

Project title : Construction and performance test for manometer-type tensiometer

Objective :

.To construct low cost tensiometer for matric water potential measurement in soil and to examine the performance of such

Data to be collected :

Main objective is to construct a low cost tensiometer. The main activities is to search the local ceramic clay mixture to satisfy a given air-entry value and to mold in various size and shape to suit the use. Data to be collected are namely :

1. air-entry value of different ceramic clay mixture and preparations
2. conductivity to water of porous cups
3. Volume of displacement to a simulated soil water tension
4. Time response of the tensiometer to a given soil water tension
5. Error and correction factor for the tensismeter

List of equipment :

Order	Item	Quantity required
1	Muffle furnace (Max.temp.1500° C)	1
2	Forced - air oven	1
3	Various size of glass and plastic tubes	200 meters (each)

Order	Item	Quantity required
4	Vacuum pump	1
5	Vacuum desiccator	2
6	Mercury	10 Kg
7	Stand, clamp holden, clip stopper	100 (each)
8	Facilities for routine physical analysis of soils	open
9	graduated cylinder (10, 100, 1000 ml)	10 (each)
10	pipette, burette (10, 25, 50 ml)	10 (each)
11	air compressor (300 psi)	1
12	air pressure regulator (0-50, 0-250 psi)	10 (each)
13	air pressure guage (0-300 psi)	10

Project title : Effects of soil and plant water stress on growth  
and nutrient accumulation in some economic plants

Objective :

1. Greenhouse experiment
  1. To follow the diurnal variation of soil and plant water potential and the dependent between the two in some economic plants
  2. To set up the relationships between plant water potential (osmotic plus matric) and plant water status (as measured by relative turgidity) for some economic plants
  3. To examine the relationships between the water driving force (water potential gradient between soil and plant) and water and nutrient absorption by plants
  4. Plant resistance to water and nutrient transports.
2. Field experiment
  1. To measure water potential and content profile of soil of different moisture regime and establish the basic relationships between average soil water potential and average plant water potential as well as relative turgidity
  2. To examine the results formal in greenhouse experiment

Data to be collected :

1. Greenhouse experiment

1. soil water potential in plant pots with time
2. soil water content with time
3. leaf water (or plant water) potential with time
4. evapotranspiration, transpiration of pot plants (total and in intervals)
5. plant dry weight
6. plant nutrient contents with time and total uptake

2. Field experiment

1. soil water potential with depth and time
2. soil water content with depth and time
3. plant relative turgidity
4. plant nutrient content and total uptake
5. plant (leave) water potential

List of equipment :

order	Item	Quantity required
1	Platform balance range 0-50 Kg.	1
2	Forced - air oven	1
3	analytical balance	1
4	Dewpoint microvoltmeter for water potential measurement	1
5	Soil psychrometer probe	100

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order	Item	Quantity required
6	Sample chamber for punched leaf water potential measurement	5
7	Thermocouple junctions, thermocouple wires of various guages (for intact leaf psychrometer construction)	100 (each)
8	Neutron moisture guage and accessories	1
9	Osmometer (for osmotic potential)	1
10	Constant temperature room and light intensity-adjustable	1
11	Flanimeter	2

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Project title: Some physical characteristics and annual variations of soils  
in the central plain of Thailand.

Objective :

To find out some physical characteristics of soils in  
the central plain (growing rice, beans, sugarcane, corns and etc.)  
The physical characteristics are, namely; texture, structural  
stability, pore size distribution, annual moisture regimes, bulk  
density, compaction, hydraulic conductivity, infiltration and  
drainage, moisture release curve, and so forth. The data  
should be used as a basic for farmer recommendation and for  
researches in soil science as well as in agronomy.

Data to be collected:

Physical characteristics named in objective's of  
the soils on different locations and at various depths during  
the year.

List of equipment:

Order	Item	Quantity required
1.	Pressure membrane apparatus with accessories	4
2.	Pressure plate apparatus with accessories	4
3.	Volume-plate extractor	4
4.	Pressure Tempe cell	20

Order	Item	Quantity required
5.	Vacuum pump	2
6.	Air blower	2
7.	Set of 5" dia. sieve	4
8.	Set of 8" dia. sieve	4
9.	Yoder-type wet sieving machine	2
10.	Neutron moisture gauge	1
11.	Soil psychrometer probe	50
12.	Undisturbed soil core sampler	2
13.	Hydraulic soil core ejector	1
14.	Standard soil core compacter	2
15.	Constant head permeameter	10
16.	Falling head permeameter	10
17.	Double-ring infiltrometer	10
18.	Constant temperature cabinet	2
19.	Other routine equipments and tools for mechanic and electric works	open
20.	Sedimentation cylinder	24
21.	Moisture can (aluminum)	200

Project title: Drip Irrigation for some cash crops

Objective :

1. Greenhouse experiment

(1) To find out the optimum soil moisture content or tension and the corresponding evapotranspiration rate of pot plants that produce maximum water use efficiency.

(2) To examine the results of 1.1 by calibrating to obtain number of water drops in a unit time.

2. Field experiment

To set up drip irrigation system in the field and check the results and deviation from greenhouse experiments.

Data to be collected:

1. Pot moisture content and water tension with time.
2. evaporation and evapotranspiration during specified period of time
3. Calibration of water drop to satisfy ET need of a specific crop.
4. Soil water content and water tension with depth and time.
5. drainage from effective root depth of soil in the field.
6. Growth and production of the crops.



## List of equipment:

Order	Item	Quantity required
1.	Platform balance (0-50 kg)	1
2.	manometer-type tensiometer	100
3.	neutron moisture gerage/accessories	1
4.	moisture can	200
5.	set of drip irrigation system (nozzles, water hoses of various size, water pressure regulators, pressure guages, water purification system, etc.)	1
6.	planimeter	2

Object title: Behavior of some nutrient elements during the process of development of acid sulfate soils.

Objective :

To trace the chemical transformation and physical translocation of macro and micro-nutrients in the successive stages of development of acid sulfate soil.

Data to be collected:

1. mechanical analysis of soils.
2. mineralogical analysis of soils.
3. chemical analysis of soils.
4. N,P,K and trace element analysis of plant samples.

List of equipment:

Order	Item	Quantity required
1.	Analytical Balance	1
2.	Top-loading Balance	1
3.	pH meter	1
4.	spectrophotometer	1
5.	Fume hood.	1
6.	Grinder for plant sample	1
7.	Grinder for soil sample	1
8.	Atomic absorption spectrophotometer	1
9.	Flame photometer	1
10.	Autoanalyzer	1
11.	Electrical conductivity bridge	1
12.	X-ray spectrophotometer	1

Project title: Comparative productivity studies of the acid sulfate soils in the Southern Central Flain of Thailand.

Objective:

1. To find the limiting factors affecting yield of rice grown on acid sulfate soils.
2. To find the stepwise methods for improvement of the productivity of the soils.

Data to be collected:

1. Soil solution analysis for pH,  $Fe^{++}$ ,  $Mn^{++}$ ,  $so_4^-$ ,  $Al^{+3}$ ,  $NH_4^+$ ,  $PO_4^-$ ,  $K^+$
2. Plant analysis for all macro and micronutrients.
3. Soil analysis for:-  
chemical CEC, N, P, K, Ca, Mg, Fe, Al, Mn, etc.  
Mineralical as montmorillonite Kaolinite, Pyrites etc.

List of equipment:

Order	Item	Quantity required
1.	Camera	1
2.	Analytical Balance	1
3.	Top-loading Balance	1
4.	pH meter	1
5.	Spectrophotometer	1
6.	Refrigerator	1
7.	Fume hood	1

Order	Item	Quantity required
8.	Air pump	1
9.	Air compressor	1
10.	Kjeldahl digestion apparatus	1
11.	Kjeldahl distillation apparatus	1
12.	Micro-Kjeldahl digestion apparatus	1
13.	Micro-Kjeldahl distillation apparatus	1
14.	Muffle furnace	1
15.	Forced-air oven	1
16.	Grinder for plant sample	1
17.	Grinder for soil sample	1
18.	Atomic absorption spectrophotometer	1
19.	Flame photometer	1
20.	Autoanalyzer	1
21.	DTA	1
22.	X-ray spectrograph	1
23.	pH meter with sensitivity .001 for use with various anion analysis such as $\text{Cl}^-$ , $\text{SO}_4^{=}$ , $\text{NO}_3^-$ , etc.	1

Project title: Fertilizations and soil managements for maintaining and increasing the productivity of Cassava Cultivated soils.

Objectives : To study the fertility status of cassava soils emphasizing mainly on the fertilizations and soil managements

Data to be collected:

1. General chemical and physical characteristic of soils collected from the field plots (i.e. pH, CEC, organic matter content, available and/or extractable cationic and anionic nutrients etc.)
2. Harvest index
3. Fresh and dry weight of top plant and tuber.
4. Nutrients content such as N,P,K etc. in plant parts at various stages of plant growth.

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

Order	Item	Quantity required
8.	Triple-beam Balance	-
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	1
20.	Blender	1
21.	Fume hood	1
22.	Desiccator	1
23.	Air pump	1
24.	Low speed centrifuge	1
25.	Titrator	1
26.	Shaker, platform type	1
27.	Wrist-action shaker	1
28.	Electrical Stopwatch	1
29.	Pipette	100
30.	Pipette washer	1
31.	Pipette dryer	-

Order	Item	Quantity Required
32.	Air comparessor	
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	
42.	Sieves (30,50,100,200 and 325mesh) 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	-

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Order	Item	Quantity required
50.	Grinder for fertilizer material	1
51.	Blender for fertilizer material	1
52.	Mixer for soil and fertilizer material	1
53.	Agitator for fluid-solid mixing	1
54.	Bouyoncos hydrometer	1
55.	Two-way pipette	1

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## Project title:

A Study on the chemical and physical characteristics of some commercial fertilizers in relation to the response of some major economic crops to fertilizations.

## Objective.:

To study the chemical and physical properties of some commercial fertilizers especially mixed fertilizers in relation to the growth and yield of corn, rice and cassava upon fertilizations.

## Data to be collected:

1. Acidity and alkalinity of fertilizers
2. Chemical analysis of fertilizers
3. Particle size distribution (Segregation)
4. Particle hardness
5. Particle density
6. Growth, yield and nutrients accumulation of corn  
rice and cassava

## List of equipment:

Order	Item	Quantity required
1.	Tyler sieve with lid and bottompan.	1
2.	Testing sieve shaker or vibrator	1
3.	Hardness tester	1

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Order	Item	Quantity required
4.	Automatic timer	1
5.	Bulk density box and cup	1
6.	Slotted single tube probe	1
7.	Double tube probes	1
8.	Steam sampling cup	1
9.	Chloride tester	

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See also the list of equipment of preceding project

Project title: Critical concentration of secondary and micronutrient elements of important field crops and vegetables.

Objective : To determine the critical concentration of secondary and micronutrient elements of some important field crops and vegetables at suitable plant age and from suitable plant tissue under field and greenhouse conditions

Data to be collected:

1. Content of Ca, Mg, S and micronutrient elements in plant tissue and soil.
2. Plant dry weight and fresh weight

List of equipment :

Oder	Item	Quantity required
1.	Typewriter (Thai)	-
2.	Typewriter (English)	-
3.	Desk Calculator	-
4.	Pocket Calculator	-
5.	Camera	-
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

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

Order	Item	Quantity required
36	Micro-Kjeldahl distillation apparatus	1
37	Muffle furnace	1
38.	Forced-air oven	-
39.	Grinder for plant sample	1
40.	Grinder for soil sample	1
41.	Sieves (30,50,100,200,and 325 mesh)	
42.	8" diameter	-
	Sieves (30,50,100,200,and 325 mesh) 5" diameter	-
43.	Atomic absorption spectrophotometer	1
44.	Flame photometer	1
45.	Colorimeter	
45.	Autoanalyzer	1
47.	Electrical conductivity bridge	1
48.	Thermocouple psychrometer for soil and plant water potential, and accessories	1
49.	Osmometer	1

Project title: Salt tolerance of important crops.

Objective :

1. To study the degree of salt tolerance of various cultivars of important field crops and vegetables.
2. To study mineral crop nutrition under salt stress.

Data to be collected:

1. Osmotic potential of plant cell saps from root and shoot.
2. Osmotic potential of culture solution as well as saturated soil extract.
3. Electrical conductivity of saturated soil extract.
4. N,P,K, secondary and micronutrient elements in plant tissue as well as in soils
5. sodium and chloride content in plant tissue as well as in soils.

List of equipment:

Order	Item	Quantity required
1.	Osmometer (No 71)	1
2.	Spectrophotometer	1
3.	Atomic absorption spectrophotometer	1
4.	Flame photometer	1
5.	Autoanalyzer	1
6.	Electrical conductivity bridge	1
7.	Analytical balance	1

See also the list of preceding project.

Project title: Incorporation of chemical fertilizer into green manure as a means of soil fertility rejuvenation.

Objective:

1. To screen varieties of plants usable as green manure.
2. To improve green manure quantity and quality through chemical fertilizer application.
3. To study the effect of incorporation of chemical fertilizer and green manure to soil fertility status.

Data to be collected:

1. nature of growth and chemical composition of plant usable as green manure.
2. effect of chemical fertilizer on growth, yield and nutrient accumulation in green manure plant.
3. accumulation of nutrient in soil under green manure.
4. other beneficial effects.

List of equipment:

Order	Item	Quantity required
1.	Autoanalyzer	1
2.	Atomic absorption spectro-photometer	1
3.	Other routine equipments for soil and plant analysis	1 set
4.	Routine equipments for soil physical analysis	1 set

Project title: Corn and sorghum cropping systems using varieties of intercrop as the system fit in.

Objective:

1. To identified crops capable of intercrop into corn and sorghum with beneficial effects.
2. To study water use efficiency of cropping systems
3. To study competition effect (nutrient, light, and water) of intercrops on row crops.

Data to be collected:

1. Water consumption of the cropping system with and without intercrop.
2. Chemical composition of corn, sorghum, and those intercrops with and without fitting in.
3. Light intensity under crop canopy.
4. Basic physical properties of soil with time.

List of equipment:

Order	Item	Quantity required
1.	Neutron moisture gauge/accessories	1
2.	Class A pan evaporimeter	1
3.	Constant head permeameter	5
4.	Manometer-type tensiometer	50
5.	Doubling infiltration meter	1
6.	Pressure membrane apparatus	1
7.	Pressure plate apparatus	1
8.	Autoanalyzer	1
9.	Atomic absorption spectrophotometer	1
10.	Planimeter	1



Project title: Study on soils for solanaceous fruit crops

Objective:

1. To study lime requirement of soil for solanaceous fruit crops.
2. To study the rate of organic and inorganic fertilizers on solanaceous fruit crops

Data to be collected:

Burned lime, quick lime, ground limestone and marl will be applied to the soil at different rates before transplanting, the growth and yield of solanaceous fruit crops will be studied.

After application of different kind of organic fertilizers and inorganic fertilizers to solanaceous crops, the growth and yield of the crops will be investigated. The composition of soil before and after planting will be studied.

List of equipment:

Order	Item	Quantity required
1	Camera	1
2	Analytical Balance	1
3	Top-loading Balance	1
4	Triple-beam Balance	1
5	Torsion Balance	1
6	pH meter	1
7	Spectrophotometer	1

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Order	Item	Quantity required
8	Refrigerator	1
9	Hot water bath	1
10	Mixer	1
11	Fume hood	1
12	Desiccator	1
13	pipette	100
14	pipette washer	1
15	Pipette dryer	1
16	Air compressor	1
17	Kjeldahl digestion apparatus	1
18	Kjeldahl distillation apparatus	1
19	Micro,-Kjeldahl digestion apparatus	1
20	Micro-Kjeldahl distillation apparatus	1
21	Grinder for plant sample	1
22	Grinder for soil sample	1

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Project title: Properties of animal wastes as related to practical management.

Objectives:

1. To study physical and chemical properties of animal wastes.
2. To study biochemical properties of animal wastes.
3. To establish criteria for designing the lagoon system
4. To determine the dimension of storage pond.

Data to be collected:

1. Daily collection animal wastes from chicken, swines and cow.
2. Soil samples.
3. Lagoon samples at specific time interval for determination of BOD, TSS, VSS.
4. Meteorological data.

List of equipment:

Order	Item	Quantity required
1.	Force-air oven	1
2.	Sieves (various size) 8" diameter	1
3.	Top loading balance	1
4.	Spectrophotometer	1
5.	Desiccator	1
6.	Electrical conductivity bridge	1

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Order	Item	Quantity required
7.	Soil core sampler	1
8.	Soil core sample ejector, hydraulic	1
9.	Oxygen analyzer	1
10.	Aluminum cans (various sizes)	1
11.	Platform balance	1
12.	Kjeldhal digestion apparatus (Micro)	1
13.	Kjeldhal distillation apparatus (Micro)	1
14.	Flame photometer	1
15.	Sieves (various size) 5" diameter	1
16.	Colorimeter	1

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Project title: Plant Nutrition of Sugarcane

Objective :

Improve quality and yield of sugarcane through application of plant nutrients.

Data to be collected :

1. Nutrient status in soils. (Chemical analysis of soils)
2. Nutrient uptake in sugar cane (Stalk & leaf)
3. Yield and quality of cane.

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	-
9	Torsion Balance	1
10	P-Platform Balance	-
11	pH meter	1
12	Spectrophotometer	1
13	Clinical centrifuge	1

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Order	Item	Quantity required
14	Moisture Equivelent centrifuge	-
15	Refrigerator	1
16	Hot water bath	-
17	Hot plate	1
18	Stiring hot plate	1
19	Mixer	-
20	Blender	-
21	Fume hood	1
22	Desiccator	1
23	Air pump	-
24	Low speed centrifuge	1
25	Titrator	-
26	Shaker, platform type	1
27	Wrist-action shaker	1
28	Electrical Stopwatch	1
29	Pipette	1
30	Piptte washer	1
31	Pipette dryer	1
32	Air compressor	-
33	Kjeldahl digestion apparatus	1
34	Kjeldahl distllation apparatus	1
35	Micro-Kjeldahl digestion apparatus	1
36	Micro-Kjeldahl distillation apparatus	1

Order	Item	Quantity required
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	
43	Atomic absorption spectrophotometer	2
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	1
51	Neutron moisture guage and accessories	1
52	Modulus of rupture apparatus	
53	Thermohydrograph	1
54	Air-pressure guage	1
55	Air-pressure regulator	1
56	Water-pressure guage	1

Order	Item	Quantity required
57	Water-pressure regulator	1
58	Bouyoucos hydrometer	1
59	Two-way pipette	1
60	Clamp	1
61	Clip for tubings	1
62	Soil core sample	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 water, potential, and accessories	1
67	Planimeter	
68	Tempe pressure cell	1
69	Tensiometer	1
70	Gypsum moisture block and accessories	1
71	Wet-sieving machine and accessories	1



Project title: Utilization of Thai rock phosphate in some agriculture crops.

Objective:

1. To compare the utilization of rock phosphate from various sources in Thailand.
2. To compare different techniques in analysis.

Data to be collected:

1. Plant analysis
2. Soil analysis
3. Histological analysis

List of equipment:

Order	Item	Quantity required
1.	pH meter	2
2.	Spectrophotometer	2
3.	Air pump	1
4.	Shaker, platform type	1
5.	pipette	1 set
6.	pipette washer	5
7.	pipette dryer	5
8.	Micro-Kjeldahl digestion apparatus	2
9.	Micro-Kjeldahl distillation apparatus	2
10.	Grinder for plant sample	1
11.	Grinder for soil sample	1

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Order	Item	Quantity required
12.	Atomic absorption spectrophotometer	1
13.	Flame photometer	2
14.	Autoanalyzer	1
15.	Electrical conductivity bridge	1
16.	X-ray fluorescence spectrograph	1
17.	Microscope with camera	1

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VI. Project in Environmental Science

Project title: Determination of Pesticide Residues in Crop Plants.

Objective: 1. To determine the pesticide residues on crops such as corn, cotton, soybean and fruit crops as well.

2. To determine whether the residues meet the requirement of tolerance limits (ppm) or not.

List of equipment:

Order	Item	Quantity required
1	Gas-liquid chromatograph equipped with (1) electron capture detector-CHCL. (2) flame photometric detector (3) Hall electrolytic conductivity detector	1 set
2	Rotary evaporator	1
3	Thin-layer chromatography	1
4	Freezer	1
5	Incubator	2
6	Scintillation counter	1
7	Sweep Co-distillater	1
8	Soxhlet extraction apparatus	1

See also general equipment in allocation list

Project title: Research and Development on Agricultural Pollution.

Objective:

1. To study and evaluate nationwide uses of fertilizers, insecticides, fungicides, herbicides, and other chemicals in agriculture.
2. To determine the impact of residue effect on man, animal and agricultural products.
3. To recommend government agencies any specific regulation for better uses of chemicals in agriculture.

List of equipment:

Presented in allocation list.

Project title: Research and Development on Environmental Agriculture

Objective:

1. To take immediate step to prevent losses in agriculture due to agricultural pollution
2. To inform government agencies, people, and farmers the effect on ecological system, agricultural pollution, resistance in plant pest and disease, and others derived from the poor plant pest management.
3. To facilitate research and development in plant pest management program.

List of equipment:

Presented in allocation list.

VII. Some Specific Research Projects Requiring Facilities of  
Central-biochem Unit.

Project title: Studies on Important Natural Products in Agriculture

Objective: Research on this project includes various programs of identification and characterization of natural products. It will facilitate the development of natural products for agricultural benefit. Some of these programs are:

1. volatile oil
2. perfumes
3. menthol and related compounds
4. insect pheromone
5. natural insecticides
6. residue studies
7. carotene

List of equipment:

Specialized equipment

Order	Item	Quantity required
1	Clinical centrifuge	2
2	Refrigerated centrifuge	1
3	Ultracentrifuge	1
4	Infrared spectrophotometer	1
5	Ultraviolet spectrophotometer	1
6	Gaschromatograph-mass spectrometer	1
7	Nuclear Magnetic Resonance Apparatus	1
8	Liquid Chromatograph	1

See also general equipment in allocation list.



Project title: Improvement of Man and Animal Nutrition.

Objective:

Research on this particular project composes of several sub. projects. Concerning man and animal nutrition. For example:

1. Analysis of amino acid composition of man and animal nutrition for quality and formulation improvement.
2. Determination of amino acid composition of biological fluid used in animal nutrition.
3. Improved technique for breeding of certain fruit trees.
4. Detection of Toxin production in stored grain.
5. Viroid: a new pathogen of citrus and tomato.

List of equipment:

Specialized equipment

Order	Item	Quantity required
1.	amino acid analyzer	1
2.	electrophoresis apparatus	2
3.	automatic titrator	2
4.	microburet	2
5.	clinical centrifuge	3
6.	homogenizer	3
7.	pH-meter	1
8.	Analytical balance	1

Order	Item	Quantity required
9.	top loading balance	2
10.	refrigerator	3
11.	stirring hot plate	2

See also general equipment in allocation list.

Project title: Substituted-nitropyrimidines as New Selective  
Herbicides.

Objective:

The objective of this research is to study the organic reactions and the biochemical behavior of substituted nitropyrimidines as related to the search for new selective herbicides. The proposed investigation is outlined as follows

1. A general investigation of certain nitropyrimidines will be made.
2. An analytical technique will be developed to be used for the detection of herbicides.

List of equipment:

Specialized equipment

Order	Item	Quantity required
1.	Infrared spectrophotometer	1
2.	Ultraviolet spectrophotometer	1
3.	Gas chromatograph-Mass spectrometer	1
4.	Nuclear Magnetic Resonance spectrometer	1
5.	Gas chromatograph	1
6.	Thermal analyzer	1
7.	Polarimeter	1

See also general equipment in allocation list.

Project title: Etiological Studies on Disease of Economically Important  
Crops using Electron Microscopy

- Objective:
1. To identify the causal agent of diseases caused by viruses, mycoplasma, rickettsia and viroid of economically important crops ie. rice, sugarcane, corn, vegetables etc.
  2. To utilize various techniques available in electron microscopy for rapid and accurate diagnosis of the diseases.
  3. To provide accurate and specific recommendations for the effective control measures of the diseases.

List of equipment:

Specialized equipment

order	Item	Quantity required
1	Transmission electromicroscope	1
2	Scanning electromicroscope	1
3	Vacuum unit for shadowcasting	1
4	Dark-room facilities	open
5	Paper drum dryer	1
6	Paper trimmer	1 set
7	Refrigerator	3
8	Air pump	1
9	Ultramicrotome	2
10	Slide viewer	1

Order	Item	Quantity required
11	Stereoscopic microscope	3
12	Phase-contrast microscope	1
13	Compound microscope	1
14	Critical point drier	1

See also general equipment in allocation list.

ON-GOING RESEARCH PROJECTS  
AT KASETSART UNIVERSITY  
(FISCAL YEAR 1978)

KASETSART UNIVERSITY DEVELOPMENT :  
STRENGTHENING  
RESEARCH AND EXTENSION SERVICE FACILITIES  
IN AGRICULTURE

JULY 1978

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ON-GOING RESEARCH PROJECTS AT KASETSART UNIVERSITY (Fiscal year 1978)

Master Project 1. Research and Development for High Protein and Oil Seed  
Crop Production.

Project	Title
1.	Breeding and Variety Improvement of Soybean
2.	Use of Radiation in Soybean Breeding
3.	Breeding and Variety Improvement of Mungbean
4	Improved Cultural Practices in Soybean
5	Study on Soil and Fertilizer in Soybean
6	Pest Management - Diseases of Soybeans in Thailand.
7	Bacterial and Viral Diseases of Soybean
8	Soybean Insect Pest Management
9	The Use of Soybean for Dairy Products
10	Economics of Soybean Production and Marketing

Master Project 2. Research and Development of Vegetable and Vegetable  
Seed Production.

Project	Title
1	Selecting Improving and Breeding on Table- tomatoes and the Tomatoes for Processing to have a Good Yield of the new Varieties for Year Round Planting
2	Improvement of Tropical Legumes for Protein Food

Project	Title
3	Commercial Seed Production of Some Economic Vegetables
4	The Improvement of Pepper <u>Capsicum</u> spp.
5	Variety Selection of Chinese Cabbage.
6	Variety Improvement of Cucumber for Slicing and Processing
7	Improvement of Horticultural Practices of Economic Bulb crops.
8	Studies on Soil and Fertilizer for Solanaceous Fruit Crops.
9	Fungus Diseases of Pepper and Tomato.
10	Studies on Causal Agent and Control of Virus and Nematode Diseases of Tomato.
11	Studies on Diseases of Vegetable Seed Production
12	Studies on life cycle and Pathogenicity of <u>Xanthomonas campestris</u> in Infested Soil.
13	Ecological Studies of Insect Pests of Chilli and Tomato, and Their Control
14	Studies of Insect Pests of Tropical Legumes and their Control
15	A Study of Insect Pests in Vegetable Cruciferous Field during Seed Production and their Control
16	Screening Suitable Varieties of Tomatoes, Chilli, Cabbages and Beans for Processing
17	Losses of Vegetables During Handling and Transportation.

Project	Title
18	Economics of Production and Marketing of Selected Vegetables
19	A Study of Costs of Production and Demand for Seeds of Economic Vegetables

Master Project 3. Research and Development for Sugarcane Production

Project	Title
1	Varietal Improvement of Sugarcane
2	Physiological Studies of Sugarcane for Yield Improvement
3	Weed Control Research in Sugarcane
4	Sugar Yield Maximization Through Proper Cultural Manipulation
5	Studies on Some Properties and Processes of Sugarcane Cultivated Soils
6	Fungus Diseases of Sugarcane in Thailand
7	Control of the Important Diseases of Sugarcane Caused by Virus, Bacteria and Mycoplasma
8	Sugarcane Insect Pest Management
9	A Study on the Role of Yeasts Associated with Palm Sugar

Master Project 4. Research and Development for Root crops.

Project	Title
1	Cassava breeding
2	The Improvement of Sweet-potato for Human Consumption and Animal Feeding.
3	Improvement of Cassava Cultural Practices
4	Weed Control Research in Cassava
5	Fertilizations and Soil Managements for Maintaining and Increasing the Productivity of Cassava Cultivated Soils.
6	Soil, Land Capability and Geomorphology of Cassava Cultivated Soil in Thailand
7	Studies on Diseases of Cassava
8	Study on the Utilization of Root Crops.

Master Project 5. Research and Development for Fiber Crop Production.

Project	Title
1	Soil Management in Fiber - Crop Production .
2	Study on Economic Diseases of Cotton .
3	Virus and Mycoplasma Diseases of Cotton and Their Control.
4	Cotton Insect Pest Management .

Master Project 6. Research and Development for Cereal Crops Production.

Project	Title
1	Varietal Improvement of Rice .
2	Rice Improvement for High Protein Content".
3	Using of New Technology for Increasing Yield in Upland Rice .
4	Soil and Fertilizer Study on Soil and Fertilizer for Cereal Crops.
5	Diseases of Cereal Crops and Their Control.
6	Insect Pest of Rice in Thailand and Their Control .
7	The Study of Protein in Rice for Genetic Improvement.

Master Project 7. Research and Development for Ornamental Crop Production

Project	Title
1	Improvement of Dendrobium Orchids for Cutflower
2	Production of <i>aphiopedilum</i> Sp.
3	Development of Anthurium Growing.
4	The Improvement of Gerbera Quality for Export
5	Production of Gladiolus
6	Hybrid Polyploid Amaryllis Production
7	Investigation on the Commercial Production of some foliage Plants (Fern, Schefflera, Dracena and Croton)
8	Orchid Flowers Production
9	Study on Caladium Bulb Production for Export

Project	Title
10	Soil and Fertilizer Studies for Flowers and Ornamental Crops.
11	Studies on Diseases of Ornamental Plants
12	Studies on Some Important Pests of Ornamental Plants and thier Control.

Master project 8. Research and Development for chemical Product Plants.

Project	Title
1	Investigation of Some Chemurgy Plants
2	Varietal Improvement of Native Tobacco
3	Collection and Production of Spices and Medicinal Plants.

Master project 9. Research and Development for Animal production

Project	Title
1	Improvement of Buffalo Production through Breeding Methods
2	Improvement of Beef Cattle Production Through Selection and Mating System
3	Study on Conception Rate of Straw Frozen Semen in Dairy Cattle
4	Studies on Problems of Meat Rabbit Production in Thailand

Project	Title
5	Profitable Improvement of Nutrition for Finishing cattle
6	Utilization of Improved Pasture: Rotational Grazing VS Continuous Grazing
7	Improvement of Efficiency of Forage Production and Utilization by Beef and Dairy Cattle
8	Improvement of Productivity and Quality of Tropical Pasture Species
9	Improvement of Soil in the Pasture
10	Preliminary Study of Skin Diseases in Swamp Buffalo and Comparative Histological Study Between Normal Skin and Diseased Skin in Swamp Buffalo in Thailand
11	Identification, Cultivation and Number of Important Rumen Protozoa for Ruminal Digestion and Concentration of Rumen Bacteria in Swamp Buffalo in Various Seasons in Thailand
12	Studies on diseases of forage crops
13	Ectoparasitic Insects of Cattle and Swine and their Control of Thailand
14	Pest Management of Important Insect Pests of Forage Crop in Thailand
15	Studies on Nutritive Value, Production and Utilization of Industrial Waste Products as Feedstuffs for Farm Animals

Project	Title
16	Comparison of Live and Carcasso Traits between Native Cattle, Brahman Crossbred and Charolais Crossbred
17	Improvement of Beef Production of Village level

Master Project 10. Research and Development for Livestock Production

Project	Title
1	Selection and Breeding for Broiler Chicken Production
2	A Study of the Thai Native Chicken .
3	Genetic Parameters and Economic Values of Some Important Traits in Chicken .
4	Investigation on Geese Production .
5	"Study on Rate of Growth, Age of the First Egg sexual Maturity, and Egg Production in Native Duck, Khaki Campbell and Cross Breeds .
6	Effect of Antioxidants, Smoking and Type of Fat and Quality of chicken Chinese Sausage

Master project 11. Research and Development for Dairy Cattle

Project	Title
1	Crossbreeding to Develop a new Breed of Dairy Cattle Adaptable to Hot and Humid Area.



Project	Title
2	Reproduction, Growth, Meat and Milk Production of Native, Crossbred Saanen and Crossbred Alpine Goats
3	Experiments on the Production of Milk Replacer for Young Calves
4	Control and Prevention of the Infectious Abortion in Dairy Cattle
5	Studies on the Incidence and the Diagnosis of Bovin Mastitis by Catalase Test
6	Studies on Intensive Production of a Small Dairy Farm

Master Project 12. Forest Management Research Project

Project	Title
1	Studies on the Management of Forest Production in Thailand
2	Effects of Logging on Tree Damage, Natural Regeneration, and Physical Properties of Soil

Master Project 13. Silviculture and Wood Properties Research project

Project	Title
1	Silviculture and Wood Properties Research
2	Experimental Arboretum Trial of Pinus Species and Some Fast Growing Species suitable for Pulp and Paper .

Project	Title
3	Management of Bamboo Forest for Pulp and Paper Industry".
4	Some Poisonous Plants in Thailand.
5	Investigation on Chemical Compositions of Wood Preservative Agent.

Master Project 14. Watershed Management on Mountain Land

Project	Title
1	Watershed Management Research on Mountainous Land
2	Removal of Some Elements by Erosion Process from Mixed Deciduous Forest, Mae-Huad

Master Project 15. Forestry Economics Research Project

Project	Title
1	Economics of Forestry in Thailand

Master Project 16. Research Project Mangrove Forest

Project	Title
1	Primary Production of Mangrove Forest in Thailand
2	Study on Microorganism in the Thai Mangrove Forest
3	Properties and Utilization of Woods in Mangrove Forest

## Master Project 17. The Aquaculture Research Development Project.

Project	Title
1	Experimentation on Inducing Sexual Maturity and Spawning of Prawn ( <i>Penaeus monodon</i> Fabricius) by Eyestalk Ablation
2	Frog culture
3	Soft Shell Turtle Culture

## Master Project 18. Fishery Biology Research Project

Project	Title
1	Studies on Effects of Water Pollution on Aquatic Animals and Fisheries: I. At Sri Racha Bay
2	A Study on Abundance of Parasites in Marine Bivalve Molluscs at Samutsongkram and Smutsakorn Provinces

## Master Project 19. Agroindustry Research Project

Project	Title
1	Microbial Protein and Vitamin Production from Agricultural Waste and Low - Cost raw Materials.
2	Evaluation of Soil Fertility and Fertilization for the Improvement of Yield and Quality of Mulberry.

Project	Title
3	Processing and Microbiology of Fermented Fish Products.
4	Enzyme Production from Microorganisms for Food Processing Industries
5	Artificial Diets and Nutritional Requirements of Silkworm and Wild Silkworm
6	Development on some Practical Characters of Silkworm Races
7	Study on Cereal and fruit combination as food for old person.

Master Project 20. Agricultural Business Research Project

Project	Title
1	The Analysis of Importer - business Management : In case of Farm Mechanics
2	Agricultural Credit of Middlemen in Selected Areas in Thailand.
3	Competition in Food Production and Distribution in Thailand.
4	A Study on Export of Small Scale Industrial Products

Master Project 21. Apply Engineering Technique for Agriculture and  
Industry Development

Project	Title
1	Wind Power for Agriculture and Electricity
2	Bamboo Reinforced Concrete
3	Waste water treatment by Frickling Filter Process.

Master Project 22. Agriculture and Forest Environment Research Project

Project	Title
1	Research on Forest Environment Biology.
2	Evaluation of the Damage caused by flooding in Deforested Areas in Thailand
3	Water Quality Prediction in Cha Phya River, ha Chin River, Maeklong River, and Bang Pakong River.

Master Project 23. Development of Agricultural System in Kamphaengsaen  
Area.

This master project have not devided into subproject.

## Master Project 24. Development of Fruit Crops Production and Utilization

Project	Title
1	A Survey, Collection and Studies of Tamarind Clones
2	Studies on Mango Production for Export
3	Studies on the Methods of Pineapple Production for Industry in Thailand
4	Studies of Rootstock Effect on the Dwarfness of Mangosteen ( <i>Garcinia Mangostana</i> , Linn.)
5	Certain Pre- and postharvest Treatments Affecting the Quality and Storage Life of Fresh Horticultural Commodities
6	Chemical Control of Flowering and Sex-expression in Rambutan
7	Study on Some Aspects for Control of off-season Cherimoya
8	Prolong Shelf Life of Fresh Fruits
9	Effects of Calciumchloride and Naphthalene Acetic Acid on Berry fruit Reduction of Loose Perlette grapes
10	Soil Characterization, Classification, and P-Sorption Evaluation in Fruit-tree Growing area in Thailand
11	Studies on Control of Citrus and Durian Decline
12	Biology, Ecology and Control of Scale Insects and Mealybugs of Economic fruit Tree in Thailand

Project	Title
13	A Study of Some Chemicals and Temperature Effects on Preservation of Lim Juice and Pectin Extraction form the Lim Residue
1	Production of Sherry from Surplus Fruits

Master Project 25. Agricultural Biology Research Project

Project	Title
1	Seed Deterioration of Economic crops
2	Studies on Clum Hypertrophy of Water Bamboo
3	Cultural Characteristics and Preservation Techniques of Rhizobium, Yeast and Fungi of Agricultural and Industrial Importance
4	Isolation and Collection of Non Symbiotic Nitrogen Fixation Bacteria in Thailand
5	Studies on Soil Fungi in Agricultural Soils.
6	Studies on Biology, Ecology and Taxonomy of Some Important Aphids in Thailand.

Master Project 26. Educational Curriculum Project

Project	Title
1	A Study on the English Entrance Examination of Test as a Predictor / English Learning Achievement in Kasetsart University

Project	Title
2	The English Learning Achievement of the tenth Grade Students in Kasetsart University
3	Trends in English Curriculum Development Focused on the Needs of Kasetsart University
4	The Evaluative Research of the Master of Arts in Teaching Program: Phase II
5	Model Curricula for Vocational Teacher Education
6	Critical Reading Skill Development of Secondary School Students in Bangkok



ALLOCATION OF THE EQUIPMENT  
FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

KASETSART UNIVERSITY DEVELOPMENT STRENGTHENING:  
RESEARCH AND EXTENSION SERVICE FACILITIES IN AGRICULTURE  
OCTOBER 1977

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

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KASETSART UNIVERSITY DEVELOPMENT STRENGTHENING:  
RESEARCH AND EXTENSION SERVICE FACILITIES IN AGRICULTURE

OCTOBER 1977

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: CENTRAL ADMINISTRATIVE OFFICE

Order	Room	Item	Quantity required	Remark
1.	Central office	Typewriter (Thai)	3	
		Typewriter (English)	2	
2.	Printing	Stencil duplicator	2	
		Stencil cutter	1	
		Copying machine	1	
		Paper guillotine	1	
		Binder, thread and wire	1	
3.	Data processing and data bank	Desk calculator	6	
		Pocket calculator	5	
4.	Auditorium and conference	Overhead projector	3	
		Slide projector	3	
		Motion picture projector (16 mm.)	1	
		Motion picture projector (8 mm.)	1	
		Rear screen projector	3	
		Screen	3	
		Tape recorder	2	
5.	Library	Refrigerator	3	
		Sound system	2 set	
		Text book	open	
		Journal	open	
		Microfilm reader printer	1	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: CENTRAL - BIOCHEMISTRY

Order	Room	Item	Quantity required	Remark
1.	Central-biochemistry laboratory I	Analytical balance	2	
		Top-loading balance	1	
		pH meter	1	
		Refrigerator	3	
		Incubator	5	
		Autoclave	1	
		Evaporator (rotary)	2	
		Hot water bath	4	
		Hot plate (small)	2	
		Hot plate (large)	1	
		Stirring hot plate	3	
		Fume hood	3	
		Desiccator	5	
		Clinical centrifuge	2	
		Refrigerated centrifuge	1	
		Ultra centrifuge	1	
		Vacuum-air pump (small)	2	
		Vacuum-air pump (large)	2	
		Muffle furnace	2	
		Kjeldahl digestion apparatus	2	

Order	Room	Item	Quantity required	Remarks
	Central-biochemistry laboratory I (continued)	Kjeldahl distillation apparatus	2	
		Microkjeldahl apparatus	3	
		Oven	4	
		Soshlet extractor	2	
		Fluorometer	1	
		Polarimeter	1	
		Shaker, platform type	1	
		Shaker, wrist action	1	
		Grinder, wiley	1	
		Grinder, cyclone	1	
		Homogenizer	1	
		Laboratory cart	2	
		Glassware	open	
		Ground-joint glassware	open	
2	General preparation	Glassware automatic washer	1	
		Sterilizer	1	
		Autoclave (large)	1	
		Autoclave (medium)	2	
		Autoclave (small)	5	
		Oven (large)	2	
		Oven (small)	2	
		Water distiller (glass)	4	
		Deionizer	1	
		Laboratory cart	4	

Order	Room	Item	Quantity required	Remark
	General preparation	Plastic bottle (20 l.)	12	
	(continued)	Plastic bottle (40 l.)	6	
		Ice-cube maker	1	
		Glassware	open	
3	Office	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	1	
		Pocket calculator	2	
4	Photography	Enlarger	1	
		Paper drum dryer	1	
		Film dryer cabinet	1	
		Washing tank	1	
		Film duplicator	1	
		Microprojector	1	
		Slide projector	2	
		Screen	1	
		Film developing system	1 set	
		Paper developing system	1 set	
		Film cabinet	3	
		Transparency cabinet	3	
		Camera cabinet	2	
		Camera	2	

Order	Room	Item	Quantity required	Remarks
	Photography (continued)	View camera	1	
		Paper trimmer	1 set	
		Copying stand	2	
		Tripod (various types)	1 set	
		Lamp (various types)	1 set	
		Exposure meter	1	
		Refrigerator	2	
		Automatic timer	3	
		General equipment and apparatus for dark room and studio	open	
5	Art and Studio	Copying machine	1	
		Drawing table	5	
		Drawing tool	5 sets	
6	Microscope	Stereoscopic microscope	3	
		Research microscope	1	
		Ultraviolet microscope	1	
		Transmission electron microscope	1	
		Scanning electron microscope	1	
		Rotary microtome	2	
		Ultramicrotome	2	
		Glass knife breaker	1	

Order	Room	Item	Quantity required	Remark
	Microscope (continued)	Automatic microtome knife sharpener	1	
		Vacuum evaporator	1	
		Ion coater (rotary)	1	
		Ultrasonic cleaner	1	
		Critical point dryer	1	
		Scanning electron microscope accessories for physical and engineering studies	1 set	
		Specimen trimmer	1	
		Fume hood	1	
		Freeze etching	1	
7	Central-biochemistry laboratory II	Analytical balance	1	
		Top-loading balance	1	
		pH meter	1	
		Clinical centrifuge	1	
		Refrigerator	2	
		Hot plate (small)	1	
		Hot plate (large)	1	
		Stirring hot plate	2	
		Fume hood	1	
		Infrared spectrophotometer	1	
		Ultra-violet spectrophotometer	1	



Order	Room	Item	Quantity required	Remarks
	Central-biochemistry laboratory II (continued)	Gas analyzer	1	
		Gas chromatograph-mass spectrometer	1	
		Liquid chromatograph	1	
		Chromatographic apparatus	2	
		Nuclear magnetic resonance apparatus	1	
		Thermal analyzer	1	
		Aminoacid analyzer	1	
		Flame photometer	1	
		Electrophoresis apparatus	2	
		Automatic titrator	1	
		Microburet	1	
		Laboratory cart	1	
		Glassware	open	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: CULTURE COLLECTION

Order	Room	Item	Quantity required	Remark
1.	Office	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	1	
		Pocket calculator	1	
		Camera	1	
2.	Mycoplasma	Transfer chamber	1	
		Incubator	1	
		Incubator shaker	1	
		Refrigerator	1	
		Continuous syringe	1	
		Micro-pipette	1	
		Bacterial filter	3	
		Glassware	open	
3.	Bacteria and virus	Refrigerator	1	
		Deep freezer	1	
		Spectrophotometer	1	
		Shaker	1	
		Incubator	2	
		Incubator shaker	1	
		Transfer chamber	1	
Cold compartment	2			

Order	Room	Item	Quantity required	Remarks
	Bacteria and virus (continued)	Microscope	1	
		Micrometer	3	
		Haemocytometer	3	
		Colony counter	1	
		Air pump	1	
		Vaccum pump	2	
		Blender	1	
		Continuous syringe	1	
		Micropipette	1	
		Desiccator	1	
		Glassware	open	
4.	Preparation area	Analytical balance	1	
		Top-loading balance	1	
		Triple-beam balance	1	
		pH meter	1	
		Refrigerator	1	
		Oven	2	
		Hot water bath	2	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	2	
		Fume hood	1	
		Autoclave	1	

Order	Room	Item	Quantity required	Remark
	Preparation area (continued)	Stove	1	
		Pipetting machine	1	
		Continuous syringe	2	
		Micropipette	1	
		Glassware	open	
5.	Specialized-equipment and culture collec- tion	Lyophilizer 1	2	
		Sealing torch 2	2	
		Vacuum tester 2	2	
		Deep freezer 1	1	
		Liquid nitrogen tank 2	1	
		Clinical centrifuge 1	1	
		Centrifuge (low speed) 1	1	
		Centrifuge (high speed) 1	1	
		Refrigerated centrifuge	1	
		Low temperature liquid cooler	1	
		Desiccator	2	
6.	Fungus	Microscope	1	
		Microscope with micromanipulator	1	
		Phase contrast microscope	1	
		Stereoscopic microscope	1	
		Micrometer	3	
		Refrigerator	1	
		Incubator	2	

Order	Room	Item	Quantity required	Remarks
	Fungus (continued)	Incubator shaker	1	
		Transfer chamber	1	
		Continuous syringe	1	
		Glassware	open	
7.	Infectious	Microscope	1	
		Refrigerator	1	
		Incubator	1	
		Deep freezer	1	
		Liquid nitrogen tank	1	
		Centrifuge (low speed)	1	
		Transfer chamber	1	
		Autoclave	1	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Air pump	1	
		Mixer	1	
		Blender	1	
		Desiccator	1	
		Continuous syringe	1	
		Micropipette	1	
		Glassware	open	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: ENVIRONMENTAL SCIENCE.

Order	Room	Item	Quantity required	Remark
1.	Air pollution	Air chamber	1	
		Air sampler (high-volume)	10	
		Air pump	1	
		Smoke meter	1	
		Gas analyzer (for measuring CO <sub>2</sub> , O <sub>2</sub> , CO and H <sub>2</sub> O, etc. in the atmosphere)	5	
		Ozonator	1	
		Infrared analyzer, dispersive	1	
		Noise level meter	3	
		Sound analyzer	1	
		Non-recording raingauge	50 sets	
		Recording raingauge	5 sets	
		Staff gauge	50 sets	
		Recording staff gauge	10 sets	
		Glassware	open	
2.	Biological assay	Refrigerator	1	
		Incubator	3	
		Hot water bath	1	
		Mixer	1	
		Blender	1	

Order	Room	Item	Quantity required	Remarks
	Biological assay (continued)	Microscope	1	
		Stereoscopic microscope	2	
		Desiccator	1	
		Air pump	1	
		Thermohygrograph	2	
		Liquid scintillation counter	1	
		Leaf hygrometer/psychrometer	50 sets	
		Glassware	open	
3.	Soil and agricultural commodity pollution	Analytical balance	1	
		Top-loading balance	2	
		Triple-beam balance	1	
		Refrigerator	1	
		Oven	1	
		Hot water bath	1	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	1	
		Desiccator	1	
		Neutron moisture probe	1 set	
		Soil hygrometer/psychrometer	50 sets	
		Electrophoresis apparatus	1 set	
		Thin-layer chromatography apparatus	1 set	
		Paper chromatography apparatus	1 set	

Order	Room	Item	Quantity required	Remark
	Soil and agricultural commodity pollution (continued)	Extraction apparatus	1 set	
		Evaporator	2	
		Glassware	open	
4.	Water pollution	pH meter	1	
		Spectrophotometer	1	
		Clinical centrifuge	1	
		Refrigerator	1	
		Incubator	2	
		Oven	1	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	1	
		Microscope	1	
		Stereoscopic microscope	1	
		Desiccator	1	
		Turbidity meter	5 sets	
		B.O.D. apparatus	1 sets	
		Ion analyzer-recorder (portable)	1 set	
		Water analyzer	1 set	
		Electrostatic precipitator	1	
		Current meter	5 sets	
		Sediment sampler	5 sets	
		Glassware	open	



Order	Room	Item	Quantity required	Remarks
5.	Office	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	1	
		Pocket calculator	1	
		Camera	1	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: LABORATORY MAINTENANCE

Order	Room	Item	Quantity required	Remark
		Tools for electronic work	1 set	
		Tools for electric work	1 set	
		Tools for workshop	1 set	
		Tools for tap water system	1 set	
		Tools for craft work	1 set	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: PLANT PEST CLINIC AND QUARANTINE

Order	Room	Item	Quantity required	Remarks
1.	Enquiry	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	1	
		Pocket calculator	1	
		Camera	1	
2.	Sample handling	Stereoscopic microscope	3	
		Refrigerator	2	
3.	Entomology	Microscope	1	
		Stereoscopic microscope	3	
		Refrigerator	1	
		Incubator	1	
		Oven	1	
		Desiccator	1	
		Mixer	1	
		Hot plate (small)	1	
		Thermohygrograph	2	
		Tower sprayer	1	
	Glassware	open		
4.	Plant pathology excluding nematology	Microscope	1	
		Stereoscopic microscope	1	
		Stereoscopic microscope with camera	1	
		Transfer chamber	1	

Order	Room	Item	Quantity required	Remark
	Plant pathology excluding nemato- logy (continued)	Clinical centrifuge	1	
		Refrigerator	1	
		Incubator	2	
		Shaker	1	
		Mixer	1	
		Homogenizer	1	
		Stirring hot plate	1	
		Freezing microtome	1	
		Desiccator	1	
		Thermohygrograph	1	
		Analytical balance	1	
		Top-loading balance	1	
		Triple-beam balance	1	
		Spectrophotometer	1	
		Glassware	open	
5.	Nematology	Microscope	1	
		Stereoscopic microscope	3	
		Camera lucida	1	
		Hot plate (small)	2	
		Desiccator	3	
		Elutriator	1 set	
		Sieve (30, 50, 100, 200 and 325 mesh)	2 sets	
		Glassware	open	

No.	Room	Item	Quantity required	Remarks
6.	Preparation	pH meter	1	
		Refrigerator	1	
		Oven	2	
		Hot water bath	1	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	2	
		Fume hood	1	
		Autoclave	2	
		Stove	1	
		Air-pump	1	
		Glassware	open	
7.	Quarantine	Fumigator	1	
		Electric fan	1	
		Hot water bath	1	
		Interferometer	1	
		Berlese type collector	2	
		Thermal conductivity analyzer	1	
		Gas-leak detector	2	
		Respirator	3	
		Incinerator, large	1	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: POSTHARVEST RESEARCH

Order	Room	Item	Quantity required	Remark
1.	Storage	Air generator	1	
2.	Postharvest pathology and entomology	Analytical balance	1	
		Top-loading balance	1	
		Refrigerator	1	
		Incubator	5	
		Oven	1	
		Hot water bath	3	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Fume hood	1	
		Microscope	2	
		Stereoscopic microscope	3	
		Desiccator	1	
		Air pump	1	
		Autoclave	2	
		Stove	1	
		Thermohygrograph	1	
		Transfer chamber	1	
		Timer	1	
		Glassware	open	

Order	Room	Item	Quantity required	Remarks
3.	Enzyme	Analytical balance	1	
		Top-loading balance	1	
		pH meter	1	
		Spectrophotometer	2	
		Clinical centrifuge	1	
		Refrigerator	2	
		Incubator	1	
		Oven	1	
		Hot water bath	3	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	1	
		Fume hood	1	
		Desiccator	1	
		Vacuum-air pump	1	
		Gas chromatograph	1	
		Ultra-centrifuge	1	
		Refrigerated centrifuge	2	
		Gradient maker	2	
		Gradient fractionator and accessories	1	
		Chromatographic apparatus	1 set	
		Timer	1	
		Glassware	open	

Ord. #	Room	Item	Quantity required	Remark
4.	Pilot packing	Triple beam balance	1	
		Hydrocooler	1	
		Vacuum cooler	1	
		Force air cooler	1	
		Controlled-environmental chamber	2	
		Hot water treatment tank	1	
		Vertical and horizontal impact machine	1 set	
		Tools for workshop	1 set	
5.	Postharvest handling	Top-loading balance	1	
		Triple-beam balance	1	
		Refrigerator	1	
		Thermohygrograph	1	
		Cold compartment	4	
		Gas cylinders with 2-step-gas regulator	9	
		Sling psychrometer	2	
		Recorder	2	
		Fruit and vegetable juice extractor	2	
		Dehumidifier	1	
		Gas flow meter	5	
6.	Postharvest physiology	Analytical balance	1	
		Top-loading balance	1	
		Triple-beam balance	1	



Order	Room	Item	Quantity required	Remarks
	Postharvest	pH meter	1	
	Physiology (continued)	Refrigerator	1	
		Hot plate (small)	1	
		Stirring hot plate	1	
		Mixer	1	
		Blender	1	
		Desiccator	2	
		Infrared gas analyzer	1	
		CO <sub>2</sub> analyzer	1	
		C <sub>2</sub> H <sub>4</sub> analyzer	1	
		Refractometer	4	
		Pressure tester	4	
		Recorder	2	
		Timer	1	
		Gas flow meter	1	
		Glassware	open	
7.	Office	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	2	
		Pocket calculator	3	
		Camera	1	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: SOIL AND FERTILIZER TESTING AND APPLIED RESEARCH.

Order	Room	Item	Quantity required	Remark
1.	Office and enquiry	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Camera	1	
2.	Data processing	Desk calculator	2	
3.	Chemical analysis	pH meter	2	
		Clinical centrifuge	2	
		Refrigerator	2	
		Hot water bath	2	
		Hot plate (small)	4	
		Stirring hot plate	4	
		Mixer	2	
		Blender	2	
		Fume hood	2	
		Desiccator	4	
		Air pump	2	
		Low speed centrifuge	2	
		Titration	4	
Shaker, platform type	2			
Wrist-action shaker	3			
Electric stop watch	3			

Order	Room	Item	Quantity required	Remarks
	Chemical analysis (continued)	Pipette washer	2	
		Pipette dryer	2	
		Air compressor	1	
		Pocket calculator	1	
4.	Kjeldahl, furnace and oven	Kjeldahl digestion apparatus	1	
		Kjeldahl distillation apparatus	1	
		Micro kjeldahl digestion apparatus	8	
		Micro kjeldahl distillation apparatus	2	
		Muffle furnace	4	
		Oven	3	
5.	Sample handling and preparation	Grinder for plant sample	2	
		Grinder for soil sample	2	
		Sieves (30, 50, 100, 200 and 325 mesh)	2 sets	
6.	Fertilizer analysis and soil fertilitiy management	phi meter	1	
		Clinical centrifuge	1	
		Refrigerator	1	
		Triple-beam balance	1	
		Oven	1	
		Hot water bath	1	
		Hot plate (small)	2	
		Stirring hot plate	2	
		Mixer	1	

Order	Room	Item	Quantity required	Remark
	Fertilizer analysis and soil fertilitiy management (continued)	Blender	1	
		Desiccator	2	
		Air pump	1	
		Kjeldahl distillation apparatus, micro	4	
		Low speed centrifuge	1	
		Fume hood	1	
		Air compressor	1	
		Shaker, platform type	1	
		Wrist-action shaker	1	
		Electric stop watch	1	
		Pipette washer	1	
		Pipette dryer	1	
		Pocket calculator	1	
7.	Instrument room I	Atomic absorption spcctrophotometer	1	
		Spectrophotometer	2	
		Flame photometer	2	
		Colorimeter	2	
		Autoanalyzer	1	
		Electrical conductivity bridge	2	
8.	Instrument room II	Pressure-membrane apparatus and accessories	3	
		Pressure-plate apparatus and accessories	3	

Order	Room	Item	Quantity required	Remarks
	Instrument room II (continued)	Volumetric pressure-plate extractor and accessories	2	
		Neutron moisture gauge and accessories	2	
		Modulus of rupture apparatus	3	
		Air compressor	1	
		Thermohygrograph	1	
		Air-pressure gauge	10	
		Air-pressure regulator	5	
		Electric stop watch	2	
		Electrical conductivity bridge	1	
9.	Balance	Analytical balance	1	
		Top-loading balance	3	
		Triple-beam balance	2	
10.	Physical analysis, soil structure and water management	Bouyoucos hydrometer	6	
		Soil core sampler	5	
		Hydraulic soil/core sampler	1	
		Constant-temperature cabinet	3	
		Sieves (5 inch, D.M.)	12	
		Triple beam balance	2	
		Thermocouple psychrometer	100	
		pH meter	1	
		Planimeter	3	
		Oven	2	

Order	Room	Item	Quantity required	Remark
	Physical analysis, soil structure and water management (continued)	Tempe pressure cell	24	
		Refrigerator	1	
		Gypsum block and accessories	100	
		Hot plate (small)	2	
		Wet-sieving machine and accessories	2	
		Sieve shaker	4	
		Fume hood	1	
		Desiccator	2	
		Moisture equivalent centrifuge	2	
		Air pump	1	
		Shaker	1	
		Pocket calculator	1	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: SEED TECHNOLOGY

SUBUNIT: SEED TESTING LABORATORY

Order	Room	Item	Quantity required	Remarks
1.	Office	Typewriter (Thai)	1	
		Typewriter (English)	1	
		Desk calculator	1	
		Pocket calculator	2	
		Camera	1	
2.	Purity	Purity working board	40	
		Magnifier	40	
		Aluminum dish	40	
		Sample pan	40	
		Seed blower	2	
		Seed and grain sieve	4	
3.	Balance	Analytical balance	1	
		Top-loading balance	1	
		Triple-beam balance	1	
4.	Seed moisture testing	Oven	1	
		Quick moisture tester	2	
		Digital moisture computer	1	
		Seed divider	2	
		Seed cleaner	1	

Order	Room	Item	Quantity required	Remark
5.	Germination testing	Stereoscopic microscope	1	
		Refrigerator	1	
		Incubator	2	
		Germinator (cabinet type)	3	
		Germinator (room type)	2	
		Germination box	20	
		Aging chamber	2	
		Counting board	10	
		Vacuum counter	2	
		Seed counter	1	
		Dissecting apparatus	10	
		Thermohygrograph	2	
		Cold compartment	1	
		Glassware	open	
6.	Biology testing	Analytical balance	1	
		Top-loading balance	1	
		pH meter	1	
		Spectrophotometer	1	
		Clinical centrifuge	1	
		Refrigerator	1	
		Oven	1	
		Evaporator	2	
		Hot water bath	1	
		Hot plate (small)	1	
		Stirring hot plate	1	

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Order	Room	Item	Quantity required
	Biology testing (continued)	Mixer	1
		Blender	1
		Microscope	2
		Stereoscopic microscope	1
		Stereoscopic microscope with camera	1
		Desiccator	2
		Air pump	1
		Autoclave	1
		Stove	1
		Transfer chamber	1
		Glassware	open
7.	Seed physiology	Refrigerator	1
		Hot water bath	1
		Hot plate (small)	1
		Stirring hot plate	1
		Mixer	1
		Desiccator	1
		Scarifier	1
		Respirator	1
		Electrical conductivity bridge	1
		Ultraviolet lamp(254, 360 nm.)	1
		Electrophoresis apparatus	1
		Chromatographic apparatus	1 set
		Evaporator	2
		Glassware	open

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: CONTROLLED CONDITION

Order	Room	Item	Quantity required	Remark
		Growth chamber size 1x2 m.	15	
		Growth chamber size 2x3 m.	10	
		Cold compartment size 3x4m.	5	

BREAKDOWN OF THE EQUIPMENT FOR  
CENTRAL LABORATORY AND GREENHOUSE COMPLEX

UNIT: HEADHOUSE

Order	Room	Item	Quantity required	Remarks
1.	Fertilizer preparation and processing	Top-loading balance	1	
		Fertilizer bulk blender	1	
		Fertilizer mixer	1	
		Fertilizer granulator	1	
		Fertilizer grinder	1	
		Vacuum dust-collector	1	
2.	Soil sample handling	Soil sterilizer	2	
		Soil grinder	2	
		Soil mixer	3	
		Plant sterilizer	2	
		Grinder for plant sample	2	
		Deionizer	1	
		Humidifier	10	
		Dehumidifier	5	
		Thermohygrograph	6	
		Cooling unit for glasshouse	4	
		Agricultural tools	open	
		Conventional facilities for greenhouse experiments such as pots	open	

Order	Room	Item	Quantity required	Remarks
3.	Plant sample handling	Top-loading balance	2	
		Balance, 5 Kg. capacity	2	
		Balance, 10 Kg. capacity	2	
		Balance, 20 Kg. capacity	2	
		Balance, 50 Kg. capacity	2	
		Hot air circulation oven, size 3x5x4 m.	2	
		Vacuum dry oven	2	
		Oven	2	
		Moisture tester	5	
		Combine paddy threshur and cleaner, lowest capacity	1	
		Rice huller	1	
		Corn sheller	1	
		Seed thresher	2	
		Seed cleaner	2	
		Seed grader	1	
		Blender	1	

KASETSART UNIVERSITY DEVELOPMENT:  
STRENGTHENING  
RESEARCH AND EXTENSION SERVICE FACILITIES  
IN AGRICULTURE

REVISED COST ESTIMATION AND FLOOR AREA REQUIREMENTS  
FOR REMAINING COMPONENTS

FEBRUARY, 1978.

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1. Summary of budgetary requirements

Order of priority	Component	Estimated cost (Baht)		Total
		Construction *	Equipment	
1.	National Agricultural Extension and Training Service Center	48,112,770	19,354,000	67,466,770
2.	Soil and Fertilizer Research Center	17,209,200	8,200,000	25,409,200
3.	Agricultural Machinery and Equipment Center	18,770,000	23,000,000	41,770,000
4.	Fresh-water Fisheries Research Center	4,293,925	2,306,075	6,600,000
5.	Agro-industry Technology Research Center	9,175,650	6,000,000	15,175,650
Total		97,561,545	58,860,075	156,421,620

\* Based on unit cost of 4,500 baht/m<sup>2</sup>.

2. National Agricultural Extension and Training Service Center.2.1 Total estimated cost

a. Construction	48,112,770	Baht.
b. Equipment	<u>19,354,000</u>	Baht
Total	<u>67,466,770</u>	Baht

2.2 Breakdown of estimated cost for construction

<u>Item</u>	<u>Area/capacity</u>	<u>Unit cost (Baht)</u>	<u>Total cost (Baht)</u>
1. Administrative building	566.5 m <sup>2</sup>	4,500	2,549,250
2. Audio-visual media building	1,411.4 m <sup>2</sup>	4,500	6,351,300
3. Printing shop	374 m <sup>2</sup>	4,500	1,683,000
4. Classroom building	2,069 m <sup>2</sup>	4,500	9,310,500
5. Cafeteria	300 m <sup>2</sup>	4,500	1,350,000
6. University Hotel and Dormitory	3,146 m <sup>2</sup>	4,500	14,157,000
7. Housing	300 m <sup>2</sup>	4,500	1,350,000
8. Circulation	816.69 m <sup>2</sup>	4,500	3,675,105
9. Fixture			4,042,615
10. Air-conditioning facilities	140 tons	25,000	3,500,000
11. Telephone	48 units	3,000	144,000
	Total		<u>48,112,770</u>



### 2.3 Breakdown of floor area requirement

#### a. Administrative building

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Entrance hall, waiting area and exhibition space	40
2. Information counter, radio link and telephone junction	15
3. Director's office	18
4. W.C.	6
5. Secretary's office	9
6. Waiting area	9
7. Deputy-director's office	18
8. Office space for specialists	48
9. Office space for co-ordinating staff (15 persons @ 5m <sup>2</sup> )	75
10. Office space for training staff	60
11. Office space for trainees (8 persons, @3.5m <sup>2</sup> )	28
12. Conference room (30-person capacity, @1.8m <sup>2</sup> )	54
13. V.I.P. room and pantry	18
14. General office (15 persons, @3.5m <sup>2</sup> )	52.5
15. Storage	20
16. Library	48
17. W.C.	<u>48</u>
Total	<u>566.5</u>

b. Audio-visual media building

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Section-head's office	16
2. Entrance hall, and waiting area	20
3. Information counter	15
4. General office	20
5. Television production unit	
5.1 T.V. studio (4 m height)	300
5.2 Waiting and dressing room	40
5.3 Control room	40
5.4 Video-tape recorder storage	40
5.5 Material storage	40
5.6 Technical operation room	20
5.7 Electric junction	12
5.8 W.C. & janitor	32
6. U.H.F. broadcasting unit	40
7. Audio production unit	
7.1 Sound track record room	30
7.2 Tape record room	25
7.3 Library for tape, recorder, etc.	25
8. Graphic roduction unit	
8.1 Drawing room	200
8.2 Storage	9

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
9. Photograph - production and photo-lab unit	
9.1 Picture-taking room	15
9.2 Dark room (booth)	32.4
9.3 Drying and washing space (double lock)	15
9.4 Film production room	60
10. Public service facility unit	
10.1 Waiting area	60
10.2 Film, tape, and video-tape library	40
10.3 Circulation-service room	40
10.4 Exhibition space	150
10.5 Pre-view room (booth)	45
10.6 W.C. & janitor	<u>30</u>
Total	<u>1,411.4</u>

## c. Printing shop

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Printing area	200
2. Storage 1	25
3. Storage 2	50
4. Letter press room	30
5. Proof-reading room	20
6. Dark room for film offset	
6.1 Film offset laboratory	15
6.2 Dark room	9
7. Office	<u>25</u>
Total	<u>374</u>

## d. Classroom building

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Audio-visual aid unit	60
2. Classroom (60 persons) (movable partition, natural ventilation; space to be enclosed for air conditioning when necessary)	540
3. Discussion room (6 units, @ 20 m <sup>2</sup> )	120
4. Training room (2 units, @ 72 m <sup>2</sup> )	144
5. Coffee-break space	80
6. Printing officer room	20
7. Sound-control room	9
8. Office space for staff	72
9. Classroom and auditorium	<u>1,024</u>
Total	<u><u>2,069</u></u>

## e. Cafeteria

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Dining room	240
2. Cooking space	25
3. Cold room	15
4. W.C.	<u>20</u>
Total	<u><u>300</u></u>

f. University Hotel and dormitory	3,146
g. Housing	300
h. Circulation	<u>816.69</u>
Grand total	<u><u>8,983.59</u></u>

2.4 Equipment

Refer to original proposal (blue book)

3. Soil and Fertilizer Research Center

3.1 Total estimated cost

a. Construction	17,209,200	Baht
b. Equipment	<u>8,200,000</u>	Baht
Total	<u>25,409,200</u>	Baht

3.2 Breakdown of estimated cost for construction

<u>Item</u>	<u>Area/capacity</u>	<u>Unit cost (Baht)</u>	<u>Total cost (Baht)</u>
1. Building	3,096 m <sup>2</sup>	4,500	13,932,000
2. Fixture (app. 10% of construction cost)	-	-	1,393,200
3. Glasshouse	150 m <sup>2</sup>	1,800	270,000
4. Screenhouse	100 m <sup>2</sup>	1,500	150,000
5. Lath house	50 m <sup>2</sup>	1,200	60,000
6. Head house	50 m <sup>2</sup>	1,500	75,000
7. Air-conditioning facilities	51 tons	25,000	1,275,000
8. Telephone	18 units	3,000	54,000
Total			<u>17,209,200</u>

3.3 Breakdown of floor area requirement

a. Ground floor

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Soil and plant preparation and storage	90
2. Fertilizer sample preparation and storage	67.5
3. Chemical and glassware storage	67.50

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
4. Dryer room	25
5. Sterilizer room	25
6. Fuel-gas and water distillation room	25
7. Conference	225
8. W.C.	27.5
9. General storage	7.5
10. Circulation	<u>442</u>
Total	<u><u>1,002</u></u>

## b. Second floor

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Chemistry and minerology laboratory 1	67.50
2. Chemistry and minerology laboratory 2	67.50
3. Chemistry and minerology laboratory 3	90
4. Chemistry and minerology laboratory 4	45
5. Instrument rooms (3 rooms)	65
6. Balance room	25
7. Chemical storage	45
8. Genesis survey and classification laboratory	
1. Laboratory proper	90
2. Instrument room	45
9. Administrative office	40
10. Offices (8 offices)	90
11. W.C.	27.50
12. Storage	7.5
13. Circulation	<u>297</u>
Total	<u><u>1,002</u></u>

## c. Third floor

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Fertility and plant nutrition laboratory	
(1) Instrument room	90
(2) Laboratory proper	45
2. Soil microbiology laboratory	
(1) Laboratory proper	63
(2) Instrument room	18
(3) Preparation room	18
(4) Aseptic preparation room	12
(5) Office space for research assistants	24
3. Soil physics laboratory	
(1) Laboratory proper	90
(2) Constant temperature room	20
(3) Instrument room	25
4. Soil conservation laboratory	90
5. Conference	45
6. Data processing	25
7. Reading room	30
8. Offices (7 offices)	82.50
9. W.C.	27.50
10. Storage	7.5
11. Circulation	<u>289.50</u>
Total	<u>1,002</u>



## d. Fourth floor

<u>Item</u>	<u>Area required (sq)</u>
1. Glasshouse	150
2. Head house	50
3. Screenhouse	100
4. Lath house	50
5. Water-tank storage	27.50
6. Machine room	7
7. Circulation	<u>55.5</u>
Total	<u><u>440</u></u>
Grand total	<u><u>3,416</u></u>

3.4 Equipment

Refer to original proposal (blue book)

4. Agricultural Machinery and Equipment Center4.1 Total estimated cost

a. Construction	18,770,000	Baht
b. Equipment	<u>23,000,000</u>	Baht
Total	<u>41,770,000</u>	Baht

4.2 Breakdown of estimated cost for construction

<u>Item</u>	<u>Area/capacity</u>	<u>Unit cost (Baht)</u>	<u>Total cost (Baht)</u>
1. Administrative building	1,360 m <sup>2</sup>	4,500	6,120,000
2. Workshop and research laboratory	3,540 m <sup>2</sup>	3,000	10,620,000
3. Farm equipment building	200 m <sup>2</sup>	1,800	360,000
4. Fixture			900,000
5. Air-conditioning facilities	29 tons	25,000	725,000
6. Telephone	15 units	3,000	45,000
	Total		<u>18,770,000</u>

4.3 Breakdown of floor area requirement

## a. Administrative building

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Director's office	24
2. Deputy .. director's office	24
3. Office space for supervisors	60
4. Documentary storage	16
5. General office & information	64
6. Waiting area & entrance hall	64
7. W.C.	64

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
8. Lecture room	384
9. Testing & research unit	
9.1 Office for staff	20
9.2 Office for researchers (2)	40
10. Training & demonstration unit	
10.1 Offices for staff (8)	190
11. Living room	48
12. Conference	48
13. Circulation	<u>314</u>
Total	<u><u>1,360</u></u>

b. Workshop and research laboratory

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
1. Testing and research laboratory	1,335
2. Fine-equipment storage	180
3. Major-equipment storage	196
4. Space for machine tool	564
5. Clean-up area	20
6. Space for carpenter tool	140
7. Maintenance area	840
8. Offices for staff (3)	140
9. Shower room and locker	60
10. Platform for washing	40
11. Space for testing pump	<u>25</u>
Total	<u><u>3,540</u></u>

4.4 Equipment

Refer to original proposal (blue book)

5. Fresh-water Fisheries Research Center5.1 Total estimated cost

a. Construction	4,293,925	Baht
b. Equipment	<u>2,306,075</u>	Baht
Total	<u>6,600,000</u>	Baht

5.2 Breakdown of estimated cost for construction

<u>Item</u>	<u>Area/capacity</u>	<u>Unit cost (Baht)</u>	<u>Total cost (Baht)</u>
1. Building	541.5 m <sup>2</sup>	4,500	2,436,750
2. Fixture (app. 10% of construction cost)			243,675
3. Air-conditioning facilities	6 tons	25,000	150,000
4. Cooling system for cold room	2.5 tons	25,000	62,500
5. Telephone	7 units	3,000	21,000
6. Concrete pond	460 m <sup>2</sup>	3,000	<u>1,380,000</u>
Total			<u>4,293,925</u>

5.3 Breakdown of floor area requirement

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
a. Administrative office	
1. Director's office	12
2. Deputy-director's office	12
3. General office	36
4. Extension and economics unit	24
5. Library and conference	48
6. W.C.	36
7. Storage	<u>24</u>
Total	<u>192</u>

<u>Item</u>	<u>Area required (E<sup>2</sup>)</u>
b. Laboratory	
1. Processing technology laboratory	24
2. Diseases and parasite laboratory	24
3. Biological productivity and water quality laboratory	24
4. Aquiculture laboratory	24
5. Nutrition laboratory	24
6. Breeding and genetics laboratory	24
7. Improvement and management laboratory	24
8. Cold storage and low-temperature laboratory	<u>24</u>
Total	<u>192</u>
c. Circulation	157.5
d. Concrete ponds	<u>460</u>
Grand total	<u>1,001.5</u>

#### 5.4 Equipment

Refer to original proposal (blue book)

6. Agro-industry Technology Research Center6.1 Total estimated cost

a. Construction	9,175,650	Baht
b. Equipment	<u>6,000,000</u>	Baht
Total	<u>15,175,650</u>	Baht

## 6.2 Breakdown of estimated cost for construction

<u>Item</u>	<u>Area/capacity</u>	<u>Unit cost (Baht)</u>	<u>Total cost (Baht)</u>
1. Building	1,727 m <sup>2</sup>	4,500	7,771,500
2. Fixture (app.10% of construction cost)			777,150
3. Air-conditioning facilities	17.5 tons	25,000	437,500
4. Cooling system for cold room	6.5 tons	25,000	162,500
5. Telephone	9 units	3,000	<u>27,000</u>
Total			<u>9,175,650</u>

6.3 Breakdown of floor area requirement

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
a. Administrative office	
1. Director's office	20
2. Deputy-director's office	20
3. General office	92
4. Staff's offices (5 rooms)	86
5. Library	40
6. Conference	60
7. Waiting area	47
8. W.C.	<u>64</u>
Total	<u>429</u>

<u>Item</u>	<u>Area required (m<sup>2</sup>)</u>
b. Laboratory	
1. Physical testing Laboratory	200
2. Chemical analysis Laboratory	304.5
3. Microbiology Laboratory	120
4. Cold room	60
5. General storage	<u>15</u>
Total	<u>699.5</u>
c. Pilot plant area	
1. Pilot plant	200
2. General storage	25
3. Cold room	<u>15</u>
Total	<u>240</u>
d. Circulation	<u>358.5</u>
Grand total	<u>1,727</u>
6.4 Equipment	
Refer to original proposal (blue book)	

REVISED SUPPLEMENTARY INFORMATION  
KASETSART UNIVERSITY DEVELOPMENT :  
STRENGTHENING  
RESEARCH AND EXTENSION SERVICE FACILITIES  
IN AGRICULTURE

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July, 1976



KASETSART UNIVERSITY DEVELOPMENT: STRENGTHENING RESEARCH AND EXTENSION  
SERVICE FACILITIES IN AGRICULTURE

Summary of budget submitted in 1977

Order	Center/complex	Estimated cost (Baht)		Remark
		Construction	Equipment	
1.	Central Laboratory and Greenhouse Complex	46,600,000	71,700,000	118,300,000
2.	National Agricultural Extension and Training Service Center	48,112,770	19,354,000	67,466,770
3.	Agricultural Machinery and Equipment Center	16,770,000	23,000,000	41,770,000
	Grand total	113,482,770	114,054,000	227,536,770

Remarks:

1. Expenditure needed for site development, movable furniture, supply and delivery of water and electricity to the project sites, and external drainage and sewage disposal facilities will be born by the Thai Government and, hence, is not included in the estimated budgetary requirements presented in the table.
2. Equipment in the table includes air-conditioning facilities, permanent fixtures and heavy laboratory furniture. It is expected that some items of the necessary equipment will be supplied through technical assistance of Japan.

KASETSART UNIVERSITY DEVELOPMENT: STRENGTHENING RESEARCH  
AND EXTENSION SERVICE FACILITIES IN AGRICULTURE

UTILIZATION PLAN FOR VARIOUS COMPONENTS OF THE PROJECT

1. Central Laboratory and Greenhouse Complex

1.1 Central Administrative Office

Activity	Frequency
1) Routine correspondence and clerical service.	All year round
2) Business meeting of Research Committee.	Weekly
3) Compilation of research proposals and preparation of report on approved research projects.	Annually 2-3 months
4) Compilation of progress reports of on-going research projects.	Every 6 months
5) Preparation of annual research report.	Once a year
6) Seminar-workshop on research organization and management.	Twice a year for 2-3 weeks each
7) Seminar, conference and workshop on subject matters requiring urgent attention.	3-4 times a year for 1-2 weeks each
8) Control, facilitation and coordination of on-going research undertakings.	All year round
9) Compilation and processing of data.	All year round
10) Graphic-media production service.	All year round
11) Procurement of important technical publications and operation of reading room.	All year round
12) Implementation of institutional research projects.	All year round
13) Evaluation of completed and on-going activities and planning of future activities.	Every 6 months
14) Service in commodity management for the whole complex.	All year round
15) Miscellaneous activities.	Varied

1.2 Central-Biochemistry Unit

Activity	Frequency
1. Service in biochemical, microscopic and physiological analyses of pesticides, fungicides, herbicides, feed, tissues of plants and animals and food materials for various research projects of graduate students and staff members of the University as well as farmers.	All year round
2. Service in preparation of deionized water, distilled water, sterilization and glassware cleaning for the whole complex.	All year round
3. Service in graphic production and photography production for various research projects conducting at Kamphaengsaen Campus.	All year round

### 1.3 Culture Collection Unit

Activity	Frequency
1) Service in collection, isolation and preparation of microorganisms of importance to agriculture and food-processing industries for researchers and the public.	All year round
2) Research in various aspects of culture collection, isolation, storage, and preparation.	All year round
3) Testing for survival of stored microorganisms and making them readily available all year round.	All year round
4) Research on potentially beneficial microorganisms.	All year round
5) Compilation of technical data and information on culture collection, isolation, storage and preparation.	All year round

1.4 Environmental Science Unit

activity	Frequency
1) Service in providing space and facilities for graduate research of at least 30 students in the interdisciplinary master's degree program in environmental science and at least 5 research projects of the staff members of the University under the environmental science master research program.	All year round
2) Compilation of technical data and information in environmental science.	All year round
3) Routine laboratory analysis of various physical components of the environment for existing as well as potential toxins and pollutants.	All year round
4) Research on nature, occurrence and control of toxins and pollutants commonly found in the environment.	All year round

1.5 Laboratory Maintenance Unit

Activity	Frequency
1) Service in routine inspection, maintenance and minor repair of utilities, equipment and apparatus of various units of the Central Laboratory and Greenhouse Complex, and in fabrication, testing and installation of simple equipment and apparatus for research and service activities of such units.	All year round
2) Service in fabrication, testing and installation of simple equipment and apparatus for research of graduate students and staff members of the University.	All year round
3) Compilation of technical data and basic information on various items of equipment and apparatus.	All year round
4) Preparation of up-to-date inventory of utilities, equipment and apparatus in the Central Laboratory and Greenhouse Complex.	All year round
5) Preparation and implementation of maintenance and repair schedule for major items of equipment and apparatus in the Central Laboratory and Greenhouse Complex.	All year round

## 1.6 Plant Pest Clinic and Quarantine Unit

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Activity	Frequency
1) Service in diagnosing causal organisms and prescribing control measures for pests and diseases of crop plants for at least 100 research projects of University staff members and over 3,500 farm families in the Kamphaengsaen area and its vicinity.	All year round
2) Service in providing space and facilities for various research projects in plant pests and diseases and their control measures.	All year round
3) Research on nature and occurrence of pests and diseases and their control measures for major crops of the Kamphaengsaen area and its vicinity.	All year round
4) Service in eradication and control of infesting plant pests and diseases of economic importance.	Varied
5) Quarantine service for introduced plant materials to avoid possibility of introduction of plant pests and diseases to the country.	Varied
6) Service in providing facilities and personnel for training students, agricultural extension workers and farmers in diagnostic techniques and control measures for plant pests and diseases.	All year round
7) Compilation of technical data and information and forecasting outbreak of major plant pests and diseases.	All year round

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1.7 Postharvest Research Unit

Activity	Frequency
1) Research on nature and extent of quality degradation, and physical, biochemical and physiological changes of perishable agricultural produce, notably fruits and vegetables, during handling and storage.	All year round
2) Research on postharvest pretreatment of perishable agricultural produce for purpose of preventing or minimizing quality degradation.	All year round
3) Research on effects of preharvest and postharvest practices on quality and permissible duration of storage of perishable agricultural produce.	All year round
4) Research on occurrence and control of toxins and other harmful contaminants in agricultural produce during handling and storage.	All year round
5) Research on most economical procedures and optimum conditions of handling and storage of perishable agricultural produce for purpose of minimizing losses and quality degradation.	All year round
6) Service to research projects of University staff members in handling, storage, and biochemical and physiological analyses of perishable agricultural produce.	All year round



1.8 Soil and Fertilizer Testing and Applied Research Unit

Activity	Frequency
1) Routine analysis of soils, fertilizers and plant materials for at least 100 research projects of University staff members and at least 3,500 farm families annually.	All year round at about 10 samples per day
2) Research in soil fertility management and fertilizer use for at least 5 major crops, namely, sugar cane, rice, vegetables and grapes.	All year round
3) Research in water use of crop, tillage operation and improvement of soil structure for at least 5 major crops mentioned in (2).	All year round
4) Research in soil aspect of the cropping-system approach.	All year round
5) Service in providing facilities and personnel for training of students, agricultural extension workers and farmers in soil fertility assessment and fertilizer recommendation.	All year round

1.9 Seed Technology Unit

Activity	Frequency
1) Service in testing, processing, storage and certification of seeds of economic crops for researchers and farmers.	All year round
2) Service in supplying certified seeds of various varieties of economic crops to researchers and farmers.	All year round
3) Service in providing space and facilities for collection of germplasm of crop plants.	All year round
4) Research in various aspects of seed testing, processing, certification and improvement.	All year round
5) Compilation of technical data and information on seeds and other types of germplasm of crop plants.	All year round

1.10 Controlled Condition Unit

Activity	Frequency
1) Service in providing space and facilities for research on environmental factors affecting plant growth of graduate students and staff members of the University.	All year round
2) Research on sensitivity to photoperiod of at least 7 kinds of crop, namely, upland rice, soybean, mung bean, peanut, sugar cane, cassava and oil crops.	All year round
3) Research on responses of at least 11 kinds of crop, namely, upland, rice, vegetables, soybean, mung bean, peanut, sugar cane, cassava, forage crops, tobacco, ornamental plants, and oil crops to various sets of environmental conditions.	All year round
4) Research on infestation and control of pests and diseases of crops mentioned in (3) under various sets of environmental conditions.	All year round
5) Research on culture of high market-value crops under controlled environmental conditions.	All year round
6) Research in various aspects of tissue culture of some economic crops.	All year round

1.11 Head House

Activity	Frequency
Service in preparation of soil and other growth media of plant and corresponding containers for experiments in the greenhouse and controlled condition units, preparation and mixing of fertilizer, preparation of culture solution, supply of distilled and demineralized water, supply of drying and sterilizing facilities for soil and plant materials in quantity, supply of utensils and apparatus needed in greenhouse and controlled-condition experiments, supply of seedlings of various experimental plants, and cleaning of greenhouse assembly and its surroundings.	All year round

1.12 Greenhouse Proper -

Activity	Frequency
1) Service in providing space, facilities and care for greenhouse experiments of graduate students and staff members of the University.	All year round
2) Pot and culture-solution experiments in the agronomic and crop-protection aspects of production of economic crops.	All year round
3) Pot and culture-solution experiments in varietal improvement of economic crops.	All year round

2. Extension and Training Center

Activity	Frequency
1) Farm visit.	Monthly
2) Press release on modern agriculture and related biological sciences.	Monthly
3) Radio program on various aspects of crop and livestock production, home economics, fisheries, forestry, agricultural economics, marketing and cooperatives.	Weekly
4) Weather forecast for agriculture, fisheries and forestry via radio.	Daily
5) Television program on important activities and development in agriculture and related biological sciences.	Monthly
6) Publication and circulation of farm journals, farm handbooks, extension bulletins, agricultural production source book, Kasetsart University newsletter, Kasetsart University students' handbook, Kasetsart Journal, University Catalog, etc.	Varied
7) Production of charts, photographs, slides, recorded tapes, motion picture and other types of audio-visual media for use in agricultural extension, short-term training, seminar, conference and teaching.	All year round
8) Establishment of appropriate demonstration plots at various locations in the Kamphaengsaen area and its vicinity.	Varied
9) Service in providing audio-visual facilities during commencement exercises and other important ceremonies of the University.	Annually

Activity	Frequency
10) Service in providing facilities for annual orientation of new staff members of the University.	Annually
11) Service in entertaining visitors on the campus and mailed questions, and providing appropriate answers to the questions asked.	Varied
12) Service in administering on-campus, vocational course offering for the public.	Twice a year for 1 month each
13) Service in sponsoring short-term training program for agricultural extension workers and farmers.	Varied
14) Service in sponsoring special training for staff members of the University.	Varied
15) Service in keeping up-to-date photographic record of and providing facilities and personnel for important events on the campus.	Varied
16) Research and evaluation on techniques and procedures in agricultural extension and training service.	All year round
17) Business meeting of Extension and Training Governing Board and various pertinent standing and ad hoc committees.	Varied
18) Seminar, workshop and/or conference on strategy, techniques and procedures in agricultural extension and short-term training as well as various other aspects thereof.	Twice a year for 1-2 weeks each
19) Evaluation of completed and on-going activities and planning of future activities.	Twice a year
20) Miscellaneous activities.	All year round

3. Agricultural Machinery and Equipment Center

Activity	Frequency
1) Intensive technical investigation on manufacture, operation, performance and care of important farm machinery and equipment.	All year round
2) Service in testing and evaluation of imported and locally manufactured farm machinery and equipment.	All year round
3) Consultation service in selection, procurement, manufacture, operation, performance and care of farm machinery and equipment.	All year round
4) Service in providing facilities and personnel for training of students, agricultural extension workers and farmers in manufacture, operation, performance and care of important farm machinery and equipment.	All year round
5) Service in providing heavy machinery and equipment and pertinent well-trained technicians needed in field experiments, performing proper maintenance and minor repair for such machinery and equipment, and fabricating simple farm implement and appliance.	All year round
6) Compilation of technical data and information on various types of farm machinery and equipment.	All year round
7) Seminar, workshop and/or conference on manufacture, operation, performance, testing, evaluation and care of various types of farm machinery and equipment.	Twice a year for 1 - 2 weeks each



## PERSONNEL

## A. Tentative list of key personnel

## I. Central Laboratory and Greenhouse Complex

Unit/name of key persons	Field of specialization
1. Central Administrative Office .	
Dr. Sam-arng Srinilta	Soil physics
Dr. Thira Sutabutra	Plant virology
Dr. Supat Attatham	Plant pathology
2. Indoor Laboratory	
2.1 Central-Biochemistry Unit	
Dr. Yongyut Chiemchaisri	Biochemistry
Dr. Thira Sutabutra	Plant virology
Mr. Amnart Tantivanid	Organic chemistry
2.2 Culture collection Unit	
Dr. Jaroon Kumnuanta	Microbiology
Mr. Charan Chettanachitara	Microbiology
Mrs. Chanya Pakkavesa	Veterinary pathology
2.3 Environmental Science Unit	
Dr. Suvit Sangthongpraow	Environmental biology
Mr. Pongsak Yuhu-	Agricultural climatology
Dr. Kasem Chankao	Watershed conservation and management
Mr. Suthep Sirivitayapakorn	Environmental engineering
2.4 Laboratory Maintenance Unit	
Mr. Sirichai Prasertwongse	Electronics

Unit/name of key persons	Field of specialization
2.5 Plant Pest Clinic and Quarantine Unit	
Dr. Supat Attatham	Plant pathology
Dr. Pensook Tauthong	Insect physiology
2.6 Postharvest Research Unit	
Dr. Suraphong Kosiyachinda	Postharvest physiology
Dr. Suranan Supatarapan	Plant physiology
Mr. Vichai Korpraditskul	Fruit crop pathology
2.7 Soil and Fertilizer Testing and Applied Research Unit	
Dr. Visoot Verasan	Soil physics
Mr. Suradej Jintakanon	Mineral nutrition of plant
Dr. Piya Duangpatra	Soil fertility
2.8 Seed Technology Unit	
Dr. M.L. Anothai Choomsai	Cytogenesis
Dr. Chalermkarp Chuayprasit	Seed pathology
Dr. Juangjan Duangpatra	Seed technology
2.9 Greenhouse Assembly	
(Controlled Condition Unit, Head house and Greenhouse)	
Dr. Supot Fuangfupong	Physiology of crop production
Mr. Thanakorn Jarupat	Plant pathology
Dr. Kasem Sooksathan	Sugar cane breeding
II. Extension and Training Service Center	
<u>Key persons</u>	<u>Field of specialization</u>
Mr. Poom Khumgliang	Agricultural Extension
Mr. Suchote Daosukho	Agricultural Extension

## III. Agricultural Machinery and Equipment Center

<u>Key persons</u>	<u>Field of specialization</u>
Dr. Apichart Anukularmphai	Soil and Water Conservation Engineering
Mr. Dhanchaw Bhaholyotin	Agricultural Machinery

## B. Full-time Staff

## I. Central Administrative office

1. Complex Director
2. Deputy Director
3. Technical Staff
4. Secretary
5. Typist
6. Clerk
7. Librarian
8. Draftman
9. Photographer
10. Messenger
- 11... Janitor

## II. Research Laboratory

1. Scientist
2. Research Associate
3. Analyst and Research assistant
4. Technician
5. Laboratory helper
6. Secretary typist
7. Clerk
8. Junitor

All full-time personnel in the research complex and centers will be staff members of Kasetsart University Research and Development Institute which had been approved in principle by the Government of Thailand.

Tentative Expert & Fellowship  
Requirement

Expert

- |  |        |
|--|--------|
| 1. Project supervision and coordination  | 36 m/m |
| 2. Advisor for organization and management<br>of Central Laboratory and greenhouse complex | 24 m/m |
| 3. Equipment specialist  | open   |
| 4. Visiting Researcher   | open   |

## Fellowship

### A. Study Tour

1. Organization, administration and operation of research and extension agencies. 18 m/m

### B. Research and Training

#### 1. Organization and management

- 1.1. Central laboratory and greenhouse for research and services. 24 m/m
- 1.2. Extension and Training Service Center 6 m/m
- 1.3. Agricultural Machinery and Equipment Center 6 m/m

#### 2. Research services, and Laboratory instrumentation.

##### 2.1. Culture Collection center

Culture Preservation & virulence test 6 m/m

##### 2.2. Plant Pest Clinic and quarantine

Mobile Clinic 3 m/m

Plant Pest Management 3 m/m

Quarantine procedure 3 m/m

##### 2.3. Seed Technology

Seed health 3 m/m

Certified seed program 6 m/m

##### 2.4. Post Harvest.

Post Harvest Physiology 3 m/m

Post Harvest Pests 3 m/m

Packing and Marketing 3 m/m

2.5.	Environmental Science.	
	Agriculture Pollution central system	6 m/m
2.6.	Soil and Fertilizer	
	Soil and Plant Chemical Analysis	3 m/m
	Soil Physical Analysis	3 m/m
	Soil and Water management and Conservation	3 m/m
	Fertilizer Technology & usage	3 m/m
2.7.	Central - Biochem	
	Electron microscope (TEM, SEM)	6 m/m
	Spectrophotometer (UV, IR, AA)	3 m/m
	Amino acid analyzer	3 m/m
	Gaschromatograph Mass spectrometer	3 m/m
	X-ray spectrometer	6 m/m
	Others (as necessary)	open
2.8.	Maintenance unit	
	Physical plant operation	3 m/m
2.9.	Head house-green house - control condition cent.	
	greenhouse management	3 m/m
3.	Extension Services	
	Production of printed materials	12 m/m
	Production of technical films	12 m/m
	Operation of audio-visual equipment	24 m/m
4.	Agricultural machinery	
	Machinery and Equipment operation	24 m/m
	Farm machanics	24 m/m

Request for New Technical Assistance Project

Project Title: Kasetsart University Development: Strengthening Research and Extension Service Facilities in Agriculture.

(A request for technical assistance to supplement and conform with the Japanese Grant-Aid Program being negotiated by DTEC with the Embassy of Japan)

Requesting Agency: Kasetsart University  
University Bureau

Proposed Source of Assistance: Government of Japan (Technical Cooperation under the Colombo Plan through Japan International Cooperation Agency)

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1. Background information and justification for the project:

Although the present activities and services to the nation of Kasetsart University encompass a wide spectrum of academic fields, the University started off as an agricultural college and agriculture remains to be the field of emphasis throughout. Realizing its primary responsibility in satisfying the persistent critical need of the nation for skilled technicians and professionals in the various aspects of agricultural science, the University has been exerting its utmost effort in developing top-level manpower competence and adequate facilities for all of its three basic functions of instruction, research and extension in agriculture and related biological sciences. The recent large increase in such national need has prompted the University to expand and intensify the activities pertaining to its three basic functions so much that there is a need to establish another campus at Kamphaengsaen, with an area of approximately 1,250 hectare, to accommodate the increased activities, and to obtain a loan from the International Bank for Reconstruction and Development

(IBRD) for the purpose. With the present total enrollment of about 7,000 at the Bangkok campus and the on-going rapid development of manpower and instructional facilities, the target of 8,000 in enrollment there will soon be reached so that operation at the new campus at Kamphaengsaen is expected to begin in a year or two with an initial student population, all in agriculture, of 1,500 and an ultimate total enrollment of 12,000 to be reached in 10-15 years thereafter. The present staff in agriculture and related biological sciences of the University numbers approximately 400 with a breakdown of about 100 doctorate holders, 200 master's degree holders and 100 baccalaureate holders. With strongly research-oriented graduate instruction programs at the master's level in practically every academic discipline of agriculture and related biological sciences having been offered by the University since 1956, there has been a steadily decreasing trend of the number of staff members with bachelor's degree in favor of the number of those with advanced degree in most of the academic departments concerned. Similarly, there should be a tendency for the number of staff members with doctoral degree to increase at the expense of the number of those with master's degree as instruction programs, also strongly research-oriented, leading to Ph.D. degree have been launched by the University starting this academic year.

In formulating policies and designing activities in agriculture and related biological sciences, Kasetsart University always recognizes the essential supplementary roles of research and extension in the making of high-quality instruction programs of relevance to the pressing national needs. Thus, research and extension are always given no less importance than instruction in the overall development program of the University. For efficient administration and effective implementation of research work, the University has set up the so-called "University Research Council" with 17 members representing various academic fields and 17 master research programs consisting of some 120 projects in agriculture and related biological sciences under



its care. The University Research Council will assume the rank of a faculty under the name of "Research and Development Institute" in the near future. Likewise, the University has set up the so-called "Extension and Training Office" with faculty status and a present staff of 38 members to take charge of its extension and short-term training activities.

With primary emphasis being given to instruction in the current development program under the loan from the IBRD, there is an apparent lag of facilities for research and extension behind those for instruction at Kasetsart University. Because a good harmony among instruction, research and extension programs is prerequisite to efficient and meaningful service of Kasetsart University to the nation, the University, with the assistance of the Department of Technical and Economic Cooperation, has been negotiating with the Government of Japan through the Japanese Embassy in Bangkok for assistance in research and extension facilities. So far, the negotiation has been very encouraging and there is a strong possibility for approval by the Government of Japan of a two-year grant-aid assistance beginning 1978. Consequently, Kasetsart University has prepared 6 development sub-projects for implementation under this prospective grant-aid assistance. The following constitutes a brief account of background information and justification for each sub-project.

1.1 Central Laboratory and Greenhouse Complex. Like other developing countries in the world, Thailand has been faced constantly with the alarming problem of persistent increases in the need for food, shelter, clothing and medicine as a consequence of rapid population growth. The common situations of rapid decline of agricultural products per unit area and diminishing availability of additional arable land have left the country with no choice other than to attain adequate improvement of productivity of the existing farm lands in order to bring about a desirable solution to such problem at present and pave the right way for a reasonably comfortable

life for its citizens in the future. The fact that every meaningful improvement in agricultural production rests strongly on research clearly indicates an immediate need for research effort, which is not only extensive in scope but also intensive in degree, in crop and livestock production in Thailand. Being the leading institution of higher learning in agriculture and related biological sciences not only in the country but also in Southeast Asia, Kasetsart University feels obligated to take responsibility in providing such effort. However, the two basic components of research undertaking, namely, adequately competent manpower and facilities, must be sufficiently available concurrently in order to efficiently attain meaningful success in such effort. At present, only the manpower component is sufficiently available at Kasetsart University. The existing laboratory and greenhouse facilities are not only primarily suitable for teaching but also limited in number, widely scattered and separately administered. For efficient administration and implementation of research activities, particularly in the various academic disciplines of importance in crop and livestock production, the Central Laboratory and Greenhouse Complex to be administered by the University Research Council or Research and Development Institute, whichever is appropriate, is envisioned. The adequate research facilities to be provided by this complex will make possible not only satisfactory fulfillment by Kasetsart University of its inherent commitments to agricultural development of the nation but also useful exploitation of its manpower resource.

1.2 Soil and Fertilizer Research Center. Realizing the vital importance of soil and fertilizer to successful crop and livestock production, Kasetsart University has always given strong emphasis in soil science and fertilizer technology not only in its instruction programs in agriculture but also in its overall development activities. As a result, its Department of Soils is at present the most advanced academic unit in terms of manpower and instructional

facilities not only in the University but also in the country as well as in the region of Southeast Asia. Of the present 25 highly competent and enthusiastic academic staff members of this Department, 15 are holders of Ph.D. degree or equivalent, 6 are in their final stages of graduate study towards Ph.D. degree or equivalent abroad, one has enrolled in a Ph.D. degree program in the Department, and 3 are M.S. degree holders who are ready to pursue appropriate study program towards Ph.D. degree or equivalent whenever an opportunity arises. Aside from the high-quality instruction programs leading to B.S. and M.S. degrees that it has been offering for more than 10 years, the Department of Soils has launched Ph.D. programs in soil science and fertilizer technology beginning the current academic year, which is the first time in the history of the University that instruction program at this highest level is ever offered.

It is known for a fact that soil is not only the primary storehouse of nutrients, water and air that are essential for growth and development of plants on which man and animals depend, but also a major receptacle of wastes and other environmental pollutants affecting man and animals. With rapidly diminishing availability of additional arable land, progressively increasing pollution and deterioration of existing cultivated land as a result of continued exhaustive utilization, and widespread practice of deforestation and shifting cultivation being the common situations throughout the country, it is only logical to call for an immediate launching of intensive studies of the soils involved as prerequisite to successful attainment of effective, economical and long-lasting solution to the prevailing critical problem of agricultural production, conservation of natural resources, and environmental pollution. Because fertilizer application is inevitable in improving crop yield and scarcity and cost of fertilizer have been increasing steadily, intensive research in fertilizer technology likewise logically deserves forefront consideration. With the present number, composition and enthusiasm

of its soil scientists and fertilizer technologists, Kasetsart University will be more than fully ready to tackle these formidable tasks of relevance to the urgent national needs, had it not been for the prevailing constraint of inadequate pertinent facilities. An immediate establishment of the proposed Soil and Fertilizer Research Center is, therefore, amply justified.

1.3 Agro-industry Technology Research Center. Many agricultural products that constitute the primary source of supply for the basic needs of human beings have to be converted into suitable forms before they can be utilized. On the other hand, many of those that can be readily utilized or consumed are not available all year round so that the surplus at the time of peak availability has to be properly preserved for use during the time of scarcity or unavailability of fresh products. Moreover, the steady increase in the demand for basic needs as a result of population explosion and the existence of potential exhaustion of the supply of conventional agricultural products needed by man have prompted him to explore all possible unconventional sources, including materials normally considered as wastes. The importance of all of these endeavors to the well-being of the Thai nationals has been fully recognized by Kasetsart University. As a consequence, institution of Faculty of Agro-industry Technology with the present Department of Food Science and Technology of the Faculty of Agriculture as the nucleus is in the making and this new academic unit of the University should emerge and be ready for operation in the very near future.

Although it was only, recently that the Faculty of Agro-industry Technology was conceptualized, instruction, research and extension activities along this line have long been in existence at Kasetsart University. Such activities have been carried out primarily by staff members of the existing Departments of Food Science and Technology, Forest Products and Fishery Products. At present, 6 Ph.D. degree holders, 34 master's degree holders and one bachelor's

degree holders comprise the staff members of these three academic departments, and there are 10 on-going research projects under the master program of agro-industry. The expected large increases in competence and number of pertinent staff members following the establishment of the Faculty of Agro-industry Technology will certainly bring the existing highly limited space and facilities for research in this category of important fields to complete exhaustion unless appropriate measures are immediately taken to guard against such undesirable exhaustion and, at the same time, take full advantage of such increases. It is only logical, therefore, to make a call for an urgent establishment of the Agro-industry Technology Research Center.

1.4 Fresh-water Fisheries Research Center. The importance of fish as the least expensive source of protein in human as well as animal nutrition is universally recognized. In Thailand, fish and fishery products not only constitute staple food of the citizens but also are among the chief exports of the country. The rapidly increasing demand for food brought about by population explosion, the diminishing availability and accessibility of international water for fishing as a result of the proclamation of the so-called "economic zone" within 200 miles from the shore by many countries, and the high risk of danger involved in off-shore fishing as a result of the differences in political ideology between Thailand and many of its neighbors have not only led to progressively rising scarcity and price of fish and fish products in the country but also indicated the need for increased and more efficient utilization of inland water resource as fishing ground. Being the only institution of <sup>higher</sup> learning in the country that offers college-level education in fisheries, Kasetsart University is naturally obligated to serve as the primary source of supply of the pertinent necessary technology. The present staff of 5 Ph.D. degree holders, 23 master's degree holders and 11 bachelor's degree holders of its Faculty of Fisheries

must, therefore, take additional responsibility of intensive research in inland fisheries or step up their effort if they have already started to do so. There is, however, still a critical constraint of limited facilities to successful launching of such effort. The proposed Fresh-water Fisheries Research Center is aimed at removing this constraint.

1.5 Agricultural Machinery and Equipment Center. In order for laboratory and greenhouse research findings in agriculture and other biological sciences and well-founded outcomes of pertinent theoretical reasoning to be of usefulness in actual application, they must stand trials under actual conditions in the field. Hence, field experiments constitute an integral part of agricultural and biological research works so that heavy farm machinery and equipment are necessary for meaningful outcome of research endeavor in crop and livestock production. In addition, handling, processing, storage and preservation of agricultural products also require the service of heavy equipment and machinery. Aside from the existence of critical shortage of such necessary services in research and instruction at Kasetsart University, there is also an urgent national need for training and research in such aspects as production, operation, performance and care of agricultural equipment and machinery to cope with the increased utilization of and rising demand for labor-saving devices in farm operation and agricultural-product manipulation. It is evident, therefore, that establishment of the proposed Agricultural Machinery and Equipment Center not only is relevant to the pressing need of Kasetsart University and that of the nation but also will greatly strengthen fruitful and more thorough utilization of the present manpower resource in the Departments of Agricultural Engineering and Farm Mechanics of the University.

1.6 Extension and Training Service Center. Effective dissemination and transmission of technical information from the laboratory and experiment station to its end-users, notably farmers

and those engaged in agricultural product enterprise, and efficient monitoring of pertinent feedback are essential to success in agricultural development. Consequently, extension and training service activities are no less important than instruction and research activities in justifying continued operation and meaningful existence of an institution of higher learning in agriculture and related biological sciences. It is for this reason that the Extension and Training Office with a faculty status and a present staff of 38 members has been established at Kasetsart University. Since its establishment, this office has been engaged in year-round activities, in close cooperation with the Department of Agricultural Extension of the Ministry of Agriculture and Cooperatives, of regular farm visit, press release, radio and television program, publication production and circulation, demonstration plot, and short-term training. Although such activities have been numerous and highly beneficial to the end-users, there is still an enormous gap between the actual practice that they follow and the technological advancement attained by the researchers of the University due primarily to critical lack of effective facilities for extension and training services. Unless such gap is urgently eliminated or at least reduced significantly, the purpose of the on-going national development effort will certainly be severely defeated. The Extension and Training Service Center being requested is, thus, seen to deserve immediate endorsement for establishment.

## 2. Details of the project:

### 2.1 Program goal:

The primary goal of this project is to provide adequate, appropriately organized and efficiently functioning facilities for intensive activities in research, extension and short-term training so as to make possible sufficient and meaningful contribution of the University to the urgent national needs and thorough

exploitation of its manpower resource capability for the good of the nation.

## 2.2 Project objectives:

The specific objectives of each of the 6 sub-projects under request are as follows:-

### 2.2.1 Central Laboratory and Greenhouse Complex.

- a. To provide office space for administrative personnel of the University Research Council for efficient administration, coordination and control of research undertakings in the University.
- b. To serve as a comprehensive source of technical information, services and recommendations that are essential for effective solution to immediate problems and meaningful long-range planning in agricultural production and environmental pollution control.
- c. To provide supplemental analytical and technical services for the various research projects of the University staff members and students, and make sufficiently available and conveniently accessible to them space and facilities for laboratory and greenhouse research work.
- d. To provide adequate space, facilities and personnel for effective implementation of action research projects that are relevant to the urgent national needs.
- e. To serve as a model of agricultural and biological research unit and provide space, facilities and personnel for short-term



training in organization, administration and management of such unit.

2.2.2 Soil and Fertilizer Research Center

- a. To carry out laboratory analysis of representative samples of important soil series of the country so as to reveal their basic chemical, mineralogical, physical and microbiological compositions and properties.
- b. To identify and characterize chemical, mineralogical, physical and microbiological processes and phenomena of pedological and agricultural importance commonly present in soil.
- c. To observe and characterize changes in chemical, mineralogical, physical and microbiological compositions, properties, processes and phenomena under various sets of internal and external conditions for each important soil series.
- d. To identify and characterize apparent soil-forming materials and processes and assess their relative significance under various actual as well as potential situations.
- e. To determine chemical and physical compositions of common fertilizers, limes and soil conditioners; assess their respective usefulness and suitability; and characterize important reactions and changes that they undergo upon being applied to the soil.
- f. To identify, characterize and assess possible substitutes for fertilizer and other soil amendments, and explore the possibilities of

making them economically and readily available.

- g. To identify important environmental pollutants commonly deposited in the soil, characterize their persistence and changes therein and their effects on the soil as the natural medium for plant growth, and determine economical corrective measures for their existing and potential undesirable effects.
- h. To provide an efficient system for collection of reliable basic information on soils and fertilizers in the country that any prospective user can readily take advantage of.

#### 2.2.3 Agro-industry Technology Research Center.

- a. To strengthen facilities needed in intensive technical investigation in the fields of fiber, textile, natural dyes, essential oil, and other agro-industrial products in accordance with the urgent needs of the nation.
- b. To provide adequate well-qualified technical personnel for effective research in agro-industrial technology.
- c. To engage and cooperate with other institutions in testing and evaluation of imported and exported agro-industrial products.
- d. To serve as a comprehensive source of technical information, services, and recommendations for effective development and promotion of agro-industrial products in the country.

#### 2.2.4 Fresh-water Fisheries Research Center.

- a. To strengthen facilities for intensive research in fresh-water environment, resources, and products.
- b. To conduct research in order to find ways and means of increasing and efficiently utilizing fresh-water resources and products that are of importance to the national economy.
- c. To serve as a comprehensive source of technical information, services and recommendations that are essential for successful development and desirable exploitation of fresh-water resources and products of the country.

#### 2.2.5 Agricultural Machinery and Equipment Center

- a. To provide adequate heavy machinery and equipment and well-trained pertinent technicians needed in field experiments.
- b. To conduct testing and evaluation of imported and locally manufactured agricultural machinery and equipment and offer pertinent advice and/or recommendation.
- c. To provide training services on agricultural machinery and equipment for students and farmers.
- d. To conduct research on manufacture, operation, performance and care of agricultural machinery and equipment.

#### 2.2.6 Extension and Training Service Center

- a. To render efficient services in dissemination and transmitting technical information in agriculture and related biological sciences to the end-users and establish an efficient feedback system for successful implementation

and effective planning of agricultural development programs.

- b. To serve as the primary source of supply of audio-visual media and materials that are needed in effective extension and training services.
- c. To conduct short-term trainings in the various aspects of agricultural production, marketing and cooperatives as well as agro-industry technology for the general public, farmers, and personnel of government agencies and private enterprises.

### 2.3 Conditions expected at completion of the project:

Upon completion of the project under request, there will be adequate manpower and space and some equipment and other necessary facilities for intensive research and extension and short-term training in agriculture and related biological sciences as well as agro-industry technology, thereby making it possible for research, extension and short-term training activities of the University to catch up and be in good harmony with its on-going expanded activities in instruction. Efficient systems of planning, administration and project implementation of research, extension and short-term training will prevail, and, as a result, the various instructional programs of the University will be greatly strengthened. In addition, an atmosphere conducive for high productivity, persistent dedication and strong willingness to cooperate in research, extension and short-term training of relevance to the national needs for most, if not all, members of the staff of each of the pertinent academic units of the University will be generated. Lastly, fruitful interagency cooperation and exchange of knowledge both within the country and internationally will

be greatly facilitated. For additional necessary equipment and facilities, the University is looking up to a continued assistance from the Government of Japan in a form other than grant-aid.

- 2.4 Recommended sources of information and data related to the project, necessary for project verification:
- 2.4.1 Kasetsart University Development Plan, Office of the Rector, Kasetsart University.
  - 2.4.2 Annual Reports of Kasetsart University, Office of the Rector, Kasetsart University.
  - 2.4.3 Research and Development Activities at Kasetsart University, Office of the Director of Research, Kasetsart University.
  - 2.4.4 Facts and Figures for Kasetsart University Office of the Rector, Kasetsart University.
  - 2.4.5 Annual records of research projects, Office of the Director of Research, Kasetsart University.
  - 2.4.6 The National Economic Development Plan, Phases I, II, III and IV, Office of the Secretary-General of the National Economic Development Commission.

2.5 Duration of the project:

From April 1, 1978 to March 31, 1981, with possible continuation for additional equipment, facilities, experts and fellowships under a form of assistance other than grant-aid.

2.6 Project sites:

With the exception of the Soil and Fertilizer Research Center and Agro-industry Technology Research Center which will be located at the Bangkok campus, all sub-projects being requested will be implemented at the newly opened Kamphaengsaen campus of Kasetsart University. For the Agricultural Machinery and Equipment Center, however, the

existing experimental farms at Sritacha, Tabkwang, Palsahong, and Doi Pui will also be the sites for satellite units of the Center at Kamphaengsaen.

## 2.7 Project work plan and activities:

### 2.7.1 Detailed work plan or project activities and scope of work:

- a. Appointment of a liaison officer for Kasetsart University as suggested by the Japanese Embassy and start of unofficial discussion with appropriate personnel of the Embassy on the feasibility of the project.
- b. Appointment of a working group for each sub-project for preparation of pertinent requirements in detail.
- c. Review of reports of the working groups by the Vice-Rector for Academic Affairs and, after necessary correction and adjustment, submission of the reports to the Council of Deans and the University Council, respectively, for approval.
- d. Preparation of the Request for New Technical Assistance Project in accordance with the reports approved by the Council of Deans and the University Council, and submission of the request to the Department of Technical and Economic Cooperation for consideration and negotiation for the assistance with the appropriate authorities representing the Government of Japan.
- e. Arrival of the Project Supervisor-Coordinator from Japan, preparation of architectural

details of buildings and other types of structure to be constructed, and ordering of equipment and other facilities.

- f. Construction of buildings and other types of structure, and installation of furniture, equipment and other facilities with the assistance of pertinent experts from Japan.
- g. Departure of staff members of Kasetsart University for Japan and/or other appropriate countries for study tour and training in the various aspects of operation of each sub-project.
- h. Completion of construction and installation works, return of the study-tour team and trainees, arrival of sub-project supervisors from Japan, and launching of operation of all sub-projects.
- i. Negotiation for continued assistance of the Government of Japan under a form other than grant-aid for additional necessary equipment, facilities, experts and fellowships.

2.7.2 Time schedule of project activities:

Activities	Tentative time schedule
(1) Unofficial discussion on feasibility of the project through Liaison officer	September, 1976 to March 1977.
(2) Preparation of request for assistance	March to June, 1977
(3) Negotiation for assistance	July to August, 1977
(4) Finalization of request	September, 1977
(5) Formal signing of agreement for assistance	November, 1977
(6) Preparation of architectural details of buildings and other types of structure	December, 1977 to February, 1978

Activities	Tentative time schedule
(7) Arrival of project supervisor, launching of construction work, and ordering of furniture, equipment and other facilities	April, 1978 to September, 1979
(8) Departure of first batch of trainees	April, 1978
(9) Departure of second batch of trainees and return of the first batch	October, 1978
(10) Departure of study-tour team and third batch of trainees, and return of second batch of trainees	April, 1979
(11) Return of study-tour team	May, 1979
(12) Departure of fourth batch of trainees, completion of construction work, and return of third batch of trainees	October, 1979
(13) Installation of furniture, equipment and other facilities	October, 1979 to March, 1980
(14) Negotiation for continued assistance	January to March, 1980
(15) Arrival of sub-project supervisors	March, 1980
(16) Return of fourth batch of trainees and launching of operation of all sub-projects	April, 1980
(17) Continuation of procurement of equipment and facilities, training and personnel exchange	April, 1980 and onward

### 3. Details of implementing/operating agency:

#### 3.1 Institutional framework:

There are 10 academic units called "faculties" that offer instruction programs and, at the same time, conduct research and render some extension and short-time training service at Kasetsart University. In addition, there are 2 academic units, also of faculty status, whose primary function is research or extension and short-term training only. Each faculty has a dean as its highest administrative officer and is subdivided into several distinct departments, each with a department head as the top executive, in accordance with the various academic disciplines under its jurisdiction. Other academic units of faculty rank are called either "institute" or "office"



with a director as the head of each and no subdivision into lower categories is allowed for reason of the highly integrated nature of their works. The University has a rector as its chief executive. The Rector is assisted by four deputies called "Vice-Rectors", one each for academic affairs, business affairs, student affairs, and development.

As pointed out earlier, the University has appointed a committee called "University Research Council" with 17 members representing the various existing academic disciplines in the University whose primary responsibility is to render an efficient administration of all research undertakings in the University. Actual implementation of research projects, however, is the responsibility of staff members of the various departments of each faculty or equivalent. The status of the University Research Council will be raised to that of a faculty under the name "Research and Development Institute" with a director as its chief and a group of full-time administrative personnel directly responsible to him. The University, likewise, has created an academic unit of faculty rank called "Extension and Training Office" to take charge of all aspects of extension and short-term training services.

With the existing institutional setting presented above, it is easily seen that the proposed sub-project of Extension and Training Service Center will be under the jurisdiction of the Extension and Training Office both administratively and operationally. The remaining five sub-projects being requested, on the other hand, will be under the jurisdiction of the University Research Council or Research and Development Institute, whichever is appropriate, for administration and under the responsibility of appropriate academic departments of the various faculties or equivalent of the University for operation.

## 3.2 Staff/personnel participating in project implementation:

Classification	Number	Qualification	Availability, % of working time
<u>A. Preparatory Phase</u>			
(1) Project coordinator	1	Ph.D.	Not appropriate
(2) Liaison officer	1	Dr. Agr.	"
(3) Members of working groups	72	varied	"
(4) Members of implementation committee	10	varied	"
(5) Sub-project supervisor	6	at least M.S.	"
(6) Architect	2	M. Arch.	"
(7) Engineer	2	M.S.	"
(8) Inspector	10	varied	"
<u>B. Operational Phase</u>			
(1) Center or Complex Director	6	at least M.S.	100
(2) Deputy Center or Complex Director	6	"	100
(3) Research Scientist	15	Ph.D.	75
(4) Research Associate	25	M.S.	75
(5) Research Assistant	40	B.S.	100
(6) Extension and Training Specialist	5	at least M.S.	100
(7) Extension and Training Associate	10	B.S.	100
(8) Extension and Training Assistant	25	Upper vocational school	100
(9) Chief Engineer	4	at least M.S.	75
(10) Associate Engineer	8	B.S.	75
(11) Assistant Engineer	15	Upper vocational school	100
(12) Foreman	15	Lower vocational school	100
(13) Helper	30	Secondary school	100
(14) Laborer	60	-	100

## 4. Assistance requested:

4.1 Expert

Field of operation/activity	Total		1978		1979		1980	
	No.	m/m	No.	m/m	No.	m/m	No.	m/r
(1) Project supervision and coordination	1	24	1	9	1	12	1	3
(2) Organization and management of Central Laboratory and Greenhouse Complex	1	12	-	-	1	9	1	3
(3) Plant supervision for Agricultural Machinery and Equipment Center	1	12	-	-	1	9	1	3
(4) Organization and management of extension and training services	1	12	-	-	1	9	1	3
(5) Supervision of operation of Soil and Fertilizer Research Center	1	12	-	-	1	9	1	3
(6) Supervision of operation of Agro-industry Technology Research Center	1	12	-	-	1	9	1	3
(7) Supervision of operation of Fresh-water Fisheries Research Center	1	12	-	-	1	9	1	3
Total	7	96	1	9	7	66	7	21

Remarks: In the later part of 1980, there will be an overall review of the project with possible request for additional expert thereafter following consultation with appropriate authorities of Japan International Cooperation Agency.

## 4.1.1 Justification for requesting experts:

- (a) Effective planning and implementation of research, extension and <sup>training</sup> activities are dictated largely by pertinent experiences of the workers involved. With all of the six sub-projects under request having no precedent not only in the University but also in the entire country, service of experts in the overall supervision and coordination throughout the period of the

project and in organization, supervision and management of operation during the initial phase of operation of each sub-project will greatly facilitate successful completion of preparatory work and easy attainment of smooth and efficient functioning of each center or complex thereafter.

- (b) Many types of equipment and other facilities needed in research work and extension and short-term training services are expensive and highly sophisticated and will not function properly if not correctly installed and appropriately taken care of thereafter. At present, specialists in installation, operation and maintenance of sophisticated equipment are not available locally so that there will be a need for assistance of experts from overseas in these matters.

4.1.2 Job description of each expert requested:

- (a) The expert in project supervision and coordination will be stationed at Kasetsart University throughout the period of the project. He will attend very closely to every aspect and detail of both the preparatory work and initial operational activities for each sub-project, act as liaison officer between the authorities of Kasetsart University and official representatives of the Government of Japan, plan out schedule of activities for each sub-project for the period of the project and exert his utmost effort to keep up with the schedule thus planned, prepare progress report on the project at appropriate time

interval and submit it to both Kasetsart University authorities and official representatives of the Government of Japan, prepare final report on the project upon completion, and make suggestion (s) and/or recommendations) that are relevant to continued smooth and efficient functioning of each center or equivalent.

- (b) The expert in organization and management of Central Laboratory and Greenhouse Complex will work closely with the personnel of the University Research Council or Research and Development Institute, whichever is appropriate, and the various unit chiefs in the complex in setting up an efficient system of administration and management for normal functioning of the Complex. He will also supervise over the selection, procurement and installation of pertinent equipment and other facilities, and offer suggestion and/or recommendation on such matters as improvement of operation and additional requirements of each unit of the complex.
- (c) The expert in plant supervision will render services at the Agricultural Machinery and Equipment Center and its satellite units. He will advise and assist the director and other personnel of the center in the procurement and installation of equipment and formulation of administration and operation schemes of the center and its satellite units, and give suggestion and/or recommendation on research activities and procurement of