

タイ国カセサート大学技術協力
調査報告書

昭和53年8月

国際協力事業団

農計技
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受入 月日	'84. 4. 21	122
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登録No.	03728	AFT

ま え が き

この報告書は、タイ国カセサート大学技術協力調査に係る報告書である。

タイ国政府から昨年度日本国政府に対しカセサート大学の農業研究及び農業普及の拡大強化に必要な施設、機材、専門家派遣及び研修員の受け入れを内容とする無償資金協力及び技術協力について要請が行われた。

わが国政府は、この要請に応じて昨年度2回に亘り調査団を派遣し既に総合研究センターの基本設計を終了しているが、今回の調査団はこれらの調査結果をふまえ次の目的を持って派遣された。第一は日本国政府の無償資金協力により建設される総合研究センターにおける技術協力の方法についてタイ側と協議すること、第二は農業普及研修センターに関する無償資金及び技術協力の実施方針についての打合せ並びに農機具センターについての日本の協力可能性を調査すること等である。

調査はタイ国関係機関から多大の協力を得て円滑かつ効果的に行うことができた。ここにカセサート大学技術協力調査報告書としてとりまとめ、提出の運びとなった。

この調査の実施に際し、ご支援とご協力をいただいたタイ国関係者及び調査団員各位の御労苦に対し感謝するとともに、格別のご指導とご協力を頂いた在タイ大使館をはじめ、わが国の関係機関に深甚なる謝意を表する次第である。

昭和53年8月

国際協力事業団
理事 有 松 晃

調査団員構成

1. 団 長 総 括 鈴 木 章 生 日本豆類基金協会常務理事
 2. 副団長 研究協力(微生物) 田 口 久 治 大阪大学工学部教授
 3. 団 員 研究協力(農 学) 山 本 出 東京農業大学農学部教授
 4. " 農業機械 高 梨 文 孝 農林水産省農蚕園芸局
肥料機械課農蚕園芸専門官
 5. " 普 及 久 保 勤 農林水産省農蚕園芸局
普及教育課活動促進係長
 6. " 協力企画 塚 田 恒 雄 国際協力事業団農業開発協力部
農業技術協力課
 7. " 業務調整 鈴 木 忠 徳 国際協力事業団農林業計画調査部
農林業技術課
- 7 月 12 日から 出木場 勝 外務省経済協力局
調査団に同行 技術協力第二課

調 査 期 間

昭和 53 年 7 月 5 日から

18 日間

同 年 7 月 22 日まで

調 査 日 程

日 順	月 日	午 前	午 後
1	7月5日(水)	東 京 —————	バンコック 団長他4名出発
2	6日(木)	大使館、JICA事務所と打合せ	DTEC、大学庁表敬訪問
3	7日(金)	カセサート大学長表敬訪問 バンケンキャンパス視察	カセサート大学関係者と意見交換
4	8日(土)	団員打合せ(調査目的等の確認)	
5	9日(日)	"	
6	10日(月)	カセサート大学関係者と意見交換(総合研究センターに係る技術協力について) 高梨、久保団員到着	
7	11日(火)	カンバンセンキャンパス視察	
8	12日(水)	・カセサート大学関係者と意見交換(総合研究センターに係る技術協力について) ・外務省出木場事務官合流 ・カセサート大学長主催パーティー	
9	13日(木)	・総合研究センターに係る技術協力について大使館に結果報告	・カセサート大学関係者に調査結果報告(総合研究センターに係る技術協力について) ・団長主催パーティー
10	14日(金)	田口、山本団員帰国 普及研修センターについて大学側と意見交換	
11	15日(土)	団員打合せ。一部調査結果のとりまとめ	
12	16日(日)	団員打合せ	
13	17日(月)	普及研修センターについて大学側と意見交換	農機具センターについて大学側と意見交換
14	18日(火)	サマリーレポートの作成	大使館及びJICA事務所と現地報告書について打合せ
15	19日(水)	} サマリーレポートの作成	
16	20日(木)		
17	21日(金)	調査結果を大使館に報告	カセサート大学長にサマリーレポートを提出
18	22日(土)	バンコック —————	東 京

主要面接者一覧

1. D T E C (Department of Technical and Economic Cooperation)
Mr. Xujati Pramoolpol Director - General
Mr. Thawal Polpuech Colombo Plan Program Officer
2. 大学庁 (University Bureau)
Prof. Kasem 大学庁長官
Dr. Prasert Under - Secretary of State
3. カセサート大学
Dr. Rapee Sagarik カセサート大学長

Kasetsart University Staff Members to Join Discussion

Name	
1. Dr. Ubol Reangsuwan (Discussion Chairman)	Professor of Education Advisor to Vice-Rector for Academic Affairs Officer-in-charge during absence of Vice-Rector for Academic Affairs
2. Dr. Sam-arng Srinilta (Soil Science)	Coordinator and Chairman KU-Japan Project Implementation Committee
3. Dr. Thira Sutabutra (Plant Virology)	Asst. Co-ordinator
4. Mr. Thanakorn Jarupat (Plant Pathology)	Secretary
5. Miss Channuan Tansathit	Assistant Secretary
6. Dr. Jaroon Kumnuanta (Microbiology)	Culture Collection Unit
7. Mr. Charan Chettanachitara (Microbiology)	Culture Collection Unit
8. Mrs. Chanya Pakkavesa (Veterinary Pathology)	Culture Collection Unit
9. Dr. Supat Attathom (Plant Pathology)	Plant Pest Clinic and Quarantine Unit
10. Dr. Pensook Tauthong (Insect Physiology)	Plant Pest Clinic and Quarantine Unit
11. Dr. M.L. Anothai Choomsai (Cytogenesis)	Seed Technology Unit
12. Dr. Chalermnarph Chuayprasit (See Pathology)	Seed Technology Unit

- | | | |
|-----|---|--|
| 13. | Dr. Juangjan Duangpatra
(Seed Technology) | Seed Technology Unit |
| 14. | Dr. Suraphong Kosiyachinda
(Postharvest Physiology) | Post-Harvest Research Unit |
| 15. | Dr. Suranant Supatarapan
(Plant Physiology) | Post-Harvest Research Unit |
| 16. | Dr. Visoot Veerasan
(Soil Physics) | Soil and Fertilizer Testing and
Applied Research Unit |
| 17. | Dr. Piya Duangpatra
(Soil Fertility) | Soil and Fertilizer Testing and
Applied Research Unit |
| 18. | Dr. Amnat Suwannarit
(Soil Fertility) | Soil and Fertilizer Testing and
Applied Research Unit |
| 19. | Dr. Suvit Sangthongpraow
(Environmental Biology) | Environmental Science Unit |
| 20. | Mr. Pongsak Yubun
(Agricultural Climatology) | Environmental Science Unit |
| 21. | Dr. Kasem Chankao
(Watershed Conservation and
Management) | Environmental Science Unit |
| 22. | Dr. Yongyut Chiemchaisri
(Biochemistry) | Central Biochemistry Unit |
| 23. | Mr. Amnart Tantivanich
(Organic Chemistry) | Central Biochemistry Unit |
| 24. | Dr. Supot Fuangfupong
(Physiology of Crop Production) | Greenhouse Assembly |
| 25. | Mr. Poom Khumgliang
(Extension and Training) | Extension and Training Service Center |
| 26. | Mr. Thatchai Saengsingkaew
(Extension) | Extension and Training Service Center |

- | | |
|--|--|
| 27. Mr. Suchote Daosukho
(Agricultural Extension) | Extension and Training Service Center |
| 28. Mr. Wattana Swanyatipati
(Agricultural Extension) | Extension and Training Service Center |
| 29. Dr. Direk Rerkrai
(Agricultural Extension) | Extension and Training Service Center |
| 30. Dr. Apichart Anukulamphai
(Soil and Water Conservation) | Agricultural Machinery and Equipment
Center |
| 31. Mr. Kumropluk Suratsawadi
(Architecture) | Project Architect |
| 32. Mrs. Yupayong Hemasilpin
(Architecture) | Project Architect |
| 33. Dr. Nuangpanich Sinchaisri
(Entmology) | Liaison Officer |

Invited Thai Members Joining Discussion
on Extension and Training Service Center

July 14 - 18, 1978

Name	Position/agency
1. Mr. Kasem Jarinto	Planning and Special Projects Division, Department of Agriculture Extension
2. Mr. Thongtor Suvarnin	Planning and Special Projects Division, Department of Agriculture Extension
3. Mr. Supote Phanichprapai	Accerated Rural Development Office Ministry of Interior
4. Mr. Banchongsak Parntong	Accerated Rural Development Office Ministry of Interior
5. Mr. Boonsom Suwachirate	Head, Department of Agricultural Engineering

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I 総論

今回の調査団は日本国政府の無償資金協力により建設される総合研究センターにおける技術協力の具体的計画につきタイ側関係者と協議すること及び、農業普及研修センターに関する無償資金及び技術協力の実施方針についての打合せ並びに、農機具センターについての日本の協力可能性等を調査し、次の実施協議チーム等の派遣に資することを目的として派遣された。

カセサート大学はアメリカの農科大学方式を採り入れ教育、研究、普及の3部門一体となった機構を有し、タイ国における農業関係全般について関係省庁と連絡を取りながら研究、人材養成を行っている。同大学はさらに大学施設の拡張、整備を行うため、新キャンパスであるカンバンキャンパスの上記施設に対し、日本側に協力を求めてきたものである。

調査団は無償資金協力と技術協力とくに技術協力をを行う場合に同一大学内に2プロジェクトを実施することが可能であれば(1)研究プロジェクト (2)普及及び農業機械関係の2つに分けて実施すべきであると考え。

一方、カセサート大学は各学科のチーフを委員とした日本-カセサート大学プロジェクト委員会を副学長を責任者として設け、日本の協力を得て研究部門を充実することを切望している。したがってもし、日本の協力規模が著しく縮小した場合にはタイ国関係者に大きな失望を与えることになるであろう。このような失望をタイ国側に与えることのないよう格別の配慮を要望致したい。

1 総合研究センター

本センターには7つの研究Unit（微生物学、植物病理害虫学、種子生産学、流通・加工、土壌肥料学、環境科学、生化学）が含まれているが、カセサート大学は今まで教育部門が中心で研究部門は緒についたばかりであるため、今後技術協力をを行う上で研究部門に全面的な指導助言及び物的援助を行う必要がある。そのためには各専門分野に機材と共に長期間専門家を派遣する必要があるが、技術協力の進め方として先ず本センター施設建設中及び完成後に研究分野全般に助言を与えることのできるアドバイザー・コーディネーターを派遣し、個々の専門分野はアドバイザー・コーディネーターの判断により短期（1～3ヶ月間）の専門家派遣で対応することが最も有効であると考え。

機材については、技術協力に伴う機材供与の財源は限られたものであるため、センターの機能を有効に発揮するためには機器類の効率的配分を考慮すべきである。したがって調査団としては各ユニットにおける必要機材の優先順位を知るとともに、年次計画に対応し

得るようそれらの緊急性順位を知りたいとの要望に対し大学もその意向を了解し各ユニットについて機器類のプライオリティを付したリスト提出があった。このリストを検討した結果最小限 1 億 5 千万円相当分が必要であると考えられる。

また研修員の受け入れについても多くの要請があり、このうちとくに学位取得について従来タイ国では研究者をアメリカ等で研修させ学位を取得させていたが、今後は日本で学位の取得をも含めた受け入れを技術協力プロジェクト開始後行うことも検討すべきである。このほかに機材が日本より供与されるのに伴い機材の操作、修理の出来る技術者の研修も行う必要がある。

その他、とくに技術協力を行うにあたってカセサート大学のいう“テクニシャン”とは日本と異なり機械装置を扱う人をさし、そのレベルは B.S.、Ms. また Ph. D を持つ場合もあるが、Teaching Administration に関係しないので教授、助教授等として扱われていないことに注意する必要がある。

2 農業普及研修センター

タイ国でいう農業普及研修は普及員の養成のみならず在役軍人、農民、4 H クラブ員を対象に普及研修を実施するものである。しかし、今までの農業普及研修は関係各省（農業協同組合省、保健省、内務省）でほそぼそと実施されていたにすぎない。

カセサート大学は新しいカンバンセンキャンパスに日本の協力を得て建設するセンターで従来各省で行われてきたばらばらの農業普及の研修を集中的に実施し、タイ国内の普及事業の中核としたい希望を有している。

このセンターに対する日本側の対応としては、まず専門家の派遣については総合研究センターと同じ方式が必要と思われる。

供与機材については、タイ側からとくに視聴覚機材の供与が強く要望されたが、タイ国の普及員の養成、普及用教材の自力生産の重要性に鑑み必要と思われる。ただし、視聴覚機材の使用法、補修は技術協力を実施するわが国農林水産省ではこの部門についての研修員の受入れ、専門家の派遣について対応が困難であるのでこの部門に関する団体、民間の協力が必要とされる。したがってこのための資金援助を更に検討する必要がある。

3 農機具センター

本センターについて調査団は関係者（カセサート大学、農務省等）と時間的に充分協議が出来なかったきらいがあるが、少ない協議時間の中で調査団が理解し得た点は農機具の検査基準が現在タイ国にないため、農機具使用に際して幾多の問題が生じているというこ

とである。この現状を改善するため検査基準の早期作成を要望していることと、建設予定の農業普及研修センターと協力して普及員等に農業機械の操作、保守等を研修させることを主目的としている。検査基準の作成については日本側の事情から対応はかならずしも容易でないと思われる。すなわち検査基準の作成については、その国内における農機具の生産使用状況等を十分承知した上で、その国における耕地の自然状況、対象作物の種類等に対応出来る機械の構造性能、強度等多岐にわたるデータの収集、調査、研究が前提として不可欠である。したがってこれらのものを収集及び作成するにはかなりの時間が必要とされるので専門家の派遣についてはかなり長期間の派遣が求められる。現在わが国で農機具検査基準の作成のための技術・研究者は農業機械化研究所（特殊法人）大学機械系、民間農機具メーカー等に所属しているが、いずれも長期間の派遣については難色を示しており、最近のこの部門技術協力の例からも人選について困難が予想される。一方農業機械の操作保守は普及員等が修得すべき技術でありまさに中堅技術者養成の観点から見ても本センターは必要であると考ええる。

カセサート大学には本プロジェクトについて従来より経験がないように見られるので機械研究、専門家派遣、研究員の養成等についての具体的プログラム作成に当っては日本側からの協力が有効で必要であると考えられる。

II 総合研究センター（Central Laboratory and Greenhouse Complex）の技術協力について

1 Culture Collection Unit

1) 農学の分野で微生物学の占める役割も重要なものの一つである。即ち窒素固定菌である Rhizobium（ライゾビウム）、Azotobacter（アゾトバクター）及び Mycorrhiza（マイコライザー）等は直接農作物の収率に関係することは衆知のことである。同時にタイのごとき熱帯地域では豊富であるとともに、特殊な農産物が比較的安価に入手でき、農産廃棄物と併せて微生物利用工業の良好な原料となる。一方において我が国などとは著しく環境が異なることから、特異な生理活性を有している微生物の存在が考えられ、新しい微生物利用工業の開発に結び得る可能性もあり、Agroindustry の一分野として発展する高い期待がもたれる。

タイには従来、小規模ではあるが、数多くの伝統的な発酵食品が存在し、こゝでも微生物学の観点から検討を進めれば、プロセス、品質の改良が可能である。

今回新設される総合研究センターに微生物関連のものとして Culture Collection Unit（菌株蒐集と保存部門）が設立されることは上記の理由から当然であり、この Unit における教育、サービス、研究に対する関係者の責務も大であると考えられる。

この Unit に対しては理学部生物学科の Dr、Jaroon、Mr、Charan が中心となって活動する予定で、設立後約 5～6 名が常駐し、約 20 名が研究に関与することである。

この Unit は他部門へのサービスとして保存菌株（動植物病原菌、土 微生物、工業用微生物）の検定と提供を行うとともに次のごとき研究を予定している。

① 農学に関連する微生物の蒐集と保存

土壌微生物を中心に農学に関連する重要な微生物の分離同定ならびに各菌株に対する適当な保存法の検討。

② 発酵食品に関連する微生物の蒐集保存

伝統的な発酵食品は殆んどが自然発酵であり、従って食品の品質及びプロセスを改良する為に食品から微生物を純粋分離し、優良株を使用する検討を行う。

③ 工業用微生物の研究

工業用の有用微生物の保存もタイにおいては従来十分に管理されていなかった。従って有用菌の保存法を検討するとともに、アルコール発酵、乳酸、酢酸、クエン酸、イタコン酸発酵に関連する微生物の優良株の分離ならびに加水分解酵素生産菌、飼料たん白源となり得る微生物の分離と保存を通してタイ国の微生物工業の進展に資する。

④ 動植物病原菌の蒐集

Plant pests and disease unit, Dept. of animal pathology と協力して病原菌の蒐集を行うとともに、これらの菌株は通常に移植法では毒性を失い易いので、保存、移植法についても詳細な検討を行う。

⑤ タイ産きのこ類の蒐集

きのこ類の斜面培養保存法とその深部培養法について検討する。

2) 必要機材

上記のサービス、研究を実施する為には最小限下記の機材を必要とする。

品 目	数	推定額、万円
ライオフィライザー	1	500
〃 付属品	1 式	100
ディープフリーザー (- 80 °C)	1	180
フラン器	3	150
通常顕微鏡	2	100
位相差顕微鏡	1	90
乾燥器	1	40
乾熱殺菌器	1	50
オートクレーブ	1	60
冷蔵庫	1	80
恒温室付振温培養機	1	120
小型発酵槽	1	140
ガラス器具	1 式	200
合 計		1,810 万円

3) 専門家の派遣

かびの分類学 短期 (2 ~ 3 ヶ月)

菌株保存法 " (")

4) 研修員の受入れ

凍結乾燥器の研修 (3 ヶ月)

応用微生物学についての研修 (3 ~ 6 ヶ月)

以上の人物交流については大阪大学工学部発酵工学科の助教授、助手、或いは東京大学応用微生物研究所の研究員の派遣が可能であり、受入れも同様に可能である。

2 Plant Pest Clinic and Quarantine Unit

本ユニットは病虫害防除に関し研究成果を政府関係者、普及員に提供し、さらにカンパセンキャンパス周辺の人々に対しても問題点の解決を計るサービス研究を行う計画である。このための人員は新規定員要求により病理 20 名、害虫 20 名のよく訓練された人を配置する予定である。

1) 必要機材

タイ国では各プロビンスに農務省の職員を配置しているが、この分野の専門家でないため適切な指導、助言に欠け、また中央官庁の対応も適確でない。したがって一つのモデルケースとして大学周辺にキメ細かいサービスを行いたいとの趣旨で、大学から現地へ出向いて、すばやく検査を行う Mobil Plant Clinic (車輦に実験、検査装置を組み込んだもの) を計画しているが、カンパセン周辺だけにサービスを行うためならば検体を直接普通車輦で総合研究センターのこのユニットに持ちこめるので、上記 Clinic Car の必要はないと考えられる。

とくに必要な機材は訓練用顕微鏡 (双眼、位相差) 20 台、Electrophoresis (電気泳動装置) は殺虫剤の抵抗性機構追求上必要度が高いと思われる。また環境科学 Unit と併せ農薬の残留実態調査用のガスクロマトグラフは必須と思われる。

2) 専門家と研修員

この分野の機器分析が行える専門家を派遣することにより、器材操作の修得のみを目的として研修員を受け入れる必要はなくなると思われる。

また、病虫害防除のためにこの国では Ecological study and forecasting outbreak of pests (発生予察) の必要性が大と思われるのでこの分野の人員交流が必要である。

3 Seed Technology Unit

種子に関してタイ国では国会で既に農産種子法 (Seed Act) が通過しているが、種子に関する研究がほとんど行われていないので、優良種子の検定、配分等の基礎的データが不足しており法の執行はできていない。わずかに National Corn and Sorgum Center においてベト病抵抗性の Corn 種子の配布を若干行っている程度であり、農家が種子を自給している。

農業省の Rice Division でも種子に関してはほんのわずかしが研究が行われていない。このためタイ国内での一般配布用米、トウモロコシ、大豆、マングビーン (緑豆) 等の種子の 1 % だけが証明書が添付されているに過ぎない。

このため野菜の種子は輸入 300t/year、自給数 100t/year に上るが、優良種の基準がないので検査が行なわれていない現状にある。

そこで① カセサート大学の研究者が農学の研究に使用するための種子の供給

② 種子の改良、保存条件の研究（含有水分、貯蔵条件）

を目的とした種子生産ユニットをつくり将来は種子センターを創設して種子法に基づく優良種子の検定配布を行う計画を有している。

総合研究センターの基本設計の段階で種子貯蔵庫は無償資金協力の対象とならなかったが、今回はとりあえず種子の Testing Unit を整備し、一方種子貯蔵庫はタイ国政府予算で要求することにし、日本の技術協力が始まる前に研究を開始したいと大学側は考えている。

2) 必要機材

カセサート大学側から必要機材リストが提出されたが、大学側のプライオリティーが高い機材は次の通り

- ・ Quick moisture tester
- ・ Digital moisture computer
- ・ Aging chamber
- ・ Air - Screen cleaner
- ・ Gravity Separator

3) 専門家の派遣

Seed Processing（マイコトキシンの発生防止に関する貯蔵技術）の技術者 1 名が必要である。

4 Post - Harvest Research Unit

変質しやすい収穫物について変質の過程を成分研究から明らかにし、その防止法を見出す研究を行うことを目的とする。ただし研究対象農産物については十分経済性を加味した検討を要する。

1) 必要機材

すでに無償供与に温度制御室が組入れられているので、その他にガスクロマトグラフは必須の機材と思われる。

2) 専門家の派遣

機材の使用法のわかる人を派遣するよう要望があったが、調査団としては収穫物保存法について広い知見、見通しを有する専門家派遣の方が望ましいと提案した。

5 Soil and Fertilizer Testing and Applied Research Unit

カセサート大学の土壌肥料学科は同大学で初めてPh.Dコースが認められた学科(2年前)であり、この分野のレベルは相当高いといえよう。同学科の人員は現在スタッフ25名のうち16名はPh.Dを保持し、4名がPh.D取得のため留学中、5名がMs.で留学待機中である。この様な状況のもとで日本に対してカセサート大学はバンケンキャンパスに基礎研究と応用研究の両面をカバーするセンター施設の無償供与を要請した。しかし、本Unitを独立センターとしてバンケンキャンパスに設置するタイ国の要請は日本側の方針に反するため、総合研究センターの一部に組みこむこととしたので(前調査団の指示)大学側はバンケンキャンパスの既存の施設を利用して基礎研究を行い、カンバンセンにおいては主として応用研究を行う計画である。したがって総合研究センターの本Unitでは主に教育、分析サービス、応用研究を行い、基礎研究は付随的に行う予定で、特に水管理の面を強化したい希望を持っている。なお、バンケンキャンパスにおいては現在約20の研究テーマが進行中であり、土壌化学及び肥料、土壌物性、土壌管理保全、土壌調査分類の4グループに分けそれぞれにコーディネータを配置し研究を行っている。

本ユニット完成後はテクニシャンに分析サービスを行わせるが、化学分析5名、肥沃度調査4名、土壌物性調査2~3名の新規増員が必要であるので、タイ国政府に要求中である。また窒素固定菌を含む土壌微生物関係の分野はCulture Collection、Biochemistry Unitと共同研究を進める予定である。

1) 必要機材

土壌分析関係機材を中心に常用するものに高いプライオリティーを置き、特殊機材はプライオリティーを低くすることとしたい。

バンケンキャンパスの現有機材の説明を受けたが、かなり細かいものまでそろっているようであるが、高額機械で故障中のものもあるようである。

2) 専門家の派遣

現時点で、分野を特定することはできないが、機器分析に精通した専門家の派遣を希望している。

6 Environmental Science Unit

タイ国での環境問題は多々あるが、ここではWater PollutionとAgricultural Commodityによる汚染の研究に中心をおきたい。汚染実体の把握が今までのところ組織的に行われていない。つまり、関連機関が散発的に蓄積しつつあるデータの集中処理がなされていない。タイのPollution問題については官房長を議長とするNational Committee

of Environment を組織しているが、特殊事態発生時のみに会議が持たれ、関係機関が処理にあたるような現状である。

このため本ユニットでは資料収集のみならず試料の分析機能を持たせ、さらに生物的水処理技術に関する教育と研究を行うことが必要である。（特に活性汚泥法による処理）。

現在林学科のスタッフがコーディネーターとなり大学院Ms.レベルの環境科学のコース（学生数67名）がおかれている。

今後、教育と研究の両面を強化する予定であり、この点他のユニットと若干違っている。特に水質のモニタリングはどこも継続的に行っていないので是非とも行いたい。

1) 必要機材

とくに小型曝気槽を用いての処理実験及びガスクロマトグラフの設置を調査団より提案した。

2) 専門家の派遣

- ① 水処理関係の専門家
 - ② 機材の指導のできる者
- が必要であろう。

3) 研修員の受け入れ

大学側はカーペット配管、配線関係のテクニシャン受け入れ希望があるが、タイ国内で対峙する事で十分であろう。

また本ユニットにかかわらず実験用ガラス機具製造のテクニシャンの受け入れが必要である。

7 Central Biochemistry Unit

1) 必要機材

特に電子顕微鏡、ガスクロマトグラフィー、UVスペクトロフォトメーター、アミノ酸分析器などが優先的に要望されたが、分析器機の集中管理をこのユニットで行いセンター全体として有効な機器類の使用を考えることとした。

電子顕微鏡は無償資金協力により供与されるが、その付属品の内容（試料調整用付属品のない場合）によっては技術協力で補う必要があり、その場合には高いプライオリティーを与える。又走査型電子顕微鏡も要請されたが、そのプライオリティーは高くする必要はない。

2) 専門家の派遣

電子顕微鏡、分析機器関係の専門家をそれぞれ4ヶ月派遣を希望している。

3) 研修員の受け入れ

テクニシャンレベルによる機材の修理、操作法の修得のための受け入れを希望している。

8 Central Administrative Office

各種事務用品の要請がなされているが、比較的高額なものはデータ処理のための卓上型電子計算機である。

9 Maintenance Unit

小修理、補修 (minor repair) を行なう人の訓練を希望している。

電子工学 (electronics) ガラス器細工技術 (glass blowing) の研修に工業高校出身者を当てたいとの要請があった。

また、建物全体についての配管 (plumbing) じゅうた敷き (carpeting) 技術者研修の要請もあったが、現地調達が可能と思われる。

本 Unit の Machine Room に真空ライン、純水ライン、電気配線、ガス配管等の集中管理を行ないたい旨の要請があった。しかし真空ライン、純水ライン等を各実験室に配置することは基本設計の中に組み入れられていないので困難と思われる。

10 Head House

機材については、Soil Sample Handling と Plant Sample Handling を優先とし Fertilizer Preparation and Processing は次位に考えたい。

Center 長の下に、スタッフからこの Head を選び集中管理を行なわせることとしたい。

11 その他

Central Laboratory の Chamber のうち、Sugar cane 用の高さ (4 ~ 5 m) のものの要請があった。

Ⅲ 農業普及研修センター (National Agricultural Extension and Training Service Center) の無償資金協力及び技術協力について

1. タイ国の農業普及とカセサート大学の位置づけ

(1) タイ国における Extension の概念

タイ国における Extension の概念は、日本の農業普及事業とは異なり、農業改良普及員はもとより、農業関係公務員、軍人（退役後農業関係の仕事に従事しようとする者）、農民のリーダー等はすべて Extension の範中として位置づけられている。

※注； 軍人は2年間の兵役中、6ヶ月間職業訓練を受けることが義務づけられており農業も訓練コースに入っている。

(2) 農業改良普及組織

① 農業協同組合省農業普及局が農業改良普及員を管轄しており、全国6つの地域に局の出先機関があり72県に農業普及部、648郡に現地レベルの郡普及所をおいている。

② 普及職員は、Extension Worker 約5500人、それを監督し、技術等についてノウ、ハウを教える Agri. Technician 約1500人、その他事務職員約2500人となっている。

③ Agri. Technician は県農業普及部に相当数配置されている。

④ Agri. Technician は4年制大学卒業後1年以上の活動経験のある者が任用され、Extension Worker は農業高校卒業程度である。

⑤ Agri. Technician の研修は、大学のマスターコースを修める方法が主であり、費用は政府もちと個人もちとがある。（政府もちは全体の5%程度）

⑥ 普及員の研修は、地方ごとに全員に毎年1カ月以内、1クラス40人程度で実施している。

その実施場所は、県が適当な施設で県内普及員を集めて実施するものと、省直営の3カ所の農業センター（アメリカ、オーストラリア等の援助で建設したもの、コンケン、チェンマイ、チャイナットの3カ所）を利用して実施するものがある。

⑦ Agri. Technician は学歴中心で任用されているきらいがあり、若い経験の浅いものが、普及員を研修したり、指導したりすることとなる。その内容も専門知識の伝達（農民への伝達方法を含めて）という感じが強い。

これらの状況からして、タイ国における普及員の資質水準は十分であるとは言い難く、資質向上を図るための研修も、適当な研修施設、人材等が不足するため効率的であるとは考えられない。また、普及員は地方の遠隔地にいるので今日的な新しい農業技術を適

切にとらえることができない。

(3) タイ国の普及におけるカセサート大学の位置づけ

① カセサート大学は、もともと農業協同組合省から分離発展したものであり、現在でも普及及び研修計画の樹立、実施についても農業普及局とたえず密接に連絡をとっている。

② カセサート大学は、普及・研修サービス業務については、教育、研究活動と同様に大学の重要な使命として位置づけ、「普及・研修事務局」を学部レベルで設置し、38人のスタッフを配置し、農業協同組合省農業普及局と密接に連絡して、近隣地域における農家の定期的な巡回指導、新聞発行、ラジオ・テレビ番組の作成、各種刊行物の発行、配布、展示場の設置、短期研修等を年間を通じて行っている。

この普及研修事務局が行っている夏期の職業コースの数は1953年には5コースであったものが1977年には40コースに増加し、受講者の数も404人から1219人に及んでいる。1975年から1977年の半ばまでに、カセサート大学が行っている主要課題に関する研修に参加した政府関係職員の数は60人から一挙に2747人に増加している。また、この普及研修事務局は、上記の研修以外に大学の職員に対する研修、教材の開発等の短期研修も行っている。

このようにカセサート大学は、普及・研修について、アメリカの土地付大学に近い形をとっており、極めて重要な役割りを果たす立場にあるといえる。

しかし、当大学普及事務局の活動は、まだ不十分であり、普及現場と大学の技術とのギャップは大きいものがある。

今回要請している普及研修センターは、これらの問題を早急に解決し、ひいては国の農業発展計画の成功に資するため、早急に建設が進められることを強く要望している。

2. 普及・研修センターの要請の概要

カセサート大学が今回要請している普及・研修センターは、これまで普及研修事務局が行ってきた①近隣地域への普及業務、②普及員等政府関係職員、農民等を中心とする各種の研修、③TV、ラジオ番組の作成、各種刊行物の発行、配布等の視聴覚教材生産業務を拡大、充実しようとするものである。

特に、視聴覚関係については、近代的な視聴覚システムを設備し、普及及び研修業務が効率的に行えるよう意図している。

(1) 普及・研修センターの目的

普及・研修センターの目的は次の4項である。

- ① 最終利用者である農家に対し、農業及び生物科学に関する技術情報を伝達普及するため効果的なサービスを実施することと、この国の農業発展計画を成功裡に遂行するための農家と大学間のフィードバックシステムを作ることに協力すること。
- ② 効果的な普及・研修サービスに必要不可欠とされる視聴覚教材等の供給の源となること。
- ③ 農業生産、市場、農業協同組合、一般的な農業工業技術等各種の分野に関する短期研修を農家、政府関係の職員、個人企業に対して行うこと。
- ④ 普及・研修事業における研究、技術評価と手続きを指導することと、その結果に基づいて、技術及び手続きの改善を政府機関に対して勧告すること。

(2) 設置場所と機構

普及・研修センターは、カセサート大学のカンバンセンキャンパスにおく予定である。

普及・研修センターは、行政的、機能的にも現在の普及研修事務局の管轄下におかれ、総務部、技術研究部、普及研修部、情報手段部、放送部の5部で構成される。

(3) 業務計画

1977年から1980年にかけての普及・研修と視聴覚教材生産の業務計画は次のとおりである。

a 普及・研修

業 務	見 積 り 参 加 者 数			
	1977	1978	1979	1980
1 継続的教育業務	人	人	人	人
① 夏期講座(4月1日～30日)	1,219	1,365	1,520	1,596
② 学期間講座(11月1日～30日)	—	500	800	900
2 普及と短期研修業務				
① 原菌生産とキノコ栽培	2,000	1,800	1,500	1,200
② ブタ生産ととうもろこし、ソルガム耕作、さとうきび栽培	3,500	3,920	4,390	4,917
3 大学職員特別研修				
① 授業用資材の開発	20	50	50	50
② 新任者研修	80	50	50	50
③ 課題管理	25	25	25	25
④ 庶務の基本と実際	—	20	20	20
⑤ その他	—	50	50	50
計	6,844	7,780	8,405	8,808

注) 当該研修計画における研修の主体は農民、普及員農業関係公務員であり、3の大学職員特別研修は普及研修センターを利用しての付随的なものである。

b 視聴覚教材生産

種 類	予 定 セ ャ ッ ト 数			
	1977	1978	1979	1980
1 ビデオテープ	—	—	12	24
2 フィルム (16 mm 10 ~ 15 分間)				
① カセサート大学の紹介	—	—	1	—
② 農業の知識	2	5	10	12
3 文書製作				
① 教育関連資料	30	30	100	150
② 本の製作	—	—	3,100	5,000
4 スライド (30 ピース)	5	10	20	25

(4) 建物の概要

新しく始める上記業務内容を遂行するためには、開発中のカンバンセンキャンパスの開発プロジェクトで予想している建物の中で行うことは不可能である。従って次の規模を有する建物の建設が必要である。

a 敷 地

カンバンセンキャンパスの隣接地 70rai (200 m × 588 m の長方形) である。

キャンパス外に設置する理由としては、研修対象が主として政府関係職員、農家等学外の人を対象とするため、学生の施設とは区分し、将来予定される病院、保健所等の公共施設建設地域におくことが好ましいと思われる。大学との連絡はキャンパス内道路の利用により特に不都合な問題はない。

b 建物の配置

普及研修センターの全体面積は、便宜上、管理のための地帯、食堂とリクレーシヨンのための地帯、住居地帯の 3 地帯に区分されている。

管理のための地帯には、管理棟、視聴覚機材棟、印刷工場、教室、講堂の 5 棟の建物が連結する構造となっている。

食堂とリクレーシヨンの地帯はテニスコート、フットボール場と食堂からなっている。

住宅地帯は、個別住宅 (4 ユニット)、寄宿舎 (3 ユニット)、ホテル (2 ユニット) からなっている。

(5) 建築費及び付帯設備費の見積額

a 総 額

建 築 費	48,112,770	パーツ
内部設備費	19,354,000	パーツ
計	67,466,770	パーツ

b 建物費の内訳

建物の名称	面 積	単 価	金 額
① 管 理 棟	566.5 m^2	4,500 パーツ	2,549,250 パーツ
② 視聴覚棟	1,411.4 m^2	4,500	6,351,300
③ 印 刷 棟	374.0 m^2	4,500	1,683,000
④ 教 室	2,069.0 m^2	4,500	9,310,500
⑤ 食 堂	300.0 m^2	4,500	1,350,000
⑥ ホテル、寄宿舍	3,146.0 m^2	4,500	14,157,000
⑦ 職員宿舎	300.0 m^2	4,500	1,350,000
⑧ 空気循環装置	816.69 m^2	4,500	3,675,105
⑨ 備 品			4,042,615
⑩ 冷 房	140トン	25,000	3,500,000
⑪ 電 話	48ユニット	3,000	144,000
計			48,122,770

なお、研修に関する建物の収容可能人数については次のとおりである。

- ① 教 室…………… 360人収容可能
(6教室 1教室当たり60人)
- ② 寄宿舍、ホテル……約300人収容可能
- | | | |
|----------|-------|-----|
| 寄宿舍…………… | 10人用 | 10室 |
| | 2～4人用 | 30室 |
| ホテル…………… | シングル | 10室 |
| | ダブル | 20室 |

注) ホテルとは、上級の研修員、農民研修の引率者、外国からの招待者、研修の講師等が宿泊する場所であり、いわばゲストハウスの用をなす施設である。

なお、普及研修センターの建設予定地であるカンバンセンキャンパスの周辺には、ホテル等は全くない。

c 内部設備の内訳

① 管理用	(7 品目)	782,290 パーツ
② テレビ番組ユニット	(20 品目)	4,890,000 パーツ
③ 映画製作ユニット	(16 品目)	4,000,000 パーツ
④ 写真ユニット	(26 品目)	397,900 パーツ
⑤ 移動研修ユニット	(14 品目)	517,200 パーツ
⑥ 視聴覚サービスユニット	(10 品目)	283,850 パーツ
⑦ 放送製作ユニット	(16 品目)	427,790 パーツ
⑧ 図表製作ユニット	(6 品目)	110,000 パーツ
⑨ 印刷	(16 品目)	7,000,000 パーツ
⑩ 教室	(12 品目)	305,410 パーツ
⑪ 講堂	(6 品目)	150,850 パーツ
⑫ 食堂とホテルの炊事場	(12 品目)	382,500 パーツ
⑬ 電気室	(9 品目)	106,000 パーツ

(6) 利用計画(年間)

普及研修センターの利用計画は、①研修活動、②情報生産活動、③集落巡回指導活動
④農業問題相談、⑤普及研究の5項目について、年間を通して行うこととしている。

(7) 研修対象者数(年間、各省から要請のあった人数等計画員数である。)

① 公務員…………… 3,224 人

(内訳)

農業普及局……………	1,100 人
地域開発局……………	990 人
社会厚生局……………	50 人
バンコック首都圏の農業関係公務員……………	64 人
軍人……………	720 人
カセサート大学職員……………	100 人
外人職員研修……………	100 人
農村開発促進事務所……………	100 人

② 農民…………… 4,125 人

(内訳)

カンパンセンキャンパス周辺の農民グループ……………	550 人
地域開発局が派遣する農民リーダー……………	235 人
バンコック首都圏が派遣する農民リーダー……………	500 人

地域開発委員会が派遣する農民リーダー……………	1,520 人
農業普及局が派遣する農民リーダー……………	1,200 人
Welfare 地方の地域リーダー……………	120 人

(8) 人員配置計画

現在のところ以下の人員を考えているが、業務が拡充すれば増員することを考えている。

① 管理事務所……………	25 人
② 情報手段に関するスタッフ……………	44 人
{ 印刷(10人)、放送(8人)、T.V.(8人) } { 研修(8人)、普及(10人) }	
計	69 人

(9) 専門家の派遣と研修員の受入れ

a 専門家の派遣

① 組織と管理	6 m / m (Jan. 81)
② T.V. 技術	6 m / m (July 81)
③ 普及事業	
④ 研修事業	} 3 m / m (Jan. 82 - June 82)
⑤ T.V. 番組製作	
⑥ フィルム製作	
⑦ 印刷事業	

b 研修員の受入れ

① 見学		
i 普及と研修活動	} 3 m / m June 81	
ii 視聴覚		
② 研修		
i 普及事業	10 m / m	
ii 研修事業	8 m / m	
iii T.V. 技術	} 18 m / m	
iv T.V. 番組製作		
v フィルム製作		
vi 印刷事業		12 m / m
		} June 81

注) 時期は、おおよその見込みである。

3. 調査の結果報告

カセサート大学から要請のあった普及・研修センターについては、利用計画、建物及び内部設備、人員の配置計画等からみて、タイ国農業発展に極めて重要な役割をなす施設であり、かつ、カセサート大学の当該センターに対する意欲は極めて高いものがある。

また、計画内容からして、我が国の技術協力は可能でありかつ有意義なものであると考えられる。

調査団は、以下の理由、意見を付して、当該センターが無償資金によって早急に建設され、かつ我が国の技術協力が実現することを期待する。

(1) 普及・研修センターの利用計画について

- a 普及員、農民等の研修計画については、すでに現在、当大学普及事務局で実施していることを基本として我が国の技術協力により、視聴覚機材を十分駆使しながら国内の他の研修施設では行うことができない全国レベルの高度かつ効率的な研修を行おうとするものであり、意義は極めて大きいものと考えられる。

なお、当センターで行う農業改良普及員の研修内容については、新しい農業技術の教授が主体となるよりも、農民に対する教育の方法を中心とする普及方法等普及員の基本的資質の向上に不可欠な研修内容を重点的に行うべきであると考えられる。この場合研修の対象は、Extension Worker よりも、彼等を指導する立場にある、Agri. Technician を主体に考える方がタイ国全体の普及事業の資質向上のために効率的と考える。

今後、我が国の専門家の派遣のもとに具体的な研修計画が樹立される場合、上記の事項に留意されるべきであろう。

- b カンバンセンキャンパス周辺の農村には未だ電気がないところが多い。

当センターは、発電装置と視聴覚機材を設えた移動研修車を利用し、当該地域の農家、グループに対し、普及活動を行おうとしている。

この普及活動は、当該地域の農業技術等の改良ひいては農業生産の向上に資することはもちろん、当該センターの行う視聴覚教材生産のテストケースとしても有益であると考察できる。

- c 視聴覚教材生産関係については、カセサート大学が、普及、研修の手段として最も重要視しているところであり、その有効性については調査団も認めるところである。

理 由 ① 農家の約1/2がラジオを所有しており、かつ聴取率が高いことから、当該センターが製作する番組を放送局を通して、全国に放送することは、農業生産の向上に極めて有効である。

- ② 当センターが刊行する資料を適時適切に普及員等に配布することにより、普及員等農業関係指導職員の資質の向上に資する。
- ③ フィルム、スライド等を普及現場に提供し、普及活動の効率化に資する。
- ④ 当センターで行う各種の研修に視聴覚教材機材を使うことにより効率的な研修を行うことができる。

(2) 建物施設について

a 建物の配置計画

当センターの利用計画からみて、当センターを管理地帯、食堂及びリクレーションの地帯及び住居地帯に区分し、建物の配置をすることは、適当であると考えられる。

b 建物施設の規模

建物施設の規模は、年間全体の計画でなく、月別の研修コース別の計画があって初めて建物施設の研修人員受入れのキャパシティが決まると思われる。(当該資料については、基本設計チームが派遣される以前(8月中)に作成し、送付するよう約束してきた。)

全体(年間)利用計画からみると、建物計画は、規模について一部に検討を行う必要がある。

なお、建物計画についてはより詳細な図面の提出があった。

[検討を要する事項]

- ① 1時点での最大研修人員と建物施設(特に、教室、講堂、寄宿舍、ホテルの規模との整合性。)
- ② 教室については、1教室60人用6教室となっているが、
 - i 60人という規模は1コースの研修人員としては、多人数すぎて必ずしも効率的ではないこと。
 - ii 研修のコース数と教室数の関連から教室数と1教室当たりの規模の検討。
- ③ デスカッションルームについては、かなり広いもの4室となっているが、その機能を考えると小規模のものを多く設置する方が有効と考える。さらにこのルームは、研修講義時間外にも利用可能にする配慮が必要であろう。
- ④ 寄宿舍内に寮生活を指導管督する者の部屋を設ける必要がある。
- ⑤ ホテル(ゲストハウス)の利用計画と室数等の規模との整合性。
- ⑥ TVスタジオは2スタジオを計画しているが、一般のテレビ局と異なるので、1スタジオで機能を果しうると思われる。

(3) 建物コストについて

大学の示した建物コストは、1㎡当たり4,500パーツ(約4万5千円)であり、安価

すぎるのではないかと思考される。

(4) 視聴覚機材

視聴覚機材については、各ユニットとも必要最少限の機種は掲上されていると考えるが、1機種当たりの数量については、必ずしもその数量を必要としないもの（例えば、各教室に各1台のテープレコーダーを設えることにしているがその必要はないと思われる。また、テレビカメラもスタジオとの関連で3台は必要ないと思われる。）があり、他の機種を設置した方が効率的になるものもあるのではないかと推察される。（視聴覚専門家による検討の要あり。）

(5) 専門家派遣と研修員の受入れ

a 専門家の派遣

我が国の普及事業から考えると

- 組織と管理
- 普及事業
- 研修事業

については、専門技術員（普及方法担当）などによって対応できると考える。

- しかし、
- TV. 技術
 - TV. 番組製作
 - フィルム製作
 - 印刷事業

については、それぞれ専門の他の機関、若しくは、購入企業による技術サービス等での対応について検討する必要がある。

なお、専門家の派遣時期については、建物施設の完成前から、建物の完成後当該センターが円滑に始動するまでの期間が必要である。

b 研修員の受入れ

aの考えと同様に、我が国の普及事業から対応できると考えられるのは、次のものである。

見 学……………普及と研修活動

研 修……………普及事業

研修事業

視聴覚関係のいわゆるハードな技術関係の受け入れについては、（財）AVCC等の公共的機関の受入れが困難とするならば、関連企業の研修施設等に頼らざるを得ないであろうと考察される。

(資料)

4. カセサート大学、普及研修センター設立に関する各機関からの要請及び設立同意の文章

Department of Agricultural Extension

Reference No.AC1101/30838

December 14, 1977

Subject: Establishment of Extension and Training Center

Respectfully submitted to: Director of Kasetsart University Extension and
Training Office

In Reference to: Communication, Reference No.UBO412/1589 dated December 13, 1977.

With reference to the communication indicated above, Kasetsart University indicated a plan for establishment of Extension and Training Center at Kamphaengsaen Campus of the University for purpose of rendering Training services in agriculture and agricultural extension to personnel of various government and private agencies.

The Department of Agricultural Extension is glad to learn of such development and would like to inform you that the Department is presently in the process of improving agricultural extension system of the country and has set a goal to provide agricultural extension workers at the Tambon (a group of villages) level in the ratio of one agricultural extension worker to 1,000 farm families. It is apparent, therefore, that the Department will be in need of a large number of additional agricultural workers. In view of this, the Department considers the proposed establishment of Extension and Training Center of Kasetsart University to be highly desirable for its work and in consonance with its need. Such center will benefit the Department greatly in terms of both pre-service and in-service trainings of not only the Tambon agricultural extension workers but also Amphur (district) agricultural extension workers and provincial agricultural extension workers, as such trainings, though highly necessary, cannot be handled effectively and adequately by the Department due to limited personnel and facilities. The proposed Extension and Training center should also facilitate the works all other government agencies involved in rural development greatly.

Please be informed accordingly.

Very respectfully yours,

(Signed) Yookti Sarigaphooti
Director-general

(Translated by Dr. Sam-arng Srinilta, Coordinator for Kasetsart-Japan Project)

Department of Community Development

Reference No. MI C402/4443

July 18, 1977

Subject: Establishment of Extension and Training Center

Respectfully submitted to: Rector of Kasetsart University

In Reference to: Communication, Reference No. UB 0412/869 dated July 13, 1977

Accompanying document: Details of assistance needed

With reference to the communication indicated above, Kasetsart University indicated a plan to establish Extension and Training Center at Kamphaengsaen Campus of the University and asked the Department of Community Development to express its view about and indicate its anticipated utilization of the services of the proposed center.

The Department of Community Development is glad to report that the proposed center will be very useful for training in agriculture. The Department will be in need of assistance from Kasetsart University every year in various aspects, such as, space and facilities, formulation of curriculum and resource personnel in its seminar-workshops for community development workers and local leaders. Attached herewith are details of the assistance needed.

Please be informed accordingly.

Very respectfully yours,

(Signed) Yuen Samanon
Director-General

Operation Division
Telephone 2220862, 2219849

(Translated by Dr. Sam-arug Srinilta, Coordinator for Kasetsart-Japan Project)

Details of Assistance needed by Department
of Community Development

1. Seminar-workshop for personnel of the Project: Pasture and Water Resources Improvement for Agriculture, once a year, 60 participants, 15 days.
2. Training for members of cattle raising group in the area coverage of the Pasture and Water Resources Improvement Project; once a year, approximately 135 participants, 15 days.
3. Seminar for personnel of the Sarapi-Center programs; once a year, 60 participants, 15 days.
4. Seminar for personnel responsible for savings-for-production groups; once a year, approximately 60 participants, 7 days.
5. Seminar for implementation committee of savings-for-production groups; once a year, about 60 participants, 7 days.
6. Seminar for provincial community-development officers and community development supervisors; once a year, about 200 participants, 3 days.
7. Training for leaders of occupational groups and local leaders in the Sarapi-Center programs; once a year, 100 participants, 10 days.
8. In-service seminar for Amphur (district) community development officers; 3 batches a year, 100 participants and 10 days each.
9. In-service training for community development workers in Region 7; two batches per year, 100 participants and 5 days each.
10. Seminar for local leaders; 3 batches per year, about 40 participants and 3-5 days each.
11. Seminar for technical officers; once a year, about 50 participants 15 days.
12. Seminar for foreign staff; 2 batches per year, 50 participants and 15 days each.

(Translated by Dr. Sam-arng Srinilta, Coordinator for Kasetsart-Japan Project)

Accelerated Rural Development Office
Ministry of Interior

Reference No. MI1611/7651

July 15, 1977

Subject: Establishment of Extension and Training Center

Respectfully submitted to: Director of Kasetsart University Extension
and Training Office

In Reference to: Communication, Reference No. U_b 0412/870 dated July 13, 1977

With reference to the communication indicated above, the Extension and Training Office of Kasetsart University would like to know the number of farmers that receive training sponsored by Accelerated Rural Development Office each year to facilitate formulation of plan for establishment of Extension and Training Center at Kamphaengsaen campus of the University.

The Accelerated Rural Development Office hereby reports the pertinent information as follows:→

1. Training for farmer leaders in duck and chicken raising, 300 participants.
2. Training for farmer leaders in cattle and buffalo raising, 200 participants.
3. Training for farmer leaders in legume cultivation, 200 participants.
4. Training for farmer leaders in corn and sorghum cultivation, 200 participants.
5. Training for farmer leaders in vegetable production, 50 participants.
6. Training for farmer leaders in horticultural crops production, 50 participants.
7. Training for farmer leaders in fresh-water fish culture, 120 participants.
8. Training for farmer leaders in mushroom culture, 400 participants.

Please be informed accordingly.

Very respectfully yours

(Signed) SOMSRI KANTAMALA
Assistant Secretary-General
for Secretary-General

Vocation and Income Development Division
Telephone 2826898

(Translated by Dr. Sam-arng Srinilta, Coordinator for Kasetsart-Japan Project)

Administration and Record Division
Bangkok Metropolitan Secretariat

Reference No. BMO307/3868

July 15, 1977

Subject: Establishment of Extension and Training Center

Respectfully submitted to: Director of Kasetsart University Extension and
Training Office

In Reference to: Communication, Reference No. UB0412/872 dated July 14, 1977.

With reference to the communication indicated above, Kasetsart University indicated the plan for establishment of Extension and Training Center at Kamphaengsaen campus with the necessary financial support being requested to the government of Japan, and wished to know the usefulness of the proposed center for the work of the Administration and Record Division and the anticipated number of staff and farmers to be served by the proposed center each year.

The Administration and Record Division hereby reports the following information:-

1. At present, the Administration and Record Division is charged with a responsibility for accelerating agricultural development in the Bangkok Metropolitan, with policy and goals for developing production capability of the farmers concerned being given top priority. The Administration and Record Division is, thus, of the opinion that the proposed Extension and Training Center will be very useful to its occupational promotion and agricultural development works both administratively and operationally.

2. The Administration and Record Division will send 64 members of its administration and agriculture personnel and 500 farmer leaders for training annually.

Please be informed accordingly, and thank you for the information.

Very respectfully yours,

(Signed) Preecha Jeerapan
Director, Administration and Record
Division for Secretary-General of Bangkok
Metropolitan

Administration and Record Division
Telephone 2221948

(Translated by Dr. Sam-arng Srinilta, Coordinator for Kasetsart-Japan Project)

Ⅳ 農機具センター (Agricultural Machinery and Equipment Center) に関する無償資金協力及び技術協力の可能性について

1 タイ国の農業機械について

タイ国における農業機械化の歴史は浅く、それに関する統計資料や研究の蓄積も不十分である。しかしながら、最近10年間をみると、水牛に代って機械による耕起作業が急速に進みつつあり、これに対応して、国内メーカーにより製作された歩行型トラクターや作業機の台数が増加している。

タイの農業人口は、全人口の80%を占めており、農業は国の基幹産業であり、農産物は、輸出においても最重点のものであるが、その増産のため種々の国策が講ぜられている。その柱となるものは、2期作あるいは2毛作であるが、とくに米については、2期作を増やすべく、灌漑計画が進められ、新品種が奨励されて、このことが歩行型トラクターの増加の大きな理由となっている。

タイ国のトラクターの利用形態は、2つに分類できる。1つは、70～80 PSのものを賃耕業者が請負作業に使うもので、作業のうち、80%は耕起作業であり、水牛や農夫を雇うより経済的であるという理由から、現在では、畑状態の耕地の60%の耕起作業が賃耕により行われている。もう1つは、6～20 PSのものを農家が所有し、自らのほ場の耕起に使うもので、4～5 ha 層の水稲農家に多い。米の2期作のため、収穫後急いで耕起する必要から、9 PS程度の歩行型トラクターを購入する農家が増えている。

主要な機械の普及台数は、表1に示すように、ポンプ以外では、歩行型トラクター、防除機、とうみが他の機械に比べて多く、おゝむね5～10万台となっている。なお、田植機、稲用収穫機については、タイ国に適したものは未だ開発されていない。

表1 Number of farm machines in Thailand, 1976

Item	Units
Large tractors	13,338
Two-wheel tractors	90,001
Four-wheel tractors	16,792
Puddlers (with engine)	9,882
Sprayers	46,317
Irrigation pumps	308,179
Winnowers (rice)	42,342
Corn shellers	5,721
Rice threshers	3,955
Windmills	1,937
Rice mills	24,658

Source: Ben E. James Jr., Report G.I.T., Atlanta, Georgia, 1977.

稲作における水牛とトラクターの地域別の利用割合は、表2のとおりであり、全体では、おむね30%がトラクターを利用している。

表2 Rice farming : mechanization vs . cattle
(Percent of farmers by region)

Area	Cattle	Small tractors %	Large tractors	Others
Central Region	41.0	31.0	25.0	3.0
East Region	25.0	44.0	10.0	21.0
West Region	62.0	13.0	23.0	2.0
North Region	80.0	11.5	6.5	2.0
Northeast Region	91.0	0	2.0	7.0
Southern East Coast	68.6	1.6	29.4	0.4
Southern West Coast	70.5	0	11.8	17.7
Average	62.3	14.9	15.3	7.5

Source: Ben E. James Jr., Report G.I.T., Atlanta, Georgia, 1977

政府では、Small Tractor の毎年の伸びについて、2 輪の歩行型トラクターが 2～3 万台、4 輪の乗用型トラクターが 3～5 千台と推測している。これらの Small Tractor の大部分は、国産となる見込みで、また、Large Tractor を含めて、disc plow、disc harrow、corn sheller、rotary tiller trailer 等付属作業機は、現在、ほとんど国産であり、今後とも、同様であると見込まれている。

国内農機具メーカーの工場の規模は、一部 100 人位を雇用しているものもあるが、大部分は 10 人程度であり、旋盤、溶接器、切断機、ボール盤等の設備を備えているが、工員の技術は、年期奉行の中で経験的に獲得されている。エンジン以外の機械部品は、国産によっているが、その材質等の基準がないため、強度、精度等に問題がある機械が組み立てられる場合も少ない。

農機具の利用農家の増大に対処して、農民を対象とする農機具の利用研修が、Patomtani 及び Takfar にある農業試験場で始められており、毎年 300 名程度の研修終了者を出している。研修の内容は、トラクターの利用、保守管理及び修理である。しかしながら、普及員等の指導者層に対する教育はなれておらず、農村の機械化の進展に対応する系統的な指導体制が欠けている。

新しい農業技術を開発し、その内容を学生や農民に対して教育することについて、カセサート大学は、これまで基幹的な役割を果たしてきており、農業省における農業技術の改良普及は、人材面においても、カセサート大学の基礎の上に成立している。大学の試験ほ場は、国の主要な農業地域区分に 5 つ配置しており、また、農業省の技術研究の場は、カセサート大学のバンケンキャンパス内にある。現在、タイ国の農業機械化の研究や研究成果の普及の重要性が高まっているが、これを解決させる実施体制は、タイ国では、カセサート大学の歴史的役割及び今日的役割からみて、この大学を中心として進めるべきであるというのが、タイ国政府関係者の意見であり、そのために、農機具センター設立の必要性が強く主張されている。

2 カセサート大学における農業機械に関する教育及び研究

農機具の学科は、農学部と工学部の 2 つにそれぞれ独立しておかれている。農学部の Department of Farm Mechanics においては、将来、農民又は普及員等になる者を対象として、

- ① 畜舎、倉庫等の設計
- ② トラクター、耕うん作業機その他簡易な機械の使い方と修理方法
- ③ 機械一般の知識について教えている。

工学部の Department of Agricultural Engineering においては、

- ① Farm Machinery
- ② Processing
- ③ Soil and Water Conservation

の3つの講座があり、このうち Farm Machinery を専攻している学生は、機械の製作に必要な知識が教えられ、工場等へ就職している。

授業は、1つの課目について、毎週、講義2時間、実習3時間の割合で、15週間行われる。教材としては、外国の文献及び自ら執筆したものをを用い、原則として、外来の講師の依頼はない。実習としては、Department of Farm Mechanics では、ほ場において機械の操作、保守管理が行われ、Department of Agricultural Engineering では、Workshop において機械の分解組立てが行われている。なお、教員の数は、Department of Farm Mechanics では10人、Department of Agricultural Engineering では14人(うち、Farm Machinery 5人)である。

農機具の研究については、Department of Farm Mechanics では行われておらず、Department of Agricultural Machinery では行われているが、世界に通用するような研究内容とはいえない。研究の目的は、設計基準を作るためのもので、トラクターの油圧機構等及びディスクブラウのディスクの強度が現在のテーマとなっている。

農機具の開発研究は、農業協同組合省の Agricultural Engineering Division でタイ国の条件に適合する機械の試作等を行っているが、これもカセサート大学バンケンキャンパス内にあり、連絡をとりながら行っている。

3 農機具センターの位置づけ

農機具センターは、カセサート大学カンパンセンキャンパスのほぼ中心部、試験ほ場地区と研究又は居住地区の境目に設立する予定となっているが、その設立目的は、次のとおりである。

- ① タイ国にとって必要性の高い農機具の製作、操作、性能及び管理に関する研究を行うこと。
- ② 輸入又は国産農機具の検査鑑定を行い、必要に応じて助言、推薦すること。
- ③ 学生、普及員、政府関係者及び農民に対して機械化研修を行うこと。
- ④ ほ場試験に必要な大型農機具及び熟練オペレーターの準備とその保守管理を行うこと。

農機具の研究で当面している問題は、国産機械に強度、性能等に問題があるものが多いため、日本でいえば JIS 規格に当る基準を作ることである。主要な歯車等はすべて鋳物

で作られているため、強度を増すように厚くすると性能面でよくない等の例が多く、今後国産機械の普及の増大に対処して、とくに、歩行型トラクターやディスクプラウが当面の対象となると考えられるが、その他の農機具についても、農機具センター設立と同時に、調査し、対象として決定したいとしている。

農機具情報については、最新の農機具の種類、技術的データ等を編集し、発行しているところはなく、また、普及員等指導者層に対して系統的な研修を行っているところもない。農機具センターでは、技術情報の収集を行うとともに、農機具の性能、取扱い、管理等についての研修の実施を、別途計画している普及研修センターとの密接な連携を保ちつつ、この施設を利用して行うことを計画している。

農機具センターは、組織的には、Research and Development Institute に属することになる。Institute の Director は、学部長格で、別に計画している Centre Laboratory and Greenhouse Complex もこの Institute に属する予定となっている。農機具センターは、4つの部門に分れて業務を行うことにしているが、現在の計画では、そこに配置する人員は次のとおりである。

農機具センター管理事務	5人
研究及び検査	8人
修理及び組立て	8人
展示及び研修	17人

配置される人員のうち、研究及び検査については、それを実際に担当する3人は Department of Agricultural Engineering に属する者で、5人はその補助を行うため Institute に属する職員である。また、修理及び組立てについても同様に、2人は Department of Agricultural Engineering に属し、他の6人は Institute に属する。研修についても、講義は3人が担当するが、この者は、Department of Farm Mechanics あるいは Department of Agricultural Engineering に属する者である。

これらの人員は、農機具センターの業務量の増加とともに増員したいという意向である。

タイ国では、農機具の検査基準の策定及びそれに基づく検査について経験がなく、この指導を受けたいという意向が強い。また、機械化研修の実施方法についての技術協力の希望も強く出された。

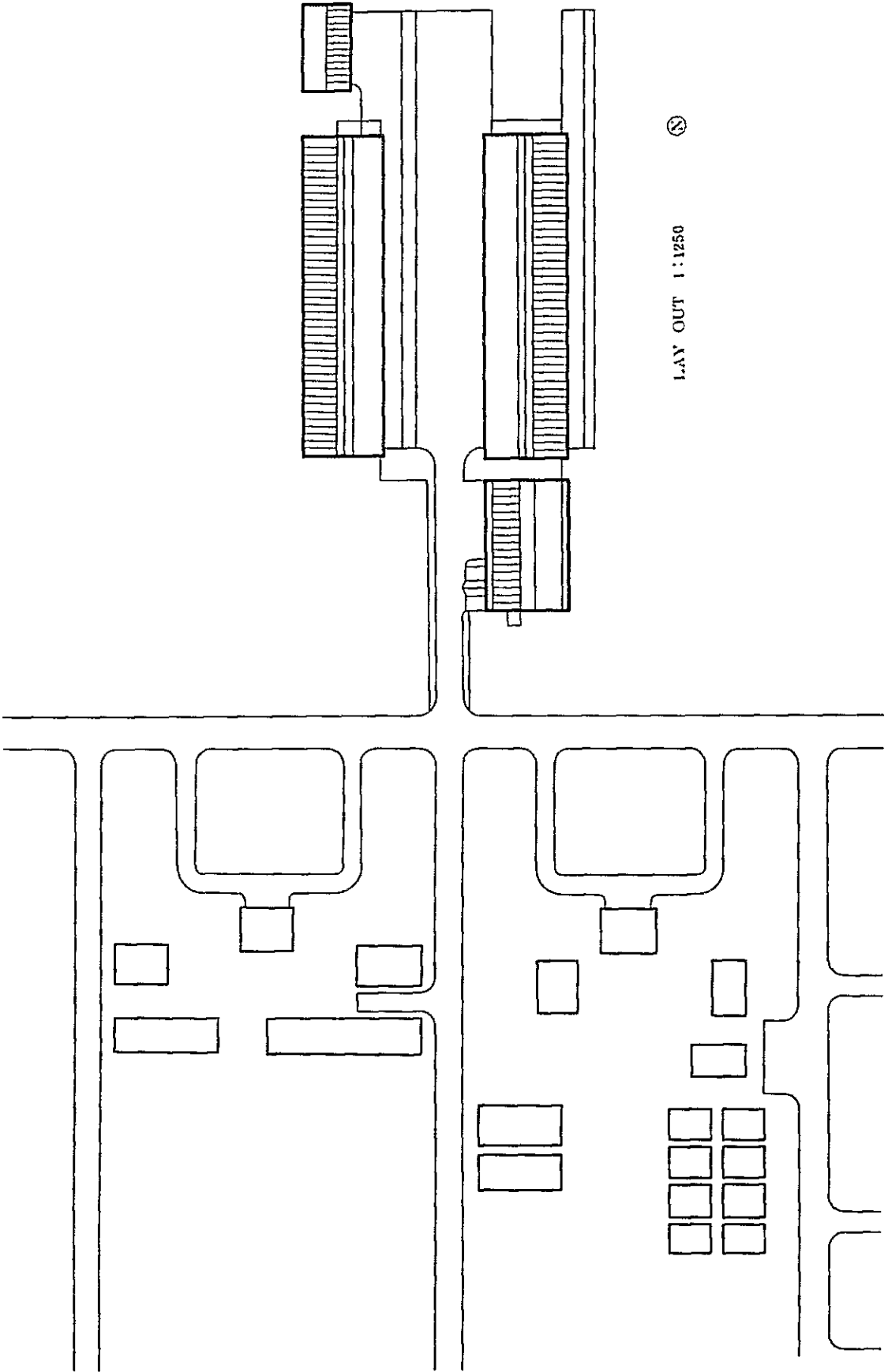
4 農機具センターの設立に関する若干の意見

大学側より、農機具センターの建物規模、備えられる農機具の種類及び員数、検査設備の種類、修理組立て用備品の種類及び員数について資料の提出があったので、これについ

て若干コメントしたい。

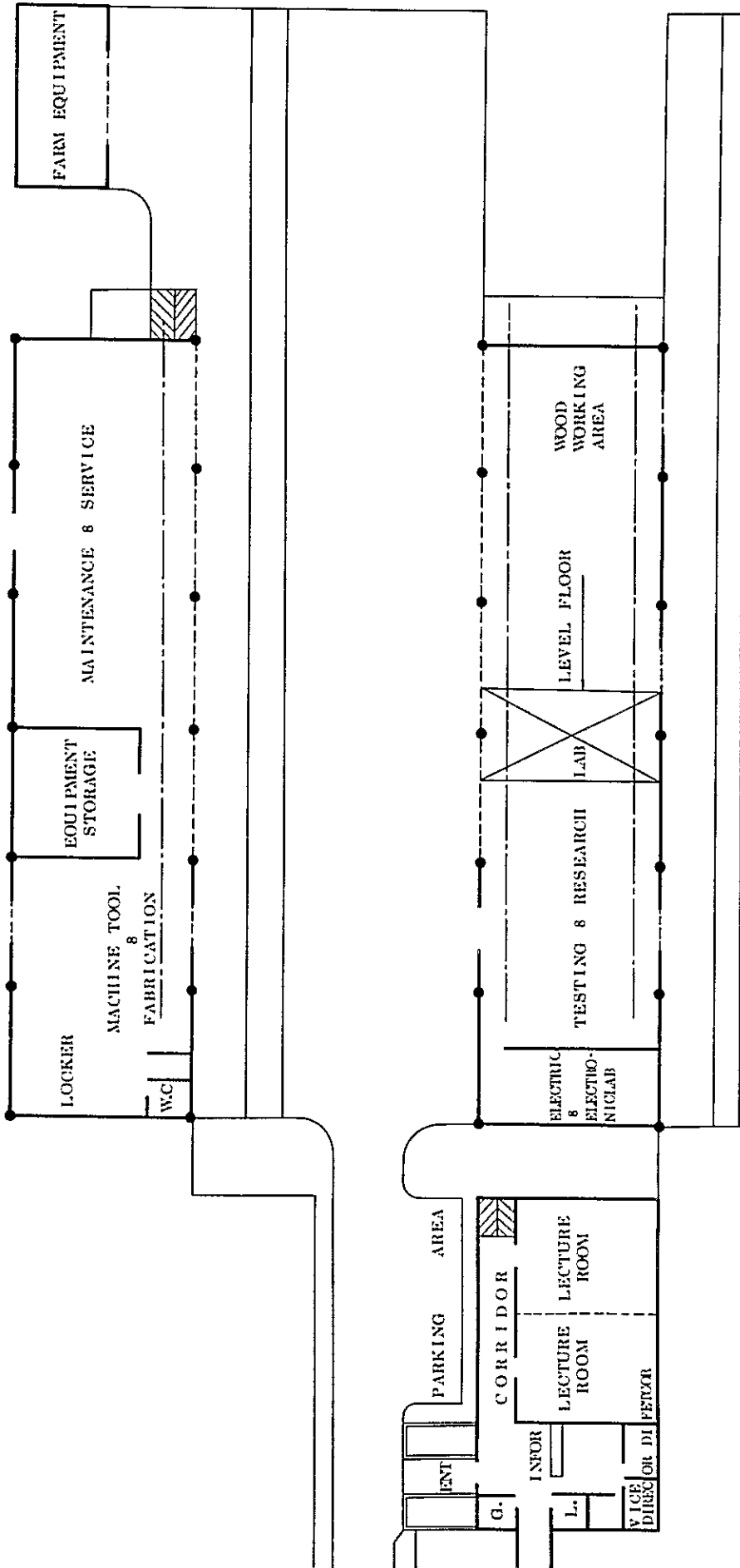
- ① すでに述べたように、農機具センター設立の目的は、研究、検査、研修及びほ場管理と多様であるが、タイ国側から技術協力の要請のある検査基準の策定及び機械化研修の実施については、その協力につき、大いに考慮する必要があると考えられる。
- ② 日本においても、検査基準に基づく検査の実施が今日のような優良な農機具の普及の基礎となったことは疑いのないところであり、タイ国においても、このことは基本的に重要なことであるといえる。しかしながら、検査基準を定める当面の農機具の種類、検査項目、検査方法等について、タイ国側には十分な蓄積がない現状にあり、この点についての日本の専門家の派遣が必要であると考えられる。検査設備の種類等については、それから後に決定されるべきである。また、タイ国の担当者の日本における研修も必要となろう。
- ③ 農機具の利用の増大に対応して、普及員等指導者層に対する系統的な研修が必要であることは言うまでもないが、タイ国では研修方法について経験が少ないので、研修のカリキュラム等についての日本の専門家の派遣が必要であると考えられる。農機具センターに備えられる研修用の農機具の種類等については、その後に決定されるべきである。
- ④ 修理組立て用備品については、農機具に必要なもののほか、検査設備を自作する必要がある場合も考慮するべきである。
- ⑤ 農機具センターの建物規模については、以上述べた事項のほか、全体の利用計画を具体的に詰めた上で決定することが必要である。

農機具センタ-

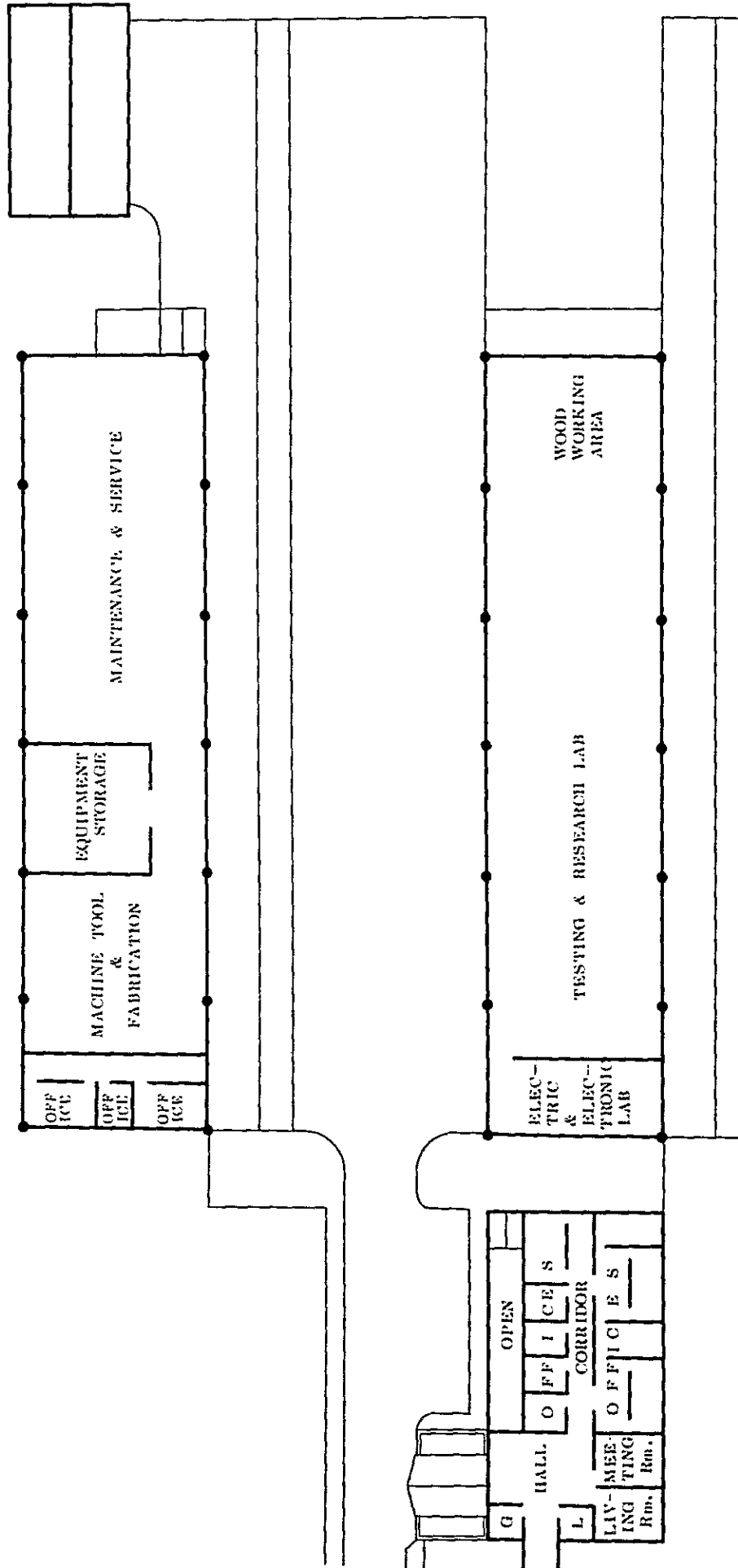


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Ⓢ



GROUND FLOORPLAN 1:500 (8)



SECOND FLOOR PLAN 1 500 (N)

資 料

1 団長あいさつ文

Introductory Statement on Japanese Survey Team of the Technical Cooperation for the Kasetsart University Development Project

Gentlemen:

We are pleased to be here for the purpose of discussing further issues on the Kasetsart University Development Project following the visits to Thailand of two Japanese Survey Teams last year.

To begin with, with your permission, on behalf of the survey team, I would like to briefly remark on the purpose of our Mission in order to expedite our consultations here during our short stay.

The present survey team has two objectives. The first is to discuss our technical cooperation in the form of expert dispatch, equipment supply and training of Thai counterparts, for the Central Laboratory and Greenhouse Complex which will be constructed by the Japanese grant aid.

Another purpose is to survey the possibility of the grant aid and technical cooperation by Japan concerning the Agricultural Extension and Training Service Centre, and also to discuss the possibility of Japanese cooperation regarding the Agricultural Machinery and Equipment Centre. We are particularly interested in the relations between the Machinery Centre and the Extension Centre in their functions.

With these objectives in mind, we would like to discuss and consult with you on the following items:

1. Contents of the technical cooperation concerning the Central Laboratory and Greenhouse Complex.
2. Contents of the grant aid for the agricultural extension programme.
3. Contents of technical cooperation in the field of agricultural extension.
4. Other items, if necessary.

I would like to refer to the prospective schedule of the Government of Japan for our cooperation with the Kasetsart University. The Government of Japan would send a preliminary design survey team in connection with the programme of agricultural extension during the present fiscal year, and in the next fiscal year, we would send a mission to finalize the technical cooperation project for the Central Laboratory and Greenhouse Complex and for the programme of agricultural extension. The result of our Mission will be reflected in these forthcoming Missions. We will prepare, for the time being, the summary report before our departure from Bangkok.

Finally, on behalf of our team, I wish to express my sincere thanks for your kind cooperation and hospitality extended to our team.

Thank you.

2 現地報告書

Prof. Kapee Sagarik

Rector, Kasetsart University

KASETSART UNIVERSITY DEVELOPMENT PROJECT

The Japanese Survey Team headed by the undersigned as organized by the Japan International Cooperation Agency visited Thailand from July 5 to 22, 1978, for the purpose of discussing further issues on the Kasetsart University Development Project following the visits of the last two Japanese Survey Teams to Thailand last year.

During our stay in Thailand, we made a survey to formulate more concrete technical cooperation plan for the Central Laboratory and Greenhouse Complex and studied the possibility of the grant aid and technical cooperation for the National Agricultural Extension and Training Service Center and the Agricultural Machinery and Equipment Center through discussion with the authorities concerned of the Government of Thailand.

We have arranged roughly the results of the survey and I am pleased to submit the summary report as attached herewith to you.

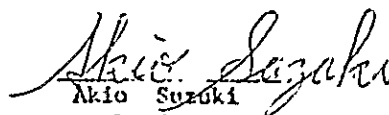
We will report in full detail the results of the survey to the authorities concerned of the Government of Japan after returning to Japan.

We hope that the technical cooperation and grant aid will be realized as soon as possible in accordance with our report.

I take this opportunity to express our appreciation and thanks to you and the staff of the Kasetsart University for the most helpful cooperation and courtesies extended to me and to my colleagues during our stay in Thailand.

July 21, 1978.

Bangkok


Akio Suzuki
Leader

Japanese Survey Team of Technical
Cooperation for the Kasetsart University
Development Project

Summary Report on Kasetsart University Development Project

A. Central Laboratory and Greenhouse Complex

On the basis of information furnished by the Kasetsart University the survey team had series of discussion with the University personnels concerning the issues such as operation and utilization of the Central Laboratory and Greenhouse Complex and respective research items of those seven units, required equipment, experts and fellowship etc. Major contents derived from the discussions are summarized as follows:

1. General

1-1 The University expressed an intention to complete its research set-up at an early date and to commence their research works in more active way when the Central Laboratory and Greenhouse Complex is established.

1-2 It is understood by both sides that supervision and guidance on research works to be performed in the Central Laboratory and Greenhouse Complex shall be conducted by appropriate academic staff of the entire university, while activities in experimentation and routine analysis shall be done by those holding B.S., M.S. or Ph.D. degree who are technical staff of the Complex.

1-3 The University confirmed the necessity for installing central systems in the machine room of the Laboratory Maintenance unit for supplying vacuum, distilled water and compressed air in the complex and the survey team agreed to inform the authorities concerned of the government of Japan about this.

2. Units

2-1 Culture Collection Unit

The survey team is of the opinion that activities of this unit shall include not only preservation of microorganisms but also research work in the field of apply microbiology.

2-2 Plant Pests Clinic and Quarantine Unit

Concerning plant pest and disease protection, the importance of integrated pests management (I.P.M.) and the necessity for forecasting pest and disease outbreaking through research in ecology were recognized.

Taking into consideration the application of large amount of insecticides, research works on the resistance against insecticides shall be needed.

2-3 Seed Technology Unit

For realizing regular distribution of qualified seeds which shall be inevitable for increasing crop yields, basic research on seed production, storage and supply, and also on setting up of grading system shall be necessary.

2-4 Postharvest Research Unit

In Thailand, problems on quality deterioration of vegetables and fruits after harvesting are deemed rather important. However during this survey period, information and opinion on research plan on this problem could not be sufficiently obtained. An overall review on this aspect shall be made to work out appropriate research items.

2-5 Soil and Fertilizer Testing and Applied Research Unit

The survey team is of the opinion that this unit should be mainly in charge of services in soil, fertilizer and plant analysis in addition to research in soil management and fertilizer technology.

2-6 Environmental Science Unit

This unit shall be implemented with an interdepartmental program to be realized in a graduate school level at the Kamphaengsaen campus for the dual purpose of research and education. As for research work under this unit, emphasis shall be placed on water pollution and agricultural commodity pollution. An analysis shall be continued on actual condition of pollution and the results derived from the research shall be utilized for education purpose.

2-7 Central-Biochemistry Unit

This unit shall aim at rendering services to all other units in the Central Laboratory and Greenhouse Complex. The purpose of this unit is to minimize inefficiency as a result of separated and/or divided equipment installation among the units, and therefore large-sized equipment shall be installed in this unit with a centralized control system.

3. Equipment

3-1 It was fully recognized by the University personnel that there are two modes in equipment supplied by the Government of Japan, namely, under grant aid and under technical cooperation program. It was understood by the University that the equipment necessary for the Kasetsart University Development Project will be supplied with the technical cooperation.

3-2 The Survey Team requested the University to prepare a priority list on those equipments needed for the implementation of the above mentioned units as there is a financial limitation under the technical cooperation. The University provided the Survey Team with the list showing priority in each unit.

3-3 After returning to Japan, the Survey Team shall specify the accessories to be supplied with the electron microscope which shall be supplied under the grant aid.

The University expressed its desire that in case the accessories under the grant aid shall not be sufficient, top priority shall be given to the same under the technical cooperation program.

4. Expert

The University requested dispatchment of the following experts:-

- (1) An expert for project planning and coordination.
- (2) An advisor for the purpose of general guidance and advise on organization, operation and management of the Central Laboratory and Greenhouse Complex.

- (3) Research experts in various specific fields such as plant pest management, applied microbiology, etc.
- (4) Experts who are well acquainted with such equipment as electron microscope, spectro photometer, gas chromatograph, etc.

5. Fellowship

The University requested the grant of fellowships in such fields as water management, applied microbiology, operation of equipment, maintenance of equipment, etc.

B. National Agricultural Extension and Training Service Center (NAETSC)

1. Based on the data and information on the NAETSC as furnished by Kasetsart University, discussions were made on the following items:

- (1) Background and reasons for requesting cooperation
- (2) Purpose
- (3) Location and organization
- (4) Project plan
- (5) Buildings and facilities
- (6) Costs for buildings and facilities
- (7) Utilization plan
- (8) Participants
- (9) Experts and fellowship
- (10) Personnel arrangement

2. The following shall be noted on the contents of the discussions made.

- (1) Coordination with other agencies involved in extension work

The University shall coordinate fully with the Department of Agricultural Extension of the Ministry of Agriculture and Cooperatives and with the Ministry of Interior.

- (2) Participants in the Training Programs

It is considered that the training program shall be carried out primarily for extension workers and farmers. University personnels indicated that those government officials and even soldiers, etc. who play an

important role in agricultural development in the country shall also be included in the training programs.

(3) Buildings and Facilities

On the basis of the anticipated number and extent of training program to be undertaken annually, building and facilities proposed for construction and installment appear to be rather excessive.

It may be necessary therefore for the University to supply additional data and information to further justify the need and, if necessary, make appropriate adjustments of the building plan and facilities in accordance with the plans for implementation and utilization.

(4) Audio-Visual Media and Publications

All the audio-visual media and materials, reports and leaflets which shall be prepared by the Center (NAETSC) shall be fully utilized in close cooperation with other agencies involved in extension work so as to serve as the central supply for these materials for the whole country

(5) Equipment to be supplied

The University indicated critical need for audio-visual and other types of equipment for extension work and training services.

(6) Expert and fellowship

The University made a special emphasis on the request for dispatchment of experts and grant of fellowships in audio-visual media.

C. Agricultural Machinery and Equipment Center

The survey team confirmed the following contents after having the explanation on the necessity of the Agricultural Machinery and Equipment Center and its role:

1. The purpose of the Center is to undertake research and testing for establishment of standards of strength, performance etc. of agricultural machinery and equipments produced by the local and foreign manufacturers, and to conduct training and provide information on farm mechanization for students, extension workers, farmers and government officials concerned, as well as to take charge of field operation in Kamphaengsaen campus of the University.

2. The Center shall be under the jurisdiction of the Research and Development Institute, and will consist of four sections, namely, administrative section, research and testing section, repair and fabrication section, and exhibition and training section.

3. The Center will utilize staff members of the Department of Agricultural Engineering of Faculty of Engineering and Department of Farm Mechanics of Faculty of Agriculture for its research and other technical activities with its own staff members serving as assistants in such activities.

4. Grant aid for construction of the Center and technical cooperation for establishment of standards of agricultural machinery and equipment, and for implementation of training in farm mechanization were requested strongly by the University.

3 カセサート大学のスタッフ及び概要

I. KASETSART UNIVERSITY

Founded 1943

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50 Paholyothin Road, Bangkhen, Bangkok 9, Thailand

Telephone

5790113

II. OFFICERS OF UNIVERSITY

Rector

Rapee Sagarik, B.S.Agr. (Kasetsart), Cert in Statistics and
Agr. Expt. Design

Vice Rector for Academic Affairs

Sutharm Areekul, B.S. Agr. (Kasetsart), M.S.(Oregon State U.)
Ph.D. (Washington State U.)

Vice Rector for Business Affairs

Phaitoon Ingkasuwan, B.S. (Hons.) Ph.D. (U. of California)

Vice Rector for Development

Arb Nakajud, B.A. (Thammasat), M.S. (Oregon State U.)

Vice Rector (Kampangsaen Campus)

Wattana Stienswat, B.S.Agr. (Kasetsart), M.S., Ph.D.
(Utah State U.)

Vice Rector for Student Affairs

Bhinyo Kalayanamitr, M.D.

Adviser to Vice Rector for Academic Affairs

Ubol Reangsuwan, B.A., B.Ed.Hons. (Chulalongkorn), M.A., Ph.D.
(U. of Northern Colorado)

Librarian

Daruna Somboonkoon, B.A. (Chulalongkorn), M.A. (Ohio State U.),
M.L.S. (Rutgers U.)

Registrar

Prateep Nutkanchanakul, B.S. in Eng., Cert, in Dam Eng. (USBR),
Cert. in Water Use Management (I.C.A.)

III. BRIEF HISTORY

Kasetsart University was formerly a 3-year College of Agriculture under the supervision of the Ministry of Agriculture. In 1943 it became a university by the amalgamation of the existing Colleges of Agriculture and Forestry with two new faculties: the Faculties of Cooperative Science (now Faculty of Economics and Business Administration) and Fisheries. Subsequent legislation in 1955 brought about the transfer of two additional faculties: the Faculty of Veterinary Science from the University of Medical Science (now Mahidol University) and the Faculty of Irrigation Engineering from the Department of Irrigation. In 1966, the Faculty of Science and Arts and the Graduate School, which is a coordinating unit for the graduate programs of all faculties, were established. The Faculties of Education and Social Sciences came into existence in 1969 and 1974 respectively. There are presently 10 faculties: Agriculture, Economics and Business Administration, Education, Engineering, Fisheries, Forestry, Science and Arts, Social Sciences, Veterinary Science, and the Graduate School.

Kasetsart is the first university in Thailand where agricultural programs were offered since it was realized that as a predominantly agricultural country, trained manpower in agriculture and related fields was very much needed. Only in recent years has Kasetsart developed into a full-fledged university with additional faculties in other fields. Considering its historical development, Kasetsart is closest to the "Land Grant" model of a university.

IV. FACULTIES AND DEANS

Faculty of Agriculture

Banjerd Boonsue, B.S. Agr. Hons. (Kasetsart), M.S.(Cornell),
Ph.D. (Purdue)

Faculty of Economics and Business Administration

Sopin Tongpan, B.A. (Hons.), M.S. (Oregon State U.),
Ph.D. (Ohio Sate U.)

Faculty of Education,

Boontham Chit-Anan, B.S. Agr. Hons. (Kasetsart),
M.S.(U. of Wisconsin), Ph.D. (Cornell)

Faculty of Engineering

Jit Pitchakul, B.S. in Engineering (Chulalongkorn), Cert. in
Dam Eng. (USBR)

Faculty of Fisheries

Mek Boonbrahm, B.S. in Fisheries, M.S. in Fisheries (Oregon
State U.)

Faculty of Forestry

Chongrak Prichananda, B.S.F.(U. of the Philippines)†
M.S.(Oregon State U.), Ph.D. (SUNY)

Faculty of Science and Arts

Dhavi Yanasugondha, B.S.Agr. (U. of the Philippines),
M.S. (Utah State U.), Ph.D. (U. of Southern
California)

Faculty of Social Sciences

Niphon Kantasewi, B.S., MEd. (U. of California-Davis), Ph.D.
(Pennsylvania State U.)

Faculty of Veterinary Science

Rampung Dissamarn, D.V.M. (Kasetsart)
Cert. in Animal Parasitology
(Texas A & M Univ.)

Graduate School

Bunjird Khatikarn, B.S. Agr. (Kasetsart),
M.S., Ph.D. (Utah State U.)

Institute of Food Research and Product Development

Amara Bhumiratana, B.S. (U. of the Philippines),
M.S. Food Science (U. of California-Davis),
Cert. Small Industry Management (Stanford)

Office of Extension and Training

Porn Resanonda, B.S. Agr. (Kasetsart), M.S. (Utah State U.)

V. TEACHING STAFF

1. Faculty of Agriculture

a. Department Heads:

Agricultural Extension:	Pote Boonruang, Ed.D.
Agronomy	: Prasan Yingchol, Ph.D.
Animal Science	: Somkiat Timpatanapong, M.S.
Entomology	: Kwanchai Sombatasiri, D.Agr.
Farm Mechanics	: Prani Changchenkit, M.S.
Food Science	: Narudom Boon-Long, M.S.
General Agriculture	: Pote Boonruang, Ed.D.
Home Economics	: Chuanchom Chandrapauraya, B.S.
Horticulture	: Paiboon Paireepairit, M.S.
Plant Pathology	: Pairoj Juangbhanich, M.S.
Soil Science	: Sorasith Vacharotayan, Ph.D.
Student Farm-operation Training Office	: Dusit Siripong, M.S.

b. Heads of Experimental Farms

Sriracha	Polthip Komarakul Na Nagara, B.S.
Tab Kwang	Nam Sirisatien, B.S., Cert. in Advanced Pig Husbandry.
Pakchong	Chalongchai Baebprasert, M.S.
Suwan	Anchern Chomphoobhodhi, M.S.
Kamphaengsaen	Surachai Chakrirat, Ph.D.
Doi Pui	Suebsak Nawachinda, B.S.

C. Academic Staff:

Professor	6
Associate Professor	7
Assistant Professor	53
Instructor	155

2. Faculty of Economics and Business Administration

a. Department Heads

Department of Accounting	: Vachira Sabhasri (Mrs.), M.S.
Department of Agricultural Economics	: Kamphol Adulavidhaya, Ph.D.
Department of Business Administration	: Manit Kitpaitoon, B.S.
Department of Cooperative Science	: Pipat Suchinda, M.S.
Department of Economics	: Paisal Kingpecharat, B.S.
Department of Marketing	: Chune Sopochana, M.S.

b. Academic Staff:

Professor	1
Associate Professor	6
Assistant Professor	27
Instructor	71

3. Faculty of Education

a. Department Heads

Department of Education	:	Prateep Siamchai, Ed.D.(UCLA)
Department of Physical Education:		Ongkarn Indarumbaraya, Ed.D. (U. of Northern Colorado)
Department of Vocational Education	:	Boontham Chit-Anan, Ph.D.(Cornell)

b. Academic Staff:

Professor	1
Assistant Professor	15
Instructor	206

4. Faculty of Engineering

a. Department Heads

Agricultural Engineering	:	Aphichat Anukuarmphai, Ph.D. (Utah State Univ.)
Civil Engineering	:	Prasert Pholdi, M.S. in C.E. (U. of Texas)
Electrical Engineering	:	Susak Thongthammachat, Ph.D. (State U. of New York)
Hydraulics and Hydrology	:	Patipan Amatayakul, B.S. in Eng. (Kasetsart), Cert. in Irrigation Technology (Israel)
Irrigation Engineering	:	Aroon Indrapalita, M.S. in Agr. Econ. (Oregon State U.)
Mechanical Engineering	:	Larb Rubsiri, M.S. in A.E. (U. of Reading)

b. Academic Staff:

Professor	-
Associate Professor	-
Assistant Professor	15
Instructor	58

5. Faculty of Fisheries

a. Department Heads

Department of Aquiculture	: Wit Tarnchalanukit, B.S.
Department of Fishery Biology	: Khanjanapaj Lewmanomont, M.S.
Department of Fishery Management	: Satuan Pinnoi, B.S.Cert.Marine Biology
Department of Fishery Products	: Tasanee Sorasuchart, M.Agr.
Department of Marine Science	: Mahn Bhovechitra, Ph.D.

b. Academic Staff:

Professor	-
Associate Professor	1
Assistant Professor	10
Instructor	25

6. Faculty of Forestry

a. Department Heads

Department of Conservation	: Kasem Chunkao, Ph.D.(U. of Washington)
Department of Forest Biology	: Somsak Sukwong, Ph.D. (Colorado State U.)
Department of Forest Engineering	: Prathuang Dhamnitayakul, B.S. in Forestry (Kasetsart U.)
Department of Forest Management	: Lert Chuntanaparb, Ph.D. (North Carolina State U.)
Department of Forest Products	: Chote Raktiparkara, M.F. (Yale)
Department of Silviculture	: Choob Khemnark, M.S.(U. of Georgia)

b. Academic Staff:

Professor	2
Associate Professor	2
Assistant Professor	17
Instructor	39

7. Faculty of Science and Arts

a. Department Heads

Department of Biology	:	Dhavi Yanasugondha, Ph.D. (USC)
Department of Chemistry	:	Krisna Chutima, Ph.D. (Purdue)
Department of Languages	:	Chujit Ratarasarn, B.A., M.Ed.
Department of Mathematics	:	Chalit Vejajiva, M.A. (Michigan State) Cert. in E.E. (U.S. Bureau of Reclamation)
Department of Physics	:	Vidhurn Hongsumalya, M.S. in E.E. (Oregon State)
Department of Statistics	:	Somsri Lilanuja, M.B.A. (Michigan)

b. Academic Staff:

Dhavi Yanasugondha, Ph.D. (USC)	
Krisna Chutima, Ph.D. (Purdue)	
Professor	3
Associate Professor	8
Assistant Professor	39
Instructor	173

8. Faculty of Social Sciences

a. Department Heads

Department of Geography and History	
Smorn Nitidhandhaphras, B.A., B. Ed. (Chulalongkorn), M.A., M.Ed. (Oregon State U.)	
Department of Political Science and Public Administration	
Pussadee Satayamana, B.A. in Political Science (Chulalongkorn), M.P.A. Hons. (Thammasat)	
Department of Philosophy and Religion	
Singthong Pornikom, M.A. (Banaras Hindu U.)	

Department of Psychology

Supanee Kotrajaras, B.Ed., M.Ed. (Chulalongkorn),
Ph.D. (U. of Northern Colorado)

Department of Sociology and Anthropology

M.R. Wutilert Devakul, B.A., M.A. (U. of Northern Colorado)

b. Academic Staff:

Professor	1
Associate Professor	1
Assistant Professor	8
Instructor	38

9 Faculty of Veterinary Science

a. Department Heads

Department of Anatomy	:	Boontham Chongcharoen, D.V.M. (Kasetsart), Dip. in Vet. Anatomy
Department of Medicine	:	Supot Anekvanich,
Department of Pathology	:	Rampung Dissamarn, D.V.M. (Kasetsart), Cert. in Animal Parasitology (Texas A & M University)
Department of Pharmacology	:	Prasob Buranamas, D.V.M. (Medical U.) LL.B. (Thammasat U.), M.S.(U. of Georgia)
Department of Physiology	:	Chitta Anukul, D.V.M. (Medical U.), Cert. in Patho (Sweden), Cert. in Patho (Texas A & M)
Department of Surgery	:	Pibul Chai-anan, D.V.M. (Kasetsart)

b. Academic Staff:

Professor	2
Associate Professor	-
Assistant Professor	5
Instructor	49

10. The Graduate School

a. Academic Staff:

Professor
Associate Professor
Assistant Professor
Instructor

11. Extension and Training Office

Division Chiefs:

Office of the Director	Porn Resananda, M.S.
Academics and Research	Tatchai Sangsingkaw
Extension	Poom Khumgliang
Communication Media	Suchote Daosukho
Broadcasting Stations	Porn Resananda

12. Institute of Food Research and Product Development

Division Chiefs:

Administration	Prateep Rachapatayakom, Ph.D.
Education and Demonstration	Suchon Nimmarnnit, Dr. agr.
Research	Bulan Pitakpol (Miss), M.S.
Quality Control	Suchinda Nimmarnnit (Mrs.), M.S.
Product Development	Amara Bhumiratana, M.S.
Bangkhon Pilot Plant	Kulwadi Trongpanich, M.S.
Kamphaengsaen Pilot Plant	Narong Niyomwit, Ph.D.

VI. ADMINISTRATIVE AND OTHER STAFF

Assistant Vice-Rector for Business Affairs

Sangtham Komkris, M.S.

Assistant Vice-Rector for Student Affairs

Nukrak Bhahalayothin, M.S.

Director, Medical Service Center

Bhinyo Kalayanamitr, M.D.

Chief, Finance Division

Boonthong Siripanich, M.S.

Chief, Personnel Record Division

Thep Chokesmai

Chief, Foreign Relations Office

Ladasiri Limangkura, M.S.

Chief, Secretarial Division

Pon Rangdang

Head, Documentation and Correspondence Section

Somsak Wiraporn, B.A., B.Ed., M.A.

VII. CONSTITUTION

Kasetsart University is a government unit attached to the Office of State Universities, Office of the Prime Minister. Control of Kasetsart University is vested on the 29 members of the Kasetsart University Council. Seventeen members are ex-officio, namely: the Secretary-General of the National Education Commission, the Rector, 5 Vice Rectors and 12 Deans and Directors. The Chairman and 9 members are appointed to a two-year term by His Majesty the King upon the recommendation of the Council. The Rector is empowered to carry on the tasks assigned by the Kasetsart University Act. B.E.2511 (1968), and by the policy entrusted by the University Council. He will answer to this Council concerning the general policy and academic matters and to the Office of State Universities for administrative matters. His administrative power is delegated to Vice Rectors, deans and Directors.

VIII. AFFILIATED INSTITUTIONS

1. Thailand National Corn and Sorghum Research Center

The Center was organized as a cooperative effort between the Ministry of Agriculture and Cooperatives and Kasetsart University to efficiently utilize the limited resources of the two governmental agencies in promoting corn production of the country.

2. National Swine Research and Training Center

The Center is under the joint responsibility of the Livestock Development Department and Kasetsart University. Its activities include research in swine nutrition, management and disease control, improvement of stocks of the purebred swine. The Center's facilities are also available for testing, multiplication and distribution of superior breeding stocks.

IX. UNIVERSITY FINANCE

As one of the 13 state-owned universities, Kasetsart obtains practically all of its financial support for basic expenditures from the national budget. A certain appropriation is also allocated for research. Additional research grants are contributed by various sources, both public and private. They are, for example, the National Research Committee, Ministry of Agriculture and Cooperatives, commercial banks, Rockefeller Foundation, and Agricultural Development Council.

Budgets by Types of Expenses

	<u>FY 1974</u>	<u>FY 1975</u>	
Salaries	34,943,400	45,991,000	Baht
Permanent Wages	8,559,500	11,053,900	
Temporary Wages	1,716,200	2,351,500	
Remunerations	2,855,000	3,022,000	
Ordinary Expenses	9,731,300	7,110,000	
Material and Supplies	8,822,300	12,589,000	
Equipment	6,452,400	27,245,000	
Land and Construction	62,317,700	104,402,000	
Subsidies	2,942,700	2,855,700	
Other Expenses	<u>22,438,400</u>	<u>20,259,100</u>	
Total	<u>157,778,900</u>	<u>237,379,200</u>	

X. GENERAL INFORMATION

Academic Year

First Term	June-October
Second Term	November-March
Summer Session	April-May

Medium of Instruction

Thai
English (used in certain upperdivision and graduate courses)

Student Enrollment (1975-76)

	Men	Women	Total
Undergraduate	3648	1934	5582
Postgraduate	396	304	700
Foreign Students	<u>1</u>	<u>-</u>	<u>1</u>
Totals	4045	2238	6283

Teacher/Student Ratio

1 : 8 (excluding 162 part-time staff)

XI. LIBRARIES

Kasetsart Central Library	Number
Books (Thai and English, including bound periodicals)	77351
Periodicals - Thai	262
- English	463
Maps	106
Microfilms (rolls)	14

Faculty Libraries

There are also faculty libraries located in the Faculties of Economics and Business Administration, Education, Engineering, Fisheries, Forestry, and Social Sciences, serving their respective fields. These in time will concentrate on providing reading facilities, while major reference sources will be located in the Central Library. The system of cross reference between Kasetsart Central Library and faculty libraries is being prepared.

XII LABORATORIES AND RESEARCH FACILITIES

The Institute of Food Research and Product Development located on the university campus offers research facilities in food science and technology for food research and products development essential to economic, industrial and agricultural growth.

Also operated by Kasetsart University are ten experiment stations for agriculture, fisheries and forestry work and student training. Social Laboratory and Farm Development Centre are now in operation.

Departments under separate faculties also are charged with the responsibility to operate research laboratories serving faculty members and, in most cases, also serving the general public as part of extension activities of Kasetsart.

The Kasetsart University Demonstration School is functioning partly as a teaching laboratory for the Faculty of Education faculty staff and students.

Located on campus are several laboratories and research facilities of certain departments in the Ministry of Agriculture and Cooperatives-Agriculture, Fisheries and Livestock. Through mutual agreement, these facilities are made available to Kasetsart staff and graduate or advanced undergraduate students. A number of scientists attached to these various units also serve as part-time lecturers, especially at graduate level.

XIII. COURSES OF STUDY

A. Undergraduate Level

1. Admission Requirements

- a. Applicants must be Matayom Suksa 5 (Grade 12) graduates, or holders of Higher Technical Certificate, or its equivalent.
- b. Pass the Joint Higher Education Entrance Examination administered by the Office of State Universities.

2. Degrees Awarded

Faculty of Agriculture

Bachelor of Science in Agriculture (B.S.Agr.)

majors - Agronomy

Agricultural Extension

Animal Science

Entomology

Farm Mechanics

General Agriculture

Horticulture

Plant Pathology

Soil Science

Bachelor of Science (B.S.)

majors - Home Economics

Food Science and Technology

Faculty of Economics and Business Administration

Bachelor of Science (B.S.)

majors - Accounting

Agricultural Economics

Business Administration

Cooperative Economics

Economics

Marketing

Bachelor of Arts (B.A.)

majors - Accounting
Business Administration
Economics
Marketing

Faculty of Education

Bachelor of Science (B.S.)

majors - Agricultural Education
Physical Education

Bachelor of Arts (B.A.)

majors - Home Economics
Physical Education

Faculty of Engineering

Bachelor of Science in Engineering (B.S. Eng.)

majors - Agricultural Engineering
Civil Engineering
Electrical Engineering
Irrigation Engineering
Mechanical Engineering

Faculty of Fisheries

Bachelor of Science (B.S.)

majors - Aquaculture
Fishery Biology
Fishery Management
Fishery Products
Marine Science

Faculty of Forestry

Bachelor of Science (B.S.)

majors - Forest Products
Forest Resources Management

Faculty of Science and Arts

Bachelor of Science (B.S.)

majors - Biology
Chemistry
General Sciences
Mathematics
Physics
Statistics

Bachelor of Arts (B.A.)

majors - Languages
Mathematics

Faculty of Social Sciences

Bachelor of Science (B.S.)

major - Psychology

Bachelor of Arts (B.A.)

majors - Anthropology
Geography
History
Philosophy and Religion
Political Science
Sociology
Sociology and Anthropology

Faculty of Veterinary Science

Bachelor of Science (B.S.) - 4 - Yr. Curriculum

major - Veterinary Science

Doctor of Veterinary Medicine (D.V.M.) - 6 Yr. Curriculum

3. Degree Requirements

- a. A minimum G.P.A. of 2.0
- b. A minimum credit requirements of 144 for the Faculties of Science and Arts and Social Sciences; 145 for the Faculties of Agriculture and Education; 149 for the Faculty of Engineering, 150 for the Faculties of Economics

and Business Administration and Fisheries; 151 for the Faculty of Veterinary Science; 152 for the Faculty of Forestry.

c. A certain number of hours of field work for the Faculties of Agriculture, Engineering, Fisheries, Forestry, Veterinary Science

B. Graduate Level

1. Admission Requirement

a. Bachelor's degree graduates with the minimum G.P.A. of 2.5

2. Degrees Awarded

Master of Science in Agriculture (M.S. Agr.)

majors - Agricultural Education
Agricultural Extension
Agronomy
Animal Breeding
Animal Nutrition
Animal Production
Entomology
Horticulture
Plant Breeding
Plant Pathology
Pomology
Soil Science

Master of Science (M.S.)

majors - Biology
Botany
Fishery
Food Science and Technology
Genetics
Microbiology
Physics
Silviculture
Zoology

Master of Arts (M.A.)

majors - Economic Development

Social Development

Master of Arts in Teaching (M.A.T.)

majors - Teaching English

Mathematics

Science

Social Studies

Thai

Master of Engineering (M.E.)

majors - Electrical Engineering

Irrigation Engineering

3. Degree Requirements

- a. Complete a minimum course requirements of 36 credits, plus 9 credits of thesis, with a minimum G.P.A. of 3.0.
- b. Pass a comprehensive (oral) examination.
- c. Fulfill the English language requirements.

XIV. FEES

	Undergraduate	Graduate
Tuition (per 1 credit)		
Resident	5	30
Nonresident	5	50
Registration fee (new student only)	10	100
Incidental fees (library, health)	350	-
Breakage deposit	50	100
K.U. Student Organization fee	100	-
Dormitory fee per year		
Resident	500	500
Nonresident	1000	1000
Summer Session	100	100

Late registration fees- 10 bahtper day after the last day of registration.

XV Scholarships and Financial Assistance

The student financial aid program of Kasetsart University is administered by the Office of Student Affairs.

A considerable number of scholarships offered by donors are available for undergraduate students of the University each academic year. These scholarships are awarded to students on the basis of high academic promise, personal qualifications and evidence of financial need. Awards are made for one academic year and are generally renewable if the student maintains high standards of scholarship and personal conduct and continues to need assistance. Grants range in value from 1,500 baht to 4,000 baht with the total number of 258 scholarships awarded in 1975-76.

In addition, certain amount of fund is available to provide aid for students who have hard-pressed financial problems as food expenses, loans and/or part-time jobs, depending on the extent of need.

XVI Student Services

The University maintains 21 dormitories capable of housing almost 3,000 students. These facilities can accommodate both men and women. Most of them are first-year students who are encouraged to live on campus. Charges are payable in full by the academic year at the rate of 500 baht.

The University runs a cafeteria that offers low-cost meals to students at the rate of 350 baht per month for three meals a day.

The University infirmary provides minor medical and dental care. A registered nurse is on duty all day. At night and on holidays a medical personnel is available on call. The University physician maintains regular hours for consultation and treatment.

XVII Student Activities

The University is convinced that student activities count to be an important part of education and training in human relationships. The University has encouraged organizations which bring students together in both professional and social groups. A number of organizations and clubs emphasizing the various fields of interest for students include:

- KU Council of Student Representatives
- KU Student Body Organization
- Agricultural Economics Club
- Agricultural Extension Club

XVII Student Activities (cont.)

Agronomy Club
Animal Husbandry Club
Bridge Club
Economics, Business and Accounting Club

Engineering Union
Entomology and Plant Pathology Club
Farm Mechanics Club
Forestry Club
Fishery Club
Food Science and Technology Club
Forestry Club
Gun Club of KU
Home Economics Club
Horticulture Club
KU Band Club
KU Country Music Club
KU English Club
Physical Education Club
Nature Conservation Group
Rotaract Club of KU
Social Science Club
Thai Music Club
University for the Community
Volunteer Students for Public Service.

Besides, Bangkok Officers Club, K.U. Alumni Association under the Royal Patronage, Orchid Society of Thailand affiliated with the American Orchid Society Incorporated, Agricultural Economics Society of Thailand under the Royal Patronage and Kasetsart Cooperative Store are also other activities under the Kasetsart University auspices.

XVIII. COMMUNITY SERVICES

The University has taken a key role in serving the community in many forms. It strives to assist through research and dissemination of knowledge that may be useful to many professions. To any new potential enterprise, the University may try to lead by demonstration. For example, the Institute of Food Research and Product Development has taken a lead in producing textured, low cost vegetable protein and processing local products that will keep longer and realize greater cash income. All these, together with marketing trials, are aimed at promoting private enterprises to carry on any promising work started by Kasetsart. The Office of Extension and Training is directly responsible for disseminating new knowledge to the public by coordinating programs in various fields including vocational short courses for the public. In summer of 1975, 885 persons participated in 22 vocational training programs and in other subjects. Some of these courses are Artificial Insemination, Beef Production, Mushroom Culture and Production, Fertilizer Application, Dairy Production, Fabric Design, Introduction to Law, Business Administration and Labor Relations, Radio Repair and Maintenance.

The Office of Extension and Training also issues regular newsprints and offer programs through the airwaves, for example, radio-broadcast of agricultural programmes handled by the network of four KU stations at strategic locations - Bangkok, Khonkaen, Chiangmai, and Songkla for a rather complete coverage of the country. This proves a popular form of community service, and an effective training for students as well.

Kasetsart University faculty staff also play an important role in community services. They serve, for example, as mediator between labor groups and their employers, give consulting service to agricultural-industrial firms, and are active in environmental protection.

XIX. PUBLICATIONS

1. Animal Husbandry, published quarterly by the Department of Animal Science, Faculty of Agriculture
2. The Cooperative, a monthly publication by the Faculty of Economics and Business Administration
3. Kasetsart News, published monthly by the Office of Extension and Training.
4. The Kasetsart Journal, occasional publications of research findings
5. KU Newsletter, published by the Office of Extension and Training
6. Horticulture, published quarterly by the Horticulture Club
7. Pra Piroon, published by the Kasetsart Student Body Organization

XX. SUMMARIES OF THE YEAR 1975-76

New Developments

Kasetsart University is presently executing a development program with the financial assistance of the World Bank and counterpart fund from the Thai Government. This program will improve the existing facilities at Bangkhen campus and establish a new campus at Kamphangsaen 80 kilometers northwest of Bangkok. The first phase of development will be completed at the end of 1977 and will provide facilities for 1,500 students and 150 staff at Kamphangsaen. Actually about 1/4 of the site development and building construction work will be completed at that time to provide for an ultimate accommodation of approximately 12,000 students.

In 1976 Kasetsart University has drafted a new five-year development program, commencing with 1973 to first, improve the quality of education particularly for undergraduates and second, to expand its program for graduate study. The Bangkhen campus, in the future, will provide a concentration of graduate facilities with a reduced undergraduate population with the expansion of Kamphangsaen.

New Appointments

Rapee Sagarik, former Vice Rector for Development, has been appointed Rector since 1975.

Arb Nakajud, Assistant Professor, Faculty of Economics and Business Administration and coordinator for Kasetsart-International Bank of Reconstruction and Development Project has been appointed Vice Rector for Development.

Ubol Reangsuwan, former Dean of the Faculty of Education, has been appointed Advisor to Vice Rector for Academic Affairs.

Boontham Chit-Anan, Chairman of the Department of Vocational Education, has been appointed Dean of the Faculty of Education.

Niphond Kantasewi, Chairman of the Department of Social Sciences, Faculty of Science and Arts has been appointed Dean of the Faculty of Social Sciences, a newly established faculty.

Degrees Awarded

<u>Faculties</u>	<u>AY 1974-75</u>
Agriculture	383
Economics and Business Administration	289
Education	221
Engineering	131
Fisheries	28
Forestry	136
Science and Arts	147
Social Sciences	-
Veterinary Science	125
Graduate School	<u>121</u>
Total	<u>1,581</u>

4 カセサート大学建設基準

Standard design for construction at Kasetsart University, Kamphaengsaen Campus.

A. General Characteristics

According to the existing campus, funded by World Bank Loan was set master plan due to campus characteristic objectives :

1. Roofing form should be pitch roof to fit with tropical monsoon area and typical Thai architectural styles.
2. Buildings should not higher than three stories according to the soil bearing capacity at the campus (average 10 tons/m.²) to save their cost of foundation, and also adequate space of the campus.
3. Buildings, should be rectangle which facing the long facades to north and south getting natural ventilation (summer wind 15° south). The narrow facades should face east and west to minimize sun heat gain.
4. Buildings should have overhang cantilever and sun-shade to protect the heavy monsoon rain and the strong sun-ray.

B. Spacing Accomodation

1. Director general office 24 m.²/person.
2. Department head office 16 m.²/person.
3. Staff office 12 m.²/person.
4. Clerical staff 9 m.²/person.
5. Classroom
 - 5.1 25 men-type 1.5 m.²/person
 - 5.2 50 men-type 1.3 m.²/person
 - 5.3 100 men-type (or more) 1.0 m.²/person
 - 5.4 Seminar and Conference Rm. 30 men-type 1.8 m.²/person
6. ^{Teaching} Research Lab.
 - 6.1 Physical lab. 5 m.²/person
 - 6.2 Chemical lab. 4 m.²/person
 - 6.3 Biological and Micro-biological lab. 3.5 m.²/person

Research

7. Teaching-Lab.

7.1 Physical lab. $10.0 \text{ m}^2/\text{person}$ 7.2 Chemical lab. $10.0 \text{ m}^2/\text{person}$ 7.3 Biological and Micro-biological lab. $10.0 \text{ m}^2/\text{person}$.

8. Corridor Width

8.1 Passenger Corridor 2.5 m. (minimum)

8.2 Stretcher Corridor 3.0 m. (minimum)

9. Ceiling Clearance (Local Code)

9.1 Housing 2.5 m. (min.)

9.2 Public Building 3 m. (min.)

9.3 Godown and Storage 3.5 m. (min.)

10. Road Width (Standard Asian Highway) 3.5 m./lane, 1.5 m./each
footpath side or road-shoulder

11. Workshops

Machine Rm. $10 \text{ m}^2/\text{person}$ Material testing lab. $15 \text{ m}^2/\text{person}$ Carpentry and Woodworking $7.5 \text{ m}^2/\text{person}$

Storage 15 % of working space

C. Structural Engineer Data1. Classroom 400 kg./m^2 2. Laboratory 500 kg./m^2 (depend upon its life-load)

3. Strength of Concrete 200 k.s.c.

4. Reinforced steel rod 1400 k.s.c.

5. Soil Bearing capacity (shoul^d be balled at each side of
construction) 10 ton/m^2 (T.E.C. recommodation)

D. Power Supply

1. 220 volt

2. 50 cycle

3. Power line insulation and conductivity based on A.S.T.M.,

B.S., N.E.C standard or M.E.A. and P.E.A.

E. Air-conditioning (should be based on the detail calculation for installation)

Approximated calculation :

1. 500 B.T.U./m.²
2. 30,000 baht/ton (Chiller type)

F. Illumination

1. Classroom 150 ft.-candle
2. Laboratory 200 ft.- candle
3. Library 250 ft.-candle
4. Pedestrial and road light 50 ft.-candle
5. Guard light (normal security) 25 ft.-candle

G. Water Supply

1. Pressure (Out let) 45 lb./inch²
2. Drinking Water (Bacteria not more than 600 ppm.) p H. 7
(should be softened and de-ionized.)

H. Cost of Construction (approximately)

1. Administration, Classroom, Laboratory etc. 3,000 baht/m.²
2. Storage, Godown, Factory or Enclosed space 2,100 baht/m.²
3. Unenclosed space, Garage or Crash Area 1,500 baht/m.²
4. Road way 20 centimetre thickness, concrete surface 300 baht/m.²
5. Fill-up plan and land clearing 85 baht/m.³ (by earth), 100 baht/m.³
(by sand)
6. Earth evacuation (without transportation) 15 baht / m.³ (transportation added 5 baht/m.³/km.)
7. Compaction 45 baht/m.³

5 Priority Listing of Equipment for
Central Laboratory and Greenhouse Complex

1. Soil and Fertilizer testing and applied research unit	1-8
2. Seed Technology unit	9-12
3. Culture Collection unit	13-15
4. Postharvest research unit	16-17
5. Environmental Science unit	18-21
6. Greenhouse proper	22-24
7. Central-Biochem. unit	25-28
8. Plant Pest Clinic and Quarantine	29-32
9. Central administrative office	33
10. List of glassware	34

Summary of Equipment Required For
Soil and Fertilizer Testing and Applied Research Unit

I. Routine Equipment

Priority: First

Order	Item	Number of project involved	Quantity required	Remarks
1	Autoanalyzer	13	1	
2	Atomic absorption spectrophotometer	12	1	
3	Analytical balance	11	2	
4	Flame photometer	10	1	
5	pH meter	10	2	
6	Spectrophotometer	10	1	
7	Top-loading balance	9	2	
8	Grinder for plant sample	9	1	
9	Grinder for soil sample	9	1	
10	Neutron moisture guage and accessories	9	2	
11	Platform balance	8	1	
12	Air pump	8	1	
13	Pipette	8	50	
14	Pipette washer	8	1	
15	Micro-Kjeldahl digestion apparatus	8	4	
16	Micro-Kjeldahl distillation apparatus	8	2	
17	Muffle furnace	8	2	
18	Forced-air oven	8	2	
19	Refrigerator	7	1	
20	Wrist-action shaker	7	1	
21	Pipette dryer	7	1	
22	Kjeldahl digestion apparatus	7	1	
23	Kjeldahl distillation apparatus	7	1	
24	Electrical conductivity bridge	7	1	
25	Pressure membrane apparatus and accessories	3	1	
26	Pressure plate apparatus and accessories	3	1	

Order	Item	Number of project involved	Quantity required	Remark
27	Bouyoucos hydrometer	7	3	
28	Two-way pipette	7	5	
29	Undisturbed soil core sampler	7	1	
30	Manometer-type tensiometer	7	100	
31	Typewriter-Thai	6	1	
32	Typewriter-English	6	1	
33	Desk calculator	6	2	
34	Torsion balance	6	3	
35	Clinical centrifuge	6	1	
36	Hot water bath	6	1	
37	Hot plate	6	2	
38	Stirring hot plate	6	1	
39	Blendor	6	1	
40	Fume hood	6	2	
41	Desiccator	6	4	
42	Titration	6	2	
43	Shaker, platform type	6	2	
44	Sieve, 8 inches diameter	6	2	
45	Colorimeter	6	1	
46	Clamp	6	100	
47	Clip for tubings	6	100	
48	Soil core sample ejector	6	1	
49	Multichannel dewpoint microvoltmeter	6	1	
50	Yoder type wet sieving machine	6	1	
51	Camera	5	1	
52	Triple beam balance	5	3	
53	Air compressor	5	1	
54	Sieve, 5" diameter	5	4	
55	Air pressure guage	5	5	
56	Air pressure regulator	5	5	
57	Water pressure guage	5	5	
58	Water pressure regulator	5	5	

Order	Item	Number of project involved	Quantity required	Remarks
59	Standard soil compactor	5	1	
60	Gypsum moisture block with accessories	5	1	
61	Low speed centrifuge	4	1	
62	Volumetric pressure plate extractor with accessories	4	1	
63	Thermohygrograph	4	1	
64	Constant temperature cabinet	4	1	
65	Constant head permeameter	4	5	
66	Double-ring infiltrometer	4	1	
67	Pocket calculator	3	2	
68	Modulus of rupture apparatus	3	1	
69	Planimeter	3	2	
70	Pressure Tempe cell	3	24	
71	Osmometer	3	1	
72	Class A pan evaporimeter	3	1	
73	Vacuum pump	3	1	
74	Mixer	3	1	
75	Electrical stopwatch	3	1	
76	Moisture can	3	100	
77	Sedimentation cylinder	3	6	
78	Glass, plastic tubes	3	open	
79	Vacuum desiccator	3	2	
80	Mercury	3	open	
81	Clamp, stand and clip	3	100	
82	Graduated cylinder	3	20	
83	Suction flask	3	6	
84	Pycnometer	3	5	
85	Soil auger	3	5	
86	Soil tube	3	5	

I. Routine Equipment

Priority: Secondary

Order	Item	Number of project involved	Quantity required	Remark
1	Flame photometer	10	1	
2	Spectrophotometer	10	1	
3	Top-loading balance	9	1	
4	Grinder for plant sample	9	1	
5	Grinder for soil sample	9	1	
6	Pipetting machine	8	1	
7	Pipette washer	8	1	
8	Micro-Kjeldahl digestion apparatus	8	4	
9	Muffle furnace	8	2	
10	Pipette dryer	7	1	
11	Electrical conductivity bridge	7	1	
12	Bouyoucos hydrometer	7	3	
13	Two-way pipette	7	5	
14	Undisturbed soil core sampler	7	1	
15	Torsion balance	6	2	
16	Stirring hot plate	6	1	
17	Blender	6	1	
18	Titration	6	2	
19	Sieve, 8" diameter	6	2	
20	Colorimeter	6	1	
21	Multichannel dewpoint microvoltmeter	6	1	
22	Yoder type wet sieving machine	6	1	
23	Triple beam balance	5	2	
24	Air pressure guage	5	5	
25	Air pressure regulator	5	5	
26	Water pressure guage	5	5	

I. Routine Equipments

Priority: Secondary

Order	Item	Number of project involved	Quantity required	Res
27	Water pressure regulator	5	5	
28	Standard soil compactor	5	1	
29	Gypsum moisture block with accessories	5	1	
30	Constant head permeameter	4	5	
31	Double-ring infiltrometer	4	1	
32	Pocket calculator	3	1	
33	Planimeter	3	1	
34	Osmometer	3	1	
35	Vacuum pump	3	1	
36	Sedimentation cylinder	3	6	
37	Suction flask	3	6	
38	Pycnometer	3	5	

Summary of Equipment Required For
Soil and Fertilizer Testing and applied Research Unit

II. Specialized Equipment

Priority: First

Order	Item	Quantity required	Remark
1	Moisture equivalent centrifuge	1	
2	Falling head permeameter	3	
3	Multi-channel dewpoint microvoltmeter with accessories	1	
4	Soil psychrometer probe	100	
5	Psychrometer sample chamber (for punched leaf)	2	
6	Thermocouple junctions and alloy wire	100	
7	Intact leaf psychrometer	10	
8	Constant head burette	24	
9	Oxygen diffusion apparatus	1	
10	Oxygen analyzer	1	
11	Light intensity meter	1	
12	Temperature sensor/transducer	10	
13	Multi-channel temperature monitor	1	
14	atmospheric hygrometer with accessories	1	
15	Mill for sugarcane	1	
16	X-ray spectograph	1	
17	X-ray fluorescence spectograph	1	
18	Microscope with camera	1	
19	Grinder for fertilizer materials	1	
20	Blender for fertilizer materials	1	
21	Mixer for soil and fertilizer materials	1	
22	Agitator for fluid-solid mixing	1	
23	Tylor sieve with lid and bottom pan (various size)	1	

Order	Item	Quantity required	Remark
24	Testing sieve shaker or vibrator (various size)	1	
25	Hardness tester	1	
26	Automatic timer	1	
27	Bulk density box and cup	1	
28	Slotted single tube probe bagged fert.	1	
29	Double tube probe bulk fert.	1	
30	Stream sampling cup belt fert.	1	
31	Chloride tester	1	

II. Specialized Equipment

Priority : Second

Order	Item	Quantity required	Remark
1.	Falling head permeameter	2	
2.	Light intensity meter	1	

Summary of Equipment Required For Seed Technology Unit

Priority: First

Order	Item	Quantity required	Remark
1	Germinator (cabinet type) (Dark and light with Alternating temperature control)	1	
2	Analytical balance	1	
3	Top-loading balance	1	
4	Oven (electrical oven)	1	
5	Quick moisture tester	1	
6	Seed divider	1	
7	Refrigerator	2	
8	Stereoscopic microscope with camera	1	
9	Compound microscope	1	
10	Incubator	1	
11	Desiccator	5	
12	Grain thermometer *	3	
13	Aging chamber (Relative humidity and temperature control)	1	
14	Electrical conductivity bridge	1	
15	Autoclave	1	
16	Seed dryer	1	
17	Respirometer	1	
18	Germinator (Cabinet, slant tray)	1	
19	Bag-sealer	1	
20	Can-sealer	1	
21	Seed hand screen (sieve) (each set consists about 10-12 screens of different size of perforated opening)	4	
22	Sample pan	20	
23	Humidity guide *	1	
24	Grain probes *	5	

* To serve post harvest physiology of cereal grain and legumes

Priority: Second

Order	Item	Quantity required	Remark
1	Germinator (cabinet type) (Dark and light with alternating temperature control)	1	
2	Seed cleaner (small model)	1	
3	Digital moisture computer	1	
4	Vacuum counter	1	
5	Stirring hot plate	1	
6	Scarifier	1	
7	Mixer	1	
8	Hot water bath	1	
9	Seed blower	1	
10	Thermohygrograph	1	
11	Blender	1	
12	Refrigerator	1	
13	Air pump	1	
14	Germination boxes	80	
15	Gravity table (small model)	1	
16	Stove	1	
17	Relative Humidity Indicator	1	
18	Transfer chamber	1	
19	Clinical centrifuge	1	
20	pH meter	1	

Priority: Third

Order	Item	Quantity required	Remark
1	Germinator (room type)	2	
2	Aging chamber	1	
3	Purity working board	40	
4	Magnifier	40	
5	Aluminum dish	40	
6	Sample pan	20	
7	Seed blower	1	
8	Counting board	10	
9	Vacuum counter	1	
10	Triple-beam balance	1	
11	Electrical oven	1	
12	Transfer chamber	1	
13	Dissecting apparatus	10	
14	Evaporator	2	
15	Chromatographic apparatus	1 set	
16	Microscope	1	
17	Spectrophotometer (visible range)	1	
18	Thermohygrograph	1	
19	Seed counter	1	
20	Seed divider	1	
21	Seed cleaner and grader (small model)	1	
22	Ultraviolet lamp	1	
23	Electrophoresis apparatus	1	
24	Glassware	open	

Priority: Fourth

Specialized for Seed Processing and Storage

Order	Item	Quantity required	Remark
1	Cold compartment	5	
2	Dehumidifier	4	
3	Thermohygrograph	3	
4	Seed Dryer	2	
5	Air-screen cleaner	2	
6	Gravity Seperator	2	
7	Seed treater	1	
8	Seed thresher	2	
9	Corn sheller	2	
10	Sacking scale	1	
11	Dust collector	2	
12	Bag sealer	2	
13	Can-sealer	2	
14	Pricking conveying bilt	2	
15	Floor-level elevator feed hoppe	2	
16	Treating bin	2	
17	Sacking bin	2	
18	Storage bin	2	

Summary of Equipment Required For Culture Collection Unit

Priority: First

Order	Item	Quantity required	Remark
1	Lyophilizer and accessories (sealing torch and vacuum tester)	1	
2	Liquid nitrogen tank	1	
3	Microscope with micromanipulator	1	
4	Incubator shaker	1	
5	Deep freezer (-70°C)	1	
6	Spectrophotometer	1	
7	Fermentor	1	
8	Refrigerator	1	
9	Incubator (ambient-100°C)	1	
10	Oven	1	
11	Autoclave	1	
12	Centrifuge (low speed)	1	
13	Top loading balance	1	
14	pH meter	1	
15	Hot water bath	1	
16	Stirring hot plate	1	
17	Mixer	1	
18	Blender	1	
19	Stove	1	
20	Transfer chamber	1	
21	Micrometer	1	
22	Continuous syringe	1	
24	Bacterial membrane filter with vacuum pump	1	

Priority: Second

Order	Item	Quantity required	Remark
1	Low temperature liquid cooler	1	
2	Air pump	1	
3	Phase contrast microscope	1	
4	Refrigerated centrifuge	1	
5	Shaker	1	
6	Stereo microscope	1	
7	Haemocytometer	1	
8	Colony counter	1	
9	Micropipette	1	
10	Desiccator	1	

Priority: Third

Order	Item	Quantity required	Remark
1	Pocket calculator	1	
2	Camera	2	
3	Typewriter	1	
4	U.V. lamp	1	
5	microkjeldahl apparatus	1	
6	Triple beam balance	1	
7	Fume hood	1	
8	High speed centrifuge	1	
9	Clinical centrifuge	1	
10	Compound microscope	1	
11	Analytical balance	1	
12	Pipetting machine	1	

Summary of Equipment Required for
Postharvest Research Unit

Priority : First

Order	Item	Quantity required	Remark
1.	CO ₂ analyzer complete set* (GC)	1	
2.	C ₂ H ₄ analyzer complete set* (GC)	1	
3.	Air supplies with gas flow meter	1	
4.	Gas regulator (2 stages)	6	
5.	Infrared gas analyzer	1 set	
6.	Thermocouple thermometer (Multipoints)	2	
7.	Dehumidifiers	2	
8.	Analytical balance	1	
9.	Top loading balances (0.01 g and 0.001 g)	2	
10.	Humidifiers	2	
11.	Thermohygrographs (Weekly)	6	
12.	Standard psychrometer	1	
13.	Standard Thermometer	6	
14.	Vibration shaker	1	
15.	Refractometer (table type)	2	
16.	Nitrogen analyzer	1	
17.	Vacuum oven	1	
18.	Oven	1	

Summary of Equipment Required For
Postharvest Research Unit

Priority : Second.

Order	Item	Quantity required	Remark
1	Hydrocooler	1	
2	Force-Air-cooler	1	
3	Vacuum cooler	1	
4	Ice making machine	1	
5	Thermocouple Thermometer (multipoints)	4	
6	Juice extractor	2	
7	Pressure tester	4	
8	Triple beam balance	1	
9	Spectrophotometer	1	
10	Temperature controlled centrifuge	1	
11	Hot water bath with shaker	2	
12	pH meter	1	
13	Titrator	2	
14	Vacuum shaker	1	
15	Refrigerator	1	

Summary of Equipment Required For
Environmental Science Unit

Priority I: Water Pollution

Order	Item	Quantity required	Remark
1	B.O.D. apparatus	1 set	
2	Ion-analyzer recorder (portable)	1 set	
3	Spectrophotometer (visible light)	1	
4	Clinical centrifuge	1	
5	Turbidity meter	5 sets	
6	Electrostatic precipitator	1	
7	Sediment sampler	5 sets	
8	3tereoscopic microscope	2	
9	Analytical balance	1	
10	pH meter	2	
11	Incubator	2	
12	Refrigerator (6 cubic feet)	1	
13	Oven	2	
14	Mixer	1	
15	Blender	1	
16	Turbidity meter	5 sets	
17	Current meter	1	
18	Hot plate (small)	1	
19	Stirring hot plate	1	
20	Desiccator	2	
21	Water analyzer	1 set	

Priority II: Soil and agricultural pollution

Order	Item	Quantity required	Remark
1	Thin-layer chromatography	1 set	
2	Paper chromatography	1 set	
3	Electrophoresis apparatus	1 set	
4	Extraction apparatus	1 set	
5	Neutron moisture probe	1 set	
6	Soil hygrometer / psychrometer	50 sets	
7	Blender	1	
8	Mixer	1	
9	Evaporator	2	
10	Hot plate (small)	1	
11	Stirring hot plate	1	
12	Top-loading balance	1	
13	Analytical balance	2	
14	Triple beam balance	1	
15	Oven	1	
16	Hot water bath	1	
17	Desiccator	1	
18	Refrigerator	1	

Priority III: Biological assay.

Order	Item	Quantity required	Remark
1	Liquid scintillation counter	1	
2	Blender	1	
3	Mixer	1	
4	Incubator	1	
5	Clinical centrifuge	1	
6	Microscope	1	
7	Stereomicroscope	1	
8	Air pump	1	
9	Hot water bath	1	
10	Asman type psychrometer	1	
11	Thermotygraph	1	
12	Desiccator	2	
13	Refrigerator	1	

Priority IV: air pollution

Order	Item	Quantity required	Remark
1	Infrared gas analyser	1	
2	Gas analyzer	5	
3	Ozonator	1	
4	Air sampler	10	
5	Air chamber	1	
6	Air pump	1	
7	Atomic absorption spectrophotometer	1	
8	Film cupboard	1	
9	Anemometer (Hot wire)	1	
10	Noise level meter	3	
11	Sound analyzer	1	
12	Recording raingauge	5 sets	
13	Recording staff gauge	10 sets	
14	Non-recording raingauge	50 sets	
15	Non-recording staff gauge	50 sets	
16	Thermohygrograph	5	

Summary of Equipment Required for
Greenhouse Proper (Headhouse and Greenhouse)

Priority: First

Order	Item	Quantity required	Remark
1	Soil grinder	2	
2	Soil sterilizer	2	
3	Soil mixer	2	
4	Vacuum dust-collector	2	
5	Agricultural tools	open	
6	Conventional facilities for green house experiments such as pots.	open	
7	Top-loading balance	3	
8	Balance, 5 kg. capacity	2	
9	Balance, 10 kg. capacity	1	
10	Oven	2	
11	Moisture tester	5	
12	Plant sterilizer	1	
13	Fertilizer mixer	1	
14	Fertilizer grinder	1	

Priority: Second

Order	Item	Quantity required	Remark
1	Thermohygrograph	6	
2	Balance, 20 Kg. capacity	1	
3	Hot air circulation oven, size 3x5x4 m.	2	
4	Combine paddy thresher and cleaner, lowest capacity	1	
5	Rice huller	1	
6	Corn sheller	1	
7	Seed thresher	2	
8	Seed cleaner	2	
9	Grinder for plant sample	2	
10	Deionizer	1	
11	Dehumidifier	5	

Priority: Third

Order	Item	Quantity required	Remark
1	Humidifier	6	
2	Vacuum dry oven	2	
3	Seed grader	1	
4	Fertilizer bulk blender	1	
5	Fertilizer granulator	1	

Summary of Equipment Required for
Central-Biochemistry Unit

Order	Room	Item/Priority	Quantity required	Remark
1	Microscope	1 Accessories for electron microscope such as vacuum evaporator, and ultrasonic cleaner (if not included in grant aid)	1	
		2) Ultramicrotome with GLASS knife breaker, automatic microtome knife sharpener and specimen trimmer	1	
		3) Research microscope	1	
		4) Stereoscopic microscope	1	
		5) Rotary microtome	1	
		6) Scanning electron microscope with necessary accessories such as critical point dryer, freeze etching and accessories for physical and engineering studies	1	
2	General prepara- tion	1) Sterilizer	1	
		2) Autoclave (large)	1	
		3) Autoclave (medium)	2	
		4) Oven (large)	2	
		5) Deionizer	1	
		6) Water distillizer (glass)	4	
		7) Ice cube maker	1	
		8) Laboratory cart	4	

Order	Room	Item/Priority	Quantity required	Remark
		9) Autoclave (small)	5	
		10) Oven (small)	2	
		11) Glassware automatic washer	1	
3	Central- biochemistry laboratory II	1) Ultraviolet spectrophotometer	1	
		2) Chromatographic apparatus	2	
		3) Gas-chromatograph-mass spectrophotometer	1	
		4) Liquid chromatograph	1	
		5) Amino acid analyzer	1	
		6) Electrophoresis apparatus	2	
		7) Infrared spectrophotometer	1	
		8) Nuclear magnetic resonance apparatus	1	
		9) Thermal analyzer	1	
		10) Flame photometer	1	
		11) Analytical balance	1	
		12) Top-loading balance	1	
		13) pH meter	1	
		14) Refrigerator	2	
		15) Clinical centrifuge	1	
		16) Automatic titrator	1	
		17) Microburet	1	
		18) Stirring hot plate	2	
		19) Hot plate (small)	1	
		20) Hot plate (large)	1	
		21) Laboratory cart	1	
4	Central- biochemistry laboratory	1) Kjeldahl digestion apparatus	2	
		2) Kjeldahl distillation apparatus	2	
		3) Soxhlet extractor	2	
		4) Evaporator (rotary)	2	
		5) Refrigerated centrifuge	1	

Order	Room	Item/Peiority	Quantity required	Remark
		6) Ultracentrifuge	1	
		7) Clinical centrifuge	2	
		8) Grinder, wiley	1	
		9) Grinder, cyclone	1	
		10) Analytical balance	2	
		11) Top-loading balance	1	
		12) pH meter	1	
		13) Refrigerator	3	
		14) Incubator	5	
		15) Polarimeter	1	
		16) Fluorometer	1	
		17) Shaker, platform type	1	
		18) Shaker, wrist action	1	
		19) Muffle furnace	2	
		20) Hot water bath	4	
		21) Microkjeldahl apparatus	3	
		22) Oven	4	
		23) Autoclave	1	
		24) Desiccator	5	
		25) Stirring hot plate	3	
		26) Vacuum-air pump (large)	2	
		27) Homogenizer	1	
		28) Hot plate (small)	2	
		29) Vacuum-air pump (small)	2	
		30) Hot plate (large)	1	
		31) Laboratory cart	2	
5	Photography	1) Enlarger	1	
		2) Washing tank	1	
		3) Paper drum dryer	1	
		4) Film duplicator	1	
		5) View camera	1	
		6) Illuminator (various types)	1 set	

Order	Room	Item/Priority	Quantity required	Remark
		7) Camera	2	
		8) Copying stand	2	
		9) Tripod (various types)	1 set	
		10) Exposure meter	1	
		11) Refrigerator	2	
		12) Automatic timer	1	
		13) Transparency cabinet	3	
		14) Film developing system	1 set	
		15) Paper developing system	1 set	
		16) Film dryer cabinet	1	
		17) Microprojector	1	
		18) Film cabinet	3	
		19) Camera cabinet	2	
		20) Slide projector	2	
		21) Screen	1	
		22) Paper trimer	1 set	
		23) General equipment and apparatus for dark room and studio	open	
6	Art and studio	1) Drawing table	2	
		2) Drawing tool	3	
		3) Copying machine	1	

Summary of Equipment Required for
Plant Pest Clinic and Quarantine Unit

Priority : First

Order	Item	Quantity required	Remark
1	Airconditioned trailer equipped with all instruments necessary for basic diagnosis of plant diseases and pests	1	Specialized equipment
2	Differential Interference contrast microscope	2	
3	Compound microscope	2	
4	Stereomicroscope	2	
5	Transfer chamber	1	
6	Refrigerator	2	
7	Incubator	5	
8	Shaker	1	
9	Vibro-mixer	3	
10	Stirring hot plate	1	
11	Desicator	5	
12	Analytical balance	1	
13	Top-loading balance	1	
14	Triple-beam balance	1	
15	Spectrophotometer (visible light)	1	
16	pH-meter	1	
17	Oven	3	
18	Hot water bath	1	
19	Autoclave	1	
20	Blender	3	
21	Sieve (30, 50, 100, 200 and 325 mesh)	1	
222	Stove	1	
23	Fumigator	1	
24	Interferometer	1	

Priority : First (Cont.)

Order	Item	Quantity required	Remark
25	Berlese type collector	1	
26	Gas-leak detector	1	
27	Respirator	1	
28	Camera	1	
29	Thermohygrograph	1	
30	Topical sprayer	1	
31	Sprayer and safe equipment for insecticide application		
	Power sprayer	1	
	Knapsack mist blower	1	
	Boom type sprayer	1	
	ULV sprayer	1	
32	D-Vac suction sampling device	1	for sampling and estimating pest populations
33	Oscilloscope	1	for study the differentiation pest population physiologically
34	Microapplicator	1	for microassay in toxicology
35	Calculator	2	
36	Ultrasonic disintegrator and emulsifier	1	
37	Sweep codistillator	1	

Priority : Second

Order	Item	Quantity required	Remark
1	Typewriter (Thai)	1	
2	Typewriter (English)	1	
3	Pocket calculator	1	
4	Stereo-microscope	6	
5	Refrigerator	3	
6	Compound microscope	3	
7	Mixer	1	
8	Thermohygrograph	5	
9	Stereo-microscope with camera	1	
10	Clinical centrifuge	1	
11	Hot plate (small)	2	
12	Elutriator	1 set	
13	Sieve (30, 50, 100, 200 and 325 mesh)	1 set	
14	Oven	1	
15	Stirring hot plate	2	
16	Mixer	1	
17	Blender	1	
18	Autoclave	2	
19	Hot water bath	1	
20	Berlese type collector	1	
21	Thermal conductivity meter	1	
22	Gas leak detector	1	
23	Respirator	2	
24	Incinerator (large)	1	
25	Electrophoresis apparatus	1	
26	Refrigerated centrifuge	1	
27	Homogenizer	1	
28	Soxhlet extraction apparatus	1	
29	Millipore filter	1	
30	Millipore filter (swinnny type)	5	
31	Freezing microtome	1	

Priority : Third

Order	Item	Quantity required	Remark
1	Desk calculator	2	
2	Hot plate (small)	2	
3	Stereo-microscope	3	
4	• Camera lucida	2	
5	Desiccator	3	
6	Air-vacuum pump	1	

Summary of Equipment Required For
Central Administrative Office

Order of priority	Item	Procurement Plan			Total
		first priority 1979	second priority 1980	third priority 1981	
1	Typewriter (Thai)	3	-	-	3
2	Typewriter (English)	2	-	-	2
3	Stencil duplicator	1	1	-	2
4	Copying machine	1	-	-	1
5	Overhead projector	1	1	-	2
6	Slide projector	2	1	-	3
7	Screen	3	-	-	3
8	Sound system	1	1	-	2
9	Refrigerator	1	1	1	3
10	Text book	open	open	open	open
11	Journal	open	open	open	open
12	Programmable calculator	1	-	-	-
13	Desk calculator	3	-	3	6
14	Pocket calculator	3	2	-	5
15	Stencil cutter	-	1	-	1
16	Tape recorder	-	1	-	1
17	Microfilm reader printer	-	-	1	1
18	Binder, thread and wire	-	-	1	1
19	Paper guillotine	-	-	1	1
20	Motion picture projector (8 (8 mm.))	-	-	1	1
21	Motion picture projector (16 mm.)	-	-	1	1
22	Rear screen projector	-	-	3	3

List of Some Glassware Required For
The Whole Complex

Order	Item	Size/volumm	Quantity required	Remark
1.	Beaker	Capacity 100 ml. 250 ml. 300 ml. 500 ml. 1,000 ml.	100 each	
2.	Cylinder	Capacity 50 ml. 100 ml. 250 ml. 500 ml. 1,000 ml.	50 each	
3.	Erlenmeyer flash	Capacity 125 ml. 250 ml. 500 ml. 1,000 ml.	100 each	
4.	Petri dish	diameter 10 cm.	1,000	
5.	Pipette	capacity 1 ml. 3 ml. 5 ml. 10 ml. 25 ml.	100 each	
6.	Test tube	length 15 cm.	2,000	

Remark: Remaining glasswares required will be requested from Thai budget.

6 総合研究センターに関する資料

Information Concerning Technical

Cooperation for Central Laboratory and Greenhouse Complex

Agricultural Extension Center/Agricultural Machinery and Equipment Center

1. Research Project Requiring Facilities of Central Laboratory and Greenhouse Complex.
2. On-going Research Projects at Kasetsart University (Fiscal year 1978)
3. Allocation of the Equipment for Central Laboratory and Greenhouse Complex.
4. Revised Cost Estimation and Floor Area Requirements for Remaining Components.
5. Revised Supplementary information/activities/personnel.
6. Expert and Fellowship.
7. Request for New Technical Assistance Project.

JULY 1978

RESEARCH PROJECT
REQUIRING FACILITIES OF
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

KASETSART UNIVERSITY
KAMPHAENGAEN CAMPUS

JULY 1978

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I . Research on Culture Collection

project title: Collection of microorganisms of agricultural importance.

Objective: The purpose of this project is to isolate and identify microorganisms which are important to agriculture. This will include microorganisms concerned in many special fields that we will provide cultures for researchers and also preserve those cultures sent to the collection unit from other departments. The maintained cultures will be tested for all properties and characteristics stated in the description of species. Special preservation techniques for some microorganisms also will be investigated, although most of the cultures will be preserved by lyophilization.

Subproject title: Collection of microorganisms concerned in food fermentation.

Objective: This project is aiming at microorganisms concerned in the local fermented food which are generally practiced by natural fermentation. Improvement of the quality of the products can be obtained only by using the selected strains, so investigation of microorganisms concerned in the fermentation and selection of the potent strains will be carried out.

Subproject title: Collection of microorganisms concerned in soil fertility.

Objective: The nitrogen fixing bacteria such as Rhizobium and Azotobacter are important to plant growth and soil fertility.

Although application of Rhizobium strains are world wide recognized, however, the local Rhizobium strains are rarely tested for their ability of nitrogen fixation. To serve this purpose, the potent strains of Rhizobium for each crop will be tested and distributed to the concerned unit for their applications.

Azotobacter, although difficult for its application, is very interesting because of its ability to fix nitrogen nonsymbiotically which is important to soil fertility.

Mycorrhiza is a root associating fungus that helps in absorption of some nutrients such as inorganic phosphate. Some of them can be isolated as pure culture. Investigation of these fungi in various crops also will be carried out.

Subproject title: Collection of microorganisms concerned in plant and animal pathogens.

The collection unit will cooperate with the department of plant pathology and animal pathology to preserve the cultures for research purposes. The methods of preservation of these cultures will be tried because there are many problems for preservation of these cultures, since virulence can be lost easily after frequent transferring of the cultures.

Project title: Investigation of microorganisms for industrial application.

There are many low cost agricultural products that can be used as substrates for industrial fermentation. Many kinds of microorganisms are employed in industrial fermentation, but maintenance of these cultures for industrial purpose is still lacking in our university. In order to promote research activities in agro-industry, the culture collection unit should provide the cultures to researchers in this field. apart from this, isolation and screening of cultures for industrial application should be investigated. These will included, for examples, acetic, citric and lactic fermentation, alcoholic fermentation, amylolytic enzyme production and single cell protein production. Usually, the selected strains will adapt to the local environmental conditions better than the strains derived from abroad, then it is worth to investigate our local strains for their potential in industrial application.

List of equipment:

See allocation list

Additional equipment

Order	Item	Quantity required
1	U-V lamp	1
2	Micro-Kjeldahl apparatus	1 set
3	Fermentor	1

V. Research on Plant Pests and Diseases.

Project title: Special Training in Diagnosis of Plant Diseases.

Objective: .

1. To train selected farmers, researchers, students, and interested person the basis diagnosis of plant diseases.
2. To alert farmers to the early stages of disease development.
3. To serve as the center for monitoring technical data concerning plant disease development and preventive control.

List of equipment:

Order	Item	Quantity required
1.	Compound microscope	10
2.	Stereomicroscope	10
3.	Refrigerator	3
4.	Incubator	5
5.	Mixer	2
6.	Hood	1
7.	Air pump	2
8.	Pressure cooker	1
9.	Camera	1
10.	Sieve	1 set
11.	Freezing microtome	1
12.	pH meter	1
13.	glassware	open
14.	Top loading balance	1

See also general equipment in allocation list

Project title: Mobile Plant Clinic

Objective:

1. To provide local and long distance assistance in diagnosis of plant pest and disease problems.
2. To give prompt and accurate effective control measures.
3. To collect useful informations pertinent to the prevention of the outbreak of any potentially important pest or disease.

List of equipment:

Order	Item	Quantity required
1.	Special "air conditional trailer equipped with necessary laboratory instruments for plant pest clinic and simple soil test."	

Project title: Control of the important diseases of sugarcane cause by virus, bacteria and mycoplasma.

Objective:

1. To study and characterized disease of sugarcane due to virus, mycoplasma and bacteria
2. To investigate the methods of diseases control

List of equipment:

Order	Item	Quantity required
<u>I Virus diseases studies</u>		
1.	Blender	2
2.	Magnetic stirrer	1
3.	Air vacuum pump	1
4.	uv/visible spectrophotometer and recorder equipped with gel scanner	1
5.	Refrigerator centrifuge	1
6.	Preparative ultracentrifuge	1
7.	Disc-gel electrophoresis apparatus	1
8.	Water bath	1
9.	Density-gradient fractionator	1
10.	Stereomicroscope	1
11.	Refrigerator	1
12.	Growth chamber	1
13.	Ultramicrotome and glass knife-maker	1

Order	Item	Quantity required
14.	Scanning electron microscope	1
15.	Vacuum evaporator	1
16.	Serological bath	1
17.	Insect proof cage (small)	5
18.	Insect proof cage (large)	5
<u>II. Mycoplasma diseases studies</u>		
19.	blender	1
20.	analytical balance	1
21.	top loading balance	1
22.	desiccator	3
23.	Stereoscopic with camera	1
24.	Ultraviolet microscope	1
25.	incubator	1
26.	mixer	1
27.	transfer chamber	1
28.	shaker	1
29.	water bath	1
30.	pH meter	1
31.	spectrophotometer	1
32.	clinical centrifuge	1
33.	magnetic stirrer	1
34.	millipore filter (swinnny stainless, 13 mm.)	12
35.	millipore filter	1 set
36.	vacuum pump.	1
37.	insect proof cage (small)	5
38.	insect proof cage (large)	5

Order	Item	Quantity required
<u>III. Bacterial diseases studies</u>		
39.	Research microscope	1
40.	Transfer chamber	1
41.	spectrophotometer	1
42.	pH meter	1
43.	stereomicroscopic	1
44.	Refrigerator	1
45.	incubator	2
46.	shaker	1
47.	mixer	1
48.	water bath	1
49.	Homozenizer	1
50.	Sterring hot plate	1
51.	Freezing microtome	1
52.	Dissicator	3
53.	Thermohygrograph	1
54.	Triple beam balance	1
55.	Analytical balance	1
56.	Top loading balance	1
57.	hot plate	2
58.	Rotary microtome	1
59.	microtome knife sharpener	1

Project title: Studies on Control of Citrus and Durian Decline.

Objective:

1. To study the symptoms of the diseases and isolate the causal agents.
2. Studies on methods of therapy, especially, antibiotic therapy by direct injection.
3. To investigate or to find the resistant varieties.
4. To study the methods of diseases control for the new plantation area.

List of equipment:

Order	Item	Quantity required
1.	Electron microscope	1
2.	Ultramicrotome	2
3.	Research Microscope (UV microscope)	1
4.	Refrigerated Centrifuge	1
5.	Refrigerator	3
6.	Incubator	5
7.	Electrophoresis apparatus	2
8.	Spectrophotometer	1
9.	blender	2
10.	air-vacuum pump.	1

See also general equipment in allocation list.

Project title: Insect Pests of Field Crops and Their Control

- Sub-Project A: Studies on insect pests of corn
" B: Studies on insect pests of cotton
" C: Studies on insect pests of sorghum
" D: Studies on insect pests of soybean
" E: Studies on insect pests of sugarcane

Objectives:

1. To develop methods of sampling techniques for estimation of pest population
2. To establish economic threshold for the major pests.
3. To develop systems of cropping and habitat management as means of ecological control of key pests, including crop rotation, mechanical and cultural control.
4. To develop selective insecticides, pathogens and pheromones for reduction of pest population below economic threshold.
5. To search for parasites, predators and pathogens that might be introduced for regulation of pest population.
6. To develop resistant varieties to major insect pests.

Justification:

Insect pests are considered as limiting factors for crop production in Thailand. They are responsible for damaging and devastating economic crops year after year. In 1968, cotton growing areas were wiped out by the American bollworm, Heliothis armigera (Hiebner). The Bombay locust,

Patanga succincta Linn. caused a tremendous loss to corn grown in Saraburi and Lopbure Provinces. The cost of insecticides employed in combating this grasshopper was figured close to 1,000,000 baht. Sorghum was also attacked by the sorghum shoot fly, Atherigona varia siccata Ronel. The bean fly, Agromyza phaseoli Cop. has played an important role for soybean production. The scale insect, Aularapis tegolensis caused severe damage to sugarcane plantation. Some insects become resistance to insecticides. The appropriate method should be developed for suppressing them. As the aboved statement, the project on insect pests of field crop and their control should be encouraged and supported in order to protect the crops from noxious insects.

List of equipment:

Order	Item	Quantity required
1.	D-VAC-suction sampling devide	1
2.	Micro-applicator	1
3.	Tropical mist sprayer	1
4.	Power-sprayer	2
5.	Hygrothermograph	2
6.	Incubator	2
7.	Top-loading balance	1
8.	Analytical balance	1

Order	Item	Quantity required
9.	Stereo-Zoom microscope	1
10.	Mass rearing room	1
11.	Greenhouse	1

See also general equipment in allocation list.

Project title: Insect Pests of Fruit tree and their Control

- Objective:
1. To study the life history and ecological aspects of the main insect pests of some fruit trees, defoliators, leaf suckers, stem borers, fruit damage insects and termite.
 2. Mass rearing the main insect pests for study the method how to control their problem
 3. To study the efficient method for control insect pests of fruit tree

List of equipment:

Order	Item	Quantity required
1	High power binocular stereomicroscope with set of camera	1 set
2	Incubator	2
3	Thermo-hygrograph	1 set
4	Sprayer and safety equipment for insecticide application	
	4.1 Granular chemical applicators-hand operated	1 set
	4.2 Dust applicators-rotary duster	1 set
	4.3 Knapsack mist blower-power operated	2 sets
	4.4 Boom type sprayer-Mobile power sprayer	1 set
	4.5 Sprayer - hand operated	2 sets
	4.6 Tropical mist sprayer	1 set
	4.7 Rubber frame goggles, respirator and PVC costed gloves	2 sets

Order	Item	Quantity required
5	Air Conditioning with humidifier and dehumidifier	1 set
6	Top loading balance	1
7	Lawn mower	1
8	Water pump	1
9	Anemometer	1

See also general equipment in allocation list

Project title: Identification, characterization, evaluation and propagation of insect pathogens for agricultural uses.

Objective:

1. To identify and characterize insect pathogens naturally occur in Thailand.
2. To evaluate the effectiveness of insect pathogens for controlling the economic important pests.
3. To produce insect pathogens in large quantity using artificial media and living system.
4. To serve as a primary source of supply of the pathogens to the farmers, the general publics and personnel of government agencies.

List of equipment:

Order	Item	Quantity required
1.	Transmission electron microscope	1
2.	Scanning electron microscope	1
3.	Ultramicrotome	2
4.	Rotary microtome	2
5.	Ultraviolet spectrophotometer	1
6.	Electrophoresis apparatus	2
7.	Autoclave	2
8.	Refregerator	3
9.	Incubator	5

Order	Item	Quantity required
10.	Tissue culture chamber	1
11.	Phase contrast microscope	1
12.	Phase contrast microscope equipped with camera	1
13.	Transfer chamber	2
14.	Lyophilizer	1
15.	Homogenizer	2
16.	Stirring hot plate	2
17.	Mixer	2
18.	Blender	2
19.	Centrifuge (Low-speed)	1
20.	Contrifuge (High-speed)	1
21.	pH-meter	1
22.	Top-loading balance	1
23.	Glass-knife breaker	1
24.	Shaker (wrist action)	2
25.	Sprayer	6
26.	Density-gradient fractionator	1
27.	Colony counter	1
28.	Thermohydrograph	4
29.	General equipment and apparatus for dark room	open

See also general equipment in allocation list.

Project title: Ecological Study and Forecasting Outbreak of Some
Insect Pests around Kampaengsan area

Objective: The common usage of pesticide in insect control without knowledge of insect ecology is not sufficient to control insect in long run. Study on ecological aspect is always negligible. To emphasize the use of sound ecological knowledge will be the best way to get more efficient in insect control. The study can be categorized as follows:

1. Study on distribution, ecosystem host range, age distribution, life table, population dynamics etc.
2. Interaction between insect population and their environment (abiotic and biotic factors)
3. Effects of abiotic factors on insect pests.
4. Keeping some suitable condition to promote natural enemies.
5. Forecasting outbreak of some insect pests.

List of equipment:

Order	Item	Quantity required
1	Environmental Chamber	3
2	Calculator	1
3	Insect suction sample	1
4	Hygrothermograph	2
5	Illuminator	5

Order	Item	Quantity required
6	Salted Hollick Soil Washing apparatus	2
7	Light trap	10
8	Incubator	5
9	Refrigerator	3
10	Pick-up car	1
11	Insect cage	20
12	Differential Interference Contrast Microscope	1

See also general equipment in allocation list

Project title: Taxonomy, Biology, Ecology and Integrated Control
Program of Phytophagous Mites in Thailand.

Objective: Phytophagous mites on plants in Thailand appear to be the important pests of economic crops in recent year. However, little was done on their identification, biology, ecology, control and eradication of the pest. Therefore, the objectives of these studies are:

1. Survey, collect and identified the mites species
2. Keep the identified species in museum for type specimen collection.
3. Study on their biology and ecology
4. Survey, collect, identified and study predators and parasites for their effectiveness in the control program
5. To mass rearing the natural enemies in laboratory for pest control program
6. Set up pest management program for control the target species

List of equipment:

Order	Item	Quantity required
1	Greenhouse	1
2	Slide carbinets	10
3	ULV sprayer	5
4	Knapsack sprayer	5
5	Tropical mist sprayer	1

Order	Item	Quantity required
6	Aminco-air system isolator	1
7	Differential Interference Contrast Microscope	1
8	Microscope with Camera	1
9	Electric .1 blender	1
10	Microvoid or positive pressure hood	1
11	Ultrasonic disintegrator and emulsifier	1
12	Micro-analytical balances	1
13	Universal ovens	1
14	Vibro-mixer	2
15	Freeze-Drying or Lyophilizer	1
16	Micropore filter	1

See also general equipment in allocation list

Project title: Resistance Problem of Insect Pests in Thailand.

Objective: To provide the information of economically important pests develop their resistant potency to insecticides

1. To study the mechanism of the resistance, particularly, the main factors involve in the mechanism
2. To forecast the situation of resistant problem as well as to solve this problem by the better methods
3. To elucidate the resistant occurrence which assure the variation of pest population

List of equipment:

Order	Item	Quantity required
1	Microapplicator	1 set
2	Electrophoresis	
	- disc electrophoresis	1 set
	- gel electrophoresis	1 set
3	Oscilloscope	1
4	Spectrophotometer	1
5	pH meter	1
6	Thermohygrograph	2
7	Refrigerator	3
8	Rearing chamber	10 sets
9	Air conditioning set with dehumidifier	2 sets
10	Glassware apparatus full set	open

See also general equipment in allocation list

Project title: Laboratory mass rearing of the pink bollworm
Pectinophora gossypiella (Saunders) and studies
of the potential of their predators and parasites
in the cotton fields

Objective: The proposal is set up with the following objectives

1. To establish the colony of the pink bollworm
for the research sake
2. To minimize the application of the insecticides
and maximize the utilization of the effective natural enemies
at the same time
3. To search for the most effective measure for
controlling the pink bollworm which are expected to cause
the outbreak in the near future.

List of equipment:

Order	Item	Quantity required
1	Incubators	5
2	Electrical blender	2
3	Electrical balance	1
4	D-Vac sampler	2
5	Refrigerator	3
6	Series of Sieves	1 set
7	Binocular microscope	2

See also general equipment in allocation list

III. Research Project in Seed Technology

Project title: Seed Longivity, Vigor, and Storability of Cereals,
Legumes, Forages and Vegetables.

Objective:

1. Determine the quality of economics cereals, legumes, some forage and vegetable seeds in term of seed viability, vigour and storage potential under local environmental condition.
2. Establish the procedure and/or general uncomplicated method for seed storage and quality control to obtain good quality seed.

List of equipment:

Order	Item	Quantity required
1.	Aging chamber	3
2.	Air pump	1
3.	Analytical balance	1
4.	Top loading Balance	1
5.	Blender	2
6.	Cold compartment	2
7.	Dessicator	5
8.	Electrical oven	3
9.	Electrical conductivity bridge	2
10.	Germination boxes	80
11.	Gravity table (small model)	1
12.	Hand lens	20

Order	Item	Quantity required
13.	Hand screen	10
14.	Hot-water bath	2
15.	Incubator	5
16.	Microscope	1
17.	pH-meter	1
18.	Refrigerator	3
19.	Respirameter	1
20.	Scarifier	2
	Seed germinator	5
21.	Slant-tray Germinator	1
22.	Thermohydrograph	4

Project title: Techniques for the detection of seed-borne organisms
and virus of Leguminous crops.

Objective:

To test for efficient method for detection of seed borne
organisms and virus of Leguminous crops.

List of equipment:

Order	Item	Quantity required
1.	Analytical balance	1
2.	pH meter	1
3.	Clinical centrifuge	1
4.	Refrigerator	2
5.	Oven	2
6.	Hot plate (small)	2
7.	Stirring hot plate	1
8.	Microscope	1
9.	Stereoscopic microscope	1
10.	Stereoscopic microscope with camera	1
11.	Desicator	3
12.	Air pump.	1
13.	Autoclave	1
14.	Stove	1
15.	Transfer chamber	1
16.	Glassware	open

Project title: Studies on longevity of germ plasm in different types of storage conditions of economic cereal, legume, vegetable, and flower seeds.

Objective:

1. To find out the suitable moisture content and temperature in prolonging the viability of these crops.
2. To find out the type to packaging for different period of storage.
3. To obtain the data which benefit to plant breeder and geneticist whom involve in crop improvement.

List of equipment:

Presented in additional list

project title: Studies on the present situation of commercial seed processing and storage in Thailand.

Objective:

1. To find out the viability and quality of seed in different type packaging material and storage condition.
2. To find out the speed of seed deterioration under conventional type of storage and environmental control.
3. To find out the problems concerning seed processing, packaging and storage.

List of equipment:

presented in additional list.

Project title: Studies on the longevity of commercial seed in different types of packaging and storage condition of economic cereals, legumes, vegetables, and flowers.

Objective:

1. To find out the suitable moisture and temperature in prolonging the viability of these crops.
2. To find out the proper type of packaging in different period of storage.
3. To obtain the data which benefit to plant breeder, geneticist whom involve in crop improvement.

List of equipment:

presented in additional list.

Project title: Studies on standardization of seed quality testing
emphasis on economic tropical species in Thailand.

Objective:

1. To find out the proper conditions facilitating the best germination which is not available from ISTA rules.
2. To standardize the new technique for tropical species.
3. To test the consistency of the results obtaining from these findings.

List of equipment:

presented in additional list

Project title: Maintenance of breeder seed and registered seed produced
Kasetsart experiment stations.

Objective

1. To multiply these classes of seeds which show a good adaptability, insect and pest resistance and high yielding varieties.
2. To serve as the source of training in seed technology for technicians and scientists.

List of equipment:

List of equipment for the 5 preceding projects

Order	Item	Quantity required
1	Purity working board	40
2	Magnifier	40
3	Aluminium dish	40
4	Sample pan	40
5	Seed blower	2
6	Seed and grain sieve	4
7	Analytical balance	1
8	Top-loading balance	1
9	Triple-beam balance	1
10	Oven	1
11	Quick moisture tester	2
12	Digital moisture computer	1
13	Seed divider	2
14	Seed cleaner	1
15	Stereoscopic microscope	1
16	Refrigerator	1
17	Incubator	2

Order	Item	Quantity required
18	Germinator (cabinet type)	3
19	Germinator (room type)	2
20	Germination box	80
21	Aging chamber	2
22	Counting board	10
23	Vacuum counter	2
24	Seed counter	1
25	Dissecting apparatus	10
26	Thermohygrograph	2
27	Cold compartment	1
28	Glassware	open
29	Seed thresher	2
30	Corn sheller	2
31	Picking-conveying belt	2
32	Floor-level elevator feed hopper	2
33	Air-screen cleaner	2
34	Gravity separator	2
35	Seed treater	1
36	Treating bin	2
37	Sacking bin	1
38	Sacking scale	1
39	Bag-sealer	2
40	Can-sealer	2
41	Dust-collector	2
42	Storage bin	2
43	Seed dryer	2
44	Temperature and humidity control compartments	1

Equipment from order 29 to 44 are for project entitled Maintenance of breeder seed and registered seed produced by Kasetsart experiment stations.

IV. Research Project in Postharvest Technology

project title: Precooling Effects on The Storage Life of Fresh
Commodities.

Objective:

1. Comparison of different precooling technique.
2. Precooling advantage in relation to market and storage life of fresh fruits, vegetables and flowers.

List of equipment:

Order	Item	Quantity required
1.	Triple beam balance	1
2.	Ice making machine	1
3.	Hydro cooler	1
4.	Vacuum cooler	1
5.	Force air cooler	1
6.	Thermocouple thermometer (Multipoint)	4
7.	Juice extractor	2
8.	Pressure tester	4

See also general equipment in allocation list

Project title: Physiological Studies of Economic Fruits, Vegetables
and Other Commodities.

Objective:

1. Investigation of respiration.
2. Study of ethylene production
3. Study the effects of various stage of maturity of commodities on respiration and ethylene production.
4. Study the effects of storage environment in relation to respiration and ethylene production.

List of equipment:

Order	Item	Quantity required
1.	CO ₂ analyzer set (G.C)	1
2.	C ₂ H ₄ analyzer set (G.C)	1
3.	Controlled temperature rooms at 5 different temperatures (0, 5, 10, 15 and 20°C)	5
4.	Air supplier with gas flow meter	1
5.	Gas regulators (2 stages)	
6.	Analytical balance	1
7.	Top loading balances (0.01 g and 0.001 g graduation)	2

Order	Item	Quantity required
5.	Intra-red gas analyzer (set)	1
9.	Standard Thermometers	6
10.	Standard psychrometer	1
11.	Humidifiers	2
12.	Dehumidifiers	2
13.	Thermocouple Thermometer (multipoints)	2
14.	Thermohygrographs	6

See also general equipment in allocation list

Project title: Determination of free sugar and starch in fruit at different storing ages and storing conditions.

Objective:

Quality of some fruits can be badly affected by storing. Conditions in the storing rooms and length of time in the storage can affect the quality of fruits stored. Therefore, it is desirable to know the relationships of these chemical constituents (starch, free sugar, acid, protein, vitamin c, etc.) in fruits stored at different conditions.

List of equipment:

Order	Item	Quantity required
1.	Temperature adjustable - water bath with shaker	2
2.	Vacuum shaker	1
3.	Titration	2
4.	Spectrophotometer	1
5.	Temperature controllable - centrifuge	1
6.	pH - meter	1
7.	Refrigerator	1

See also general equipment in allocation list

Project title: The effects of CO₂ level on the longevity of fresh fruits and vegetable in the stored room.

Objective:

The life of fresh products is also depended on the storing conditions. It has been reported that CO₂ level can affect this storing life, however, each commodity has its own ability to stand certain CO₂ level. Therefore, to know the level of CO₂ needed to extend the longevity of each fresh products which are of economically value is desirable.

List of equipment:

Order	Item	Quantity required
1.	Infra-red gas analyser	1
2.	Cold storing room	5

See also general equipment in allocation list

Project title: Determination of amino acid and protein content in stored fruits and vegetables.

Objective:

The quality of stored fruits and vegetables includes in their nutritional values. Some useful constituents such as protein and amino acid in which plant=products contained were rather low in comparison to those from animals. Therefore, the maintenance of these compounds during storing is necessary

List of equipment:

Order	Item	Quantity required
1.	Nitrogen analyzer	1
2.	Liquid chromatograph amino acid - analyzer multichrom - B	1
3.	Vibration shaker	1
4.	Electrical balance	1
5.	Refractometer (table)	2
6.	Water distillater	1
7.	Ordinary oven	1
8.	Vacuum oven	1

See also general equipment in allocation list

Project title: Post Harvest Pests of Fruit crops

Objective: 1. To study important postharvest pests of important fruit crops

2. To prolong the shelf life of economically important fruit crops through proper control of pest in storage

List of equipment:

See equipment allocation list

V. Project in Soil Science and Fertilizer Technology

Project title: Soil management in fiber-crop production

Objective :

1. To collect pertinent data on current fertility status and physical conditions of soils that have been planted to economically important fiber crops.
2. To study responses in growth, water use, nutrient uptake and yield of important fiber crops to various sets of soil fertility levels and physical conditions.
3. To determine appropriate management scheme for each of the major soils for fiber crop production.
4. To characterize some of the important processes and phenomena, such as water infiltration and redistribution, oxygen diffusion, root penetration, nutrient movement and nutrient fixation for major fiber-crop soils

Data to be collected:

1. Basic soil chemical properties within root zone of the crops (pH, cation exchange capacity, and contents of various nutrient elements and minerals, etc.)
2. Basic soil physical properties within root zone of the crops (particle-size distribution, bulk density, particle density, water retention curve, hydraulic conductivity, oxygen diffusion rate, aggregation indices, etc.)
3. Changes in chemical and physical properties of the soils in question in the root zone due to various soil treatments and management practices.

4. Seasonal changes of chemical and physical properties of the soils in question within the root zone
5. Nutrient element contents and water status of plants grown on the soils in question.
6. Consumptive use of water for each crop grown on the soils in question.
7. Root distribution water infiltration and redistribution characteristics, and movement and recycling of plant nutrient element.

List of equipment:

Order	Item	Quantity required
1	pH meter	1
2	suction flask	10
3	vacuum pump	1
4	autoanalyzer (for N, P, K, and Ca)	1
5	Two-way pipette	10
6	Bouyocoes hydrometer	10
7	Constant temperature cabinet	1
8	undisturbed core sampler with accessories	1
9	pycnometer	20
10	pressure membrane apparatus	2
11	pressure plate apparatus	2
12	constant head permeameter	10
13	O ₂ - diffusion apparatus	1

Order	Item	Quantity required
14	O ₂ - analyzer	1
15	Set of 5" diameter sieves	4
16	Yoder-type wet sieving machine	1
17	Soil auger	5
18	Soil tube	5
19	Class A evaporation pan	1
20	Soil psychrometer probe	100
21	Dew point microvoltmeter (for soil water potential)	1
22	Double- ring infiltrometer	1
23	Neutron moisture meter	1

Project title: Soil water regimes and water relations in crop production.

Objective:

1. To characterize water relations as well as other properties and behaviors of major soils of Thailand that have been planted to selected economically important crops.
2. To obtain relationships between soil water regimes and leaf water status, growth and yield of high-yielding and potentially promising varieties of selected crops under various sets of soil fertility levels and soil management schemes.
3. To estimate water requirements of high-yielding and potentially promising varieties of selected crops during each stage of growth as well as for the entire period of growth under various combinations of soil fertility levels, soil water regimes and other soil physical conditions, and environmental conditions.
4. To determine the most desirable combination of crop variety, level of soil fertility, and soil water management scheme for production of the selected crops.

Data to be collected :

1. Basic soil chemical and physical properties.
2. Hydrologic properties of the soils involved.
3. Periodic status of soil water content, soil water potential, leaf water content, leaf water potential, and growth and yield indices of crops involved.
4. Pan evaporation data, light intensity, air temperature and humidity, etc.

List of equipment

Order	Item	Quantity required
1	See 'some physical char. of soils.'	open
2	Soil psychrometer probes	100
3	Multi-channel dewpoint microvoltmeter	2
4	Intact leaf psychrometer/hygrometer	20
5	Constant temp. room with high intensity adjustable	1
6	Light intensity meter	5
7	Analytical balance	1
8	Top-loading balance (0-5 kg)	1
9	Class A pan evaporimeter	1
10	Temperature sensor/transducer (for soil and atmosphere)	100
11	Multi-channel temperature meter	1
12	atmospheric hygrometer with accessories	1
13	Constant head permeameter	10
14	Double-ring infiltrometer	1
15	Neutron moisture gauge with accessories	1

Project title : Soil and Fertilizer Researches for Increasing
Yields of Kenaf and Jute

Objective :

1. To examine responses of kenaf and jute to fertilizers and to find suitable rate of fertilizer
2. To find suitable fertilizer usage for kenaf and jute
3. To find standard of judgement for chemical methods of soil fertility evaluation for kenaf and jute

Data to be collected :

1. Chemical and physical analysis of soils
2. Chemical analysis of plant
3. Yields of fiber, dry matter, etc.

List of equipment :

Order	Item	Quantity required
1	Typewriter (Thai)	1
2	Typewriter (English)	1
3	Desk Calculator	1
4	Pocket Calculator	1
5	Camera	1
6	Analytical Balance	1
7	Top-loading Balance	1
8	Triple-beam Balance	1
9	Torsion Balance	1

Order	Item	Quantity required
10	Platform Balance	1
11	pH meter	1
12	Spectrophotometer	1
13	Clinical centrifuge	1
14	Moisture Equivalent centrifuge	-
15	Refrigerator	1
16	Hot water bath	1
17	Hot plate	1
18	Stiring hot plate	1
19	Mixer	1
20	Blender	1
21	Fume hood	1
22	Desiccator	1
23	Air pump	1
24	Low speed centrifuge	1
25	Titration	1
26	Shaker, platform type	1
27	Wrist-action shaker	1
28	Electrical Stopwatch	-
29	Pipette	10
30	Pipette washer	10
31	Pipette dryer	10
32	Air compressor	1
33	Kjeldahl digestion apparatus	1

Order	Item	Quantity required
34	Kjeldahl distillation apparatus	1
35	Micro-Kjeldahl digestion apparatus	1
36	Micro-Kjeldahl distillation apparatus	1
37	Muffle furnace	1
38	Forced-air oven	1
39	Grinder for plant sample	1
40	Grinder for soil sample	1
41	Sieves (30, 50, 100, 200 and 325 mesh) 8" diameter	1
42	Sieves (30, 50, 100, 200 and 325 mesh) 5" diameter	1
43	Atomic absorption spectrophotometer	1
44	Flame photometer	1
45	Colorimeter	1
46	Autoanalyzer	1
47	Electrical conductivity bridge	
48	Pressure-membrane apparatus and accessories	1 set
49	Pressure-plate apparatus and accessories	1 set
50	Volumetric pressure-plate extractor and accessories	1 set
51	Neutron moisture gauge and accessories	1 set
52	Modulus of rupture apparatus	1 set
53	Thermohydrograph	
54	Air-pressure gauge	1

Order	Item	Quantity required
55	Air-pressure regulator	1
56	Water-pressure guage	1
57	Water-pressure regulator	1
58	Bouyoncos hydrometer	2
59	Two-way pipette	2
60	Clamp	15
61	Clip for tubings	15
62	Soil core sampler	1
63	Soil core sample ejector, hydraulic	1
64	Standard soil compactor	1
65	Constant-temperature cabinet	1
66	Thermocouple psychrometer for soil and plant and accessories	-
67	Planimeter	-
68	Terpe pressure cell	-
69	Tensiometer	10
70	Gypsum moisture block and accessories	10
71	Wet-sieving machine and accessories	1 set

Project title : Comparative Studies on Effects of Different
Cultivated Plants on Fertility and Other
Properties of Soil

Objective :

To compare long-term effects of different cultivated
crops, especially economic crops, on properties of soil

Data to be collected :

1. Chemical and physical analysis of soils
2. Microbiological studies on the soils
3. Chemical analysis of plants
4. Yields of grain, dry matter, etc.

List of equipment :

Order	Item	Quantity required
1	Typewriter (Thai)	1
2	Typewriter (English)	1
3	Desk Calculator	1
4	Pocket Calculator	1
5	Camera	-
6	Analytical Balance	1
7	Top-loading Balance	1
8	Triple-beam Balance	1
9	Torsion Balance	-
10	Platform Balance	1

Order	Iten	Quantity required
11	pH meter	1
12	Spectrophotometer	1
13	Clinical centrifuge	1
14	Moisture Equivalent centrifuge	1
15	Refrigerator	1
16	Hot water bath	1
17	Hot plate	1
18	Stiring hot plate	1
19	Mixer	1
20	Blender	1
21	Fume hood	1
22	Desiccator	1
23	Air pump	1
24	Low speed centrifuge	1
25	Titration	1
26	Shaker, platform type	1
27	Wrist-action shaker	1
28	Electrical Stopwatch	-
29	Pipette	1
30	Pipette washer	1
31	Pipette dryer	1
32	Air compressor	1
33	Kjeldahl digestion apparatus	1

Order	Item	Quantity required
34	Kjeldahl distillation apparatus	1
35	Micro-Kjeldahl digestion apparatus	1
36	Micro-Kjeldahl distillation apparatus	1
37	Muffle furnace	1
38	Forced-air oven	1
39	Grinder for plant sample	1
40	Grinder for soil sample	1
41	Sieves (30, 50, 100, 200 and 325 mesh) 8" diameter	1
42	Sieves (30, 50, 100, 200 and 325 mesh) 5 " diameter	1
43	Atomic absorption spectrophotometer	1
44	Flame photometer	1
45	Colorimeter	1
46	Autoanalyzer	1
47	Electrical conductivity bridge	1
48	Pressure-membrane apparatus and accessories	1 set
49	Pressure-plate apparatus and accessories	1 set
50	Volumetric pressure-plate extractor	1 set
51	Neutron moisture gauge and accessories	1
52	Modulus of rupture apparatus	1
53	Thermohydrograph	1
54	Air-pressure gauge	1
55	Air-pressure regulator	1

Order	Item	Quantity required
56	Water-pressure guage	1
57	Water-pressure regulator	1
58	Bouyancos hydrometer	2
59	Two-way pipette	4
60	Clamp	5
61	Clip for tubings	10
62	Soil core sampler	1
63	Soil core sample ejector, hydraulic	1
64	Standard soil compactor	1
65	Constant-temperature cabinet	-
66	Thermocouple psychrometer for soil and plant ^{1/2} , and accessories	-
67	Planimeter	-
68	Tempe pressure cell	-
69	Tensiometer	10
70	Cypsum moisture block and accessories	10
71	Wet-sieving machine and accessories	1 set

Project title : Soil and Fertilizer Researches for Multiple
Cropping

Objective :

1. To find suitable soil management for different multiple cropping systems
2. To study effects of different multiple cropping systems on properties of soil

Data to be collected :

1. Chemical and physical analyses of soils
2. Chemical analysis of plant
3. Yields of grain, dry matter, etc.

List of equipment :

Order	Item	Quantity required
1	Typewriter (Thai)	1
2	Typewriter (English)	1
3	Desk Calculator	1
4	Pocket Calculator	-
5	Camera	1
6	Analytical Balance	1
7	Top-loading Balance	1
8	Triple-beam Balance	1
9	Torsion Balance	1
10	Platform Balance	1

Order	Item	Quantity required
11	pH meter	1
12	Spectrophotometer	1
13	Clinical centrifuge	1
14	Moisture Equivalent centrifuge	1
15	Refrigerator	1
16	Hot water bath	1
17	Hot plate	1
18	Stiring hot plate	
19	Mixer	
20	Blender	1
21	Fume hood	1
22	Desiccator	1
23	Air pump	1
24	Low speed centrifuge	1
25	Titration	1
26	Shaker, platform type	1
27	Wrist-action shaker	1
28	Electrical Stopwatch	1
29	Pipette	1
30	Pipette washer	1
31	Pipette dryer	1
32	Air compressor	1
33	Kjedahl digestion apparatus	3
34	Kjeldahl distillation apparatus	2

Order	Item	Quantity required
35	Micro-Kjeldahl digestion apparatus	3
36	Micro-Kjeldahl distillation apparatus	2
37	Muffle furnace	1
38	Forced-air oven	1
39	Grinder for plant sample	1
40	Grinder for soil sample	1
41	Sieves (30, 50, 100, 200 and 325 mesh) 8" diameter	1 set
42	Sieves (30, 50, 100, 200 and 325 mesh) 5" diameter	1 set
43	Atomic absorption spectrophotometer	1
44	Flame photometer	1
45	Colorimeter	1
46	Autoanalyzer	1
47	Electrical conductivity bridge	1
48	Pressure-membrane apparatus and accessories	1
49	Pressure-plate apparatus and accessories	1
50	Volumetric pressure-plate extractor and accessories	-
51	Neutron moisture gauge and accessories	
52	Modulus of rupture apparatus	1
53	Thermohydrograph	1
54	Air-pressure gauge	1
55	Air-pressure regulator	1

Order	Item	Quantity required
56	Water-pressure guage	1
57	Water-pressure regulator	1
58	Bouyencos hydrometer	1
59	Two-way pipette	1
60	Clamp	5
61	Clip for tubings	5
62	Soil core sampler	1
63	Soil core sample ejector, hydraulic	1
64	Standard soil compactor	
65	Constant-temperature cabinet	
66	Thermocouple psychrometer for soil and plant and accessories	1 1
67	Planimeter	
68	Tempe pressure cell	1
69	Tensiometer	5
70	Gypsum moisture block and accessories	1 set
71	Wet-sieving machine and accessories	1 set

Project title : Integrated Research Program on Soil and Fertilizer
Requirement for Increasing Yields of Corn and
Sorghum

Objective :

1. To find ways to improve yields of corn and sorghum through proper soil management
2. To find suitable chemical methods for evaluation of nutrient status of soils for corn and sorghum and to establish standard for judgement of nutrient status
3. To study long-term effects of chemical and organic fertilizers on soil
4. To find ways to improve efficiency of fertilizers.

Data to be collected :

1. Chemical and physical analysis of soils
2. Chemical analysis of plant
3. Yields of grain and dry matter

List of equipment :

Order	Item	Quantity required
1	Typewriter (Thai)	1
2	Typewriter (English)	1
3	Desk Calculator	1
4	Pocket Calculator	1

Order	Item	Quantity required
5	Camera	1
6	Analytical Balance	1
7	Top-loading Balance	1
8	Triple-beam Balance	1
9	Torsion Balance	1
10	Platform Balance	1
11	pH meter	1
12	Spectrophotometer	1
13	Clinical centrifuge	1
14	Moisture Equivalent centrifuge	-
15	Refrigerator	1
16	Hot water bath	1
17	Hot plate	1
18	Stiring hot plate	1
19	Mixer	-
20	Blender	1
21	Fume hood	1
22	Desiccator	1
23	Air pump	1
24	Low speed centrifuge	-
25	Titrator	1
26	Shaker, platform type	1
27	Wrist-action shaker	1
28	Electrical Stopwatch	-

Order	Item	Quantity required
29	Pipette	1
30	Pipette washer	1
31	Pipette dryer	1
32	Air compressor	1
33	Kjeldahl digestion apparatus	1
34	Kjeldahl distillation apparatus	1
35	Micro-Kjeldahl digestion apparatus	1
36	Micro-Kjeldahl distillation apparatus	1
37	Muffle furnace	1
38	Forced-air oven	1
39	Grinder for plant sample	1
40	Grinder for soil sample	1
41	Sieves (30, 50, 100, 200 and 325 mesh) 8" diameter	1 set
42	Sieves (30, 50, 100, 200 and 325 mesh) 5" diameter	-
43	Atomic absorption spectrophotometer	1
44	Flame photometer	1
45	Colorimeter	1
46	Autoanalyzer	1
47	Electrical conductivity bridge	-
48	Pressure-membrane apparatus and accessories	-
49	Pressure-plate apparatus and accessories	-
50	Volumetric pressure-plate extractor and accessories	-

Order	Item	Quantity required
51	Neutron moisture guage and accessories	-
52	Modulus of rupture apparatus	-
53	Thermohydrograph	-
54	Air-pressure guage	-
55	Air-pressure regulator	-
56	Water-pressure guage	-
57	Water-pressure regulator	-
58	Bouyoucos hydrometer	2
59	Two-way pipette	2
60	Clamp	5
61	Clip for tubings	10
62	Soil core sampler	5
63	Soil core sample ejector, hydraulic	1
64	Standard soil compactor	1
65	Constant-temperature cabinet	-
66	Thermocouple psychrometer for soil and plant and accessories	-
67	Planimeter	-
68	Tempe pressure cell	-
69	Tensiometer	10
70	Gypsum moisture block and accessories	10
71	Wet-sieving machine and accessories	1