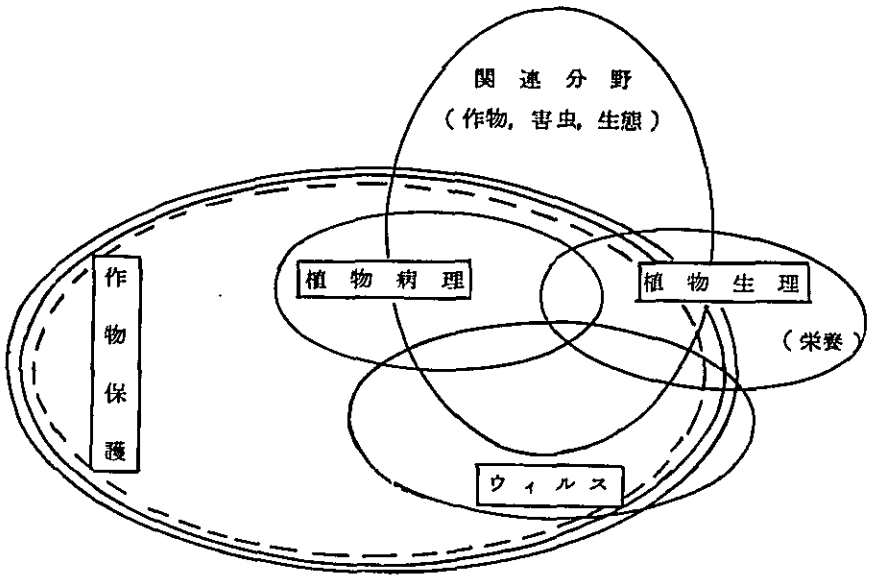
	月 日	曜	行 程	泊 地
第 1 日	6月 8日	日	東京→ＪＫＴ	ＪＫＴ
2	9	月	大使館，ＪＩＣＡ，農業省表敬及び打合	Bogor
3	10	火	中央農研所長表敬，日本専門家との打合	〃
4	11	水	作物部実験室・圃場見学Ｓｔａｆｆ Ｍｅｅｔｉｎｇ	〃
5	12	木	病虫部 〃 〃	〃
6	13	金	生理部 〃 〃	〃
7	14	土	Ｍｕａｒａ試験地視察，団員打合	〃
8	15	日	休 養	〃
9	16	月	中央農研所長及Ｓｔａｆｆとの Ｄｉｓｓｃｕｓｓｉｏｎ	〃
10	17	火	大使館・ＪＩＣＡとの打合	ＪＫＴ
11	18	水	農業省と Ｄｉｓｓｃｕｓｓｉｏｎ	〃
12	19	木	〃	〃
13	20	金	とりまとめ（大使館）	〃
14	21	土	ＪＫＴ→東京	

2. プロジェクト延長に対する考え方

前回の巡回指導調査において，本プロジェクトの進捗状況は約５８％，これを完結するための所要年数は，平均で約８年の結論を得た。今回の調査はこれに基づき，質的に前述の必要性を確認するために行ったものであり，調査内容は，インドネシア関係当局者との協議が主体をなした。

前回の調査においては，本プロジェクトがインドネシアの農業研究所　において，そのレベルアップにかなりの効果をあげ，また，インドネシア関係当局者も，プロジェクトに対する高い評価を行うとともに，本プロジェクトの延長及び分野拡大を望んでいるとの報告がなされた。本調査団も，調査，協議のプロセスにおいて，それと同様の内容をもつ感触を強く受けるとともに，プロジェクト延長の必要性を強く認識し，また，延長及び関連分野のとり込みの必要性を確認したつもりである。

即ち，本協力による分野は協定によりまづ作物保護の分野と規定され，この具体的課題として，植物病理，ウィルス及び植物病理に係る課題が設定されている。しかし，これに基づいて，試験研究を実施する場合これら８分野は，下図のようにそれぞれ，また，関連する他の分野に密接に結合しているものであり，それぞれを切り離して考えることは，逆に，それぞれの遂行を阻害することになる。



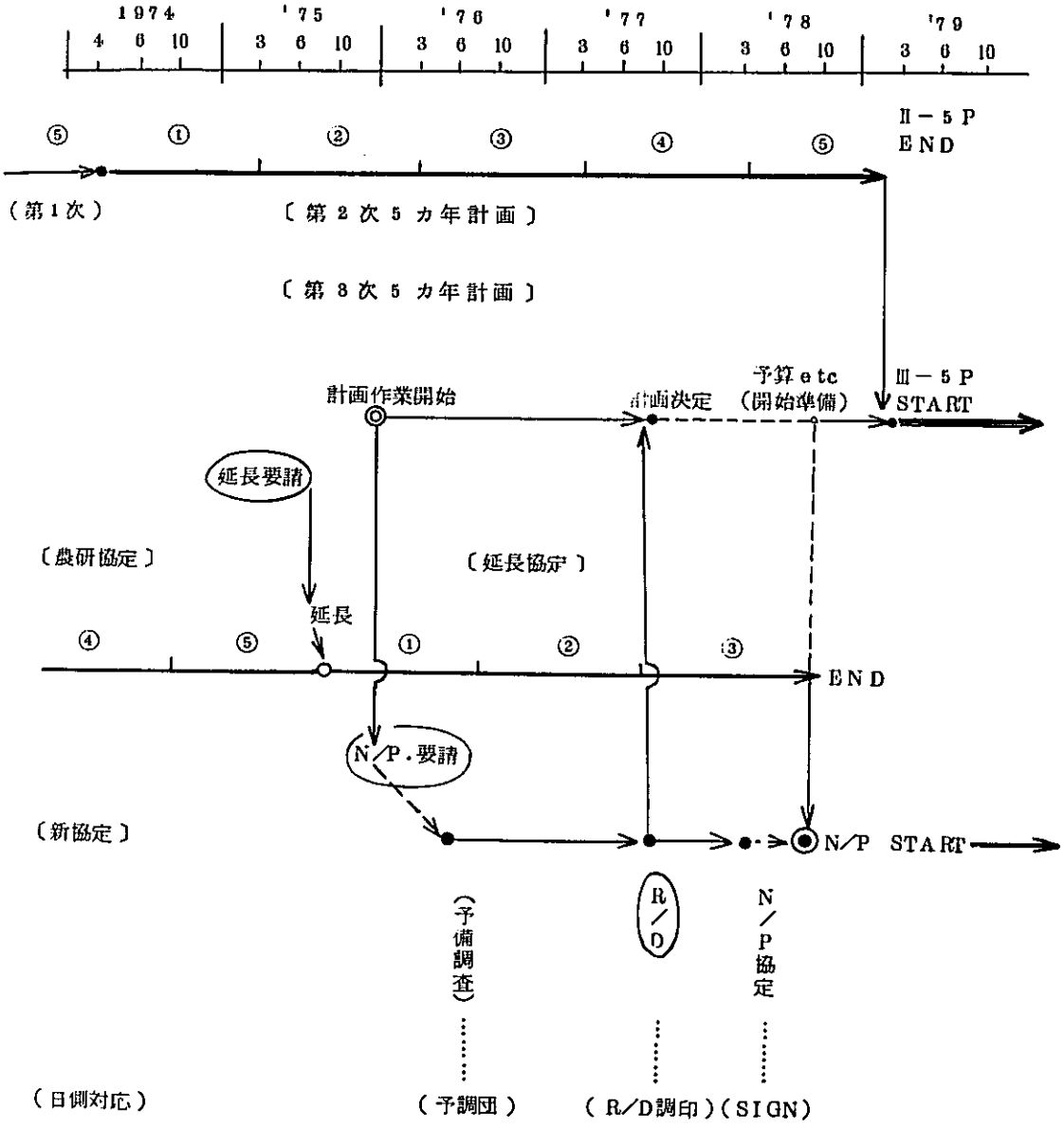
つまり，作物保護の分野ないし，具体的な3分野の研究を遂行し，あるいは遂行する能力をインドネシア側の研究者にもたせるということを考えるならば，単に，植物病理，ウィルス及び植物生理（栄養）という限られた範囲の協力ないしレベルアップでは完結しえないということである。本協力により，確かに協力3分野の能力水準は，かなりのレベルまで引き上げられた。しかし，インドネシア側研究者が，独自に新研究に対応するには，まだその能力は充分ではないし，特に問題になるのは，関連する分野の能力が不充分であるということである。

したがって，切角ここまで（日本の研究水準に近いまで）引き上げた協力効果を現時点において放置することは，再度協力前の水準に引き下げることと同様と考えられ，これをあと一押しすることの効果及び関連分野のとり込み効果のきわめて大きいことを本調査団としては提言したい。

3　協定延長に対するインドネシア当局者の考え方

前回の巡回指導調査の際提示された中央農研の本プロジェクトに対するプロポーザルでは，5カ年間の協定延長及び分野拡大があげられていたが，本調査時点では，インドネシア内部の事情即ち，経済開発5カ年計画に基づく財政措置手続きに整合する農業研究体制改善の側面から現協定の3カ年間の延長及び，その後の新プロジェクトの設立が適当とする旨の提言がなされた。そのタイムスケジュールは表－10に示されるとおりである。

表－１０　インドネシア農業研究協力協定に対するイ側の考え方



附　屬　資　料

V-1

A PROPOSAL FOR EXTENTION OF INDONESIA–JAPAN JOINT FOOD CROP RESEARCH PROGRAM 1975–1980

1. INTRODUCTION

The Central Research Institute for Agriculture (CRIA) has a mission of improving agricultural production technology based on problem oriented research with "agroclimatic package of technology" as its main objective.

In order to serve its mission most effectively the Institute is organized into disciplines on permanent basis as well as on commodity projects on a temporary basis. Based on disciplines, CRIA has 3 Departments i.e. Department of Agronomy, Department of Pests and Diseases, and Department of Plant Physiology. Based on commodities, members of the 3 Departments are organised into Rice Project and Secondary Food Crop Project.

In serving the farmers in various parts of Indonesia, each package of technology on food production invented by CRIA is backed up by trials conducted in Bogor as well as data collected at various locations throughout the country. For these purposes 2 CRIA branches (i.e. Sukamandi and Maros), 4 representative offices (i.e. Central Java, East Java, South Kalimantan and West Sumatora) and a net work of 22 Substations are already established. CRIA Bogor served as headquarter for research coordination and administration as well as a centre for training and upgrading to improve both technical skill and know how of staff personnels in the various stations. As a main station and centre for obtaining improved technical skill, it is essential that CRIA Bogor be provided with enough facilities, capable scientists and technicians and a budget reasonable for physical development and experimentations. A technical cooperation with foreign governments on a grant basis is one of many ways to enhance the process of development which is urgently required.

A cooperative program for food crop research between the Japanese and the Indonesian Government was signed in 1970. This program was organized to strengthen research in Plant Pathology, Plant Virology and Plant Physiology. The program has been one of the most successful program among various bilateral technical program in CRIA. The cooperation has promoted research activities, research facilities and research capabilities of junior staff personnels in respective field.

The following project proposal was prepared based on progress obtained to date and the future prospect of progress which is expected through an extention of the Indonesia–Japan Joint Food Crop Research Program for another 5 year period, covering the year 1975 to 1980.

2. BACKGROUND INFORMATION

2.1 The role of new technology in food crop production

Agriculture is basic to the Indonesian economy, employing approximately 75% of its people and producing about 55% of its Gross National Product. Therefore in the Five-Year Development Plans (REPELITAS), agriculture has been placed on top priority list. Agricultural production can be substantially increased most efficiently by the application of modern science and technology to agriculture and its associated industries.

In a rapidly developing agriculture, each new technology must be adapted to the changing physical and socio-economical factors at farm level. New technics in crop production which is available either in the country or abroad must be tapped, tested and given to the farmers as soon as possible.

In the mean time, current agricultural research is not sufficiently equipped to meet present and future needs. Thus, basic principles of research knowledge from other countries is extremely important in helping to solve agricultural production problems faced in Indonesia.

2.2 Current Indonesia–Japan Joint Food Crop Research Program, 1970–1975

This project was established in 1970, with the aim of contributing to the improvement of agricultural production through technical cooperation, under the agreement between Indonesia and Japan. The program is intended to strengthen research activities in CRIA covering the field of plant pathology, plant virology and plant physiology. The research theme described in the agreement involves three items:

1. Study on ecology and control of major diseases of food crops.
2. Study on forecast of occurence of major diseases and vectors of virus diseases of food crops.
3. Plant physiological studies on physiological disorders and its relation to major diseases of food crop.

The cooperation between the two government covering a period of 5 years could be considered as fruitful since many aspects has been observed to be much improved. The Indonesian staff members together with their Japanese counterparts have done their best to improve research facilities and to create proper atmosphere for intensive research in each laboratory. The Indonesian researchers are increasing in their research competent by using proper techniques and instrumentations. During the period of cooperation more Indonesian staff are recruited and trained. Implementation of the laboratory with machineries and apparatus donated by the Japanese Government through JICA(OTCA) has gradually make possible more elaborate experimentations to be conducted in the laboratory as well as in the field.

From the Indonesian Government more budget for site development was contributed resulting in more building space was constructed, electric power was increased and the water supply was much improved.

With better facilities and trained staff researcher, more sophisticated research could be conducted which give new findings leading to basic solution to fundamental and practical problem in food crop production.

Some of the principle progresses obtained to date are encouraging despite minor problems incountered during the 4 year of cooperation.

2.2 Research facilities

Electricity:

To meet the requirements for all the laboratory instruments, the electricity have been increased in Plant Pathology and Plant Physiology laboratories. Rehabilitation of old building was done to accommodate new equipments and new building have been constructed to provide more working spaces for the expanding research activities. The power in each laboratory is now 2 to 3 times higher than the previous one.

Water supply:

Water reservoir was constructed and waterpump is operating to ensure high water pressures. Another water reservoir is intended to be constructed soon, and another waterpump is available, donated by the Japanese Government.

Gas supply:

Since town gas is not available at Plant Physiology Laboratory, iron cylinders of different sizes are used to store gasses (acetylene, propane, LPG). This system could meet the requi requirements of laboratory works.

Implementation:

Implementations of the laboratory with instruments, apparatus, machines, etc. was provided by the Japanese Government every year. At the present time the laboratories are fairly well equipped.

Building construction:

In Plant Physiology Laboratory in Sindangbarang, during the four years cooperation, the following buildings were constructed to meet the expanding needs:

1. Rooms for plant preparation and soils analysis.
2. Generator house.
3. Gas house.
4. Wire house.
5. One glasshouse.
6. Rehabilitation of the existing buildings and increasing electric power from 24 KVA to 75 KVA.

7. *Rooms for experts/staff and strengthening of the glasshouse slope.*

In Plant Pathology Laboratory in Cikeumeuh the following activities was completed:

1. Building rehabilitation and electrical installation.
2. Increase of electric power from 39 KVA to 95 KVA.
3. Five prefabricated greenhouses installed.
4. One unit of godown and generator house.
5. Water reservoir and waterpump installation.

Reconstruction of half of the old building in the Department of Plant Pests and Diseases will be initiated this year. A summary of development and research budget allocated for the Cooperative Program is listed in APPENDIX A.

2.2b Personnesl

In 1969 only 2 research staff available for Plant Pathology and 3 researchers for Plant Physiology. At present there are 9 researchers and 5 research assistants for Plant Pathology Research and 8 researchers, 4 chemists and 6 field assistants for Plant Physiology. More over the research capabilities of the young researchers are very much improved by overseas training and local guidance by their Japanese Counterparts.

During the cooperation, Japanese experts and consultants dispatched by the Japanese Government were: Mr. F. Yazawa (1971–1973), Mr. M. Higuchi (1972–1973), Mr. M. Miyake (1973–1975) and Mr. K. Hayami (1974). Their assistance played an improtant role for the success of the program in Plant Physiology research.

Research in Plant Pathology has been strengthened by the dispatched of Japanese Plant Pathologist and Plant Virologist. The following researchers and consultants have been working in Plant Pathology laboratory: Dr. Y. Iwata (1970–1975), Dr. T. Nishisawa (1971–1973), Mr. H. Satomi (1971–1973), Mr. T. Yamamoto (1972–1975), Dr. Iwaki (1973–1975), Dr. T. Kajiwara (1973–1975), Mr. H. Mikoshiba (1971–1975), Dr. T. Hino (3 months in 1973), Dr. Tominaga (3 months in 1974).

2.2c Research activities

The Indonesian and their Japanese counterparts have been conducting laboratory as well as field experimentations cooperatively each season. All of these are integrated into current research projects of CRIA by using the existing budget from our DIP. The cooperation has been based on mutual respects and understandings, on one hand on the problems faced by Indonesians as a developing nation and on the other hand on Japan limitation due to government regulations in Japan.

Field trip and observation works are done together by the Japanese and their Indonesian counterparts, sharing together lodging space or any other facilities. This opportunity is also used to exchange opinions and cultural background between the two nations.

Scientific Seminar or Symposium either in the country or abroad are attended together as much as possible in accordance with the need and budget currently available. Seminar Indo Indonesian researcher have attended scientific meetings and observation trip in Japan and discussed current research activities in Indonesia and various research problem in Japan. This help the policy makers in both countries to decide which researcher to be dispatched to Indonesia.

Most of the Indonesian junior staff have visited Japan for a short term training of 3 - 6 months period. On the other hand many Japanese researcher visited Indonesia as short term consultant on a special request.

2.2d Research results

Various papers on new research findings on plant disease identifications and control, and on mineral nutrition uptake and physiological diseases of food crop are published. Among the important findings are:

Plant Pathology:

1. Identification of penyakit habang (tungro like) in South Sulawesi and South Kalimantan; grassy stunt in Sukamandi, Tegal and Banyuwangi; yellow dwarf and orange leaf virus in Java.
2. Identification of new virus diseases on grain legume crops in Sumatora, Java and the other islands.
3. Identification of bacterial and fungal diseases of food crops.
4. Epidomiology and infection process of Sclerospora maydis and its control on corn.
5. Chemical control of sheath blight and bacterial leaf blight.
6. Identification of bacterial sirains through varietal reaction.
7. Electron microscopic studies on virus diseases newly identified.
8. Testing for resistance of lines/varieties to major diseases.

Plant Physiology:

1. Complex of nutritional disorder of rice at Cihea.
2. Study on the effect of fertilization on growth, nitrogen nutrition and the occurence of Helminthosporium leaf spot in lowland rice.
3. N recovery of rice in major Java soils.
4. The importance of straw incorporation in rice cultivation.
5. The discovery of sulphur hunger of lowland rice in Java.
6. Phosphorus and potash deficiency of rice in Lampung.
7. P fertilization of rice at Muara.
8. Nutrient uptake of soybean at Muara.

At the present time many experimental data was collected for further evaluation and will be publish later on. A list of publications by researchers engaged in this program is presented in APPENDIX B.

3. JUSTIFICATION FOR EXTENTION OF THE PROGRAM

After the arrival of the Japanese experts in March 1971 for implementation of the Indonesia–Japan Joint Food Crop Research Agreement, concerning the field of physiological diseases, plant pathology and Virus-vector studies, a considerable progress has been made.

The achievements obtained are:

3.1 The Japanese experts directly give guidance to their counterparts and have improved their capability in doing research either in the laboratory or in the field.

3.2 *The Division for Plant Pests and Diseases Sub-division Pathology and Plant Physiology* Department are gradually well eqluipped with modern apparatus and machineries which enable the two Divisions conducted more extensive and basic research.

3.3 More money was allocated to the Division of Plant Pests and Diseases and Plant Physiology, so that improvements has been achieved *on recruiting staff personnel*, rehabilitation and extension of buildings, electric facilities and water supplies.

3.4 The sending of counterparts for further short term training in their respective field of research in Japan, also has contributed in the increasing research capability of the staff personnel.

3.5 Important research findings in the field of plant physiology, diseases and virus which were published in the Institute's contribution and in papers of the annual staff meeting were obtained.

3.6 The Japanese researchers have guide students of IPB, UNLAN and ITB for preparation of thesis through experimentations in CRIA laboratory. The success achieved up to now has contributed an important support to the First Five Year Development Plan.
Due to this success and to the important role of CRIA in the field of research on food crops, the agreement which will be terminated in October 1975, deems necessary not only to be extended from the present activities but also to be expanded to other discipline including Eatomology, Agronomy and Breeding.

Entomology:

1. Rat which is the major pest of food crops should be studied more intensively. Basic research such as population dynamics, behaviour and control measures need to be studied more deeply. Since expert and facilities for research is still minimal, a technical aid is urgently required.

2. The use of pesticide is still one of the important means for pest control. CRIA, as a member of the National Pesticide Committee, has a crucial role in the policy of pestcide use. More basic study on made of action, toxicity, effectiveness and side

effect to non-target pest needs to be studied. Facilities and research staff is far from adequate and need to be developed and improved.

3. A large insect collection of pests on food crop is kept at the Division for Plant Pests and Dieseases a toxonomist to take care for this collection and to identify unknown pests is urgently needed. Also improvement of the collection itself is considered to be a necessity.

Agronomy:

A new technology in crop management is needed if an average yield of above 5 tons of rice per ha is expected. Research on rice agronomy must be more intensively carried out in the future. In CRIA, this disciple is necessary to be strengthen in the near future.

Water requirements for various crop plants is a crucial aspects of crop husbandry. Studies on this subject will help efficient use of irrigation water in various parts of Indonesia.

Weeds are decreasing yeild probably more than anything else through its composition with our crops. There are many ways to control weeds, and research on effective means of controlling it is urgently required.

Breeding

Breeding to obtain high yielding varieties resistant to the important diseases and pests is one of the main target of the breeding program. It was planned to release rice varieties resistant to tungro and grassy stunt in the Second Five Year Development Program. Also rice varieties tolerant to drought, salt water, toxic agent has to be discovered. To reach this goal breeder and research facilities and equipments needed to be improved.

4. PROJECT DESCRIPTION

The development of the project justifies an extention of the present Indonesia–Japan Joint Food Crop Research Program for 5 years after the termination of the current program. Some expansion of research field is proposed in the following:

4.1 Plant Pathology

4.1a Study on the bacterial leaf blight of rice:

1. Study on varietal resistance.
2. Study on variation in virulence.
3. Study on bacteriophage.
4. Study on chemical control.

4.1b Study on sheath blight and stem rot of rice:

1. Study on varietal resistance.
2. Study on chemical control.

4.1c Study on virus diseases of rice and their vectors:

1. Identification of virus diseases.
2. Seasonal prevalence of vestors.
3. Varietal reaction to rice virus diseases and their vectors.

4.1d Study on virus disease on legumes:

1. Identification of virus diseases and its distribution.
2. Study on the vectors.
3. Study on varietal resistance.

4.1e Study on downy mildew:

1. Field study on conidial dissemination under natural conditions.
2. Varietal resistance study.
3. Study on the chemical control.

4.2 Plant Physiology

4.2a Study on plant nutrition:

1. Continuation of research on nutritional disorders of food crops to increase regional productivity.
2. Research on nutrient requirement of food crops using conventional as well as isotope techniques.
3. Study on the efficient use of fertilizers consumed by food crops plants.

4.2b Study on growth, development and soil microbiology:

1. Study on growth and development to create an ideal plant type for high crop production.
2. Research on the effect of drought and cool temperature on plant performance and crop yeild.
3. Research on the physiological characteristics as affected by cultural practices.
4. Soil microbiology research in relation to nutrition uptake.

The following programs are newly proposed to be covered also in 1975 - 1980 period.

4.3 Entomology

4.3a Study on rat ecology and its control:

1. Determination of rat species important to agriculture.
2. Study on population dynamics.
3. Study on rat movement.
4. Study on the possibility of the forecast of rat outbreak.

4.3b Toxicology:

1. Study on the methodology of side effect of pesticides to non target insects.
2. Study on the mode of action of pesticide.
3. Study on the pesticide residue through chemical analysis and bio-assay.

4.3c Insect taxonomy and insect collection.

4.4 Agronomy

1. Agronomy research on rice crops, grain legumes and tuber crops.
2. Water requirement and water management for rice and upland crops.
3. Weed control research on rice, grain legumes and tuber crops.

4.5 Breeding

1. Breeding rice varieties resistant to pest and diseases with high grain qualities.
2. Breeding for high yielding varieties resistant to pests and diseases of grain legumes and tuber crops.

It is essential that further details of the Cooperative Program theme be discussed and determine by the Director of CRIA and the Japanese Team Leader.

The technical cooperation between CRIA and various foreign donors covered a wide range of activities. Each donor participates in one particular aspect in each field so that the intergation of such studies into the overall program of CRIA could quickly stimulated various research field.

APPENDIX A.

A summary of structural development and research budget allocated by the Indonesian Government for the Indonesia–Japan Joint Food Crop Research Program during 1971 - 1975 (in thousand rupiah).

Activities	1971/72	1972/73	1973/74	1974/75	Total
Research					
Disease	Rp.8,500	Rp.6,800	Rp.10,400	Rp.11,000	Rp.36,700
Plant Nutrition	3,000	4,100	7,600	8,400	23,100
Building Construction					
Disease	5,750	13,650	–	24,000	43,400
Plant Nutrition	–	7,750	23,000	15,000	45,750
Handling Cost	4,500	5,000	7,500	7,000	24,000
	Rp.21,750	Rp.37,300	Rp.48,500	Rp.65,400	Rp.172,950

A summary of budget for equipment, training and others allocated by OTCA for the Indonesia–Japan Joint Food Crop Research Program during 1970 - 1974 (in thousand yen).

Items	1970/71	1971/72	1972/73	1973/74	Total
Equipment	¥32,192	¥30,948	¥32,183	¥28,000	¥124,323
Training of counterparts	–	1,108	4,303	4,303	9,714
Others	3,577	18,924	23,555	21,059	67,115
	¥35,769	¥50,980	¥60,041	¥53,362	¥201,152

APPENDIX B.

LIST OF REPORT AND PUBLICATIONS

PLANT PATHOLOGY

1. TANTERA, D.M., H. SATOMI and ROECHAN. 1973. Crassy stunt disease of rice in Indonesia. Contrib. CRIA Bogor, No. 2 : 8 p.

2. TANTERA, D.M. and H. SATOMI. 1972. Laporan hasil-hasil peninjauan penyakit padi didaerah Sulawesi Selatan tgl. 11–19 Desember 1972 : 6 p. (mimeograph).

3. SATOMI, H. 1972. Yellow dwarf disease of rice in Indonesia. Paper presented in South East Asia Regional Symposium on Plant Diseases in the Tropics, Yogyakarta, September 11–15, 1972 : 1 p. (abstract).

4. TANTERA, D.M. 1973. Studies on rice virus/myrus/mycoplasma diseases in 1972. Paper prosented in CRIA Staff Meeting, Bogor, July 25–26, 1973 : 25 p. (mimeograph).

5. NISHIZAWA, T., M. MACIHMUD, MUKELAR A. and OTJIN SUMANTRI. 1973. Studies on sheath blight and stem rot of rice (March 1971 - March 1973). Plant Pathology Report : 38 p. (mimeograph).

6. NISHIZAWA, T., T. YAMAMOTO, M. MACHMUD, MUKELAR A., HARTINI RAMLAN H., Studies on bacterial leaf blight of rice. Plant Pathology Report : 59 p. (mimeograph).

7. SATOMI, H. 1973. Interim report of the research on rice virus diseases and their vectors. CRIA Pathology Report : 10 p.

8. SUDJADI, M., H. NIKOSHIBA and D.M. TANTERA. 1973. Studies on downy mildew disease of maize during the year 1972/1973. Paper CRIA Staff Meeting, Bogor : 24 p. ((mimeograph).

9. TANTERA, D.M. 1974. Cultural practices to decrease losses due to corn downy mildew diseases. Proc. International Symposium on downy mildew of maize, Sept. 17–22, 1974. Tokyo : 7 p.

10. KAJIWARA, T. 1974. Some experiements on downy mildew of maize. Proc. International Symposium on downy mildew of maize, Sept. 17–22, 1974. Tokyo : 6 p.

11. IWAKI, M., M. ROECHAN and D.M. TANTERA. 1974. Virus diseases of legume plants in Indonesia.
    1. Soybean stunt virus, CRIA Pathology Report :

12. IWAKI, M., M. ROECHAN and D.M. TANTERA. 1974. Virus diseases of legume plants in Indonesia.
2. Cowpea Aphid born mosaic virus, CRIA Pathology Report : 14 p.

13. ROECHAN, M. 1973. An electron microscopic study on rice tungro virus disease in *Indonesia. Training Report, Institute for Plant Virus Research Chiba, Tokyo (Japan)* : 4 p.

14. MACHMUD, M. 1973. Advance training on bacteriology. Training Report, National Institute of Agricultural Sciences, Nishigahara, Tokyo (Japan) : 14 p.

15. MACHMUD, M., T. NISHIZAWA, HARTINI, T. YAMAMOTO, NUNUNG, H.A. and I.N. OKA. 1973. Hasil penelitian beberapa penyakit penting padi pada tahun percobaan 1971–1972. Paper CRIA Staff Meeting, Bogor : 15 p.

16. SUDJADI, M. 1974. Histopathology of corn plants infected by downy mildew fungus, Scolorospora maydis. Training Report, National Institute of Agricultural Sciences, Nishigahara, Tokyo (Japan) 7 p.

PLANT PHYSIOLOGY

1. ISMUNADJI, M., L.N. HAKIM, I. ZULKARNAINI and F. YAZAWA. 1973. Physiological disease of rice in Cihea. Contr. Centr. Res. Inst. Agrio. Bogor 4 : 1–10.

2. ISMUNADJI, M., I. ZULKARNAINI and F. YAZAWA. 1973. The effect of straw incorporation on growth and nutrient status of lowland rice.
1. The effect of straw incorporation on 13 rice varieties. Contr. Ceatr. Res. Inst. Agric. Bogor 8 : 1–19.

3. ISMUNADJI, M., SISMIYATI, SUTANTYO and F. YAZAWA. 1973. The effect of fertilization on growth, nitrogen nutrition and the occurrence of Helminthosporium leaf spot in lowland rice. Costr. Centr. Res. Inst. Agric. Bogor 5 : 1–12.

4. ISMUNADJI, M., I. ZULKARNAINI, A. PRAWIROSANUDRO and F. YAZAWA. 1973. Productivity of some major Java soils with special reference to yield and nitrogen nutrition of lowland rice. Contr. Centr. Res. Inst. Agric. Bogor 7 : 1–17.

5. ISMUNADJI, M. 1974. Utilization of cereal crops residues and its agricultural significance in Indonesia. Paper presented at a seminar on the utilization of cereal crops residues in Tokyo. July 7–13, 1974 (mimeograph).

6. ISMUNADJI, M., I. ZULKARNAINI and P. YAZAWA. 1972. Nitrogen requirement of lowland rice on major Java soils. CRIA Staff Meeting. May 29–30, 1972.

7. ISMUNADJI, M. 1973. Penyakit fisiologis tanaman padi di Indonesia. (Physiological disease of rice in Indonesia). CRIA Staff Meeting. July 25–26, 1973.

8. ISMUNADJI, M., I. ZULKARNAINI and M. MIYAKE. 1974. Sulphur hunger of rice in Java soils (in preparation).

9. HAYANI, K. 1974. Studies on the possibility for the occurrence of sulphur deficiency (mimeograph).

10. HASAN, R., M. NASIR, M. ISMUNADJI and F. YAZAWA. 1972. CRIA Staff Meeting. May 29–30, 1972.

11. HIGUCHI, M., A. HIDAYAT, M. ISMUNADJI and F. YAZAWA. 1974. The effect of N, P, K, line and stable manure application on nutrient uptake, growth and yield of soybean, (typed).

V-2 BRIEF REPORT OF PROGRAM SURVEY FOR JAPAN-INDONESIA JOINT FOOD CROP RESEARCH PROGRAM

November 26, 1974

Pre-Evaluation Team for Japan-Indonesia Joint Food Crop Research Program, Japan

The Japanese Pre-Evaluation Team for the Program, organized by Japan International Cooperation Agency (JICA) headed by Dr. Y. Sakurai, has visited Indonesia for 15 days from the 13th to the 27th of November, 1974. Members of the team, five in all, studied the present situation and problems of the Program, and discussed with Japanese experts as well as Team leader, Dr. Y. Iwata.

Moreover, we also discussed with Dr. Satari, Director of Central Research Institute for Agriculture (CRIA), Dr. Rusli, Associate Director of the CRIA and staffs concerned in Agronomy Division, Plant Diseases and Pests Division, and Plant Physiology Division of the CRIA, on "A proposal for Extension of Indonesia-Japan Joint Food Crop Research Program" which has been prepared by CRIA.

The team also exchanged the views on the proposal from CRIA with Dr. Rahardja, Secretary of the Director General of Agriculture and Dr. Sumantri, Special Advisor of Director General of Agriculture. A short trip for surveying three experimental substations of CRIA located in East Java has also been made.

The outline of the finding will be described as follows.

1. Progressing status of the Program

With aim of the strengthening of research activities in the field of plant protection of CRIA, the Agreement between the Government of Japan and the Government of Japan and the Government of the Republic of Indonesia concerning the implementation of Japan-Indonesia Joint Food Crop Research Program was initiated on October 1970. In early 1971, Dr. Iwata, Japanese team leader, and other experts arrived in Bogor and the joint research program was started. Until now seven Japanese experts in the field of plant pathology, plant physiology, and plant virology and four short term consultants including researchers from Tropical Agriculture Research Center were dispatched.

For the implementation of the Program, a lot of equipments, instruments, tools, machieneries, vehicles and their soare parts were donated by Japanese Government.

According to the Agreement, ten junior researchers of CRIA have received the training in Japan in their respective fields and three senior researchers have visited Japan for observation

tour.

On the other hand, Indonesian Government has made much efforts to increase the number of researchers who are engaged in the joint research program and to improve research condition such as space of laboratory, electric power and water supply. As the results of these close cooperation, the joint research program has been making a favorable progress.

2. Research activity

The Program is progressing satisfactorily by both the improvement of laboratory condition, and the efforts of CRIA and the Japanese team. Indonesian and Japaneses researchers have cooperated closely, and done their best on the research planning, practice of experiments, arrangement of data and so on. About 16 and 11 reports have been made on the plant pathological and plant physiological research fields respectively since the starting of the Program. The results of the researches contribute not only to the agricultural development in Indonesia but also to the advancement of the related research in Japan.

The outline of results and remaining problems is as follows;

1) Plant pathological and virological research

Recently sheath blight of rico (Rhizoctonia solani) is becoming serious due to the distribution of the varieties having short culm and high tillering. Investigation on the field resistant varieties should be done because major gene resistant varieties are not yet found in the field and seedling tests.

Classification of the isolates of Xanthomonas oryzae collected in Indonesia was conducted by their reaction to the differential varieties of rice. Most virulent strain IV which can infect all differential varieties was proved to be distributed commonly in Java and other islands. Therefore, it is necessary to find major gene resistant varieties to IV strain, and also resistant varieties such as Pelita which have high field resistance to all strains.

Penyakit habang broke out in South Sulawesi and South Kalimantan. Symptom and mode of transmission of penyakit habang resemble to those of tungro virus, but it is very interesting that particles of causal agent was proved to be bacillioform, different from that of tungro virus in the Philippines.

Mycoplasma like microorganisms were found in the diseased rice plants showing yellow dwarf symptom, but not yet confirmed in the grassy stunt diseased rice plants.

Another important rice diseases are blast (Pyricularia oryzae) and panicle blight. Blast is not so serious in plain region, but according to the increase of nitrogenous fertilizer application rice plants will be exposed to the menace of blast. Identification and distribution of the race are desirable to be investgated.

Causal fungus of panicle blight in Indonesia have not yet been clarified, but Helmin-

thosporium oryzae, Cercospora oryzae, Fusarium nivale, Leptosphaeria salvinii have occurred commonly on the leaves and sheaths of rice plants. These fungi may naturally cause panicle blight in Indonesia as in Japan. It was very interesting that the outbreak of rot or blight of panicles caused by sheath rot fungus (Acrocylindrium) was observed in some places in East Java.

Research works on the most serious maize disease, downy mildew, were conducted earnestly, and fruitful results have been obtained. Inoculation methods were established, and the relation between the infection process and disease occurrence was clarified. The varietal resistance was recognized by inoculation and field tests, but highly resistant varieties which have high yield and good quality are not yet found. Control measures including resistant varrieties, crop rotation, chemical control etc. shoul be investigated.

Regarding the legume plant diseases, causal fungus of scab on mungbean was identified with Elsinoe phaseoli. Two viruses of soybean were found and identified with soybean stunt and dwarf virus respectively. Dwarf resembles to Japanese soybean dwarf in respects of symptom and transmission mode, but different in the aphid species of vector. On peanuts, mottle and ring spot viruses were found, and witches' broom were confirmed to be caused by mycoplasma. Leaf curl of peanut is transmitted experimentally only by grafting up to now, therefore vectors should be detected to make clear natural outbreak of this disease. There are many kind of white flys in Indonesia. It is necessary to find legume plant viruses transmitted by this insect.

2) Plant physiology

An experiment was conducted in Cihea to study the physiological disease of lowland rice, which commenced with orange to brown discoloration of the lower leaves. Occurrence of the disease was mainly due to potassium deficiency, which in some cases induced iron toxicity. The rather high manganese content of the plant samples very likely contributed also in the abnormal appearance of the rice plant. It could be concluded that the physiological disease of rice in Cihea is a complex of nutritional disorder. Potassium sulphate as wellas potassium chloride were both effective to improve the nutrient status of the rice plant and to increase crop yield significantly.

A fertilizer experiment conducted in a grumusol area in Yogyakarta, where the soil consists of new volcanic ash, have shown that nitrogen application reduced the serity of Helminthosporium leaf spot infestation. Silicon application in the form of slag had no effect on the occurrence of the disease, due to sufficient supply of silicon originated from the soil and irrigation water. The results also indicated that nitrogen was effective to increase grain yield. The highest yield was obtained in the ball fertilizer plot, a slow acting fertilizer containing the major nutrients N, P and K.

The productivity of major Java soils in five locations with special reference to yield and nitrogen nutrition of high yielding lowland rice varieties was studied. Increasing rates of N application up to 180 kg N per hectare increase grain yield significantly in all locations, except Muara which obtain the highest yield at 135 kg N per hectare. There is a positive corelation

between N content in grain and yield. The total N uptake at harvest increases with increasing N supply. The total absorption varies between 46 to 148 kg N per hectare and 46 to 65 kg N originates from the natural supply of the soil. There is a close positive correlation between total N uptake and grain yield. From the total N absorbed about 70% is translocated to the grains. The N requirement to produce 100 kg grain increases with increasing N supply. Yield return per kg fertilizer N used varies between 17 to 22 kg grain. The N utilization ratio of added fertilizer varies from location to location for Muara 29%, Pusakanegara 42%, Centeng 45% and Mojosari 48%. The study of N recovery in other locations is necessary to be conducted.

An experiment conducted in a grumusol area in Cihea low in potassium have shown, that straw incorporation at a rate of 3 tons per hectare increased the grain yields of most rice varieties and it increased also potassium uptake and potassium content of the rice plant. The beneficial effect of rice straw incorporation in this area is probably due to the potassium fertilizing effect of the rice straw and it could be considered as a substitute of inorganic potassium fertilizers in rice cultivation. There was only a slight increase in total N and P uptake.

An experiment conducted recently in a latosol area in Muara proved that plowing under of fresh straw one week before planting did not reduce grain yield of rice significantly in comparison with two or four weeks before transplanting. This evidence indicates that decomposition of rice straw under flooded condition proceeds very fast in the tropics, so that adverse effect on plant growth and yield of rice is hardly observed. The rapid decomposition of rice straw may be the reason that in the tropics making compost from rice straw does not get its general practice as is the case in temperate regions.

Pot experiments conducted in the glasshouse using soils from different parts of Java vound interesting results related with sulphur hunger in rice seedlings. The results have shown, that rice seedlings grown without application of sulphur were inferior compared with sulphur treated seedlings in some soils, among other soils from Ngale, Jakenan, Magelang, Muara and Citayam. The plants without sulphur showed disorder symptoms and seemed to be due to sulphur deficiency, the plants were poor and yellowish in color typical for sulphur deficient plants. The chemical analysis of the rice seedlings have shown that the rice plant tissues without sulphur were low in sulphur content far below the critical level of 0.1% sulphur. Further experiments with Ngale and Jakenan soil have shown, that ammonium sulphate application was effective to improve the nutrient status of the rice plant. Advanced experiments are now in progress.

In a pot experiment with Muara soil (Latosol), one of the Indonesian soils low in phosphorus availability, response to phosphate on plant growth could be seen only in the early stage of growth and there were no significant difference on grain yield between treated and untreated plots. Since similar results were obtained in the succeeding field experiments, the low effectiveness of phosphate fertilizers in Muara soil is being studied with soil incubation test and total P analysis. Field experiments on phosphatic fertilizer have been and will be conducted on Grumusols, Podzolic and Mediteranean soils as well as Latosols.

Effect of low temperature on the grain fertility of rice varieties is being studied in

a glasshouse at Sindangbarang, using the thermostatic waterbath apparatus at 15°C to find out the critical period of plant growth for cool injury. Screening of cool resistant varieties is the purpose of this experiment.

Experiments on the effect of drought on the growth of rice varieties are also being conducted in some locations in Java to find drought resistant varieties.

Experiments are and being conducted in the glasshouse, using sand as well as water culture to produce nutritional disorder symptoms of food crops, like rice, maize, soybean, peanuts and sweetpotato. It is the intention to make color prints and it is considered as a useful tool for extension officers and farmers to be able to evaluate the nutritional status of the crop and the soil, so that countermeasures could be applied.

Other nutrio-physiological studies and fertilizer experiments are being carried out on maize, soybean and peanut.

3. Some problems in the research environment

1) Number of researchers and research assistants engaged in the Program have been increased considerably and also the laboratories have been fairly well equiped. However, the training of recruits for the new scientific techniques should be contiued as an important part of the activities under the Program. For the upgrading of competant staffs, a long term, advanced training course should be taken into consideration in the future besides the current six month training in Japan.

2) Remarkable improvements have been done in the electric power and water supply and also the construction of the buildings has been advanced to meet the research progress of the Program. It would be expected to extend electric wiring and water piping into new building and to maintain them in good control.

3) With the development of Indonesian industry and trading, local purchase of spare parts, chemicals etc., and also repairing of instruments will be feasible, therefore, the increase of the budget for local purchase from JICA as well as CRIA would be desirable.

4. Conclusion

1) All of the members of the Team are happy to learn that the Japan-Indonesia Joint Food Crop Research Program has been obtaining an excellent results for the past four years. We greatly appreciate the cooperative activities of Indonesian authorities concerned and earnest efforts of Japanese experts.

2) The term of the Agreement will terminate on October 1975. However, based on the special character of agricultural research and on the results of our intermediate evaluation, the extension of the current program was considered to be necessary for a certain period after October 1975.

3) A proposal for the extension of the Program which was prepared by CRIA involves not only the continuation of the current research cooperation but also the expansion of research cooperation to other research fields such as agronomy, breeding and entomology. For the establishment of agricultural techniques on food crop production the research activities on the fields such as plant pathology, entomology, agronomy and physiology should be proceeded keeping balance among them.

4) Although the expansion of the research cooperation to the research fields other than those prescribed in the current Agreement will be difficult at the extension of the Program, some possibilities to cooperate in the research subjects losely related to the present cooperating researchfields would be suggested.

5) The final discussion for the extension or expansion of the Program will be made by the final evaluation team which is expected to be dispatched by JICA next year. We would report the results of our pre-evaluation of the Program and the CRIA-s proposal to Japanese authorities concerned.

Finally we would express our sincers gratitude to all of the officials concerned in Indonesian Government and Japanese experts of the Program who have extended cordial assistance and cooperation to our Team.

V-3 SUMMARY REPORT OF PROGRAM SURVEY FOR JAPAN-INDONESIA JOINT FOOD CROP RESEARCH PROGRAM

Dr. J. Hirano

Team for Japan-Indonesia Joint Food Crop Research Program, Japan

1) In November 1974, an informal proposal was made by CRIA Indonesia, to the preliminary evaluation team headed by Dr. Sakurai, on the extension of Japan-Indonesia Joint Food Crop Research Program.

Several discussion meetings were held among the staffs concerned in Ministry of of Foreign Affairs, Ministry of Agriculture and Forestry, and JICA in Tokyo, and came to the following conclusions:

a) In consideration of the activities and the fruitful success of the presont Research Program, it is desirable that the Program would be continued further, at the time of termination of the Agreement, if it is mutually agreed by both Governments.

b) Period of extension will be 2 to 3 years.

c) During these 2 or 3 years, additional long-term and short-term experts will be dispatched if necessary, to cover the additional closely related fields. To these additional research fields, necessary equipments or struments will be provided, and the training of counterpart researchers will also be done.

d) If further request is made from Indonesian side, a new cooperation research program covering wider range of uncooperated research fields will be taken into consideration.

2) The present evaluation team was dispatched to explain above mentioned situation, and to discuss with Indonesian side including Japanese experts on the following problems;

a) The period of extension.

b) Details of the proposal.

c) Sounding views of Indonesian side on the above mentioned new program.

d) Overlapping or competition between Japanese program and programs of other countries or international organization.

3) The present evaluation team visited Ministry of Agriculture, Jakarta, CRIA, Bogor, together with Japanese Program Team Leader Dr. Iwata and other experts of the Program.

After having enthusiatic discussion meetings, and looking at field equipments or laboratory instruments, the evaluation team members learned much about the present activities and future aspects of respective research fields of the Program.

The findings were;

a) The period of extension

Indonesian side desires to extend the Program for the period of 3 years. The evaluation team members also considered 3 years will be necessary. Final dicision, however, will be made later at the discussion meeting by the persons in concern of the Japanese Government.

b) Detail of the proposal, and the corresponding plan of Japanese side.

As reported by the pre-evaluation team, equipment, facilities and research staffs at CRIA were much improved according to the Program. The present evaluation team would like to express their respects to the activities and efforts of the personnels concerned in both countries.

However, considerable improvements are still needed, especially in closely related research fields to which the Program has not covered. Such improvements of research environment should be made keeping balance. Therefore, during the period of extension of the Program, careful consideration of the personnels concerned in both countries will be desired.

Details of the proposal were explained by CRIA staffs about the research fields to be continued, and the additional related fields to be started during the period of extension.

Among these, the fields to which additional long-term experts were requested were as follows;

Divisions and fields	Long-term expert
Plant physiology	
Soil microbiological study for high yield production of food crops	1*
Effect of drought and low temperature on crop yields	1*
Ideal plant type study in food crops	
Entomology	
Insect toxicology	1
Agronomy	
Water manegement study in various types of rice cultivation	1
Ideal plant type study in rice	1*

* From Japanese side, much difficulties were expressed for these experts.

Besides, short-term experts were also requested in some research fields such as bacterial leaf blight, plant organic analysis, insect taxonomy, farm machinery management etc.

c) Futhermore, at the termination of 3 years extension of the Program, Indonesian side strongly desired to start new research program, putting emphasis on uncooperated research fields.

The new program is to be considered in connection with the Third 5 years plan of economic development of Indonesia which will be started in April, 1979.

d) Now in CRIA, USAID project in agronomy and breeding (1971 - 1976), and Dutch project in entomology and crop ecology (1968 - 1974, 1974 - 1977) are going on.

However, complete adjustments were already made by CRIA staffs as for specified fields of research. No competition or overlapping will be anticipated.

4) After finishing several discussion meetings, Indonesian authorities concerned expressed to issue as soon as possible, formal letter off proposal for the extension of Indonesia-Japan Joint Crop Food Research Program.

The present evaluation team has agreed to do so.

V-4

PROJECT REVIEW PAPER
AGRICULTURE RESEARCH

Fiscal Year Proposed for Financing: 1975
Appropriate Category: Food Production and Nutrition
Date of Submission to Bureau:
Project Development Team: Robert L. Sweet, AGR
Ronald G. Trostle, EA
Alan Gordon, CONTR
Steven P. Mintz, DL/PE

1. Priority and relevance

The Government of Indonesia's (GOI) second five-year development plan (Pelita II) recognizes agriculture as the most important sector of the Indonesian economy. Within the agricultural sector, increased production of food crops, i.e., rice, secondary crops and horticultural crops is awarded first priority. The primary objectives of increased production are stated to be 1) increased per capita income of farmers and 2) a balance between supply and demand or, self-sufficiency. To achieve these objectives, Pelita II calls for intensified research activities with emphasis on adaptive research for the development of new high yielding varieties and the rehabilitation and construction of headquarters and regional research stations.

The importance and relevance of agricultural research in the USAID program is set forth in the DAP, pages 49-50 and 76-78, wherein existing organization and administration arrangements were recognized as constraints to improving effectiveness. Since the DAP was written, the Department of Agriculture (DOA) has initiated significant changes in the organization of research, described later in this paper.

Now, with the formation of single agency for agriculture research within the Departement of Agriculture (DOA), the rice research project proposed herein will assist in strengthening a national effort on Indonesia's major food crop by addressing many of the areas of recommended assistance set forth in the DAP.

2. Description of Project

The project is intended to integrate and strengthen the national research system for rice by consolidating existing activities and facilities and by providing assistance to address specific institutional and physical weeknesses. The primary focus will be on the Central Research Institute for Agriculture (CRIA) and its research implementation capabilities. The quantity and quality of rice research technicians and scientists will be expanded through an accelerated manpower development plan, using in-country and regional facilities and U.S. and third-country Universities. A national network of research atation will be upgraded and /or established using predominantly GOI funds with some local cost assistance from this loan. Senior Indonesian scientists together with technical advisors provided under this loan will introduce research organizational and methodological techniques to ensure greater focus on problem

oriented research; foster a multi-disciplinary team approah to problem solving; and strengthen linkages between research and extension through the initiation of an extension rice specialist function located at the research stations. Additionally, the National Rice Research Program (NRRP) office will be assisted through this loan to improve the resource allocation, planning and evaluation functions through the provision of office facilities and staff training.

Rice research and information dissemination is the responsibility of the DOA. There also exists a limited program of rice research in the university sector and in other governmental and private institutions where rice is in itself of specific interest or is a crop in a rotation system. During recent years, an ad hoc NRRP has existed, functioning through a committee made up of all GCI agencies concerned with rice research, production, and marketing. Its task has been one of jaw-boning the agencies into a cooperative, comprehensive, and non-duplicating rice research effort. The total effort has made progress but has been characterized by a lack of resources and limited coordination. Numerous agencies were involved and leadership and resources were lacking, due largely to unwillingness on the part of the GOI central planning agencies to allocate resources without a definite plan of action.

In September, 1974, the DOA was reorganized and, of specific interest to this project, all agriculture research was placed under the newly created Agency for Agriculture Research and Development (AARD). Dynamic leadership has been provided and the various agencies dealing in agriculture research will now report to a central body. The first move of AARD has been to signal a shift to commodity-oriented research, with the stated objective of utilizing the multi-disciplinary team approah to fact finding. Three sections ("centers") were created and six national commodity research programs are in the formative stage. These are the new NRRP, the National Food Crop Research Program, the National Industrial Crops Research Program, the National Forestry Research Program, the National Animal Husbandry Research Program, and the National Fisheries Research Program.

The national rice research system will be the responsibility of AARD. The functional components of this system are:

1) the AARD for overall policy formulation and direction;

2) an NRRP office attached to the Rice and Food Crops Section of the AARD with a chief and two sections for a) coordination and planning, and b) evaluation;

3) an advisory committee made up of all institutions involved in rice research including those not directly responsible to AARD; and

4) implementing institutions (CRIA and others) that will present distinct sub-projects and after approval will subsequently be responsible for field implementation.

See Annex 1 for Organizational charts

The major implementation role is assigned to the Central Research Institute for Agriculture (presently CRIA, but the name may be changed). It will function through its main

rice research station at Sukamandi, seven branch stations, seven sub-stations, and other DOA stations (CRIA or other institutes), as appropriate. See Annex 2 for list of stations. Its role is the development of technology through research and the dissemination of this information to the extension system. See Annex 3 for list of research problem areas. Presently, CRIA is understaffed and the stations do not have the resources to conduct the amount of research necessary to meet the needs of the country.

Other DOA institutes and projects, such as the Soils Research Institute (LP Tanah) the Agro Economic Survey (AES), Data Processing Center, and other crop stations, will coopeRate in the program. Their function will be one of joining multi-disciplinary teams and/or conducting more in-depth studies in selected problem areas. They will receive support from the NRRP in obtaining resource allocations and/or be given sub-contracts from CRIA todo specific tasks. These institutes are, at the present time, lacking in resources, although some are receiving support from other donors.

The universities will receive the support from the NRRP and/or CRIA in a manner similar to other DOa institutes. The present GOI research allocation to the universities is very small and, in the initial stage of the program, they will be used primarily as sub-contracting bodies in the program.

The dissemination of technology to farmers is handled by the DOA's Agency for Education, Training, and Agriculture Extension. This agency, which has recently been reorganized, has successfully implemented the Mass Guidance Programs (BIMAS/INMAS) currently involving some 30% of Indonesia's rice production in improved varieties. This agency is receiving substantial support from the World Bank.

3. Borrower, grantee, administrating agency

The borrower is the Government of Indonesia;

The administrating agency will be the DOA's Agency for Agriculture Research and Development with the implementation through its NRRP office and CRIA.

4. Beneficiaries

The primary beneficiaries of the loan are the farmers of Indonesia, who, through the research and extension system will realize increased yields and productivity. Thus, the incre ased production will generat additional income for them. The average farm size in the densely populated areas of Indonesia is about 0.6 hectares and the outer islands' farm size runs from 0.5 to 10 hectares. There are from 15 to 19 million smallholders that dominate agricultural production in Indonesia. These small farms, where much of the work is done by women, will benefit greatly from the outputs of the project.

See Annex 4 for examples of benefits to farmers.

5. Project design

See attachment 5 for Logical Framewark.

6. A.I.D. experience

In 1971 a PROP was completed to provide grant assistance in agricultural research with the primary concentration on rice. This is an on-going project with funding currently programmed through FY 1976. Briefly stated, the targets are as follows; to coordinate and consolidate the activities of the multiple research organizations on research projects of high economic priority; to establish one specific project to develop improved varieties and techniques for rice and related crops as a model for other coordinated research project; to institute professional development programs for research administration and staff; and to establish the effective linkages with extension and education necessary for the dissemination of the new technology to farmer producers.

Under this project AID has been financing five technicians (two plant breeders, two agronomists, and one statistician/economist) through a contract with the International Rice Research Institute (IRRI). A sixth position, Agricultural Research Administrative Assistant is expected to be filled in FY 75. In addition, USAID has provided participant training opportunities and some commodity support, primarily for research equipment and logistic support. The principal recipient agencies have been CRIA and SRI. Further information on this project may be found in the project documents, e.g., ProAg, contracts, PIOs, and PARs.

The proposal for an AID development loan contained herein contemplates an expanded assistance package to GOI's rice research efforts, including the phasing over of current grant project activities to loan funding for a program of five year's duration.

(AID/W is requested to provide additional information on Agency wide experience wide experience with project relevant to this proposal.)

7. Other donor coordination

There are several international donor project that are providing various amounts and kinds of assistance to Indonesia's rice research efforts, summarized in Annex 6.

These diverse project have not always been well coordinated, resulting in less than full efficiency from the provision of technical and physical inputs. The creation within DOA of the Agency for Research and Development, the organizational location of the NRRP within that Agency, and the clarification of rice research implementation responsibilities through CRIA, is expected to provide a much improved mechanism through which to achieve better coordination of foreign donor support. The NRRP has been given this specific role and, during planning sessions relevant to the preparation of this PRP, has fostered several productive coordination meetings with the donors.

The Ford Foundation has expressed its interest in continuing financial support for

the Rice Research Administrator advisory position, who would simultaneously act as in-country coordinator for IRRI.

Under bilateral assistace from Holland and Japan, technical experts commodities, and some training are being provided.

A world Bank loan was initiated in 1972 and recently amended, bringing the total assistance to approximately $1.6 million, supporting certified seed production and rice rese arch. The project finances a team of five expatriate advisors (provided through IRRI) participant training, and small commodity elements for the Sukamandi station. All rupiah coats associated with this loan are provided from COI sources. This input has been taken into consideration in projecting the future requirements indicated in this paper. Additionally the World Bank is negotiating another loan to the GOI for Agriculture Research and Extension for crops other than rice. It may have elements dealing with upland crops rubber and horticulture crops, and assistance to ten agriculture information centers. The project preparation report (Dec. 1973) suggests that the loan input might reach approximately U.S.$60 million. Specific linkage may develop at the Sukamandi station which is anticipated to be developed as the headquarters station for upland crops research. Discussions have been held with the D.O.A. and the World Bank in programming the various inputs in order to achieve complementarity of resources.

The NRRP has accepted the task of melding these inputs, together with anticipated increases in annual GOI budget allocations, into a coherent and coordinated national rice research activity over the next five years. The proposed AID loan would augment the national structure of these activities, focusing on a research system that creates a small network of station, their associated facilities, staff and equipment, and an operational machanism that enhances the quality and quantity of high priority adaptive research.

8. Financial plan

During the past year the GOI, with the assistance of consultants, has developed a plan for rice research based on the objective of providing Indonesia with an adequate base for rice research on a ten (10) year time frame with a five (5) year intermediate target. It is this five-year intermediate program which is the focus of this loan proposal, and which is reflected in the attached budget (sea Annex 7).

The targets that are expected to be achieved during the first five years include upgrading of physical facilities, research organization and management improvements, and continued manpower development. It must be reorganized, that the longer planning horizon, i.e., ten years, becomes essential to accommodate the training requirements for an adequate staff of research scientists. The staff development process is lengthy, involving the selection of person nel from a limited number that are academically qualified for advanced training, normally one year of English language study and then two-to-three years of graduate work. Given the avai lable pool from which advanced training candidates can be drawn and the need to maintain ongoing research in-country, it is realistic to project no more than ten-to-fifteen departures for advanced training per year.

Five Year Capital Budget – 1975 Prices (estimated)

(in Rps and $1 000 s)

	Foreign Exchange Rp	Local Rp	Foreign Exchange $	Local $
1. Technical assistance (Honoraria, training, experimentation and Adm.)	-	1,967,775	2 015.5	-
2. Supplies		78,100	-	-
3. Library	-	-	170.1	-
4. Research equipment, furnishings, and vehicles	-	353,010	2,214.4	-
5. Site development	-	912,700	-	-
6. Construction (Housing and Structures)	-	2,563,110	-	1,000
7. Commodity handling	-	86,735	-	-
Total in US$		5,961,430	4,400.00	1,000
		$14,365	$5,400	

The five year intermediate program will give high priority to manpower development, but can not be expected to do more than contribute to the longer term staff requirements. The five-year planning horizon will, however, insure the establishment of essential facilities, and does provide a secure funding base for an accelerated training program. In this connection, it should be noted that the proposed AID loan contribution to the local costs of construction at the research station, while small percentagewise, is considered essential to insure sufficient and timely allocations of GOI counterpart funds, and insure professional review of plans, specifications, and constructions standards.

The USAID loan component will be implemented as follows:

1) Techinical assistance, training, commodities

Program will be operated by the GOI, using normal Letter of Commitment and Letter of Credit procedures.

2) Construction

Program will be operated by the GOI through their normal contracting procedure and disbursements will follow the Fixed Amount Reimbursement (FAR) procedure.

9. Project development schedule

1) PRP transmitted to AID/W	January 15, 1974
2) AID/W review and instruction to USAID	February 15, 1975
3) PP preparation completed	April 15, 1975
4) Loan authorized	June 1, 1975
5) Loan signed	August 15, 1975
6) TA contract negotiated	September 1, 1975
7) Implementation commences	September 1, 1975

The USAID project committee is operational, as is a similar GOI committee. No problems are foreseen in developing the PP without the assistance of TDY personnel.

10. Analysis

Further work that will be required prior to the final submission of the PP are listed below.

A determination will have to be made, in consultation with all parties concerned, on loan funding versus grant funding of the technical assistance component of this project. The present contractor, IRRI, has expressed a strong preference for continuation of grant funding, based on their current experience with technicians in country under both types of arrangements. Other factors, however, support the case for loan funding, e.g., technical assistance, as with the other major components, would have assured funding for the life of the project. This would be less dependable should that one component be subject to annual funding availabilities. This issue will have to be resolved during the intensive review.

At least two of the stations scheduled for development are marginal because of land availability. These can be used, but the possibility of using alternate sites is being considered. Resolution of these issues should be completed by the time the PP is submitted.

Sukamandi will be the headquarter station, but at the present time this function is carried out by Muara (Bogor). Taking into account construction time and manpower training requirements, a scheduled time frame for the transferring of headquarters to Sukamandi is being worked out.

The PP will examine the capacity of the research system as a whole, as well as the beneficiary institutions to absorb the increased GOI budgetary allocations as well as present and anticipated programs of assistance.

The multiple disciplinary team approach and funding allocations required new procedures within the DOA. Work is under way to include the required procedures and delineate responsibilities.

At the present time, the DOA rice research program is receiving support from five donors. To insure non-duplication in the fields of technical assistance, commodity and training supply, a detailed plan of coordination is required and is currently being addressed by the GOI and the denors.

The World Bank is currently negotiating a loan to provide other food crop research, with its main station at Sukamandi. USAID and the World Bank are currently engaged in an excange of information to insure no duplication of facilities, technical assistance, and commodities at the station.

There is a dearth of reliable information on which to quantitatively analyze the economic justification of investment in this particular project. This agricultural research project is similar to other projects which have been analyzed in detail and been shown to have yielded high economic returns. The Mission plans to use these analyses, as summarized in an IBRD Agricultural Extension Project Preparation Report, as the basis for the project's economic justification.

Statistics separating small farmers and women as sub-groups of the agricultural sector are lacking in Indonesia, and the Mission is inclined to proceed without expanding on the information that is available in the World Bank Agriculture Sector Analysis.

AGR: 1/8/1975

ANNEX 1

CRIA RESEARCH CENTERS FOR RICE

Center	Province	Kabupaten	Height Above Sea Level (m)	Area (ha)	Type of Soil
Main Station					
Sukamandi	W. Java	Subang	6	250	Latosol
Branch Station					
Muara	W. Java	Bogor	270	40	Latosol brown regosol
Maros	S. Sulawesi	Maros	10	110	Latosol
Banjar Baru	S. Kalimantan	Banjarmasin	2	60	Red brown
Mojosari	E. Java	Mojokerto	20	30	Regosol
Padang	W. Sumatra	Padang	-	60	Alluvial
Palembang	S. Sumatra	Palembang	to be established		Alluvial
Sub-Station					
Pusaka Negara	W. Java	Kuningan	5	40	Alluvial
Ngale	E. Java	Ngawi	50	40	Crumsol
Genteng	E. Java	Banyuwangi	450	25	Latosol
Rambatan	Riau	—	500	10	Latosol
Kampar	Riau	Kampar	20	18	Sands loom
Handil Manarap	S. Kalimantan	Banjarmasin	2	19	Organosol
Lanrang	S. Sulawesi	Rappang	28	44	Alluvial
Other Co-operating Sub-Stations					
Cikeumauh	W. Java	Bogor	240	20	Latosol red brown
Citayam	W. Java	Bogor	75	11	Latosol red brown
Singamerta	W. Java	Serang	5	7	Hydromolik grey
Paset	W. Java	Cianjur	1,138	1	Andosol
Jakenan	C. Java	Pati	5	30	Padsolik
Kendalpayah	E. Java	Malang	450	20	Crumusol
Jambegede	E. Java	Malang	350	19	Andosol
Muneng	E. Java	Probolinggo	10	40	Andosol
Tamanbogo	Lampung	Lampung	20	24	Padsolik
Padanglawas	W. Sumatra	Padang	400	10	Latosol

Center	Province	Kabupaten	Height Above Sea Level (m)	Area (ha)	Type of Soil
Balandean	S. Kalimantan	Banjarmasin	2	10	Organosol
Parn Bai	S. Kalimantan	Bara Bai	300	5	Grumsol
Buntobili	S. Sulawesi	Rappang	20	22	Latosol
Peaggentungan	S. Sulawesi	Rappang	7	10	Latosol

ANNEX 2

CENTRAL RESEARCH INSTITUTE FOR AGRICULTURE
RICE RESEARCH PROGRAM AREAS AND INTERDISCIPLINARY IMPLEMENTATION

	Problem Area	Disciplines									
		Agro-nomy	Soil Science	Physio-logy (Climato-logy)	Breed-ing	Entomo-logy	Patho-logy	Chemi-stry	Econo-mics	Agr. Engr.	Communication Subject Matter Specialist
1.	Varietal Improvement	x	x	x	xx	x	x	x			
2.	Soil Fertility & Mgt.	x	xx	x	x				x		
3.	Caltural Practices	xx	x	x	x				x	x	
4.	Water Management	xx	x	x					x	xx	
5.	Rice Cropping System	xx	x	x	x	x	x	x	x	x	
6.	Pest Management				x	xx	xx		x		
7.	Harvesting, Storage Processing			x				x	x	xx	
8.	Machinery Development and Evaluation	x	x			x	x		xx	xx	
9.	Marketing and Socio Economics	x				x	x		xx	x	
10.	Training and Communi-cations	x	x		x	x	x		x	x	xx

Notes: x = Team Members

xx = Team Leaders

ANNEX 2'

CENTRAL RESEARCH INSTITUTE FOR AGRICULTURE
PLANNED ALLOCATION OF RESEARCH FUNDS AMONG PROBLEM AREAS

		1975	1976	1977	1978	1979
1.	Varietal Improvement	35	40	40	40	50
2.	Soil Fertility and Cultural Practices	20	10	10	10	5
3.	Water Management	5	5	10	10	5
4.	Pest Management	15	15	10	10	10
5.	Harvest/Processing Storage	5	5	5	5	5
6.	Machinery	0	5	5	5	5
7.	Economic and Social Factors	5	5	5	5	5
8.	Cropping Systems	5	5	5	5	5
9.	Training and Communications	5	5	5	5	5
10.	Area Expansion	5	5	5	5	5
		100%	100%	100%	100%	100%

Source: Department of Agriculture

ANNEX 3

SELECTED RESEARCH PROBLEM AREAS

1. Varietal improvement

This is one of the most essential phases of rice improvement and production and is given high priority within the program. Varietal evaluation will involve agronomic characteristics, quality, resistance to diseases and insects, tolerance to drought, low temperature, adverse soils conditions, flooded and/or deep water varieties.

2. Soil fertility and cultural practices

One means of realizing the inherent yield potential of new varieties is by providing the necessary nutrients upon which plant growth and production depend and, when necessary, provide soil amendments in a timely manner to enable the plant to utilize the nutrients available or supplied.

3. Cultural practices will be studied to enable the favorable interaction of variety and fertilization to produce high yields. Included will be land preparation, placement of fertilizer, age of seedling, seedling per hill, plant spacing, transplanting factors, multiple cropping and rainfall pattern.

4. Water management

Water management has been an important factor influencing the spread of new varieties and will involve a coordinated effort of several disciplines.

5. Cropping systems

Identification of agronomic problems in the existing cropping patterns, and solutions to these problems, considering the introduction of new varieties in a rotation system, will be undertaken in order to improve productivity and farmer income per unit area of land. Farm management studies will be an important element of this problem area.

6. Pest management

Consideration must be given to such controls as chemical, biological, pest escaping, mechanical and an integrated application of all these included along with varietal resistance.

7. Harvest, processing, storage

An integral part of the process will be research into these areas to prevent losses and

deterioration of the farm product.

8. Machinery development and evaluation

This will include all aspects of mechanization to handle the rice crop from land preparation to final processing storage and packaging.

9. Economic and social factors

Studies of the interaction of marketing, production costs and farm management alternatives will lead to an identification of constraints and possible solutions to removing such constraints.

10. Training and communication

A critical element is to provide the linkage with those agencies whose chief role is to work with the farmers in the application of packages of technology.

11. Area expansion

New areas of production such as tidal rice lands, upland rice lands, and newly irrigated lands require specific attention of all the above areas of concentration in order to maximize returns to capital investments.

ANNEX 4

RESEARCH EFFECTS ON FARMER INCOME

A. Examples of positive benefits to farmers of technology

1. Production of milled rice with local varieties and applications of fertilizers, pesticides, and approved cultural practices has historically averaged 1.90 Mt.'s per Ha. per crop in Indonesia. With the introduction of the High Yielding Varieties (specifically PB 5 and PB 8) coupled with the use of fertilizer and pesticides, yields per Ha. have increased to an average of 2.6 Mt's of milled rice. In selected areas yields of 4.0 Mt's have been achieved. The average incremental production resulting from the use of HYV technology is 0.7 Mt's. With milled rice currently priced at approximately Rp.80 per kg at the farm gate, the gross benefit to farmers is approximately Rp.56,000 per Ha. per crop. Most introduced varieties, however, produce the best results only in selected ecological zones.

2. C 4 is a recently introduced variety. In ecological zones where it is adaptable, farmers prefer growing this variety because of higher farm gate prices attributable largely to better taste qualities.

3. Short season rice varieties and/or proper water management will make available large areas for secondary crops to be used to increase cropping intensity. Many areas currently use a crop rotation system and research has contributed to significant increase in farmer income. The new soybean variety (ORBA) can increase yields by up to one ton per Ha. and means an increase to the farmer of Rp.30,000 per crop per Ha. Corn yields can easily be increased 10% with farmer benefits of some Rp.2,000 per crop. With the increasing world demand for animal feed and the availability of new cassava varieties where yields can be increased 100%, the incorporation of this crop in a rotation system can increase farmer returns per crop by some Rp.60,000.

4. A new variety of upland rice has been introduced in selected areas of Java. Traditional varieties of rice grown under upland agronomic conditions yield less than 1 Mt. milled rice per crop per Ha. In these areas only one crop per year is harvested. The new variety yields an average of 1.5 Mt. milled rice per crop per Ha. The increase of gross income to farmer per Ha. is approximately Rp.35,000 per crop.

B. Examples of problems affecting farmer incomes

1. Varieties such as PB 5 and C 4 are very susceptible to Tungro disease. Losses in production caused by Tungro, currently reaching the critical stage in South Sulawesi, range from 0.5 to 1.5 Mt. per Ha. per crop, equivelent to Rp.40,000 to Rp.120,000 per Ha. Tungro resistant varieties with an on-farm yield level of 2.5 T/Ha. or more are needed to restore farmer incomes to acceptable levels.

2. The production of most varieties and especially the high yielding varieties is good when sufficient fertilizer and pesticides are used in a timely manner. Insufficient fertilizer and pesticides, late application or a combination of both can reduce yield by 30% to 40% or more. Research must produce production recommendations that optimize the use of inputs to achieve broadly applicable increases in farmer incomes.

3. Grassy stunt has attacked rice varieties in East and Central Java during the past five years. Its incidence has increased yearly. Yields on affected farms have been reduced by 20% to 30%. This results in an average production loss of from 0,5 Mt. to 0.7 Mt. milled rice per crop per Ha. Approximately 10,000 Ha. was affected in 1973. Gross losses to farms, due to unavailability of resistent varieties, range from Rp.80,000 to Rp.112,000 per year (two crops per year).

4. Downy mildew in corn, lef hoppers, fertilizer availability, tidal rice varieties, agronomic problems on new lands, cold tolerant rice varieties, returns to farmers from multiple cropping system, crop processing, small and large farm mechanization requirements, rice blast varieities, rice viruses, fertilizer application, pesticide x, recommendations, drought resistant varieties, input/output factors and short season rice varieties for use in alternate cropping system and all problems that require urgent and continuing research.

C. Indonesian Rice Situation in Terms of G.N.P.

Year	Production Milled Rice (000 Mt.)	% of G.N.P.	Demand (000 Mt.)	Population (000)	Production Demand Deficit	Actual Import by G.O.I (000 Mt.)
1969	11,385	17	12,946	112,377	-1,561	238.2
1970	13,199	17	13,858	115,568	- 253	323.9
1971	13,800	15	14,021	119,232	- 221	119.5
1972	13,326	15	14,473	121,833	- 1,147	334.6
1973	14,702	13	14,956	124,635	- 254	309.4
1974	15,032	12*	15,453	127,501	- 421	1,200.0
1975	15,633	11*	15,964	130,433	- 331	N.A.
1976	16,383	10*	16,482	133,433	- 109	N.A.
1977	17,235	8*	17,035	136,502	+ 288	N.A.
1978	18,183	8*	17,593	139,642	+ 588	N.A.

Note: 1) 1974 - 1978 production is estimated
2) 1974 - 1978 demand is estimated
3) Rate of population growth is 2.3% annually (1972 - 1978)
4) N.A. = not available

* Computed on 1974 prices of Rp.60 per kg milled rice at farm gate. Figures will increase due to recent price increase which now average Rp.80 per kg. Future price adjustments are unpredictable. The 1974 - 1978 production figures are taken from Repelita II targets. The objective of the research program is to provide the base for increased rice production capacity sufficient to meet the production targets. Viewed in another way, the objective is to reduce the gap between demand and domestic production.

PROJECT DESIGN SUMMARY – LOGICAL FRAMEWORK

Project Title and Number: AGRICULTURE RESEARCH
LOAN:

Life of Project:
from FY 75/76 through FY 79
Total U.S. Funding: $5,400,000
Date prepared: December, 1974

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATOR	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
A.1: Program or Sector Goal: Increased agricultural production (through the development of improved technological research and dissemination of the results).	A.2: Measures of Goal Achievement: * Increased farm productivity by 5.0% per year by 1979. * Expand employment of rural population by 1.5% per year by 1979. * Increase sectorial capital formation by 5.0% per year by 1979. * Basic strategy: Agriculture Sector: Pellita II.	A.3: 1. GOI/MOA reports. 2. Repellita II targets, reports.	A.4: Assumptions for achieving goal targets. 1. Increased agricultural production will remain high priority in the GOI second five-year Development Plan. 2. Technological research can make a significant contribution to an increase in the agricultural production
B.1: Project Purpose: Continued development of an effective coordinated National Rice Research Program to plan and coordinate the use of agricultural research resources for the production of improved technology that is problem-oriented and to assist in distributing the technology to agricultural educational and extension institutions.	B.2: Conditions that will indicate purpose has been achieved: End of project status Closely coordinated cooperative research program operational including Indonesia's 18 agricultural institutes and 11 major universities with agriculture programs, The advisory and resource allocation responsibility will rest with the NRRP. The NRRP's main implementing arm will be the Central Institute for Food Crop Research (CRIA) under the Director of Agriculture Research and Development of the MOA.	B.3: 1. Reports of the NRRP, the various institutes and universities. 2. Review of number of meetings held, attendance by institute/university, and meeting results/reports. 3. Research publication and dissemination, and application of extension activity reports.	B.4: Assumptions for achieving purpose:: 1. GOI policy and attention will be concentrated on the establishment of a legal body to coordinate, plan, manage and disseminate research resource activities which are directed toward higher agriculture production. 2. Sufficient leadership and administrative mechanism for research program within Ministry of Agriculture are provided.
C.1: Outputs: 1. Conducting of planned and coordinated research activities covering problem-oriented rice research that is of high economic priority. 2. CRIA Rice Research stations established, funded and operating within the Ministry of Agriculture. 3. Associated institutes (non CRIA) adequately staffed, funded, and receiving assistance, financial and/or programming from the NRRP. 4. A professional manpower development program for scientists, administrators, and technicians. 5. Systemic on going evaluation program in place that relates to the end-user of the technology. 6. Effective linkage established with extension and educational institutions for dissemination of technology to farmer producers.	C.2: Magnitude of Outputs: 1.1. Active and effective National Rice Research Program (NRRP) composed of agricultural institutes, and representatives from 30 field stations throughout Indonesia, 11 universities and the directorates of the Ministry of Agriculture. 1.2. 25 problem areas are scheduled per year for research findings release. 2. Physical construction, staffing and funding of CRIA's main, 7 branches and 7 substations completed. 3. Associated institution (non CRIA) are active members of the NRRP and are receiving assistance in budget defence and/or financial assistance from the NRRP. 4. 110 technical staff have received training, both incountry and overseas, and are effectively placed at desired locations. 5. The NRRP is publishing systematic reports of the economic ramification of the use of the research finding by the end-users. 6. The World Bank supported program for Agricultural Information Centers (11) are established and functioning and further disseminated through World Bank Extension project.	C.3: 1. Reports of NRRP. 2.1. Inspection of sites. 2.2. Construction reports. 2.3. Budgetary allocations. 3.1. Institute reports on staffing and research programs. 3.2. NRRP report on fund allocation. 3.3. Research activity reports. 4.1. Funding drawn down. 4.2. Reports on numbers of trainees abroad during the year. 4.3. Progress reports on incountry training. 4.4. Positions held and utilization of training reports. 5.1. NRRP reports. 5.2. Institute reports. 6.1. World reports. 6.2. Agricultural information center reports. 6.3. Extension reports on end-user utilization of research. 6.4. On site inspection.	C.4: Assumption for achieving outputs: 1. Research actually conducted, reported and disseminated. 2. Indonesian staff available for training and willing to return to assignment locations. 3. World Bank's Information and Extension projects become effectively operational. 4. Associated institutions are willing participants to NRRP.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATOR	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
D.1: Inputs: USAID Loan: Total $5,400,000 to include TA $1,080,000. Commodities $2,384,500. Training $9,355,000. Local costs $1,000,000 GOI: Routine budget Rp.3.75 billion for remainder of Repellita II. Development budget Rp.5.98 billion. Other donors: Japan $400,000 (TA, Comm., Part). Netherlands 74/77 $587,000 (TA, Comm., Part). Ford Foundation $500,000 (TA, Comm., Part). World Bank 72/77 $1,481,687 (TA, Comm., Part).	D.2: Implementation Target (Type and quantity): U.S. Loan: TA – full-time advisors providing a total of 252 man months. Part – 55 (Lt, St, U.S. and 3rd country) for 1,111 man months. Commodities $2,384,500. Local costs – 14% of building constructions. CY 1975 prices. GOI: Routine budget Rp.3.75 billion. Development budget Rp.5.96 billion. Other donors: TA, Part, Commodities.	D.3: Inputs: USAID Loan: Total $5,400,000 to include TA $1,080,000. Commodities $2,384,500. Training $9,355,000. Local costs $1,000,000. GOI: Routine budget Rp.3.75 billion for remainder of Repellita II. Development budget Rp.5.98 billion. Other donors: Japan $400,000 (TA, Comm., Part). Netherlands 74/77 $587,000 (TA, Comm., Part). Ford Foundation $500,000. World Bank 72/77 $1,481,687.	D.4: Implementation Target (Type and quantity): U.S. Loan: TA – full-time advisors providing a total of 252 man months. Part – 55 (Lt, st, U.S. and 3rd country) for 1,111 man months. Commodities $2,384,500. Local costs – 14% of building constructions. CY 1975 prices. GOI: Routine Budget Rp.3.75 billion. Development Budget Rp.5.96 billion. Other donors: TA, Part, Commodities.

OTHER DONOR SUPPORT

1. USAID: 1971 to present time — US$1,340,000.-

   1976 grant programmed and related consultants: — US$310,000.-

   Supply of a six-man technical assistance contract through IRRI; provision of large academic and short term training program; supply of housing and technical support of the contract team and commodity support element for the technical assistance team. FY 76 grant funding is programmed to cover the transition period untill the proposed loan is operational.

2. Ford foundation: 1967 through 1974 — US$625,000.-

   Surveys, equipment, training and the provision of a full time coordinator for the IRRI contracts in Indonesia. Continuing support of the in-country IRRI Coordinator is planned.

3. *Holland:*

   a. Bilateral 1974 through 1977 — US$591,370.-

      Supply of a technical assistance team in entomology and agro-climatology, a large commodity element, and minor assistance in training.

      Support is programmed through 1977

   b. Assistance through IRRI 1974 to 1977 — US$374,000.-

      Provisions of a three-man technical assistance team to the Maros substation working basically on varietal development. Assistance is mainly technical advisors, with minor elements of training and equipment.

      Support is programmed through 1977.

4. World bank: 1972 through 1977 — US$1,600,000.-

   Provision, through a GOI contract with IRRI, of a five-man technical assistance team, participant training, and a small-commodity element for rice research and seed multiplication work at Sukamandi station. All rupiah costs associated with this loan are provided from GOI sources.

In addition to the activity described in Section II c, the World Bank has under study an Agricultural Research and Extension Project, which would be related to this rice research proposal. The main objectives of the World Bank's prospective project are 1) the establishment of an Agriculture Research and Development body within the D.O.A., with overall control of research programs, budgets, personnel policies, staffing and coordination of outside support; 2) the development of national programs of research in three commodities, i.e., upland crops, rubber, and horticultural crops; and 3) effective linkage between research and extension subject-matter specialists and the development of about ten agricultural information centers.

CRIA is to be the implementing agency for two national research projects - upland crops and rice.

Sukamandi has been selected as the location of the main station for both activities. Discussions have been held with D.O.A., World Bank, and USIAD representatives on programming the various inputs to achieve complementarity of resources.

Careful consideration has been given to Indonesian manpower requirements to adequately staff these two research projects. The training of young staff is a critical element in these research projects and is a major factor in setting a five-year time frame for implementation. USIAD believes that CRIA is capable of meeting the project objectives over this time period.

5. Japanese Government: 1970 through 1974 — US$409,374.-

Provision of four-man technical assistance team, commodities, and training. Emphasis has been on plant pathology. Continuing support in this field and in similar amount is anticipated.

PROPOSED BUDGET GOI FY 1975 – 1979

NATIONAL RICE RESEARCH PROJECT

ANNEX 7

		West Java Sukamandi		*West Java* Muara		*South Sulawesi* Maros		*East Java* Mojoaari		*Kalimantan* Banjar Baru		*South Sumatra* Palembang		*West Sumatra* Padang		*Seven* Sub Stations		NARP Bogor		GOI Contrib.	AID Loan
		Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)	Rp.(1,000)	$(1,000)
1.	Technical Assistance																				
	- Technical Ass. or *Support*	30,000	240	120,000	840	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150,000	1,080
	- Honoraria	125,100	0	144,600	0	71,400	0	48,120	0	47,250	0	14,040	0	32,340	0	32,940	0	19,680	0	535,470	0
	- Staff Training	2,492	91	4,359	202.5	2,803	157	4,671	89.5	3,150	135	1,246	45.5	3,115	135	1,869	47	0	33	23,705	935.5
	- Experimentation	210,000		326,000	0	249,000	0	30,000	0	82,000		18,000		88,000		126,000		0	0	1,129,000	0
	- Administration	20,000	0	30,000	0	12,000	0	12,000	0	12,000	0	3,100	0	12,000	0	3,500	0	25,000	0	129,600	0
2.	Supplies	25,000	0	30,000	0	5,000	0	5,000	0	2,000	0	3,100	0	2,000	0	3,500	0	2,500	0	78,100	0
3.	Library	0	30	0	63.1	0	15	0	12	0	12	0	6	0	12	0	17.5	0	2.5	0	170.1
4.	Equipment																				
	- Vehicles	62,090	74	69,540	84	33,815	39	14,075	15	14,075	36	10,220	12	14,075	15	15,085	21	6,565	9	239,540	305
	- Field Equipment	0	204	0	152	0	53.5	0	115.5	0	108	0	99.5	3,000	83	0	105	0	0	3,000	920.5
	- Laboratory Equip-*ment*	0	200	0	100	0	60	0	80	0	80	0	60	0	80	0	0	0	0	0	660
	- Office Equipment	3,000	80	0	19	800	6.8	1,040	19.4	1,040	96.8	1,040	19.9	0	24.4	0	40.6	600	4	7,520	310.9
	- Furniture	35,550	10	13,650	0	3,000	0	10,450	0	8,500	8	5,750	0	11,500	0	10,350	0	4,200	0	102,950	18
5.	Site Development	210,000	0	24,600	0	161,500	0	64,500	0	64,500	0	37,500	0	64,500	0	285,600	0	0	0	912,700	0
	Staff Housing	303,710	0	223,970	0	124,230	0	63,530	0	74,020	0	33,720	0	76,860	0	113,680	0	32,830	0	1,046,550	0
7.	Structures	548,450	0	151,060	0	173,500	0	212,400	0	186,100	0	159,300	0	187,500	0	295,750	0	17,500	0	1,931,560	0
8.	Handling Cost 10%	21,745	0	14,358	0	5,616	0	9,414	0	12,615	0	7,676	0	8,274	0	6,767	0	270	0	86,735	0
	Total	1,597,137	929	1,152,137	1,460.6	842,664	331.3	475,200	331.4	507,250	475.8	294,692	242.9	503,164	349.4	895.041	231.1	109,145	48.5	6,376,430	4,400

* Distribution of construction costs (Rp./U.S.$) per station not defined. Allocation of U.S.$ (converted to Rp.) for each station to be determined during intensive review.

Construction Cost Adjustment*	-415,000	+ 1,000
Total	5,961,430	5,400
U.S.$ Equivalent (in U.S. $1,000)	14,365	5,400
Total Project Cost (Current Prices) U.S.$	19,765	
Contingency (15%)	2,965	
Sub-total	22,730	
Inflation (20% + 10% + 10%)	7,360	
Total Estimated Implementation Costs, U.S.$	30,090	