6－3　評価活動に関するもの

本プロジェクトに関する評価は、1990年2月及び1991年1月に行われた巡回指導調査の際にも、日本側調査団によって行われ、その結果が報告書としてまとめられている。また1990年9月の段階において、KURDIの責任において本プロジェクトの実施状況についての評価調査が行われた。その結果は「Evaluation of the Kasetsart University－Japan Project, Phase Ⅱ, 1987－1992」という報告書にまとめられている。この評価調査では研究の進捗状況、研究のタイ農業に対する貢献度、研究の将来性などの点から評価しているが、主として研究者に対する聞き取り調査及びアンケート調査の結果に基づいているため、評価にやや客観性を欠いている部分がある。

今回行った評価調査は、本プロジェクトとして最終的なものであるが、評価は日本側の調査員のみでなくタイ側の調査員をも加えた合同調査によった。今回の調査では、研究活動について一応次のような観点から成果を評価することとした。

(1) 個々の研究課題について研究が目標に到達しているかどうか（研究の達成度）

(2) 個々の研究課題について、どの程度独創的な発想をもって研究が進められてきたか（研究の充実度）

(3) 研究方法の習得などをとおして自発的に研究が実施できる研究者が育っているかどうか（人材養成の程度）

(4) 研究成果を学術論文として発表しているかどうか

などに基づいて、それぞれのトピック、サブトピックを総合的に評価し、到達度として、A、B、Cで表す方法をとった。この方法は、研究活動を評価するにはかなり有効な方法であると思われた。

ただ本プロジェクトは、特定の課題について研究成果をあげることのみでなく、それをとおしてカセサート大学における研究能力を向上させることを最終的な目的としている。この最終目的に対しての評価は、より広い観点からの評価が必要である。今回の評価にあたっても、可能なかぎり各方面からの評価を試みたが、必ずしも完全なものとはいえないように思われる。

いずれにしても、このようなプロジェクトを実施した場合には、その成果を正確に評価することが重要であることはいうまでもない。しかし研究の成果や研究能力の向上の程度を客観的に評価することは、道路や橋梁を建設するような場合とは異なって極めて難しい。今後はこの方面のより適格な評価法の開発に努める必要があるように考えられた。

附属資料 1

タイ・カセサート大学研究協力
フェーズⅡ計画における
フォローアップ実施計画

付属資料1

タイ・カセサート大学研究協力フェーズⅡ計画における

フォローアップ実施計画

Ⅰ．フォローアップが必要と判断されるトピック

(1) Ⅰ－2－3：試験管によるサトウキビ、パパヤの生殖質保存

(2) Ⅰ－3－3：昆虫フェロモンによるCotton Bollwormの防除

(3) Ⅰ－3－4：Sclerotium rolfsiiによるトマト根茎腐敗病の生物学的防除

(4) Ⅰ－4－3：野菜の系統間差異決定、種子活性検査のための生物学的技術

(5) Ⅰ－4－4：植物育種における器官培養

(6) Ⅱ－A－4：動物疾病及び植物病虫害制御に有効な生理的活性植物成分

(7) Ⅱ－B－3：換金作物におけるアフラトキシンの制御

(8) Ⅱ－B－4：園芸生産物の処理、包装、貯蔵技術体系の開発

(9) Ⅲ－2－2：自走式刈取脱穀機の改善

(10) Ⅲ－3　：高水分トウモロコシの脱粒機の開発

(11) Ⅲ－4　：全茎式サトウキビ収穫技術改善

Ⅱ．研修実施計画

以下のとおりである

プロジェクトⅠ

トピック２；遺伝資源保存

サブトピック３；試験管によるサトウキビ、パパヤの生殖質保存

（リーダー；Mr. Sonthichai Chanprame）

遺伝資源の保存が植物育種にとって重要であることは、広く認識されている。しかし、生殖質の圃場での保存は容易ではない。サトウキビの場合、広大な圃場と多大の労力とが必要であるし、パパヤにおける雌雄性の発現は栽培環境によって影響をうけやすい。さらに、病虫害などにより、貴重な遺伝資源が失われる可能性がある。

本研究の目的はサトウキビ、パパヤで、これらの難点を解決するため、培養組織と超低温保存を用いた生殖質保存の技術を確立しようとするものである。フェーズⅡで一部の研究は進捗したが、最終目標にはまだ達していない。従って、フォローアップの期間中に下記の研究を行う。

(1) in vitro組織の成長抑制剤として適当な物質の検索、

(2) 培養組織の超低温保存技術の確立、

(3) 長期に保存された組織の植物体への再生の確認、

研究計画：

研究項目	1992	1993	1994
同定	·····		
評価		·····	
報告書製作			·····

プロジェクトⅠ

トピック３；病虫害防除のためのバイオテクノロジー

サブトピック３；昆虫フェロモンによるCotton Bollwormの防除

（リーダー；Dr. Somnuk Wongtong）

フェロモン利用による農作物害虫の防除は、すでに先進国で実用化されている。農薬利用による制御に比べ、抵抗性の発現もなく環境に与える影響も少ない。しかし、タイ国で商業的に利用できるフェロモンは高価であることが問題である。

フェーズⅡにおけるフェロモン利用の研究で、非常に有望な結果を得たので、これを基に低価格を目指したフェロモンの粗抽出とその実用化のための研究をフォローアップ期間中に行う。

研究計画：

研究項目	1992	1993	1994
フェロモン粗抽出法の検討	.....		
有効成分の生物活性調査		.....	
フェロモン・トラップ実用化検討		.....	
フェロモン利用の適切な技術開発		.....	
報告書作成			.....

プロジェクトI

トピック3；病虫害防除のためのバイオテクノロジー

サブトピック4；Sclerotium rolfsiiによるトマト根茎腐敗病の生物学的防除

（リーダー；Dr. Chiradej Chamswarng）

トマト根腐れ病は土壌菌、Sclerotium rolfusiiによって発生するが、農薬による防除は困難である。拮抗菌、Trichoderma Gliocladiumの利用による制御はこれに替わる望ましい防除法である。1987～1989年、本トピックの研究者はカンペンセンの土壌からこれらの拮抗菌を分離し、in vitro試験の結果、これらが病原菌の成長を抑制することを確認した。その他、Aspergillus, Penicillium も同様の効果があることを見出だし、これらすべての拮抗菌による防除効果をポット試験で検討した。一方、大量処理のための拮抗菌の増殖をジャーファメンターを用いて行った。

今後、フォローアップ期間中にはこの方法による生物学的防除法として、Trichoderma種の利用による最も適切な処方と適用方法を見出だし、最終的には圃場規模におけるトマト根腐れ病の実際的防除法を検討する。

研究計画：

研究項目	1992	1993	1994
拮抗菌の大量生産培地の検討	·····		
上記の成長条件の検討	·····		
拮抗菌の処理用処方の検討	·····		
処方された拮抗菌の質的評価	·····		
圃場条件での拮抗菌製剤の有効性の評価	·····		
報告書作成			·····

プロジェクトⅠ

トピック４；育種

サブトピック３；野菜の系統間差異決定、種子活性検査のための生物学的技術

（リーダー；Mrs. Panie Temiesagdie）

本トピックの研究は育種素材の遺伝的純度と種子の品質を評価することを目的としている。ゲル電気泳動法はBrassica類、スイートコーン、オクラ、トマトなどの品種間差異をタンパクやアイソザイムレベルで区別するのに有用である。すでにフォスファターゼ、グルタミン酸トランスアミナーゼ、アルコール脱水素酵素、エステラーゼなどによるキャベツ、オクラの品種間差異や遺伝的純度の検討に成功した。

近年他の多くの酵素による、品種同定の方法も開発されつつある。延長期間中にはこれまでの成果をふまえ、いくつかの野菜のアイソザイムレベルでの標準的な品種間差異の検定方法の確立を行う。

研究計画：

研究項目	1992	1993	1994
トマト、Brassica類の品種間同定	·····		
スイートコーン、オクラの品種間同定		·····	
クラスター分析		·····	
報告書作成			·····

プロジェクトⅠ

トピック４；育種

サブトピック４；植物育種における器官培養

（リーダー；Miss Chuanpis Aroonrungsikul）

in vitro器官培養は自家不和合性のBrassica属育種のために有用な技術である。子房培養、胚培養は種間雑種の育成に効果的に用いられている。フェーズⅡにおいて浸水種子の春化処理と日長処理によって、いくつかのBrassica属の開花誘導に成功した。また、これらの間の交雑種子を得る事が出来たが、にずれも胚、子房の発育が十分でないので、発芽個体を得ることが出来なかった。

雑種個体を得るためには、これら未熟種子の胚、子房培養が必要である。今後、延長期間内に開花条件をさらに確実にし、いかなる時期にも交配作業を可能にし、上記技術とあわせ、雑種個体の育成を実現する計画である。

研究計画：

研究項目	1992	1993	1994
開花誘導と交配	.....		
子房、胚培養	.....		
雑種植物の成長試験	.....	.....	
報告書作成		.....	.....

プロジェクトⅡA

トピック4；動物疾病及び植物病害制御に有効な生理的活性植物成分

（リーダー；Dr. Narong Chungsamarnyart）

近年合成農薬による熱帯家畜ダニと野菜害虫、diamond back moth幼虫の制御は、抵抗性系統の出現により深刻な問題となりつつある。ピレスリンのような植物由来の殺虫剤は哺乳動物への毒性も低く、抵抗性個体の出現も少ない。従って植物からの新しい殺虫成分の開発が要望される。

本研究は、タイ産の植物エキスをスクリーニングすることによって、家畜ダニ、野菜害虫、病原糸状菌の制御に活性ある物質を発見しようとするものである。フェーズⅡにおいて、すでに多くの植物の中から非常に有効な植物エキスを発見することができ、農家もこれに関心を示している。実用化のための研究として今後さらに毒性の検討と、エキスの適用方法の研究、さらに有効成分の化学構造の解明に関する研究が必要で、これらの研究を行う。

研究計画：

研究項目	1992	1993	1994
有効植物エキスの実際的適用法の検討	.....		
有効植物エキスの分劃と精製	.....		
精製物質の生理活性の検討	.....		
精製物質の急性毒性の検討	.....		
有効物質の化学構造の解明	.....		
報告書作成			.....

プロジェクトⅡB

トピック3；換金作物におけるアフラトキシンの制御

（リーダー；Ms. Chintana Chana）

最近、タイ国ではメイズの輸出において、アフラトキシンの制御が大きな問題となっている。しばしば国際基準をこえる汚染がおこるからである。その主要な原因の1つに貯蔵中における穀粒の含水率が高い、とくに雨期に高いことがあげられる。アフラトキシン汚染は不注意に扱えば、収穫前からその後にいたるあらゆる時期に発生する。

汚染を制御し、アフラトキシンを早期に検出するための研究が行われてきたが、残念ながらまだ完成していない。CLGCにおいて、アフラトキシン用の実験室の改修工事が完成したので、フォ

ローアップの期間中には、90年の修正計画に従い、下記の研究を継続して行う。

1．抗原及び抗血清の生産過程の改善とELISA法によるアスペルギルス菌及びアフラトキシンの検出法の確立

2．化学的手法によるアフラトキシン濃度の抑制

研究計画：

研究項目	1992	1993	1994
アフラトキシンの迅速、正確な検出法の開発	·····		
ELISAによるアフラトキシン検出のための抗原及び抗血清の作成	·····		
化学的なアフラトキシン制御の方法	·····		
報告書作成		·····	

プロジェクトⅡB

トピック4；園芸生産物の処理、包装、貯蔵技術体系の開発

（リーダー；Dr. Bundit Jarimopas）

タイ国はおいしい熱帯果実や野菜の生産に適しており、国内ばかりでなく外国からも評価されている。これら園芸生産物は収穫後、市場品質を維持するため、予冷と冷蔵を行い、洗浄、品質選別、大きさ選別、包装などを行うことが決定的に必要である。これらの各工程は現在、労働集約的な人力作業で行われている。実際には、ある工程、例えば予冷は実用的には無視され、全工程処理は行われていない。この結果、生産物の大きさ、色択など不揃いであり、損失もおこる。熱くて高湿度の自然条件下で、農家の庭先から市場への早期出荷では損失が多く、市場での価格の低下を起こしている。これらは生産者及び国に経済的な損害を与えている。

一般に、園芸生産物の品質は日本及び他の先進国では、少ない人数のオペレーターによる機械操作で維持管理されている。タイ国の園芸生産物についても品質と生産物管理のため、収穫後の取り扱い技術、包装機械技術、冷温貯蔵技術などが必要とされる。しかし、収穫後技術に用いられる器具、機械は有効に利用できるとしても、高価であり、複雑であり、タイ国内の経済条件にはマッチしていない。そこで、簡単で農家レベルでよく知っている技術を用い最小労働力で利用できる、好適収穫後処理機械の開発が必要になってくる。

過去5年間のプロジェクトにおいて、大きさ選別機、洗浄機、ワックス処理機、包装機械、後熟促進機など、いろいろな種類の果物に適する第1号機を試作した。しかし、予冷機械の研究には

至っていない。また、全工程の整備された包装施設の設計、組み立てと開発も実施出来なかった。延長によりこれらの研究を完成する。具体的には予冷装置、洗浄機械、大きさ選別機、ワックス処理機、包装機械、追熟機など総てを包むパイロット・パッキングハウスの設計と組み立てとその評価を行うことである。

研究計画：

研究項目	1992	1993	1994
予冷機械の開発	.....		
パイロット・パッキングハウスの開発と評価		.....	
報告書作成			.....

プロジェクトⅢ

トピック２；稲収穫・脱穀技術改善

サブトピック２；自走式刈取脱穀機の改善

（リーダー；Mr. Vicha Manthamkan）

タイ国における稲の収穫はナイフや鎌を利用し人力で行われている。この人手収穫は多くの労力が必要とされ、その能率は１人１日当り、¼－½ライ程度である。労賃は１日50バーツ、または１ライ当り150～200バーツに相当する。稲の収穫時期には労働力が不足し、特に収穫最盛期の不足はひどい。収穫適期に遅れた刈取は減収と品質劣化をもたらす。ヨーロッパ型の収穫機が試験的に導入されたが、機械が大きくかつ重いため、タイ国の小区画水田及び軟弱地盤には問題があった。また、日本製の自脱型コンバインが試験的に導入されたが走行性、耐久性、機械の複雑さ等からタイ国の条件に合わなかった。

以上のような背景から、タイ国の水田状態と社会経済的に向く稲用のコンバインを開発する必要がある。1990～1991までの期間にタイのローカルメーカーでつくられたコンバイン、及び日本製自脱型コンバインの性能試験調査及び軟弱地盤で問題の多い走行部の試作などを実施したが、まだ十分でない。フォローアップ期間中には、特に走行部の研究に重点をおいて改良機の試作に努める。

研究計画：

研究項目	1992	1993	1994
試作走行部の性能試験	.....		
性能試験：稲刈取部	.....		
搬送供給部	.....		
脱穀部	.....		
原型稲コンバインの組み立て	.....		
原型コンバインの性能試験と評価	.....		
報告書作成	.....		

プロジェクトⅢ

トピック３；高水分トウモロコシの脱粒機の開発

（リーダー；Mr. Prayouth Suwanchewakorn）

トウモロコシはタイ国にとって重要な作物であるにもかかわらず、生産量が減少している。その

原因は工業化に伴って、収穫期における若年労働力が得られなくなったことに加えて、収穫時期の悪天候によって高品質の生産が難しいことにある。これらの問題解決のため、過去５年間のフェーズⅡで実施した高水分トウモロコシ用脱粒機の開発研究では、実験室の段階で一応満足すべき結果が得られた。しかし、実際のトウモロコシ生産現場に適応した機械として完成させるために、試作機をさらに修正、改造して、耐久性及び性能の向上を図ることが必要で、そのための研究を行う。

研究計画：

研究項目	1992	1993	1994
脱粒機構及び装置の改良	·····		
材料供給部の改良、開発	·····		
選別部の改良、開発	·····		
駆動装置及び駆動方法の改良	·····		
改造機による実験と改良		·····	
報告書作成			·····

プロジェクトⅢ

トピック４；全茎式サトウキビ収穫技術改善

（リーダー；Mr. Banchaw Bhaholyodhin）

タイ国におけるサトウキビ栽培面積は約400万ライ（64万ha）であり、１年間の収穫は3000万トンに達する。現在、急速な工業化により、農村での労働力の不足が著しい。サトウキビ生産において、労働力の最も必要とされるのは収穫時期の３～４カ月である。このことから、収穫期への労働集中の改善を考えなければならない。サトウキビ収穫機は研究開発されていないこと、よくない条件という理由で、あまり利用されていない。サトウキビ収穫機は収穫期に集中する労働力に代わり得るものとして大切な役割を果たすであろう。なおまた、収穫から製糖工場への工程を速くし、収穫をより完全に行い、製糖工場の稼働率を改善するのに役立つ。

フェーズⅡの過去５年間に多くの研究をおこなった。脱葉力を含むサトウキビ作物体の物理的特性、歩行型及び乗用型収穫機の開発などである。現在これらの試作機の改善に努力中である。延長期間中に次の研究を行う。

(1) 生産条件に合致するサトウキビ全茎式収穫機の開発

(2) この収穫機に用いられる脱葉機の開発

研究計画：

研究項目	1992	1993	1994
原型収穫機の性能試験	.....		
原型脱葉機の性能試験	.....		
原型収穫機の改良、開発	.....		
原型脱葉機の改良、開発	.....		
両改良機の性能試験		.....	
開発原型機の組み立て		.....	
報告書作成			.....

附 属 資 料 2

合同評価報告書（英文）

NOTE OF UNDERSTANDING ON JOINT EVALUATION OF
THE JAPANESE TECHNICAL COOPERATION FOR
THE STRENGTHENING RESEARCH ACTIVITIES (PHASE II) PROJECT
AT KASETSART UNIVERSITY

With about four months prior to the termination of the cooperation period on April 15th, 1992, as stated in the Record of Discussions which was signed on April 16th, 1987, the Japanese Evaluation Team organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and led by Dr. Ryoji KAWASHIMA, Professor Emeritus of Kyoto University, visited Thailand from November 25th to December 7th, 1991.

The objective of the visit was to conduct an overall evaluation of the performance of The Strengthening Research Activities (Phase II) Project at Kasetsart University (hereinafter referred to as "the Project"). The evaluation was conducted jointly with the Thai Evaluation Team led by Dr. Supot Faungfupong, Vice President for Education and Student Affairs of Kasetsart University.

The teams conducted interviews with Japanese experts and Thai counterparts assigned to the Project, held a series of discussions with Thai authorities concerned, made field surveys, and exchanged views and ideas among them.

As a result, both teams agreed to forward to their respective Governments for consideration the summary of their evaluation and recommendations contained in the document attached herewith.

Bangkok, December 6th, 1991

Ryoji Kawashima

Dr. Ryoji KAWASHIMA
Leader
Japanese Evaluation Team

S. Faungfupong

Dr. Supot FAUNGFUPONG
Leader
Thai Evaluation Team

JOINT EVALUATION REPORT ON THE JAPANESE TECHNICAL COOPERATION FOR THE STRENGTHENING RESEARCH ACTIVITIES (PHASE II) PROJECT AT KASETSART UNIVERSITY

1. INTRODUCTION

Based on the Record of Discussions (hereinafter referred to as "R/D") signed on April 16, 1987, the Governments of Japan and the Kingdom of Thailand have been implementing a technical cooperation program for the Strengthening Research Activities (Phase II) Project at Kasetsart University (hereinafter referred to as "the Project") for almost five years.

The purpose of the Project is to strengthen research activities of Kasetsart University, the leading institution of agricultural education in Thailand, and thus to contribute to agricultural development of the country. The Project has been carried out at Central Laboratory and Greenhouse Complex (hereinafter referred to as "CLGC") and National Agricultural Machinery Center (hereinafter referred to as "NAMC") in Kamphaengsaen Campus of the university.

To realize the purpose mentioned above, following three research projects have been implemented.

Project I: Biotechnology and Breeding Program for Crop Improvement
- Topic 1: Tissue Culture (3 sub-topics)
- Topic 2: Genetic Resource Conservation (3 sub-topics)
- Topic 3: Biotechnology for Pest Control (6 sub-topics)
- Topic 4: Breeding (4 sub-topics)

Project II: Agricultural Environment and Quality Assurance Technology
- II-A: Management of Agricultural Environment (4 topics)
- II-B: Development of Quality Assurance Technology (4 topics)

Project III: Agricultural Mechanization Technology Development
- Topic 1: Land Preparation for Rice Transplanter
- Topic 2: Rice Thresher
- Topic 3: Corn Sheller under High Moisture Content
- Topic 4: Whole Stalk Sugarcane Harvester

Note: Projects I and II have been conducted at CLGC, and project III at NAMC.

On January 12th, 1988, Tentative Implementation Program (TIP) was set up by the Joint Committee.

On March 6th, 1990, the Work Plan of TIP was revised by the Joint Committee, including main alterations as follows:

1) Discontinuation of sub-topic 3: *Papain Production by Papaya Cell Culture* under Topic 1 of Project I;
2) Cancellation of the proposals on construction of biogas pilot plant for *Utilization of Agricultural and Industrial Wastes*, Topic 3 of Project II-A;
3) Addition of *Rotary Tiller for Land Preparation* as a sub-topic to Topic 1 of Project III; and
4) Addition of *Self-Propelled Cutter and Thresher* as a sub-topic to Topic 2 of Project III.

With the cooperation period soon to reach termination, the Governments of Japan and the Kingdom of Thailand have carried out a joint evaluation of the results of the Project from November 25th through December 7th, 1991.

2. MEMBERS OF THE JOINT EVALUATION TEAM

2.1 Japanese Evaluation Team

(1) Dr. Ryoji KAWASHIMA (Leader/Agricultural Environment)
Professor Emeritus, Kyoto University

(2) Dr. Shoji SHIGENAGA (Crop Improvement)
Professor, Faculty of Agriculture, Kyoto University

(3) Dr. Yoshio IKEDA (Quality Assurance Technology)
Professor, Faculty of Agriculture, Kyoto University

(4) Mr. Takashi KUWANA (Agricultural Mechanization Technology)
Director, Department of Farm Mechanization,
National Agriculture Research Center,
Ministry of Agriculture, Forestry and Fisheries

(5) Mr. Kei JINNAI (Planning and Administration)
Staff, Development Planning Division,
Agriculture, Forestry and Fisheries Planning and Survey Department, JICA

2.2 Thai Evaluation Team

(1) Dr. Supot Faungfupong (Leader)
Vice President for Education and Student Affairs, KU

(2) Dr. Chatt Chamchong (Representative from DTEC)
Associate Professor,
Department of Agricultural and Resources Economics,
Faculty of Economics and Business Administration, KU

(3) Mr. Tomikazu INAGAKI (Representative from DTEC)
JICA Expert at DTEC

(4) Dr. Chantavit Sujatanond (Representative from MUA)
Director, Foreign Relations Division, MUA

(5) Mr. Chak Chakkaphak (Representative from DOA)
Director, Agricultural Engineering Division, DOA

(6) Dr. Amnat Suwanarit (Representative from KU)
Professor, Department of Soil Science,
Faculty of Agriculture, KU

(7) Dr. Chucheep Piputsitee (Representative from KU)
Assistant Professor, Department of Economics,
Faculty of Economics and Business Administration, KU

(8) Mr. Kittisak Yosthasan (Observer from DTEC)
Staff, Monitoring and Evaluation Sub-Division,
Policy and Planning Division, DTEC

Remarks;

KU: Kasetsart University
MUA: Ministry of University Affairs
DOA: Department of Agriculture, Ministry of Agriculture and Cooperatives
DTEC: Department of Technical and Economic Cooperation, Office of the Prime Minister

3. OBJECTIVES OF THE EVALUATION

(1) To carry out a comprehensive evaluation of the project achievement;

(2) To make recommendations and suggestions on the post-Project period to the concerned authorities of the two Governments; and

(3) To recommend useful experiences obtained through implementation of the Project so that future projects could be planned and implemented more effectively.

4. ITEMS OF THE EVALUATION STUDY

4.1 Input

4.1.1 Cooperation from the Government of Japan

4.1.2 Measures taken by the Government of Thailand

4.2 Research Activities of the Project

4.2.1 Crop Improvement

4.2.2 Agricultural Environment

4.2.3 Quality Assurance Technology

4.2.4 Agricultural Mechanization Technology

4.3 Overall Effects of the Project

4.4 Administration of the Project

4.5 Others

5. RESULTS OF THE EVALUATION

5.1 Input

5.1.1 Cooperation from the Government of Japan

Dispatch of Japanese Experts

Nine (9) long-term experts have been dispatched in the fields of biotechnology, plant biochemistry, agricultural environment, agricultural mechanization and agricultural machinery, including two team leaders and two coordinators.

Forty-five (45) short-term experts have also been dispatched as of November, 1991. Two more short-term experts are scheduled to be dispatched by the end of the Project, then, the total number of short-term experts would finally be forty-seven (47).

These experts (See Annex 1) have contributed to the attainment of the Project objectives.

Acceptance of Thai Personnel in Japan

Thirty-one (31) Thai counterparts have been sent to Japan for technical training and for study visit on agriculture and research work in Japan as of November, 1991. Another one is expected to be trained in Japan, so the total number of trainees would be thirty-two (32) by the end of the cooperation period (See Annex 2).

Out of thirty-one (31) Thai counterparts trained in Japan, thirty (30) have been working for Kasetsart University except one (1) who left the university.

Provision of Machinery and Equipment

Laboratory equipment, agricultural machines, machine tools, vehicles, spare parts and stationery (amounting to approximately 214.5 million yen) have been provided by JICA to supplement technology transfer in the Project (See Annex 3). Machinery and equipment generally satisfied the requirements for implementation of the Project.

Others

JICA made special arrangements to supplement the local costs, amounting to approximately 43 million yen, as follows: modifications, enlargements and repairs of the facilities, technology diffusion, publication of journals and survey on output of the project (See Annex 4). Furthermore, approximately 6 million yen of local business expenses have been spent to facilitate the research works in urgent needs and in repairs of equipment (See Annex 5).

Three JICA missions were sent to the Project to give guidance on, to review and to discuss technical matters which arose during the course of implementation.

5.1.2 Measures Taken by the Government of Thailand

Provision of Land, Buildings and Facilities

Land, buildings and facilities for implementation of the Project were provided by the Government of Thailand with the past support of Japanese grant aid.

Under the grant aid program, the buildings for CLGC and NAMC were constructed in 1979-80 and KU-Japan Project (Phase I) was implemented in advance of the Project.

Appointment of Counterparts and Other Personnel

Kasetsart University has assigned and maintained stable number of necessary staff, including counterparts and other personnel, to the Project. The total number of the staff attached to the Project was 109 in 1987 and is 119 in 1991. Detail of the staff responsible for the Project is shown in Annex 6.

Operation Costs

The Government of Thailand has borne expenses on operational costs including research activities, labor, machinery and equipment, materials, facility maintenance and so on, amounting to approximately 29.5 million Bahts for the Project duration of five years (See Annex 7).

5.2 Activities of the Project

5.2.1 Project I: BIOTECHNOLOGY AND BREEDING FOR CROP IMPROVEMENT

Crop improvement is considered a long term process to accomplish its objective. Application of plant biotechnology for crop improvement, however, is strongly anticipated for rapid development of new crop varieties with desirable characteristics to meet market and food industry requirements. On the other hand, there are constraints for developing countries including Thailand to immediately introduce the newly developed technology for the local agricultural production.

The underlying concept for the implementation of the Project in coping with the existing problem is to integrate the biotechnology with conventional breeding program.

The project consists of four topics, i.e., tissue culture, genetic resource conservation, biotechnology for pest control, and breeding.

TOPIC 1 *Tissue Culture*

In this topic, sugarcane and papaya were adopted as the experimental materials. Sugarcane is one of the most important crops for the agricultural production in Thailand. Papaya, which is the important perennial crops consumed as fruit or vegetable and for the papain production, is cultivated throughout the country. Planting stocks, if originally infected, would generate a successive amount of infected planting materials with lower yield and poor quality. With the introduction of plant tissue culture techniques, especially the meristem culture, the SCMV free sugarcane was obtained and multiplied as planting stocks. Theoretically, SCMV free sugarcane could contribute to 10 - 20% yield increase compared to the conventional cane production.

True-to-type planting materials can also be obtained through tissue culture. In this program, a technique to propagate true-to-type papaya seedlings *in vitro* was developed, and their horticultural characteristics were determined by biochemical analysis.

Sub-topic for papain production by papaya cell culture was discontinued in March, 1990 due to the study leave of the

sub-topic leader for her Ph.D. degree abroad and low potential for success of the sub-topic.

TOPIC 2 *Genetic Resource Conservation*

Germplasm of *Saccharum* and related genera, i.e., 4 accessions of *S. officinarum,* 126 accessions of *S. spontaneum,* 36 accessions of *Erianthus* spp., 2 accessions of *Sclerostachya fusca,* and 4 other accessions, were collected from the central, eastern and northern regions in Thailand. The collected materials were planted in drums at the Department of Agronomy, Kamphaengsaen Campus, Kasetsart University for further studies. After completion of the construction of sugarcane field of the Research and Development Center (KURDI at Kamphaengsaen) supported by JICA, they were transplanted there to examine the necessary characteristics for breeding.

Twenty-seven accessions of papaya plants were collected from northern Thailand, and were planted in the experimental fields of CLGC in Kamphaengsaen Campus to investigate on their growth and flowering habit and fruit characteristics. Some of these collections could not bear fruit due to their sensitivity to the environmental conditions. These strains are now maintained as seeds. All of these collections are for the breeding program.

For the establishment of germplasm bank of sugarcane and papaya, the technique of *in vitro* germplasm conservation by tissue culture and cryopreservation was investigated. Cell suspension from callus of sugarcane variety ROC-3 was cryopreserved by using daminozide and sucrose as the cryoprotectant. After being kept in liquid nitrogen at -196°C for 30 minutes, development of cell suspension was observed and the suitable concentration of cryoprotectant was determined. However, no plant was regenerated from callus developed from suspension. Improvement of cryopreservative conditions for regeneration ability is now being studied. Attention is paid on type of tissue to be preserved in order to maintain the genetic component and increase regeneration ability. Follow-up of the program will lead to more fruitful outcomes.

TOPIC 3 *Biotechnology for Pest Control*

Using tomato as the model, the project was designed to study the possible mechanism of resistance to virus infections. Tomato yellow leaf curl virus (TYLCV) coat protein gene was transferred into tomato plant to induce resistance. Transgenic plants obtained via *Agrobacterium* mediated gene transfer were successfully produced and now being tested for resistance.

For the control of the cotton bollworm (*Heliothis armigera*) in Thailand, the development of nuclear polyhedrosis virus (NPV) as a bioinsecticide was tried. Basic information including the restriction endonuclease pattern, cloning of the restriction endonuclease fragments and the construction of specific probe for viral detection was obtained.

Crude pheromone extracted from virgin female moth of cotton bollworm was tested for its control of cotton bollworm. A test of effectiveness of the pheromone under field conditions provided positive results, but with lower effectiveness than the commercial synthetic pheromone.

For biological control of root and stem rot of tomato caused by *Sclerotium rolfsii*, antagonistic microorganisms of *Trichoderma- Gliocladium* group were screened *in vitro* and were found to suppress effectively the growth of *S. rolfsii* on a culture medium through parasitic activity. *Trichoderma harzianum* in powder and granulated forms was developed to control the stem rot disease biologically.

Pre-immunization of papaya seedlings to control papaya ringspot virus (PRV) and the cross protection method to control cowpea aphid-born mosaic virus (CAMV) in yard long bean were investigated to minimize the use of toxic chemicals for the safe environment and good health. Eight isolates of mild strains of PRV were obtained, and PRV-F_1 isolate has been propagated and distributed to papaya growers to be used as protectant in some regions of Thailand. Mild virus strains of CAMV were selected by heat or cold treatment and nitrous acid treatment. High cross protection effectiveness was observed with the application of these strains to yard long bean seedlings.

TOPIC 4 *Breeding*

Breeding program can help produce plants to meet the changing requirements in the market.

Tomato improvement was focussed on fruit of peach type, pink color with larger size and better table-quality. Cucumber improvement was emphasized on the local mini-cucumber of oblong fruit with high ratio of female flower. The improvement of okra varieties was geared for five-ridged pod with attractive shape and color. All of these breeding programs were conducted with F_1 method. In each vegetable, some numbers of promising combination of the hybrids were identified.

The breeding program of bt_1 gene in sweet corn was conducted, and population improvement and inbred-hybrid development were achieved.

Biological techniques for varietal verification were studied with sweet corn, *Brassica* species, tomato and okra. Polyacrylamide gel electrophoresis analysis of isozyme banding patterns was used; peroxidase in sweet corn, alcohol dehydrogenase in *Brassica* species, and esterase in tomato and okra were suggested to be the best expression of banding pattern to distinguish the difference among varieties and breeding lines. Other enzymes such as malate dehydrogenase, glucose 6 phosphate dehydrogenase should also be tested in order to complete this technique.

Organogenesis *in vitro* for the successful hybrid between different species of *Brassica* was investigated. Due to the study leave abroad of former sub-topic leader, the attainment of the target has been delayed even though the successor could attain the substantial step of the program.

5.2.2 Project IIA: MANAGEMENT OF AGRICULTURAL ENVIRONMENT

The project is being proposed to organize a task force of scientists concerned to investigate thoroughly the mechanism of agricultural pollution, to diffuse and transfer modern agricultural technology to farmers and, hopefully, to secure the healthy environment for both producers and consumers.

The objectives of this project are as follows:

1. To assess appropriate methods for controlling toxic residues in the agricultural commodities;
2. To assess the effect of pesticides on soil microorganisms and soil borne pathogens;
3. To study the appropriate control of pesticide residues in the soil by using biodegraders;
4. To investigate the utilization and treatment of agricultural and industrial wastes, particularly animal manures and crop residues;
5. To develop appropriate technology to cope with natural adversary soil properties and those caused by the toxic residues and wastes; and
6. To investigate the medicinal plant substitute for synthetic drugs in animal therapy and plant pest controls.

To achieve those objectives, four topics were arranged. The studies have been conducted rather smoothly and successfully in spite of some small problems.

TOPIC 1 *Pesticide Residues Diminishment in the Soil and Their Microbial Degradations*

The quantitative change of herbicide in soil has been studied under various conditions and the effect of herbicide on soil microorganisms in the sugarcane field was examined. The studies observed the change of microorganisms in terms of flora and population, and selected some species which were sensitive to herbicides. Tolerant soil microbes as well as their biodegrading abilities were tested with three herbicides. The effects of herbicides on soil borne pathogens and antagonistic organism to soil borne pathogens were also studied. The studies have been carried out successfully and there was remarkable progress during

these five years.

TOPIC 2 *Monitoring of Soil Adversary Properties in Tropical Savanna Climate for Effective Management*

The problems of the salt affected soil in Mae Klong basin were studied. The study made clear the patchy distribution of the salt affected soil and pointed out the effect of the irrigation canal. The chemical as well as physical properties of the soil and the factors affecting productivity of the sugarcane were analyzed. The technology package for improvement of sugarcane production was proposed. The studies covered various problems on the salt affected soil, and succeeded in solving some of them.

TOPIC 3 *Utilization and Treatment of Agricultural and Industrial Wastes*

The main objective of the topic was to study the biogas production as a means for waste treatment. However, the pilot plant necessary for study was not constructed due to budgetary limitation. As the results, the studies were concentrated on the fungi having high capability of lignin and cellulose degradation, and succeeded in selecting some of effective fungi. There are some aspects still remained for study, but it would be better to terminate the topic.

TOPIC 4 *Physiological Active Plant Substances for Animal Therapy and Plant Pest Control*

To select the plant active substances effective to tropical cattle tick and diamondback moth larvae, extracts from various plants have been examined. From extracts of two hundred plant species, some effective extracts were selected. Among them, the extracts from *Annona squamosa, Pachyrrhizus erosus, Calotropis gigantea* were most effective. The chemical analysis of the extracts is now being carried on. It is expected to take two more years to complete the study. The extension of the project is, therefore, needed.

5.2.3 Project IIB: DEVELOPMENT OF QUALITY ASSURANCE TECHNOLOGY

Thai fruits, vegetables and flowers have just entered the world market. However, horticultural commodities are at various degree perishable. Their perishability brings about a great deal of unnecessary loss. Particularly in Thailand, the importance of postharvest handling, packaging, transportation and storage is not well recognized and implemented. Practically modern quality control technologies are not yet available. Handling of the horticultural commodities with better quality control technology will reduce postharvest losses and hence increase available food supply.

Importance and benefits of the studies are as follows:

1. To develop techniques for determination of maturity and quality of the horticultural commodities;
2. To develop techniques for handling, packaging, shipping and storage;
3. To develop pre- and postharvest treatments to prevent losses caused by insects and diseases including toxin; and
4. To extend the research outcome to the public.

To realize those benefits, four topics of studies were arranged. The studies have been done rather successfully, and some subjects are still being continued.

TOPIC 1 *Quality Determination and Storage of Horticultural Commodities*

The physiological as well as morphological changes of the maturity of fruits such as durian, mango and mangosteen *etc* were studied. Useful indices of the maturity of fruits were developed. The storage conditions to keep the fruits in good quality were investigated, and the relationships between factors such as temperature, humidity and coating materials *etc* and the fruit quality were pointed out. Although there was remarkable progress in the studies, they are limited to laboratory level. It is expected to apply the results at the practical levels.

TOPIC 2 *Postharvest Disease and Insect Control*

The diseases of mango and mangosteen after harvest were studied. Three main fungi causing stem end rot on mango were investigated and the relationship between fungi infection and various conditions was cleared. The control measures were also studied. Similar studies have been performed for mangosteen. The main objectives have been achieved.

TOPIC 3 *Control of Aflatoxin in Economic Crops*

The studies on solar dryers of corn have been performed. The results are presented in the KU-Journal's Special Issue(No. 2). The conditions affecting fungi infection have been studied, and the importance of the moisture condition of corn grains was pointed out. The studies aiming at developing the detection method of aflatoxin at low concentration have been carried on recently. To complete the studies, the extension of the project is required.

TOPIC 4 *Development of Handling, Packaging and Cold Storage System for Horticultural Products*

The prototype of postharvest machines such as fruits sizing, waxing and cleaning machines were developed. However, it is necessary to study how to combine and arrange those individual machines to manage horticultural products as a system.

5.2.4 Project III: AGRICULTURAL MECHANIZATION TECHNOLOGY DEVELOPMENT

The objectives of the study are as follows:

1. To conduct research work in the fields of agricultural machinery, mechanization and related fields, especially, land preparation for rice transplanter, rotary tiller, rice thresher, self-propelled cutter and thresher, corn sheller, and sugarcane harvester;
2. To develop the agricultural machinery which is suitable for local condition;
3. To improve the existing agricultural machinery and equipment locally made;

4. To develop, to improve, and to transfer technology on agricultural machinery by means of some media such as publication, training, seminar,etc.

Work plan is mainly consisted of machine performance test, engineering evolution, modification, design and construction.

TOPIC 1 - Sub-topic 1 *Land Preparation for Rice Transplanter*

Four different transplanters (4-row Japanese riding-type, 2-row Japanese walking-type, IRRI walking-type, 4-row Chinese walking-type) were evaluated for field performance and planting accuracy. The 2-row Japanese type showed the best performance, i.e, 88.6% field efficiency, 0.5% missing hills, 1.5% buried hills, 1.0% floating hills, and 0.144 ha/hr field capacity.

TOPIC 1 - Sub-topic 2 *Rotary Tiller for Land Preparation*

Regarding the rotary tiller, useful data on (i) soil crushing performance by means of NAMC soil bin, and (ii) tractor performance on ridging for vegetable production were obtained. Combination of ridging and crushing will lead to a new vegetable production systems.

TOPIC 2 - Sub-topic 1 *Rice Thresher*

Many useful data on optimal revolution of main shaft to reduce grain losses of locally-made rice thresher were obtained. Combined type of the thresher (hold-on and throw-in) had already been developed. More efficient smaller sized thresher was also acquired.

TOPIC 2 - Sub-topic 2 *Self-propelled Cutter and Thresher*

The performance test of Thai locally-made rice combined harvester showed that the main problem of the machine was the head loss which was as high as 6.75%. The performance test of the head-feeding type Japanese rice combined harvester showed that the most suitable speed of the machine was about 0.8 m/s. Head losses at this speed varied from 2.4 to 3.2%. Tractive device, comprising the final drive gear transmission with 10:1 ratio, a pair of wooden track and a hydrostatic transmission drive for the prototype of combined rice harvester was constructed.

TOPIC 3 *Corn Sheller under High Moisture Content*

The moisture content of corn grain suitable for shelling by existing local shellers were from 16 to 18%. The corn sheller prototype was of axial flow type, with spike teeth arranged on open drum of 68 cm long. Expected drum speed to get the best results was about 500 to 650 rpm. The performance test for higher efficiency will be made in December 1991.

TOPIC 4 *Whole Stalk Sugarcane Harvester*

Studies on some physical properties of four varieties of sugarcane and labor harvesting as well as some types of mechanical harvester were performed. The experimental prototypes and their performance were assembled and tested. The last prototype performed fairly well in the conventional plantation.

A lot of useful data out of laboratory tests and some field tests were obtained. However, regarding to sub-topic 2 of Topic 2, Topic 3 and Topic 4, further modification associated with experimental fields are indeed needed for practical use. Thus, the project extension for 2 years is desired.

5.3 Administration of the Project

The Project has been carried out at CLGC for research projects I and II, and at NAMC for research project III. Basic unit of each project is topic or sub-topic with the leader and several co-workers. A group leader is assigned to each of the three projects to supervise research activities of its topics /sub-topics. The Director of KURDI, as the Project Manager, harmonizes the three projects totally on his substantial responsibility. Also, the Directors of CLGC and NAMC actively involved in the progress of research activities.

To discuss fundamental issues, the Joint Committee composed of both Thai and Japanese members has held meeting once or twice a year irregularly according to R/D.

To coordinate the organization and the research activities, Regular Meeting, which consists of the Director and the Deputy Director of KURDI and each group leader from Kasetsart University, and the Leader and the Coordinator from Japanese Expert Team, has been held periodically.

Kasetsart University organized Policy Committee and Implementation Committee. The former is composed of 11 members including the Vice President in charge of research activities as the chairman and has handled important issues of the project. The latter consists of 15 members including the Deputy Director of KURDI as the chairman with the main responsibility on coordination and communication among research projects.

Japanese Experts Team has held their regular meeting once a week to communicate and coordinate each other.

In general, the Project has been properly administered by those organizations. In a few cases, however, some research activities have been overlapped or delayed because of insufficient communication and coordination among project leaders, topic leaders and co-workers. In addition, there is a case in which replacement of the sub-topic leaders was not made soon enough after their leave for study abroad.

5.4 Overall Effects of the Project

Research activities at CLGC and NAMC have been considerably strengthened with the cooperation from the Government of Japan. For instance, 53 contribution papers derived from the Project have been published in three special issues (1989, 1990, 1991) of the "Kasetsart Journal" which is one of the most authoritative academic journals in Thailand. Furthermore, the abstracts of the research work within the project have been presented at the annual conferences and published in annual "Progress Report in Research Activities" and also in "Newsletter" of CLGC and NAMC periodically (See Annex 8).

Indirectly, as for the merit of the Project, some of the counterparts could get advanced degree in some universities in Japan during the technical cooperation period (See Annex 9).

In short-term, the Project has contributed to the expansion of the functions of CLGC and NAMC in offering research services not only to Kasetsart University but also to the whole agricultural community in Thailand. In long-term, the expansion of the functions of CLGC and NAMC is considered essential for further advancement of Thai economy because Thailand is the agricultural exporting country.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

(1) Since the start of the Project on April 16, 1987, both the governments of Japan and the Kingdom of Thailand have made great effort to attain the objectives of the Project.

Input support activities by Japanese-side and input measures undertaken by the Thai-side have been generally appropriate as prescribed by the agreements in R/D, TIP and the Revised Work Plan.

(2) It can be considered that CLGC and NAMC have been strengthened as research institutes with high capability to attain their own objectives by the projects.

(3) By making full use of the facilities in CLGC and NAMC, the research projects have made good progress and produced a number of remarkable results. These achievements have been presented at the annual conferences and published in various academic journals as stated in 5.4.

(4) However, some of the research topics /subtopics are still behind the schedule set at the beginning of the project mainly because: 1) Such researches faced unexpected difficulties in developing and applying methodology of frontier science like biotechnology; 2) Supply, maintenance or repair of equipment was delayed or not available; 3) Training of counterparts in Japan or dispatching of short-term experts was delayed or its timing was not appropriate; and 4) Unexpected leave of key person.

6.2 Recommendations

(1) Based upon the consideration mentioned in 6.1 (4), the Joint Evaluation Team recommends that the 11 topics/sub-topics should be followed up by extending their cooperation periods. Necessary period of follow-up is 2 years as shown in Attachment 1.

(2) In case the project is followed up by extension of the cooperation period, both sides of Thailand and Japan should put efforts to secure sufficient budget for the effective program.

(3) Most of research topics of the project are still in the experimental stage in the laboratories, therefore such topics are expected to be applied to agricultural development of Thailand through the efforts of the researchers and the institutions concerned.

(4) To sustain the research capability of CLGC and NAMC for the future, Kasetsart University is expected to establish the proper system including budgetary aspect for maintenance and utilization of their facilities, especially buildings, equipment and machinery.

(5) In general, acquiring sophisticated research methodology and equipment is indispensable in conducting research, in which frontier science like biotechnology is involved. Therefore, it is recommended that training of sufficient number of counterparts in Japan, and expediting the supply and securing of appropriate after-sales services of the equipment are necessary for this type of projects.

Attachment 1. Topics / Subtopics To Be Extended For Two (2) Years

Project I: Biotechnology and Breeding Program for Crop Improvement (Research Project 1)

Topic 2: Genetic Resource Conservation

sub-topic 3: *in vitro* Germplasm Conservation of Sugarcane and Papaya

Topic 3: Biotechnology for Pest Control

sub-topic 3: Control of *Heliothis armigera* in Cotton by Insect Pheromone

sub-topic 4: Biological Control of Root and Stem Rot of Tomato Caused by *Sclerotium rolfsii* Sacc.

Topic 4: Breeding

sub-topic 3: Biological Techniques for Varietal Verification and Seed Vigour Test of Vegetables

sub-topic 4: Organogenesis *in vitro* for Plant Breeding

Project II-A: Management of Agricultural Environment

Topic 4: Physiological Active Plant Substances for Animal Therapy and Plant Pest Control

Project II-B: Development of Quality Assurance Technology

Topic 3: Control of Aflatoxin in Economic Crops

Topic 4: Development of Handling, Packaging and Storage Systems for Horticultural Products

Project III: Agricultural Mechanization Technology Development

Topic 2: Rice Thresher

sub-topic 2: Self-propelled Cutter and Thresher

Topic 3: Corn Sheller under High Moisture Content

Topic 4: Whole Stalk Sugarcane Harvester

ANNEX 1

TABLE I-1: LIST OF EXPERTS, LONG TERM

as of 15/11/91

NO.	NAME	FIELD/POSITION	DURATION	COUNTERPART
1.	Dr.Hiroshi HARADA	Biotechnology Team Leader	2 y+2 mnths 1/7/87 - 31/8/89	Mr.Kamphol Adulavidhaya, Ph.D. Vice President
2.	Dr.Toshio TSUTSUMI	Agri.Environment PJ-II Team Leader	2 y+8 mnths 18/8/89-16/4/92	Mr. Kamphol Adulavidhaya, Ph.D. Vice President
3.	Mr.Masahiro YONEYAMA	Coordinator	3 y+ 2 mnths 1/7/87-31/8/90	Mr.Thira Sutabutra, Ph.D. Dir. KURDI Vice-President
4.	Mr.Tamio IJIRI	Coordinator	1 y+ 8 mnths 6/8/90-16/4/92	Mr. Viroch Impithuksa, Ph.D. Dir. KURDI
5.	Dr Tadashi NOBUCHI	Plant Biochem Project II	1 year 26/3/88-25/3/89	Mr.Jingtair Siripanich, Ph.D. Ms.Vilai Santisopasri, Ph.D. Mr.Narong Chungsamarnyart, Ph.D. Ms.Suratwadee Jiwajinda, M.S.

TABLE I-1: LIST OFEXPERTS, LONG TERM

NO.	NAME	FIELD/POSITION	DURATION		COUNTERPART
6.	Dr.Sachihiko MITSUOKA	Plant Biochem Project III	3 years	26/4/89-16/4/92	Mr. Supat Attathom, Ph.D. Mr. Kriuk Naritoom, M.S. Mr. Wichai Korpraditskul, Ph.D. Mr. Narong Chungsamarnyart, Ph.D. Mr. Kasem Piluek, Ph.D.
7.	Dr.Yoshiaki GOTO	Agri Mechanization Project III	4 y+6 mnths	8/10/87-16/4/92	Mr. Bundit Jarimopas, Ph.D. Mr. Vicha Manthamkan, M.S.
8.	Mr.Toshio YAMAUCHI	Agri Machinery Project III	2 years	16/10/87-15/10/89	Mr. Akradet Artachinda, M.S. Mr. Kanoksak Eam-O-Pas, M.S.
9.	Mr.Kunihiko MAEOKA	Agri Machinery Project III	1 y+10 mnths	17/6/90-16/4/92	Mr. Bundit Jarimopas, Ph.D. Mr. Prayouth Suwanchewakorn, B.Sc.

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
	1987 Japanese F.Y.					
1.	1. Dr.Tadashi ASAHIRA	Tissue Culture	41 days	11/7/87-20/8/87	Mrs. Malee Suwanna-adth Mr. Kriuk Naritoom	I-1,2,4,
2.	2. Dr.Jiko SHISHIYAMA	Biotechnology	31 days	21/12/87-20/7/88	Mr. Supat Attathom Ms. Pissawan Chiemsombat	I-3,IIA-1. IIB-3.
3.	3. Dr.Ritsuya YAMASHITA	Quality Assurance Technology	34 days	11/7/87-13/8/87	Mr. Bundit Jarimopas Mr. Jingtair Siripanich	IIB-1,2.3.4
4.	4. Dr.Eiichi TAKAHASHI	Agricultural Environment	37 days	15/12/87-20/1/88	Mr. Irb Kheoruenromne	IIA-2.
5.	5. Dr.Koichi KOSHIMIZU	Agricultural Environment	31 days	21/12/87-20/1/88	Mr. Neungpanich Sinchaisri	IIA-4.
6.	6. Mr.Nobuhiro ITOKAWA	Soil Preparation Technology	46 days	30/1/88-16/3/88	Mr. Kanoksak Eam-O-Pas	III-1
7.	7. Mr.Kazutomo ICHITO	Harvesting Technology	46 days	30/1/88-16/3/88	Mr. Banchaw Bhaholyothin	III-4

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
	1988 Japanese F.Y.					
8.	1. Mr.Hirofumi YAMAMOTO	Plant Cell Culture	53 days	10/7/88-31/8/88	Ms. Manee Tuntirungkit Ms. Rongrong Visessuwan	I-1-3
9.	2. Dr.Shigeki NAGATOMI	Genetic Resource Conservation	30 days	25/11/88-24/12/88	Mr. Kasem Sooksathan	I-2-1
10.	3. Dr.Haruhisa INDEN	Breeding and Genetics	39 days	6/12/88-13/1/89	Mr. Kasem Piluek Ms. Chuanpis Aroonrungsikul	I-4-1
11.	4. Dr.Tetsuji YAMADA	Plant Genetics Engineering	33 days	16/1/89-17/2/89	Mr. Supat Attathom Ms. Pissawan Chiemsombat	I-3-3
12.	5. Dr.Shozo KUWATSUKA	Biodegradation of Pesticide	23 days	31/7/88-22/8/88	Mr. Wichai Korpraditskul	IIA-1
13.	6. Dr.Koro KATO	Aflatoxin Prevention Technology	32 days	31/9/88-31/10/88	Ms. Chintana Chana Mr. Somsiri Sangchote Mr. Ronnapop Bunjoedchoedchu	IIB-3

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
14.	7. Dr.Hisao FURUKAWA	Soil Ecology	29 days	1 - 29/12/88	Mr. Irb Kheoruenromne Ms. Chancharat Verasarn	IIA-
15.	8. Dr.Yoshio IKEDA	Handling, Packaging of Agricultural Product	33 days	12/12/88-13/1/89	Mr. Bundit Jarimopas	IIB-4
16.	9. Mr.Yukio AZUMA	Corn Sheller under High Moisture Content	61 days	21/9/88-20/11/88	Mr. Akradet Artachinda	III-3
17.	10. Mr.Kyo KOBAYASHI	Rice Thresher	55 days	28/10/88-21/12/88	Mr. Somyot Chirnacksorn	III-2
18.	11. Mr.Kazutomo ICHITO	Sugarcane Harvester	31 days	20/1/89-19/2/89	Mr. Banchaw Bhaholyothin	III-4
19.	12. Mr.Shigeki ISHIYAMA	Implementation Design for Infrastructure	40 days	8/8/88-16/9/88	====	
20.	13. Mr.Hirohiko NOZOE	Implementation Design for Infrastructure	40 days	8/8/88-16/9/88	====	

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
	1989. Japanese F.Y.					
21.	1. Dr.Masahiro MII	Embryogenesis for Plant Breeding	22 days	11/10/89-1/11/89	Mr. Jurapark Chunwong Ms. Panie Temiesagdie	I-4-4
22.	2. Dr.Akira OGOSHI	Biological Control of Soil-borne Pathogens	47 days	28/11/89-13/1/90	Mr. Chiradej Chamsawarng Ms. Kanittha Sangkaha	I-3-4
23.	3. Dr.Michihiro KOBAYASHI	Genetic Engineering of Insect Virus	42 days	23/1/90-5/3/90	Ms. Tipvadee Attathom Ms. Sudawan Cheaychomsri	I-3-2
24.	4. Dr.Mari MAYAMA	Post-Harvest Plant Pathology	61 days	20/6/89-19/8/89	Mr. Somsiri Sangchote Mr. Ronnapop Bunjoedchoedchu	IIB-2
25.	5. Dr.Tadashi NOBUCHI	Post-Harvest Technology	37 days	22/6/89-28/7/89	Mr. Jingtair Siripanich Mr. Saichol Katsa	IIB-1
26.	6. Dr.Hajime OHIGASHI	Plant Chemistry, Bioactive Plant Substance	29 days	24/7/89-21/8/89	Mr. Neungpanich Sinchaisri Mr. Narong Chungsamarnyart	IIA-4

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
27.	7. Mr.Kyo KOBAYASHI	Modification of Rice Thresher	33 days	25/1/20-28/2/90	Mr. Prasarn Kradang-ngar	III-2
28.	8. Mr.Mikio KANAMITSU	Sugarcane Harvester	28 days	1-28/2/90	Mr. Banchaw Bhaholyothin	III-4
29.	9. Mr.Takeshi TSURUSAKI	Ultra-centrifuge	8 days	16-23/6/89	====	
30.	10. Mr.Shigeki ISHIYAMA	Preparation of Contract Agreement and Supervision	30 days	1/9/89-30/10/89	====	
31.	11. Mr.Kazushi YAMAZAKI	Supervising of Construction Works	5 months+14DS	1 October 1989 - 14 March 1990	====	
	1990 Japanese F.Y.					
32.	1. Dr.Kazuhiro FUJIWARA	Tissue Culture	61 days	9/10/90-8/12/90	Mr. Kriuk Naritoom Ms. Siriwan Burikam	I-1-2
33.	2. Dr.Eiji NAWATA	Seed Biochemistry	151 days	1/11/90-31/3/91	Ms. Panie Temiesagdie Ms. Chuanpis Aroonrangsikul	I-4-3
34.	3. Dr.Masato IKEGAMI	Molecular Virology	29 days	1-29/3/91	Mr.Supat Attathom Ms. Pissawan Chiemsombat	I-3-1

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.		NAME	FIELD	DURATION		COUNTERPART	
35.	4.	Dr.Hirotoshi KITAGAWA	Post-Harvest Technology of Horticultural Crops	25 days	15/6/90-9/7/90	Mr. Jingtair Siripanich Mr. Saichol Ketsa Ms. Teeranud Romphophak	IIB-1
36.	5.	Dr. Toru MATOH	Saline Soil Management	92 days	3/7/90-2/10/90	Mr. Irb Kheoruenromne	IIA-2
37.	6.	Mr.Osamu KAWAMURA	Aflatoxin Detection	30 days	23/1/91-21/2/91	Ms. Pranee Hamelink,	IIB-3
38.	7.	Mr.Masahiro MIYAZAKI	Land Preparation Technology	37 days	10/7/90-15/8/90	Mr. Kanoksak Eam-O-Pas	III-1
39.	8.	Mr.Shigeki ISHIDA	Corn Sheller to be Used with High Moisture Content	42 days	14/9/90-25/10/90	Mr. Akradet Artachinda Mr. Prayouth Suwanchewakorn Ms. Ratana Udomanusorn	III-3

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
	1991, Japanese F.Y.					
40.	1. Dr. Ichiro UYEDA	Genetic Engineering of Potyviruses	29 days	12/11/91-10/12/91	Ms. Pissawan Chiemsombat Mr. Supat Attathom	1-3-1
41.	2. Dr.Yutaka SHINOHARA	Organogenesis in Vitro for plant breeding	26 days	7/10/91-2/11/91	Mr. Kasem Piluek Ms.Chuanpis Aroonrungsikul	I-4-4
42.	*3. Dr. Hyoji NAMAI	Vegetable Breeding	29 days	16/2/92-15/3/92	Mr. Kasem Piluek Mr. Chairerg Sangwansopyakorn	I-4-1
43.	4. Dr. Hidemasa IMASEKI	Enzymology of Ethylene biosynthesis	13 days	3/8/15-15/8/91	Mr. Jingtair Siriphanich Mr. Saichol Ketsa Ms. Teeranud Romphopak, M.S.	IIB-1,2
44.	5. Dr. Hideo HAYASHI	Purification of Plant Substances	38 days	7/11/91-14/12/91	Mr. Narong Chungsamarnyart Mr. Weerapol Jansawan Mr. Neungpanich Sinchaisri	IIA-4
45.	*6. Dr. Mitsuru HIROTA	Toxity Test of Plant substances	26 days	2/12/91-27/12/91	Mr. Narong Chungsamarnyart Mr. Weerapol Jansawan Mr. Neungpanich Sinchaisri	IIA-4

TABLE I-2: LIST OF EXPERTS, SHORT TERM

NO.	NAME	FIELD	DURATION		COUNTERPART	
46.	7. Mr. Toshihiko IZAWA	Rotary Tiller	31 days	6/8/91-5/9/91	Mr. Tanya Niyamapa	III-1-2
47.	8. Dr. Katsunobu GANNO	Rice Combine	30 days	3/9/91-2/10/91	Mr. Vicha Manthamkan	III-2-2

Remark : Long term experts = 9, Shot term experts =47 (PJ.I : 15 PJ.II : 6 PJ.III : 11 others : 5)

* scheduled

ANNEX 2

Counterparts studied in Japan
1987-1992

	No.	Name	Duration	DYS	Field	Present Post	PJ	TPC	S-TPC
		1987 Japanese F.Y.							
1	1)	Mr. Thira Sutabutra,Ph.D.	11-25/10/87	(15)	Research Administration	Vice-President			
		1988 Japanese F.Y.							
2	1)	Mr. Thira Chaichanavong,Ph.D.	15-29/3/89	(15)	Agricultural Mechanization	Resigned	(III)		
3	2)	Ms. Pissawan Chiemsombat,Ph.D.	29/9/88 - 27/10/88	(90)	DNA Recombination	Instructor: Fac.Agri Dept. Plant Pathology, KPS.	I	3	6
4	3)	Ms. Sudawan Chaeychomsri,M.S.	3/10/88 - 27/12/88	(86)	Insect Cell Culture	Researcher (stdd in Jpn):CLGC	I	3	2
5	4)	Mr. Bharata Kunjara, M.Eng.	2/8/88 - 30/11/88	(121)	Post-Harvest Technology	Assist. Prof. (stdd in Jpn): Fac. Eng. Dept. Agri. Eng. NAMC, KPS	IIB	4	
6	5)	Ms. Teeranud Romphophak, M.S.	2/8/88 - 30/11/88	(121)	Post-Harvest Techology	Researcher : CLGC, KPS.	IIB	1	
7	6)	Mr. Prasarn Kradang-ngar, B.Sc.	24 /10/88 - 26/2/89	(125)	Testing & Standatdization of Agricultural Machinery	Engineer: NAMC, KPS.	III	2	1
		1989 Japanese F.Y.							
8	1)	Ms. Chuanpis Aroonrungsikul,M.S.	10/7/89 - 27/10/89	(171)	Plant Genetic Resources	Researcher : CLGC, KPS.	I	4	4

	No.	NAME	Duration	DYS	Field	Present Post	PJ	TPC	S-TPC
9	2)	Mr. Sonthichai Chanpraem, M.S.	12/3/90 - 16/6/90	(97)	Plant Germplasm	Instructor : (study in abroad) : Fac. Agri., Dept. Agronomy, KPS	I	1	3
10	3)	Ms. Rongrong Visessuwan, M.S.	8/1/90 - 3/5/90	(116)	Plant Tissue Culture	Researcher : CLGC, KPS.	I	1	1
11	4)	Mr. Permpong Sriprasertsak, M.S.	26/2/90 - 24/2/91	(364)	Plant Certification	Researcher :CLGC, KPS.	I	3	5
12	5)	Mr. Kriuk Naritoom, M.S.	4-25/3/90	(22)	Plant Biotechnology	Assist. Prof.:Fac. Sci. Dept. Appl. Radiation and Isotopes, KPS.	I	1	
13	6)	Mr. Jingtair Siripanich, Ph.D.	26/7/89 - 20/11/89	(149)	Post Harvest Physiology	Assist. Prof.: Fac. Agri. Dept. Horticulture, KPS.	IIB	1	
14	7)	Mr. Vicha Manthamkan, M.S.	24/7/89 - 23/9/89	(62)	Agricultural Machinery	Instructor : Fac. Eng. Dept. Agri. Eng., NAMC, KPS.	III	2	2
		1990 Japanese F.Y.							
15	1)	M.L. Uemsook Kitiyakara,	24/9/90 - 8/10/90	(15)	Research Administration	Director of Foreign Relations Office, BKN			
16	2)	Mr. Kasem Sooksathan, Ph.D.	20/9/90 - 23/10/90	(34)	Sugarcane	Assist.Prof.: Fac. Agri. Dept. Agronomy BKN	I	2	1

	No.	NAME	Duration	DYS	Field	Present Post	PJ	TPC	S-TPC
17	3)	Ms. Sutevee Sukprakarn, Ph.D.	24/9/90 - 26/10/90	(33)	Seed Technology	Assist. Prof.: Fac. Agri. Dept. Horticulture, BKN	I	4	1
18	4)	Ms. Sirikul Wasee, M.S.	8/10/90 - 4/3/91	(140)	Plant Breeding	Researcher: AVRDC, KPS.	I	2	2
19	5)	Mr. Wichai Kositratana, Ph.D.	28/3/91 - 3/7/91	(98)	Biotechnology	Assist. Prof.:Fac. Agri. Dept. Plant Pathology, KPS.	I	3	5
20	6)	Ms. Anchalee Suddthiprakan,Ph.D.	1/8/90 - 31/10/90	(92)	Soil Physics, Mineralogy	Assist. Prof.:Fac. Agri. Dept. Fac. Agri. Dept. Soil Sci. BKN	IIA	2	
21	7)	Mr. Wichai Korpraditskul, Ph.D.	24/9/90 - 14/1/91	(113)	Pesticide Effect on Soil Microorganismus	Assist. Prof.: Fac. Agri. Dept Plant Pathology, KPS.	IIA	1	
22	8)	Mr. Akradet Artachinda, M.S.	24/9/90 - 25/12/90	(93)	Agricultural Machinery	Assist. Prof.:Fac. Eng. Dept. Agri. Eng. KPS.	III	3	
23	9)	Mr. Banshaw Bahalayodhin, M.S.	3-30/3/91	(28)	Production System of Sugar Crops	Assist. Prof.,Assistant Dean: Fac. Eng. Dept. Agri. Eng., KPS.	III	4	
		1991 Japanese F.Y.							
24	1)	Mr. Viroch Impithuksa, Ph.D.	14-29/10/91	(16)	Research Administration	Assoc. Prof.,Director of KURDI			
25	2)	Ms. Tipvadee Attathom, Ph.D.	16/9/91 - 19/11/91	(65)	Genetic Engineering	Assist. Prof.:Fac. Agri. Dept. Entomology, KPS.	I	3	2

	No.	NAME	Duration	DYS	Field	Present Post	PJ	TPC	S-TPC
26	3)	Mr. Niphone Thaveechai, Ph.D.	30/9/91 - 25/12/91	(87)	Plant Pathology	Assist. Prof.: Fac. Agri. Dept. Plant Pathology, BKN	I	3	5,6
27	4)	Mr. Somnuk Wongthong, Ph.D.	7/10/91 - 21/12/91	(76)	Insect Pheromone	Assist. Prof.: Fac. Agri. Dept. Entomology, BKN	I	3	3
28	5)	Ms. Prapaporn Tangkijchote, M.S.	26/8/91 - 31/3/92	(218)	Fungal Biotechnology	Assist. Prof.: Fac. Agri. Dept. Horticulture, KPS.	IIA	3	
29	6)	Mr. Saichol Ketsa, Ph.D.	30/9/91 - 3/12/91	(65)	Post Harvest Physiology	Assoc. Prof. : Fac. Agri. Dept. Horticulture, BKN	IIB	1	
30	7)	Mr. Weerapol Jansawan, D.V.M.	7/10/91 - 21/12/91	(76)	Insecticide & Anthehalminthic Bioassay	Assoc. Prof. : Fac. Veterinary Medicine, BKN,	IIA	4	
31	8)	Mr. Ronnapop Bunjoedchoedchu,M.S.		(92)	Aflatoxin Detection	Instructor : Fac. Agri. Dept. Plant Pathology, KPS.	IIB	2,3	
32	9)	Mr. Prayouth Suwanchewakorn,M.S.	13/10/91 - 21/12/91	(70)	Packing Engineering	Engineer : NAMC, KPS.	III	2	1

Total 32 (Project 1 : 14, Project 2 : 9, Project 3 : 5, others : 4)

Annex 3. List of Major Equipment / Machinery Provided for the Project (in delivered year)

1988: For CLGC:
Water Filtering Unit; Pick Up Truck; Gas Chromatograph; Multi-channel Temperature Recorder; Densitometer; Rotary Spray Tower

For NAMC:
Sugar Cane Harvester; Rice Transplanter; Signal Analyzer; Corn Penetrometer

1989: For CLGC:
Station Wagon; Micro Bus; Mini Bus; Laminar Air Clean House; ELISA Reader Set; Inverted Microscope; LAN-Computer System; Humidity Chamber; Transfer Chamber; Soxhlet Extractor; Gas Chromatograph; Ball Mill Mixer; Lapping Machine; Orbital Shaker Control

For NAMC:
Tractor; Small Combine; 4WD Station Wagon; Micro Bus

1990: For CLGC:
Cryogenic Preservation Kit; Biohazard Cabinet; Freeze Dryer; Deep Freezer; Leaf Area Meter; Refractable Index Detector; Ultracentrifuge; UV-SpectroPhotometer; Macro Kjeldahl Distillation; Spectro Color Meter; Soxhlet Extractor; Deep Freezer; Cryostat

For NAMC:
Universal Drill Grinder; Small Rice Milling Machine; Hydraulic Punching Machine; Vibration Analyzer; Book

1991: For CLGC:
Power Generator; Refrigerated Truck; DNA Sequencer; Macro Kjeldhal Distillation; Freeze-Dry Apparatus; Dendrometer; Portable Jet Washer; Vibrational Culture Incubator

For NAMC:
Analyzing Recorder; High Speed Camera; Air Conditioner; Sugarcane Cutter; Rice Color Meter; Mobile Thresher; Sun Rheo Meter; Basic Electronic Instrumentation Set; Gear Cutting Machine

Annex 4

Special arrangement to supplement local costs

Modification works for			
1)Tissue culture Lab.	89/90	B452,650.-	¥2,340,000.- @5.17
2)Air condition system	89/90	B357,000.-	¥2,006,340.- @5.62
3)Aflatoxin Lab.	90/91	B552,000.-	¥3,062,000.- @5.44
Improvement work for			
4)Experimental farm of breeding & paddy	89/90	B4,856,600.-	¥25,700,000.- @5.292
5)Screen net house	89/90	B240,000.-	¥1,351,440.- @5.631
Project seminar			
6)CLGC conference	88/89	B88,000.-	¥466,000.- @5.292
7)CLGC conference	90/91	B156,677.-	¥813,000.- @5.533
Technology diffusion and publicity			
8)Publication of movement of KU-JAPAN(phase-Ⅱ)	89/90	B98,000.-	¥552,000.- @5.631
9)The Ksaetsart jurnal vol.24,no.5	90/91	B98,000.-	¥570,000.- @5.817
Locally appropriate technology development and research technology evaluation survey			
10)Rice thresher	90/91	B330,000.-	¥2,112,000.- @5.817
11)Corn sheller for high moisture content corn	90/91	B375,000.-	¥2,400.000.-@5.817
12)evaluation survey	90/91	B300,962.-	¥1,751,000.- @5.817
	g.total	B7,904,889.-	¥43,123,780.-

ANNEX 5

Expenses under the emergency budget from Japanese Experts for repair of equipments, instruments and others

Budget Year	Numbers	Amounts	
1987/88	64	B431,110.-	
1988/89	35	B263,997.-	
1989/90	14	B203,929.-	
1990/91	3	B54,751.-	
		s.total B953,787.-	
1991/92.4.15	( )	B300,000.-	have already been paid after '91.9.30
		g.total B1,253,787.-	

ANNEX 6

persons allocated for KU-JAPAN (phase-II) Project

	Position	'87	88	89	90	91
1	Project Manager	1	1	1	1	1
2	Coordinator of the Project	2	2	2	2	2
3	Research Group Leader	3	3	3	3	3
4	Reseaarch Member	97	99	98	93	94
5	(Lecturer & Professor)	(63)	(63)	(63)	(61)	(58)
6	(Reseaarcher & Engineer	(32)	(33)	(31)	(29)	(32)
7	(Temporary Staff)	(2)	(3)	(4)	(3)	(4)
8	Secretary & Clerical Staff	4	10	7	7	10
9	Driver	2	6	8	7	9
	Total	109	121	122	113	119

ANNEX 7

The Counterpart Budget Allocated by R.T.G. for The Project

	4.16/87-9/87	10/87 - 9/88	10/88 - 9/89	10/89 - 9/90	10/90 - 9/91	10/91 - 4.15/92	
1. KU-Japan Implementation Unit							
- Material and supplies	124,999	250,000	250,000	350,000	363,000	273,600	10/91-9/92
- Operation Cost	98,119	228,160	366,060	360,700	437,520	270,600	
- Utilities	2,499	-	3,000	3,000	3,000	3,000	
- Wages	121,557	126,840	161,610	172,200	193,680	450,000	
Sub-total	347,174	605,000	780,670	885,900	997,200	997,200	
2. Counterpart budget for experts through DTEC							
- Secretaries	13,275	159,158	310,786	289,872	371,400	202,118.33	10/91-4/15/92
- Drivers	10,170	91,751					
- rentals	-	264,517	286,662.35	238,645.16	288,000	155,466.66	
- Fuel	-	96,351	101,327.88	85,689	126,103.20	64,287.69	
Sub-Total	23,445	611,777	698,776.23	614,159.16	785,503.20	421,872.65	
3. Research Budget	3,173,462.10	2,200,000	2,000,000	1,279,000	1,749,000	1,401,000	
4. Another Sources	1,435,606.40	1,535,606.40	2,101,206.40	2,443,606.40	2,466,206.40	-	
Grand Total	4,979,687.50	4,952,383.40	5,580,652.63	5,222,665.56	5,997,909.60	2,820,072.65	
					G.G. Total	29,553,371.34	

ANNEX 8

PUBLICATIONS

	Event	PJ-I	PJ-II	PJ-III	Total
1	The Kasetsart Journal Supplement issue, Vol.22(5),1988	5	6	3	14
2	Vol.24(5),1990	4	7	2	13
3	Vol.25(5),1991	12	11	3	26
4	CLGC Conference,No.6,1988	11	8	4	23
5	CLGC Conference,No.7,1989	9	6	0	15
6	CLGC Conference,No.8,1990	14	9	3	26
7	CLGC Conference,No.9,1991	11	12	4	27
8	Others	(20)	(26)	(11)	(57)

ANNEX 9

List of counterpart received the degree of Master or Doctor in Japan
(including Phase 1)

1. Ms.Pissawan Chiemsombat,Ph.D.	Dr. Degree Fac. Agri., Unversity of Osaka Prefecture
2. Ms.Vitchuporn Vongsuvanlert,Ph.D.	Dr. Degree Fac. Agri., Kyoto University
3. Mr.Tanya Niyamapa,Ph.D.	Dr. Degree Fac. Agri., Kyoto University
4. Mr.Rewat Lersrutaiyothin,Ph.D.	Dr. Degree Fac. Agri., Kyoto University
5. Mr.Julapark Chunwongse,M.S.	M.S. Degree Fac. Agri., Nagoya University
6. Ms.Patcharaporn,M.S.	M.S. Degree Fac. Agri., Kyoto University
7. Ms.Suratwadee Jiwajinda,M.S.	M.S. Degree Fac. Agri., Kyoto University
Studing in Japan, at present	
8. Ms.Manee Tantirungkij,	Doctor course Fac. Engi., Osaka University
9. Ms.Arunsiri Kumlung,	Doctor course Fac. Agri., Nagoya University
10.Ms.Roongnapa Korpraditskul,	Doctor course Fac. Agri., Nagoya University
11.Mr.Bharata Kunjara,	Doctor course Fac. Agri., Kyoto University
12.Ms.Sudawan Chaeychomsri,	Doctor course Fac. Agri., Nagoya University
JSPS. (Study for Doctor Degree)	
13.Ms.Panie Temiesagdie	Dissertation Ph.D.,The RONPAKU Program Fac. Agri., Meijyo University
14.Mr.Permpong Sriprasertsuk	Study for Ph.D. Fac. Agri., Okayama University

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