III. SAVANNAKHET AGRICULTURAL COLLEGE PROGRAM

CHAPTER III

SAVANNAKHET AGRICULTURAL COLLEGE PROGRAM

III-1 Background

1) Agricultural Education and Training

The current education and training system in the Agriculture sector is outlined as follows:

(i) Agricultural Faculty of Lao National University:

The Lao National University was established in 1996 to educate high level officers, managers and engineers in both public and private sectors. The Agricultural Faculty of the Lao National University was established in the same year by combining the former Nabong Agricultural College and Dodok Forestry College (both of them had been under MAF). The former School of Irrigation at Tadthong under MAF was also incorporated into the Engineering Faculty of the Lao National University. At university, students normally receive 5-years education for the bachelor degree. In addition, the agricultural faculty and engineering faculty provide a Middle Level Diploma Program (2 to 3 years study) and a Higher Diploma Program (3 years study) according to the needs in each field. As of March 1999, there were 649 students in the agricultural faculty, 530 of which were male and 119 were female.

(ii) Agricultural Colleges:

The Prime Minister Decree 1998 that all technical education is under the jurisdiction of the Ministry of Education (MOE) however, the actual situation of the vocational education system is still under adjustment among the concerned ministries. As of 2001, there are three agricultural colleges in the country, located in Luangprabang, Bolikhamxay and Champasak, providing a 2-year course (associate diploma) to upper secondary graduate students. Actually some colleges provide an additional one year schooling as a preparatory year to ensure the educational level of students. These colleges are under the control of MAF and are managed by the provincial governments. Some graduates of these colleges are employed in DAFO and PAFO as technical staff. Each college

receives 150 to 180 students a year according to the high demand for skilled staff. However, the number of students is too many for the available facilities, due to a limited budget, insufficient facilities and a lack of teachers.

(iii) Agricultural Training Centers:

There are five agricultural training centers in the country, and government officers as well as farmers are trained according to the training programs at each center. The centers are:

- Savannakhet agricultural training center in Savannakhet province;
- Xepon forestry training center in Savannakhet province;
- Hinheup upland agriculture training center in Vientiane province;
- Xienguen agricultural training center in Luang Prabang province; and
- Namtan agricultural training center in Saybouly province.

The Savannakhet Agricultural Training Center (formerly named the Savannakhet Agricultural College) is located in Ban Nake, Kanthabouly district. Until 1995, it provided a 3-years agricultural course (technical diploma) to an annual intake of about 100 upper secondary graduate students. However, due to a change in the vocational education system by central government and financial constraints, the college was turned into be a training center, to provide training course for DAFO and PAFO staff as well as farmers. Presently the center provides an 18-month training course to about 100 DAFO/PAFO staff to upgrade their skills and knowledge. The center provides short training courses for farmers as well. There are 3 courses of livestock, planting and farmers' education for a period of one week, each for 30 to 35 persons. These farmers' training courses are generally undertaken 4 to 5 times a year depending on the financial availability, most of which is supported by external organizations. The center is currently managed by PAFO and financed by MAF.

Agricultural education and training needs are increasing; however, the further development of educational/training activities face major constraints as follows:

- Lack of finance for operation;
- Lack of teaching equipment and materials;
- Lack of knowledge on the market-oriented economy and farm management; and
- Lack of incentives for teachers and technical staff.

2) Agricultural Education under the Market Economy

The transformation from subsistence agriculture to market-oriented agriculture is one of the major issues of the government's agricultural policy. At present, farmers and public institutions are more concerned with "production" than

"marketing". Despite the fact that many agricultural projects have insisted on the importance of marketing for crop diversification, actually marketing has been left for farmers themselves. In order to promote "market-oriented agriculture", "marketing" and "profitability" should be more addressed than "production". Projects normally recommend some promising crops to farmers, but they cannot find stable markets and often lose from new crops and never try them again. Now is the time that the government must pay attention to "what should be done by the public to transform to market-oriented agriculture".

Unfortunately, only a few government staff have been educated or trained on practical marketing in schools or training centers and little information has been accumulated by them to promote the market economy. Under such circumstances, there is an urgent need to educate the young generation in acquiring practical knowledge and skills in agriculture under the market economy so that they can practice it in the public and private sectors. One of the objectives of agricultural education and training is to cultivate "entrepreneurship" among students.

3) Cases of Practical Agricultural Education

The following two cases are good examples to understand how practical training is important in agricultural education and training and how the proposed Savannakhet Agricultural College can be developed.

Rajamangala Institute of Technology Kalasin Campus (Thailand)

The Kalsin campus is one of 40 campuses distributed by the Rajamangala Institute of Technology, under the Ministry of Education in Thailand. The campus is situated on an area of 80 ha along Kalasin-Sakonnakorn road, and it also owns 160 ha of "Practice Farm" for giving practical classes to students and training courses to local farmers.

Since its establishment in 1939, the institute has educated thousands of students to serve the country in both government and private sectors. It's main task is to provide students in the region with courses at both diploma and degree levels in the area of vocational and technological education. Besides teaching, it has responsibilities for:

- Conducting experiments to acquire new knowledge and to solve the community's and country's problems;
- Providing local people with services such as short course training, consulting, and academic booklets;
- Conserving and promoting local (I-saan) cultures;
- Cooperating academically (students/staff exchange) with neighboring counties, especially with Lao PDR.

The institute offers three full-time courses, i.e., i) Diploma program (2-years) for year-12 graduates, ii) Degree program (2-years) for vocational diploma graduates and iii) Degree program (4-year) for year-12 graduates. The major subjects are: Crop science, Animal science, Food science and technology, Horticultural science, Marketing, and Management.

Zamorano (Pan American School of Agriculture)

Zamorano, known as the Pan American School of Agriculture, located Hondulas, is a private, non-profit, non-sectarian center of higher education, offering four-year, university-level education with career paths in Agricultural Science and Production, Agribusiness Management, Agro-industry (with emphasis in Food Technology), and Socio-economic Development and Environment. The principles of this educational program, known as the "4x4 Program" are learning-by-doing and academic excellence for character and leadership formation.

In the 1999 academic year, over 800 students from 23 counties with a wide range of socio-economic backgrounds were enrolled on its campus of about 7,000 ha. Zamorano has served to bring up leaders who make important contributions to the economic, social and environmental well being of the region. It couples theory, practice and character formation. Through outreach activities, students and faculty disseminate technologies, such as integrated pest management and improved cropping systems, which improve the sustainability of tropical agriculture. Zamorano helps communities protect forests and watersheds, by offering viable alternatives to destructive forms of agriculture and natural resource exploitation. Working with agribusinesses of all sizes, Zamorano helps increase performance in the face of increasingly competitive global markets.

III-2 Objectives and Strategies

1) Objectives

The main objective of the proposed Savannakhet Agricultural College is to educate 11th graduate school students in agricultural knowledge and skills, who will play a key role in the field of agricultural development as government officers and private entrepreneurs. The college also aims at training DAFO/PAFO staff and community leaders in order to upgrade and strengthen knowledge and skills for agricultural development of these key persons.

The programs focus on practical and market-oriented agricultural education. The most important point is to acquire skills and knowledge through "learning-by -doing". Practical experiences mean not only technical matters but also economic

aspects. Most Lao farmers in the Mekong and the central regions are already involved in the market economy, and the household economy is gradually shifting to market-oriented commodity production. The consistent and practical training from production to marketing is, therefore provided through “leaning-by-doing” at the Savannakhet Agricultural College.

2) Proposed Strategies

To attain the above objectives, it is proposed that the following strategies are adopted in formulating a plan for the Savannakhet Agricultural College:

(1) Target area

Applicants for the college will be principally targeted to the persons who live in Savannakhet, Khammouan and neighboring provinces to promote integrated regional development. The college will not preclude applicants from other regions, as it will be equipped with dormitories.

(2) New concept

The proposed agricultural college will expand the functions of the present Agricultural Training Center, but will introduce new concepts in the light of recent economic changes in the region. The new concepts are:

- “Learning-by-doing”
  Practice is a key word for the proposed college. Acquiring knowledge and skills will occur through practical training.
- “Consistent Knowledge and Skills”
  Due to the recent economic trends in agriculture, consistent knowledge and skills from production to market-oriented farm management will be the focus in training programs, including technologies of post-harvest management, processing and packaging of crops for the market.
- “Integrated Farming including Local Industry”
  Value added products will be promoted for more profitable farm management through agro-processing, integration with local industry such as sericulture, mushroom products and winery, and integration with forest products.
- “Residential Training”
  The proposed college will be a boarding school, where all students and trainees stay in the college dormitory and receive concentrated residential training.
- “Self-supporting College”
  In view of the facts that most all technical schools and training centers in Lao PDR are facing financial constraints, it is proposed that this agricultural college be self-supporting, based on the sale of products produced in the college farm.

(3) New location

To introduce practical training and income generation activities, a new sizable location is needed for development of the college. Considering the regional potential and opportunities for growth in this field, 500 ha to 800 ha are required to ensure enough income generation to maintain a self-supporting system. The function of the present Agricultural Training Center at Nake (11 ha) will be transferred to the new location step by step.

(4) Income generation

“Lack of finance” has always been one of the major constraints to maintain government institutions. It is proposed that this agricultural college be kept sustainable based on a self-supporting system. The college will be designed to generate its own income as much as possible by selling products from the college farm. Some agricultural products would be processed using the processing facilities in the college. These activities are market-oriented, which should be leaned by students through on-the-job or practical training in the field. This market-oriented mind is important for the graduates to realize entrepreneurship, as well as through working as extension workers in the field.

(5) Phased development

As the area for the new agricultural college is relatively large, phased development is proposed to minimize the initial investment cost and to develop the college farm step by step by teachers, staff and students themselves through on-the-job training. For this reason, it is proposed that the college be equipped with such heavy equipment as bulldozer, motor grader, wheel loader, backhoe, roller, and other machinery, which will be used for land clearing, road and fishpond construction. This heavy equipment can also be used on a rental basis for fishpond construction and land clearing outside of the college to earn some incomes for college management. Initially it is proposed that the college receive 30 students a year, then the number should be increased to 50 students by the fifth year.

III-3 Program Outline

1) Location of the Proposed Agricultural College

Due to limited area in the present agricultural training center in Ban Nake (about 11 ha), a new site is to be proposed for development of the Agricultural College. Three alternative sites have been identified as follows:

Site-1: The first site is located about 30 km north of Savannakhet. The site is accessed by all weather road leading to Ban Kengkabao port, 5 km from the site on the Mekong river. The site covers about 800 ha and is in a single block.

Site-2: The second site is along the Savannakhet to Xeno road, principally on the NE side, between Km 12 and 20 from Savannakhet. There are about 450 ha of mainly forest lands in two to three blocks. Some land is already under paddy cultivation and would have to be acquired from farmers.

Site-3: The third site is 35 km to the southeast of Savannakhet near the Laos/Japan KM-35 Agricultural Development Project. There is an existing dam and irrigation system. The farm covers 950 ha of which 550 ha are irrigated in the dry season. Adjacent to this area are 300 ha of government land, principally secondary forest areas. The dam water is insufficient to meet the current requirements of the farmers and, therefore, the proposed agricultural college site would have to have additional pond facilities.

An Initial Environmental Examination (IEE) has been conducted on these alternative sites. On all three sites, secondary forests dominate. These would have to be partially cleared and the ground leveled to undertake most of the arable agricultural activities. However, it is recommended to leave several cover trees, as this is the typical farming method in the surrounding areas. Where pastoral agriculture is to be demonstrated, 25 to 50 cover trees should be left per hectare, especially browse trees. Also, additional fodder trees are recommended as are live fencing. Where trees have to be cleared, the bulk should be used for poles, charcoal and sawn wood instead of burning in situ. The trash could be burnt to provide some initial fertilizer.

Site-1 is principally a “green-field” area, thus there will be no serious environmental impacts apart from the removal of the tree over-stock. One of two shifting cultivation farmers may have to be compensated. At present, there are few farming activities in the surrounding areas.

Site-2 is a mixture of forest and farmland. The farmland would have to be purchased from existing farmers, and farmhouses would have to be removed. As part of the area is already cleared and some is existing paddy land, there would be less of an impact related to forest clearing. The students could study at first hand farming practices of the surrounding farmers.

Site-3 is principally forest land adjacent to an experimental farm area with irrigation. There are many paddy farmers round about and some are practicing aqua-culture. It is the smallest site and may be insufficient to meet the

requirements of the proposed college. To extend the area, some farmland could be acquired from surrounding farmers. Because some of the experimental area has salt on the surface, experiments could be undertaken on the reclamation of such land. Also, improved water management of the dam is required so that the dry season irrigation area could cover more than 60% as occurs at present.

On all three sites chemicals may be used (pesticides, herbicides, mineral fertilizers and laboratory chemicals). Proper provision should be provided for their storage, handling, use and disposal. All building should conform to building codes, taking full precautions against possible noise hazards. Disposal and/or use of organic waste from farm animals and humans should meet international standards. This IEE should be followed up with a thorough IEE once the site has been picked and the plans have been draw up for the college and farm. Then, it can be decided if a full Environmental Impact Assessment is required.

In order to determine the final selection of the proposed site, the following three key factors are taken into account based on the results of the IEE for the three sites, site investigation and other information obtained from the concerned authorities.

Table III-1 Key Factors to be Considered for Site Selection

	(1) Location, 1/	(2) Available Area, 2/	(3) Water Availability, 3/
Site-1	50 km distance by an all weather road.	800 ha in a single block, government owned, except for 35 ha. The current land use is secondary forest.	Most probable water would have to be taken from the Mekong river by pumping with about 4 km long of pipe line system.
Site-2	12 to 20 km distance by an all weather road.	450 ha in two to three blocks, mainly forest area and some land (about 20% of the land by rough estimation with 1:10,000 scale topographical map) is already under paddy and would have to be acquired from farmers.	Construction of a reservoir along Nam Bo river and pumping system is required for stable water supply to the area.
Site-3	35 km distance by an all weather road.	300 ha in a single block, government owned, principally secondary forest areas.	The existing dam water is insufficient to meet the current requirements of the farmers and therefore, the proposed agricultural college site would have to have additional pond facilities. However, no stable water resources are available nearby.

Note:

1/ Distance from Savannakhet and accessibility are important key factors in view of demonstration of the activities, marketing and convenience for other activities of the college.

2/ Available area, needs of land acquisition, land development potentiality for agricultural purposes are also important key factors in view of environmental aspects.

3/ Water availability for irrigation and domestic purposes are also important for agricultural development possibility, many training activities as well as residential purposes.

Source: JICA Study Team

Through evaluation of these factors, the Site-3 has been precluded first due to water availability. Further, the Site-2 would also have difficulty or limitation of water particularly in the dry season, even though a reservoir or pond can be constructed along the Nam Bo river. The compensation for paddy land acquisition would also be a hard task for the government because of limitedly available areas for resettlement nearby.

On the contrary, the Site-1 has been reserved by the government for future development and only about 35 ha remains as private paddy fields, which may be acquired from the farmers without serious problems, according to the interview with farmers in March 2001. Water supply by pumping from the Mekong river seems to be somewhat costly; however, the cost for irrigation facilities would be minimized by applying supplemental manual watering to field crops using plastic pipes. Effectiveness and minimization of the operation and maintenance cost for

irrigation would be one of the important issues in the practical training at the proposed college as well.

The relatively long distance from Savannakhet is a weak point for the Site-1. However, since the road is all-weather, one hour's drive is not considered to be a serious fault for the proposed site. Therefore, the Site-3 has been finally selected for the proposed Agricultural College (refer to Figure III-1).

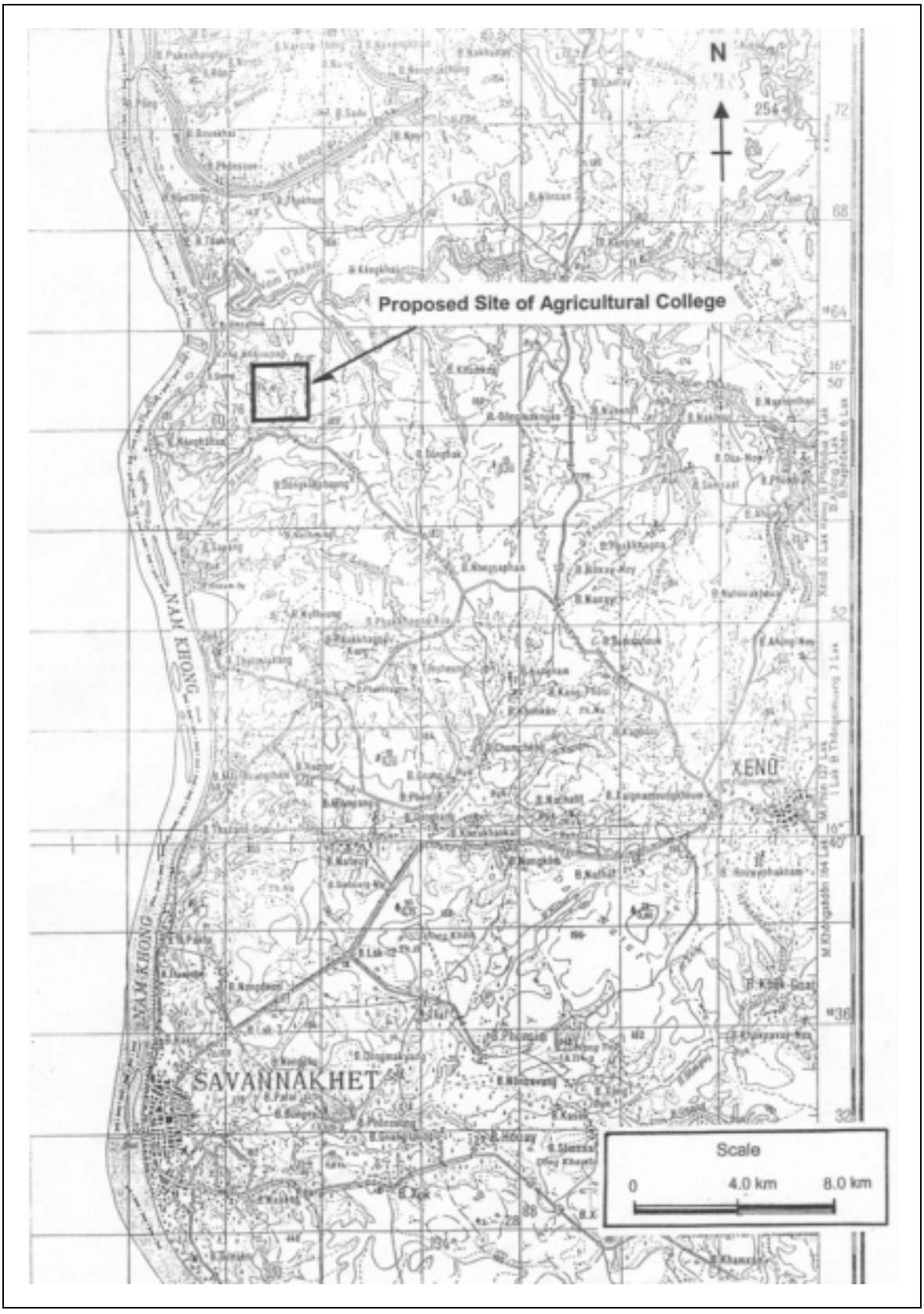


Figure III-1 Location of Savannakhet Agricultural College

The selected land for the Agricultural College has a total area of about 800 ha, located Ban Km-6 and Ban Dongphoung in Xaybouly district of Savannakhet province, about 30 km to the north of Savannakhet city. The site is reached by traveling about 6 km from Kengkabao on the provincial road to Ban Naxay, or about 30 km from Xeno town on Route 13. This land is owned by the government for future development, except for about 35 ha owned by the villagers of Ban Km-6 and Ban Dongphoung. According to the provincial government, this area will be allocated for the proposed Agricultural College with full support of the provincial government, including land acquisition for the remaining 35 ha of private land.

The proposed area is rolling with about 3% to 6% in slope, and about EL140 m to 185 m a.m.s.l. The present land use is mostly secondary forest, bush and fallow land with small rainfed paddy fields. The dominant soils are sandy based on a site reconnaissance.

2) Target Groups

(1) Full-time students

The proposed college will eventually receive 50 students a year and provide a 3-years course for a total size of 150 students. The 50 students will be divided into 4 groups (each having 10 to 15 students) and each group will receive practical training in 2 to 3 months period. The proposed qualification for admission is summarized below.

- At least 11th grade student;
- At least 30% of new students must be female;
- 50% of the quota will be admitted without examination upon recommendations from the districts;
- 50% of the quota will be admitted through entrance examination; and
- All students will stay in the college dormitories during their study period.

(2) Short-term training

No specific qualification for admission is required for the short-term training course. The trainees are admitted in groups of about 10 persons; these may be active government officers and community leaders. The training period is planned to be one month for government officers and 2 weeks for community leaders/farmers. It is planned that 10 short-term training courses will be undertaken each year.

The proposed 3 major courses of the Agricultural College are summarized below.

Table III-2 Courses Proposed at Agricultural College

Course	Qualifications/ target	Period	Nos. per year
1) 3-years diploma	11th graduate	3 years	50 students
2) Short-term training-1	DAFO/PAFO staff	1 month	10 per group, 10 groups
3) Short-term training-2	Farmers/Community leaders	2 weeks	10 per group, 10 groups

Source: JICA Study Team

(3) Schooling/Training Plan

Full-time students and short-term course trainees will be admitted by a gradual build-up based on practical and steady development of the college. Consequently, the annual number of students and trainees is estimated for the initial 5 years as follows:

Table III-3 Annual Received Students and Trainees

(unit: persons)

	Year-1	Year-2	Year-3	Year-4	Year-5
I. Full-time school students (3 years)					
- 1st year students	30	30	30	-	-
- 2nd year students	-	35	35	35	-
- 3rd year students	-	-	40	40	40
- 4th year students	-	-	-	45	45
- 5th year students	-	-	-	-	50
Sub-total	30	65	105	120	135
II. Short-time trainees					
a) 3-months course (10 per course)	10	10	20	20	30
b) 1 month course (10 per course)	10	20	20	30	30
c) 1 week course (10 per course)	10	20	30	40	50
Sub-total	30	50	70	90	110
Total	60	125	155	210	245

Source: JICA Study Team

3) Training Courses

(1) Crops

Rice

Rice will be grown in the lowland of the college farm for self consumption by the college staff, students and trainees. Rice bran is valuable to feed animals in the farm. Farming practice with appropriate application of organic manures and use of improved varieties and managed water supply will be introduced to students and trainees.

Field Crops

Increasing the yields of maize, soybean, mungbean and peanuts is the goal. Production can be increased through use of improved varieties, organic manures, crop rotations and cultural practices. Since integrated farming with organic manure is proposed as a sustainable farming system in this region, this concept should be enhanced and practiced in the college farm.

Since the college farm lands are mostly rolling areas, the farming practice should concentrate on identifying well adapted crop varieties, suitable crop rotations, soil and water management practices (fallow management practices, cover crops, sloping land practices such as contour strips and agro-forestry possibilities), including the use of integrated pest management (IPM) practices aimed at developing integrated and sustainable systems. Peanuts are promising crops in this region and will be grown in the college farm to demonstrate it's marketability. The peanut crop will be sold to a vegetable oil company in Savannakhet. Maize should also be cultivated to a large extent to cover the feed requirement for livestock farm. Maize and peanuts will be rotated with cassava, sweet potato, sunflower and other field crops to maintain the soil. Post-harvest technology such as post-harvest management, processing and packaging of crops will be an important focus for marketing both locally and for export.

(2) Livestock

Cattle raising

The college farm land has large areas of natural grassland or secondary forest suitable for pasture development. These areas are suitable for expansion of cattle raising through more intensive and even feedlot systems. Increased production will depend on improved control of animal health and improved provision and utilization of feed resources. The college will initially raise cattle in a rather extensive way with minimal input for production and will gradually introduce more intensive practices in the light of the economic returns from the investment.

Facilities and equipment for control of animal health are indispensable. For the improvement of livestock productivity and to develop export markets, the following factors will be focuses in the training program:

- Basic animal health care to control major epidemic diseases and internal parasites;
- A disease surveillance system to provide early warning of dangerous animal disease; and
- Improved quarantine procedures.

Appropriate feed technology should be introduced for cattle, pigs and poultry, utilizing local crops, crop residues and by-products from agro-processing and high protein leguminous forages. Development of pasture technology should be based on use of suitable grasses and legumes both annuals and perennials. Suitable methods of pasture establishment, maintenance and management for feeding, is also a priority program in the livestock training.

Pig and Poultry production

Pig and poultry meat production can be greatly increased through improved disease control, introduction of improved breeds and development of improved feeds and husbandry practices. Basically all animal feed will be raised on the farm. It should be produced through the proposed crop rotation.

(3) Fisheries

Due to high domestic demands and prices, fish production is expected to increase yearly. This expansion will depend on improved fingerling production and distribution, increased pond area and improved fish raising methodologies. In the college farm, those technologies will be a focus of the training program.

(4) Agro-forestry

Perennial-crop-based agricultural systems (fruit trees, fodder trees, industrial crops, non-timber forest trees, pasture and livestock) and fruit orchards, as well as other income generating shrubs and trees (e.g., mulberry trees) can also be combined in the agro-forestry systems. With many flowering plants, it is possible to develop bee hives and produce honey.

(5) Agro-industry

Pineapple and mango are popular for agro-processing (e.g., juice, jam and dry fruits), which can be developed on the college farm. Fruits can be transformed into wine through fermentation. Native fruits such as cashew, pineapple, guava, and banana can be processed into good wine. Since the demand for wine is increasing, further potential exists in developing a winery. Among fiber crops, cotton has potential for increased production. Cotton yields can be increased through improved varieties and improved cultural practices, including use of integrated pest management practices.

(6) Irrigation/ Agricultural machinery

Basic knowledge and skills on irrigation, including operation and maintenance of the facilities, should be acquired in the college. However, in this farm, the major farming practice will be based on rainfed condition in view of the real farming practice prevailed in the whole country, particularly for upland crops. Since watering in the dry season is effective for agricultural production, the effective use of irrigation water will be one of the key issues to be addressed in practical training. Actually, water will be pumped from the Mekong river about 4 km from the center of the college. This would be a good demonstration to learn the true water costs. Knowledge and skills of agricultural machinery will also be taught to the students as a basic requirement for modern arable/pastral farming.

III-4 Curriculum Plan

1) Curriculum for School (Full-time Students)

The curricula will be composed of three categories; i.e., general education, professional basic education and specific course. The professional basic education will include the study on the environment and ecology. The specific course will be divided into arable agriculture, livestock, irrigation/agricultural machinery, fishery and forestry/agro-forestry. Students are required to study all courses. General education and basic professional education are required to study mainly during the first and second years. Specific courses are required to study mainly during the second and third years.

Each specific course is designed to complete in three months. Students take two or three specific courses during their second and third years when practical training with some lectures on technical knowledge will be executed.

Table III-4 Courses for Fill-time Students

	1st Year	2nd Year	3rd Year
General Education	General Education (I)	General Education (II)	
Basic Professional Education	Agricultural Technique		Accounting/ Economics/ Entrepreneurship
	Agricultural Management (I)	Agricultural Management (II)	
	Environment and Ecology	Integrated farming system	Agro-industry/ processing
	Computer Information Technology (I)	Computer Information Technology (II)	Marketing
Specific Course		Arable agriculture (I)	Arable agriculture (II)
		Irrigation/ Agricultural Machinery	Livestock
			Forestry/agro-forestry
			Fishery

Source: JICA Study Team

Outline of each curriculum is proposed in Attachment I.

2) Short-term Training

Short-term training courses will be open to the public. The duration of each training courses are one to two months, depending upon the course contents. The training courses are divided into regular courses and short-term courses. The regular courses are organized every year. The short-term courses are based on the public demand. These short-term courses are also specifically designed in view of the participants' requirements.

The contents of the regular courses are similar to the subject components for full-time students. The regular courses will comprise:

- Agricultural management/Accounting
- Promotion of Agro-Industry/Agro-business
- Entrepreneurship/Marketing
- Environment and Ecology
- Computer Information Technology
- Animal Science/ Animal Production
- Animal Management
- Plant Science/ Plant Production
- Irrigation System/ Integrated Farming System
- Fishery Science
- Agro-forestry/Forestry

3) Entrepreneurship

There are four fields to be introduced for entrepreneurs development training program, i.e., (i) entrepreneurial quality/identity development, (ii) enterprise set-up and resource appraisal, (iii) enterprise management including cost and financial account, and (iv) enterprise discipline and social responsibility. The curricula of the entrepreneurship training programs are proposed in Attachment II.

4) Linkage with Other Institutions

It is proposed that Savannakhet Agricultural College will have linkages with other educational institutions through exchange of students and application of a common accrediting system, in order to share updated information, technology and skills.

Lao National University

It is proposed that the college be linked with the Lao National University so that the students of the Agricultural Faculty of the Lao National University can take a practical training course in the college. The students will be able to lean more practical subjects in Savannakhet which are not offered in the university.

Rajamangala Institute of Technology Kalasin Campus (Thailand)

The Rajamangala Institute of Technology Kalasin Campus is offering an academic cooperation (students/staff exchange) with Lao PDR but the extent of cooperation is still limited now. This program should be more expanded, particularly with the Savannakhet Agricultural College. Since the distance of the two institutions is short (about 200 km) and they have traditionally the same culture. It is also expected that cooperation will be developed not only in the public sector but in the

private sector, and will be further linked with expansion of agricultural business in the future.

III-5 Layout of Facilities

The Savannakhet Agricultural College will have the facilities as proposed below. A layout of Savannakhet College is shown in Attachment III.

1) Buildings

The following buildings are proposed for the curriculum plan and activities in the Agricultural College (Layouts of buildings are shown in Attachment IV):

(1) Campus

A main building of the college, where 150 full-time students take lessons, is composed of 10 class rooms, 10 practical class rooms, 5 teacher's rooms, 1 administration room, 1 library including computer facilities, 1 cafeteria, and 1 conference room. A total floor area is estimated to be 6,320 m^2. In addition, two dormitory buildings are planned, one for men and the other for women, and all students will stay during their study period. The floor area of dormitories is estimated to be 560 m^2 each.

(2) Teacher's compound

40 residences, 20 for permanent teachers/staff and 20 for short-time teachers/staff, are also located with a floor area of each residence being estimated at 60 m^2.

(3) Workshop

Five workshop buildings are planned for the 5 major courses. Two types of workshop are proposed; Type-1 workshop buildings with a total floor area of 480 m^2 constructed near the livestock field and a fishpond, respectively, and Type-2 workshop buildings with a total floor area of 600 m^2 attached to crop fields, agro-industry fields and local industry fields, respectively.

For the livestock fields, 2 pig houses, 2 chicken houses and one cattle house are additionally required, where students and trainees can take practical lessons. Further, one breeding house for fingerlings (72 m^2) is to be constructed near the fishponds. Likewise, a pig house with a total floor area of 54 m^2 and a play ground of 89 m^2 are proposed for pig raising. The pig pen's floor should be concreted to make cleaning easier and to minimize the presence of parasites and diseases. On

the other hand, a chicken house with a total floor area of 72 m^2 and a play ground of 48 m^2 are proposed. The chicken house will be built on porous soil and on a gently sloping terrain for better drainage. The shed type roof is ideal for a one-story chicken house with some or all of sides open. The manure from these facilities (at least the pig sty) should go to a bio-gas digester to produce bio-gas for heating/cooking purposes and slurry for fertilizer.

(4) Machinery center

All machinery and vehicles are kept at one place, namely a machinery center, to control and maintain them effectively. The proposed machinery center is composed of one repair shop (280 m^2) and three garages (280 m^2 each) for heavy equipment, vehicles and farm machinery.

2) Farm Infrastructure

(1) Roads

A systematic road network on the college campus is indispensable for effective activities in field training. At the same time, all the campus design should be carefully prepared from the environmental point of view. Some existing forests should be preserved to maintain the ecological situation. At the initial stage, the main road and some secondary roads are to be constructed as minimum requirements for the field program. It is proposed that the other necessary roads will be constructed step by step by the college staff and students, which must also be part of the practical training in the college.

The main road is designed to connect Ban Km-6 with Ban Sivilay, so as to go around the campus. The total length of the proposed main road will be 7 km. In addition, a total of 11 km of secondary roads are proposed at the initial stage. The secondary roads are designed to connect the main road with workshop buildings and various facilities such as paddy fields, fishponds, field crop fields, pig houses, poultry houses, a cattle house and pastures. Drainage facilities such as crossing drains and side drains are indispensable to maintain traffic in the rainy season. Sufficient drainage capacity is required to maintain the drainage system and to prevent soil erosion. The cross sectional designs for main and secondary roads are proposed as follows:

Table III-5 Proposed Road Design

Proposed Road	Main road	Secondary road
Total length	7 km	11 km
Pavement	Gravel pavement	Gravel pavement
Pavement width (carriage way)	4.5 m	3.0 m
Shoulder	3.0 m (1.5 m x 1.5 m)	2.5 m (1.25 m x 1.25 m)
Total road width	7.5 m	5.5 m

Source: JICS Study Team

(2) Farm land

Five (5) types of farm lands are proposed at the initial stage to gain minimum agricultural products for consumption by the college staff and students as well as for marketing:

Table III-6 Proposed Area of Farm Land

Farm land	Area (ha)
1. Paddy fields	30
2. Upland crop fields	30
3. Orchards (fruit trees)	5
4. Pasture (cattle raising)	50
5. Mulberry trees fields	1

Source: JICA Study Team

The existing paddy fields will be used for paddy production. Based on the topographic conditions, the present plots will be re-zoned and enlarged, and some farm roads will be additionally constructed for effective use of machinery.

Upland crop field will be newly developed in some areas between EL 160m and EL 170m with less than 3% in slope, in order to use soil moisture as much as possible. For developing these fields, most of trees and bushes will be cleared and burnt for sterilizing the soils. The land for orchard and mulberry trees will be newly developed in some sloping land to demonstrate SALT (Sloping Agricultural Land Technology) farming. The existing forests between EL 170m and 180m will be used as a pasture land for cattle raising. The grazing land will be fenced with paling and barbed wires. Logs for palings will be collected from the cleared areas. The grazing land will be developed to the improved grass land, step by step, to demonstrate a semi-intensive cattle raising system.

(3) Irrigation facilities

Water for irrigation and domestic purposes will be taken from the Mekong river, about 5 km from the center of the proposed campus. It is proposed that water is lifted by pump and delivered by pipeline to the No.1 regulating pond (E.L.=176 m)

located at the west end of the campus; thereafter half the volume of water is further pumped up to the No.2 regulating pond (EL= 187 m) located at the center of the college farm area. Water is distributed by gravity pipelies to each field from these regulating ponds. The irrigation facilities are designed in the following manner:

(i) Water resource: Mekong river (LWL=120.0 m)

(ii) Water requirement: 5.0 ha dry season irrigated rice, estimated with the following assumptions:

- Evapotranspiration + Percolation = 10 mm/day = 1.16 l/s/ha
- Irrigation efficiency = 70%
- Gross water requirement per ha = 1.65 l/s
- Gross water requirement per 5.0 ha = 8.25 l/s
- Gross water requirement for all college farms (including 5.0 ha of irrigation and domestic use) = 8.25 x 1.2 = 9.9 l/s
- Pump capacity (6 hours operation /day) = 9.9 x 24/6 = 39.6 l/s = 2.38 m^3/min

Based on these assumptions, the facilities are designed as summarized below (Diagram of Irrigation and Domestic Water Supply Facilities is illustrated in Attachment V).

Table III-7 Dimensions of Facilities:

Pump station	Discharge Volume (m^3/min)			Actual head (m)	Total head (m)	Length of pipe line (m)
	Irrigation	Domestic	Total			
No.1	1.98	0.40	2.38	56	66	2,200
No.2	0.99	0.20	1.19	13	27	3,500

Source: JICA Study Team

Table III-8 Required Pumps and Motors

Pump station	Pump			Motor (kw)	Pipe line	
	Type	Diameter (mm)	unit (nos.)		Diameter (mm)	Length (m)
No.1	Centrifugal	150	2, */	50	250	2,200
No.2	Centrifugal	125	2, */	10	200	3,500

Note: */ one pump each is stand-by.

Source: JICA Study Team

Table III-9 Pipeline Network

Distribution		Pipe line	
from	to	Diameter (mm)	Length (m)
Regulating Pond No.1	Pig, Cattle, Poultry houses	50	1,000
Regulating Pond No.2	Field crops	50	1,000

Source: JICA Study Team

Table III-10 Required Regulating Pond

Regulating pond	Storage capacity (m^3)	L x W x H (m x m x m)	Type	EL	
				HWL (m)	LWL (m)
No.1	842	24 x 24 x 2	Reinforced concrete	176.5	175.0
No.2	421	18 x 16 x 2	- do -	187.5	186.0

Source: JICA Study Team

(4) Potable water supply facilities

It is planned that potable water for each building will use deep wells near the campus. Potable water requirement is estimated to be about 9.3 m^3 a day based on the following assumptions:

Table III-11 Potable Water Requirement

Location/Facilities	Persons	lit./person/day	lit./day
1. Campus			
- Main building	150	15	2,250
- Dormitory	200	15	3,000
2. Teacher's Compound			
- Staff residence	150	15	2,500
3. Farm			
- Workshop building	100	15	1,500
- Cattle house	5	15	75
- Pig house	5	15	75
- Poultry house	5	15	75
4. Machinery center			
- Repair shop	10	15	150
(Total)			(9,375)

Source: JICA Study Team

The groundwater potential varies depending on the hydro-geological conditions. According to interviews at Ban Km-6, farmers have constructed their tube wells by hand easily and are pumping up water by hand pumps. The results of pumping test undertaken in the southern provinces of Lao PDR by JICA in 1995 also indicates that groundwater discharge is estimated to be 15 to 20 lit/min on an average. Thus, 15 lit/min (0.25 lit/sec) is applied as a potential discharge of deep well in the proposed campus. Based on the potential discharge of 15 lit/min, two deep wells are required to meet the estimated requirement at the college; i.e.,

9,300 lit (daily requirement) / 15 lit/min x 60 min x 6 hours = 1.7 wells.

Each system is composed of a deep well equipped with a submersible pump, an elevated water tank, a distribution pipeline network and some faucets. The first system is constructed near the campus for water distribution mainly to the main building and dormitories. The second system is constructed near the farm for water distribution mainly to the farm facilities and staff residences. The facilities required for potable water supply are summarized below.

Table III-12 Potable Water Supply System

Potable Water Supply System	No. 1	No. 2
1) Water resource	Ground water/ tube well	Ground water/ tube well
2) Pumping facilities	Submersible pump	Submersible pump
3) Pumping capacity	15 lit/min	15 lit/min
4) Actual head	50 m	50 m
5) Motor capacity	1.5 kw	1.5 kw
6) Elevated tank capacity	6.0 m^3 (2m x 2m x 1.5m)	6.0 m^3 (2m x 2m x 1.5m)
7) Distribution pipeline	L= 1,000 m, dia.= 32 mm	L= 1,000 m, dia.= 32 mm
8) Distribution area	Main building, dormitory	Staff residences, farm buildings

Source: JICA Study Team

(5) Fish pond

Four (4) fishponds with a total area of 1.0 ha in net (40 m x 70 m x 4 ponds) are planned for the fishculture training course. The location of pond will be carefully determined in the lowland, since it is important to have clean flowing water to irrigate the pond as much as possible. Flowing water prevents breeding of bacteria that are infections to fish. In the college farm, during the dry season, the minimum water can be supplied from the Regulating pond No.1.

The proposed pond is a dug-out excavated type with a depth of 1.5 m. Two meter high perimeter dikes will be constructed around the pond using the soil excavator. The inner sides of the pond will be firmed up by pressing with a board or heavy log. Two pipes or small canals with control valves or gates are to be installed on the opposite sides; one serving as an inlet and the other serving as an overflow. The fishpond will be fenced with paling and any available local materials. Living fence of legume trees or fruit trees such as banana, papaya and coconut are desirable in terms of integrated farming.

(6) Power line

There are two 22kv transmission lines available at the proposed site, one running along the provincial road from Kengkabao to Ban Km-6 and the other 22kv line running along the village road, namely along the Mekong river from Kengkabao to Ban Sivilay. The existing 22 kv transmission line will be extended to the center of

the campus. The total length of the extended 22 kv line is estimated to be 7 km. For pumping facilities of both irrigation and potable water supply, the voltage will be lowered to 400 v.

3) Equipment, Vehicles, Farm Machinery and Training Tools

(1) Heavy equipment

It is proposed that one fleet of heavy equipment be placed in the college for the following three purposes:

- Phased development of the college farm to minimize the initial cost and to develop the college farm, step by step, through on-the-job training;
- Income generation activities for farm land development such as land clearing and fishpond construction outside the college; and
- Maintenance of the college farm infrastructure.

The specifications of heavy equipment are proposed as shown below.

Table III-13 List of Heavy Equipment

Heavy Equipment	Specification	Number
1. Bull dozer	180 PS	1
2. Motor grader	115 PS, W=3.1 m	1
3. Wheel loader	85 PS, 1.2 m^3	1
4. Backhoe	0.5 m^3	1
5. Roller	4t	1

Source: JICA Study Team

(2) Vehicles

Vehicles are important tools for effective farm management as well as for training. Based on schooling and training programs, as well as on the numbers of teachers, staff and students, the following vehicles will be required at the initial stage of operations:

Table III-14 List of Vehicles

Vehicles	Specification	Number
1. Pick-up	4WD, 2500~3000cc	3
2. Micro bus	12 seats, 3000~4000cc	1
3. 4WD wagon	3000~4000cc	1
4. Cargo truck	8t	1
5. Dump truck	8t	1
6. Water tanker	6000 lit	1
7. Motor cycle	125cc	10

Source: JICA Study Team

(3) Farm machinery

The following farm machinery is required for the proposed farming operation in the college farm:

Table III-15 List of Farm Machinery

Farm Machinery	Specification	Number
1. Farm tractor	65PS, with a trailer and attachments	2
2. Hand tractor	12PS, with a trailer and attachments	5
3. Rice mill	0.3ton/h	1

Source: JICA Study Team

Rice mill will be used for milling not only college produced but also rice harvested outside the college, to get some income for the college operation.

(4) Training tools

20 sets of computer with its accessories are required; 10 sets will be used for college and farm management, and the other 10 sets for schooling and training programs. Meteorological observation equipment, hatching equipment, a soil testing equipment and other necessary training equipment, tools. and materials are required for practical training.

III-6 Initial Cost of the Facilities

Based on the required facilities for the agricultural college, the total cost of the facilities is estimated to be US$ 11.4 million as summarized below. The breakdown of the estimated cost is shown in Attachment V & VII.

Table III-16 Summary of Initial Investment Cost

Description	Amount ($ '000)
Buildings	3,821
Farm Infrastructure	4,340
Equipment/Vehicles	1,746
Engineering Services	1,493
Total	11,400

Source: JICA Study Team

III-7 Operational Plan

1) School Management

The following numbers of teachers and staff are proposed for college operation, who will be posted during the initial 5 years, step-by-step:

Table III-17 Numbers of Teachers and Staff

(unit: persons)

College Staff	Year-1	Year-2	Year-3	Yera-4	Year-5	Year-6~10
I. Teachers/ Experts						
- Foreign experts	4	4	4	2	2	0
- Thai teachers	4	4	4	4	4	4
- Local teachers	4	6	8	12	14	16
(Sub-total)	12	14	16	18	20	20
II. Technical Staff						
- Local staff	10	12	15	18	20	20
III. Administration						
- Local staff	6	7	8	9	10	10
Total	28	33	39	45	50	50

Source: JICA Study Team

It is proposed that foreign experts/teachers be assigned under the bi-lateral technical assistance programs during the initial 5 years at no cost to the college. In this period, several local experts will be trained as teachers. Initially, some teachers will be assigned from the Lao National University, MAF and other concerned institutions. After the 6th year, it is recommended that a limited number of foreign experts be stationed at the college. 20 technical staff and 10 administration staff will be recruited, step-by-step, in accordance with the increase in the numbers of students. Consequently, training costs are preliminary estimated as follows:

Table III=18 Training Costs

	Tuition	Accommodation
3-years full-time school	$ 50 per year	$ 50 per year
3-months course	$ 15 per course	$ 0.5 per day
1 month course	$ 10 per course	$ 0.5 per day
1 week course	$ 5 per course	$ 0.5 per day

Source: JICA Study Team

2) College Farm Management

(1) Cropping plan

The cropped areas are estimated for the initial 10 years based on stage-wise development of the farmland. The annual crop areas will increase from 17 ha in the first year to 66 ha in the fifth year and kept at the same level of production from sixth year to tenth year due to limited manpower. On the other hand, the fruit tree and mulberry tree crop plantation will be promoted more in view of less manpower requirements for maintenance as well as potentials for marketing by agro-processing and sericulture development. It is proposed that fruit trees be

planted at 5 ha per year and mulberry trees at 1 ha per year, as summarized below:

Table III-19 Annual Cropping Plan

(unit: ha)

(Year)	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9	Y-10
I. Annual crops										
- Paddy (wet season)	10	15	20	25	30	30	30	30	30	30
- Paddy (dry season)	1	1	1	1	1	1	1	1	1	1
- Field crops (wet season)	5	10	15	20	30	30	30	30	30	30
- Field crops (dry season)	1	2	3	4	5	5	5	5	5	5
Sub-total	17	28	39	50	66	66	66	66	66	66
II. Tree crops										
- Fruit trees (1st year)	5	5	5	5	5	5	5	5	5	5
- Fruit trees (2nd year)	-	5	5	5	5	5	5	5	5	5
- Fruit trees (3rd year)	-	-	5	5	5	5	5	5	5	5
- Fruit trees (4th year)	-	-	-	5	5	5	5	5	5	5
- Fruit trees (5th year)	-	-	-	-	5	5	5	5	5	5
- Fruit trees (6st year)	-	-	-	-	-	5	5	5	5	5
- Fruit trees (7nd year)	-	-	-	-	-	-	5	5	5	5
- Fruit trees (8rd year)	-	-	-	-	-	-	-	5	5	5
- Fruit trees (9th year)	-	-	-	-	-	-	-	-	5	5
- Fruit trees (10th year)	-	-	-	-	-	-	-	-	-	5
- Mulberry trees (1st year)	1	1	1	1	1	1	1	1	1	1
- Mulberry trees (2nd year)	-	1	1	1	1	1	1	1	1	1
- Mulberry trees (3rd year)	-	-	1	1	1	1	1	1	1	1
- Mulberry trees (4th year)	-	-	-	1	1	1	1	1	1	1
- Mulberry trees (5th year)	-	-	-	-	1	1	1	1	1	1
- Mulberry trees (6st year)	-	-	-	-	-	1	1	1	1	1
- Mulberry trees (7nd year)	-	-	-	-	-	-	1	1	1	1
- Mulberry trees (8rd year)	-	-	-	-	-	-	-	1	1	1
- Mulberry trees (9th year)	-	-	-	-	-	-	-	-	1	1
- Mulberry trees (10th year)	-	-	-	-	-	-	-	-	-	1
Sub-total	6	12	18	24	30	36	42	48	54	60

Source: JICA Study Team

(2) Cattle raising plan

At the initial stage, 50 head of cow and 10 bulls will be raised in the cattle grazing land of 50 ha. Presently, the grazing land is mainly secondary forest and the carrying capacity is estimated to be one head of cattle per ha. However, in the longer term, a semi-intensive raising system with improved pasture will be applied to increase the number of cattle. In the college farm, such an improved semi-intensive raising system will be demonstrated for the training purposes. With 50 head of cow and 10 bulls in the initial year, it is estimated that the numbers of cattle will be increased to 104 heads of adult cattle and 86 head of calves for raising, with 54 head of adult cattle for selling in the tenth year. Based on a delivery ratio of 60% and a mortality rate of 10%, the annual increase in cattle is estimated as shown below.

Table III-20 Annual Increase of Cattle

(unit: head)

(Year)	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9	Y-10
I. for Raising										
- Adult (female)	50	45	41	49	55	59	65	72	79	87
- Adult (male)	10	9	8	9	10	11	12	14	16	17
- Calves (female)	0	15	27	24	26	30	32	35	39	43
- Calves (male)	0	15	27	24	26	30	32	35	39	43
Sub-total	60	84	103	106	117	130	141	156	173	190
II. for Selling (adult)	0	0	0	10	18	24	32	39	46	54

Source: JICA Study Team

(3) Pig raising plan

The pigs to be raised on the college farm will be native breeds fed mostly with maize, rice bran, cassava and other farm by-products to minimize the raising cost and maximize the use of farm by-products. A pig reaches maturity in 9 months (70 kg live-weight). The feed requirement for 9 months is estimated to be about 510 kg of agricultural products. It is proposed that 4 sows and 1 boar are raised at the initial stage. A sow will have 7 to 8 healthy piglets with two delivery per year. Therefore, it is estimated that a total of 60 pigs can be sold for income generation.

(4) Chicken raising plan

Sixty (60) native chickens, 50 hens and 10 roosters, will be raised on a free range system. A native chicken needs 4 to 5 months to be adult (1.2 kg live-weight). Feed requirement for 5 months is estimated to be about 7.4 kg of agricultural products such as maize, rice bran and other farm by-products. With 50 hens, a daily yield of 10 large-size eggs and 500 chickens each year are expected for income generation.

(5) Fishculture plan

Four (4) fishponds with a total area of 1.0 ha, or 0.25 ha (40m x 70m) each, are proposed for fishculture program in the college farm. To this end, an integrated system using own-grown products and waste of maize, rice bran and chicken manure is proposed as food to minimize production costs and maximize the use of farm products. Low cost inputs are proposed so that farmers will promote fishculture programs by themselves. Feeding fish is normally done by providing chicken manure. Supplemental feeding is only necessary for two weeks before harvest to fatten the stock and to improve its taste. A total of 10,000 fingerlings, about one week old with a size of 2 to 3 cm, will be reared in a nursery pond or in a caging net in the rearing pond. When the fingerlings reach a length of about 5 to 7 cm, they are transferred from the nursery or caging net to the rearing pond. It is

estimated that live-weight of fish will increase to 500 g per fish with about 65% of survival rate. Thus, the total annual fish production of from 1.0 ha of fishponds is estimated to be 3,250 kg.

3) Estimated Operational Cost

The operational cost is broadly divided into the cost for salaries of teachers, staff and seasonal workers, and the cost of the facility operation.

(1) Salaries

The annual cost of salaries for teachers and staff is estimated to be $13,100 in the first year, $29,640 in the fifth year, and $31,200 after the sixth year as summarized below.

Table III-21 Salaries of Teachers and Staff

College Staff		Year-1	Year-2	Year-3	Yera-4	Year-5	Year-6~10
I. Teachers/ Experts							
- Foreign experts	prs.	4	4	4	2	2	0
	$	-	-	-	-	-	-
- Thai experts	prs.	4	4	4	4	4	4
	$	-	-	-	-	-	-
- Local	prs.	4	6	8	12	14	16
	$	3,120	4,680	6,240	9,360	10,920	12,480
(Sub-total)		12	14	16	18	20	20
II. Technical Staff							
- Local	prs.	10	12	15	18	20	20
	$	6,240	7,488	9,360	11,232	12,480	12,480
III. Administration							
- Local	prs.	6	7	8	9	10	10
	$	3,744	4,368	4,922	5,616	6,240	6,240
Total		13,104	16,536	20,592	26,208	29,640	31,200

Source: JICA Study Team

(2) Wages for seasonal workers

Regular works on the farm are managed by staff, students and trainees; however, additional seasonal workers are needed for annual crop production, particularly for transplanting of rice and harvesting crops. It is estimated that, out of an average 120 labor-days requirement per ha, 20 labor-days (17%) will be employed as seasonal workers. The employed workers will increase in accordance with the increase in annual crop areas from 340 labor-days in the first year to 1,320 labor-days in the fifth year onwards, as summarized below.

Table III-22 Wages for Seasonal Workers

	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6~10
Annual crop area (ha)	17	28	39	50	66	66
Labor requirement (Labor-days)	2,040	3,360	4,680	6,000	7,920	7,920
Seasonal worker employ. (L-days)	340	560	780	1,000	1,320	1,320
Amount of employment ($)	510	840	1,170	1,500	1,980	1,980

Source: JICA Study Team

(3) Operation cost of facilities

Major operation costs of facilities in the college are for fuel and electricity. The fuel cost is estimated on the basis of unit fuel consumption per hour for each equipment/vehicle and estimated operation hours per year. The total fuel consumption is estimated to be 79,000 lit/year in the fifth full-operation year, the cost of which is $ 27,000. Electricity charge is estimated on the basis of capacity of machinery and estimated operation hours per year. The total annual consumption is estimated to be about 260,000 kwh in the fifth full-operation year, the cost of which is $ 10,000. Annual operation costs will be increased in accordance with the increase in students and trainees, as well as increase in farming activities, which are estimated to be 60% of the full operation in the first year, 70% in the second year, 80% in the third year, 90% in the fourth year and 100% in the fifth year, respectively as summarized below.

Table III-23 Annual Operation Cost

	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6~10
1. Fuel Consumption ('000 lit)	46.8	54.6	62.4	70.2	78.0	78.0
- Fuel and oil cost ($ '000)	16.2	18.9	21.6	24.3	27.0	27.0
2. Electricity ('000 kwh)	156.0	182.0	208.0	234.0	260.0	260.0
- Electricity charge ($ '000)	6.0	7.0	8.0	9.0	10.0	10.0

(4) Maintenance cost of facilities

Total maintenance cost of buildings, facilities, equipment and vehicles is estimated to be $8,000 per year in the fifth full-operation year. Annual maintenance costs will be increased annually, which are estimated to be 10% of the full operation in the first year, 20% in the second year, 50% in the third year, 80% in the fourth year and 100% in the fifth year onwards.

(5) Depreciation cost of equipment/vehicle/machinery

Depreciation cost is taken into account in order to replace the equipment/vehicle/machinery in accordance with their lives. The replacement cost of farm operation machinery/vehicle is estimated to be $891,000 excluding such construction equipment as bulldozer, motor grader, wheel loader, backhoe, roller,

dump truck and water tanker. It is proposed that such farm operation machinery/vehicle will be replaced in kind by external cooperation (public on private).

4) Estimated Revenue

(1) Tuition/Accommodation fees

Based on the tuitions and accommodation fees and the schooling/training plan proposed above, the annual revenue from the tuition and accommodation fees are estimated to be $3,935 in the first year and $16,475 in the fifth year, as summarized below.

Table III-24 Estimated Tuitions/ Accommodation Fees

(unit: $)

	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6~10
Full-time students	3,000	6,500	10,500	12,000	13,500	13,500
Three months course	600	600	1,200	1,200	1,800	1,800
One month course	250	500	500	750	750	750
One week course	85	170	255	340	425	425
Total Revenue from Tuition	3,935	7,770	12,455	14,290	16,475	16,475

Source: JICA Study Team

(2) Farm products

Based on the proposed cropping plan, cattle, pig, chicken raising plan and fishculture plan, the net income from the farming activities are estimated to be $ 9,686 in the first year and $ 43,568 in the tenth year, as summarized below.

Table III-25 Net Income from Farm Products

(unit: $ '000)

(Year)	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9	Y-10
Annual crops	5.9	9.9	13.8	17.8	23.7	23.7	23.7	23.7	23.7	23.7
Fruit tree/tree corps	0	0	0.4	0.7	1.5	2.6	4.1	6.0	8.2	10.4
Livestock/Fishculture	3.8	3.7	3.7	4.8	5.7	6.3	7.1	7.9	8.6	9.5
Total	9.7	13.6	17.9	23.3	30.9	32.6	34.9	37.6	40.5	43.6

Source: JICA Study Team

(3) Rental of heavy equipment

In rural areas, one of the burdens farmers is to open new lands. Farmers also have strong interest in fishculture. However, such civil work as land clearing and fishpond construction is hard work by manual labor. Presently, there is no heavy equipment for rent in SKR, and farmers can only ask individually and temporarily a bulldozer operator who works on construction projects nearby. Thus, rental of

heavy equipment will be appreciated by farmers, and at the same time the college can earn some income with the effective use of heavy equipment. Rental of heavy equipment is not a main college function, but useful for effective use of the existing equipment. Further, it will be possible for college students to operate this equipment for practice and on-the-job training. It is also expected that when some graduates go back to their villages, they will use the knowledge and skills they learnt at the college including the use of heavy equipment. Since the requirement for heavy equipment in the college farm will be high in the initial period, the rental of equipment will be started in the third year and this activity will be gradually expanded according to the requirements in the rural areas. The income from rent of heavy equipment is estimated to be $ 5,000 in the third year, $15,000 in the fifth year and $20,000 after sixth year based on the rental period of 10 days, 20 days and 30 days a year respectively, as summarized below.

Table III-26 Net Income from Rented Heavy Equipment

(unit: $)

Equipment		Year-1	Year-2	Year-3	Year-4	Year-5	Year-6~10
Bulldozer	days	0	0	10	20	30	40
	($)	0	0	2,500	5,000	7,500	10,000
Backhoe	days	0	0	10	20	30	40
	($)	0	0	1,900	3,800	5,700	7,600
Dump truck	days	0	0	10	20	30	40
	($)	0	0	600	1,200	1,800	2,400
Total Net Income		0	0	5,000	10,000	15,000	20,000

Source: JICA Study Team

III-8 Preliminary Evaluation

Although the proposed college aims to be a self-supporting operation, an educational institution of this type will not be manageable without the public support for operations. It is therefore proposed that the basic salaries of the permanent college staff be paid by the government. In addition, the cost of foreign experts during the initial five years would be born separately under the bi-lateral technical assistance programs.

1) Public support

The government support will cover the basic salaries for permanent staff, while their allowances will be paid by the college. The government support will increase from $10,000 in the first year to $24,000 in the sixth year and thereafter, as summarized below:

Table III-27 Salaries and Allowances for Local Teachers/Staffs

(unit: $ '000)

(Year)	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Y-7	Y-8	Y-9	Y-10
Basic Salaries										
(Government Portion)	**10.0**	**12.7**	**15.8**	**20.2**	**22.8**	**24.0**	**24.0**	**24.0**	**24.0**	**24.0**
Allowances										
(College Portion)	3.0	3.8	4.8	6.0	6.8	7.2	7.2	7.2	7.2	7.2
Total	13.0	16.5	20.6	26.2	29.6	31.2	31.2	31.2	31.2	31.2

Source: JICA Study Team

2) Technical assistance

It is proposed that technical assistance be introduced, particularly during the initial 5 years, in order to support college operation. The cost for foreign experts, which is estimated to be $0.96 million per year during the initial 3 years and $ $0.60 million per year in the fourth and fifth years and $0.24 million per year in the sixth yea and thereafter, will be born by the bilateral technical assistance programs.

3) Preliminary Cash Flow

A preliminary cash flow, exclusive of the public support and technical assistance, is prepared as shown below.

Table III-28 Preliminary Cash Flow for College Operation

(unit: $)

	Year-1	Year-2	Year-3	Year-4	Year-5
Revenue					
1. Tuitions/Accommodation Fees	3,935	7,770	12,455	14,290	16,475
2. Income from Farm Products	9,686	13,629	17,947	23,344	30,800
3. Income from Rental Heavy Equip.	0	0	5,000	10,000	15,000
(Sub-total of Revenue)	13,621	21,399	35,402	47,634	62,275
Expenditure					
1. Allowances of Teachers/Staffs	3,024	3,816	4,752	6,048	6,840
2. Wages of the Seasonal Workers	510	840	1,170	1,500	1,980
3. Operation Cost for the Facilities					
- Fuel and oil	16,200	18,900	21,600	24,300	27,000
- Electricity	6,000	7,000	8,000	9,000	10,000
4. Maintenance Cost	800	1,600	4,000	6,400	8,000
(Sub-total of Expenditure)	26,534	32,156	39,522	47,248	53,820
Balance	-12,913	-10,757	-4,120	386	8,455

(unit: $)

	Year-6	Year-7	Year-8	Year-9	Year-10
Revenue					
1. Tuitions/Accommodation Fees	16,475	16,475	16,475	16,475	16,475
2. Income from Farm Products	32,555	34,897	37,504	40,482	43,568
3. Income from Rental Heavy Equip.	20,000	20,000	20,000	20,000	20,000
(Sub-total of Revenue)	69,030	71,372	73,979	76,957	80,043
Expenditure					
1. Allowances of Teachers/Staffs	7,200	7,200	7,200	7,200	7,200
2. Wages of the Seasonal Workers	1,980	1,980	1,980	1,980	1,980
3. Operation Cost for the Facilities					
- Fuel and oil	27,000	27,000	27,000	27,000	27,000
- Electricity	10,000	10,000	10,000	10,000	10,000
4. Maintenance Cost	8,000	8,000	8,000	8,000	8,000
(Sub-total of Expenditure)	54,180	54,180	54,180	54,180	54,180
Balance	14,850	17,192	19,799	22,777	25,863

Source: JICA Study Team

The above table shows negative figures of balance until the third year and positive figures from the forth year onwards. It shows that, if a total deficit amount of about $28,000 during the initial three years is finance by some international foundations as in the case of Zamorano Pan American School of Agriculture, the college operation will be financially viable.

Attachment I

Curricula for School (Full-time Students)

(I) General Education

1. Objectives:

- To understand basic knowledge of various social phenomena;
- To gain basic ideas and understandings of science that are necessary to live; and
- To create a platform of basic knowledge that helps learn and understand professional subjects.

2. Contents:

- Lao language
- English
- Mathematics
- Chemistry
- Biology
- Physics
- Social study and culture
- Physical education

(II) Basic Professional Subjects

1. Objectives:

- To gain basic knowledge of agricultural and management
- To gain skills and technique for agricultural management and farming

2. Contents:

(1) Agricultural Technique
- i) Basic soil science
  - Soil and crops
  - Soil testing, soil chemistry, fertilizer application (organic, non-organic, lime, etc.)
  - Soil development and improvement
  - Soil erosion control
- ii) Basic water resource study
- iii) Modern agricultural technology
- iv) Integrated agricultural systems

(2) Agricultural Management
- i) Farm management and control
- ii) Principle and methods of agricultural extension

(3) Marketing
- i) Principles of marketing
- ii) Product knowledge
- iii) Sales promotion
- iv) Consumer behavior
- v) Marketing strategy

(4) Promotion of Agro-Industry/Processing

(5) Entrepreneurship/Economics/Accounting
- i) Entrepreneurial quality and identity development
- ii) Enterprise set-up and resource appraisal
- iii) Enterprise management
- iv) Enterprise discipline and social responsibility

(6) Environment and Ecology
- i) Organic farming
- ii) Fertilizers and pesticides

(7) Computer Information Technology

Attachment I

(III) Livestock
1. Objectives:
- To gain basic knowledge and skills for livestock raising - To gain various technique of livestock and management
2. Contents:
i) Animal Science - Principles of animal breeding and selection - Animal feeds and feeding - Animal diseases and sanitation - Animal showing and judging - Animal nutrition - Behavior of animal - Animal waste - Animal power (in place of machinery) ii) Animal Production - Beef production - Swine production - Poultry production - Dairy production iii) Animal Management - Livestock farm management - Swine farm management - Poultry farm management - Dairy farm management iv) Grassland management (grazing and browsing) v) Export/Quarantine Laws vi) Practical Activities
(IV) Arable Farming
(1) Objectives:
- To gain basic knowledge and skills for arable farming - To gain various technique of farm management
(2) Contents:
i) Plant Science - Plant propagation - Plant diseases and their control - Insect pests and their control - Weeds and their control - Principles of plant breeding - Seed technology ii) Production - Rice production - Field crops production - Mushroom culture - Vegetable crop production - Fruit crop production - Cereal crop production - Oil crop production - Fiber crop production - Forage crop production iii) Conservation of plant genetic resource iv) Practical Activities

Attachment I

(V) Fishery
(1) Objectives:
- To gain basic knowledge and skills for fishery - To gain various technique of fishery management
(2) Contents:
i) Introduction to fishery Science - Aquaculture - Technical fisheries skill - Fish breeding - Fish feed and feeding - Introduction to planktonology - Disease and parasite of aquatic animals - Water quality and pond management - Ichthyology - Fish law ii) Construction of fish pond iii) Production - Fish culture - Aquantic plant - Frog culture iv) Practical Activities
(VI) Irrigation and Agricultural Machinery
(1) Objectives:
- To gain a basic knowledge of water resources - To gain basic skills of irrigation systems - To gain various irrigation techniques and their management - To gain a basic knowledge of agricultural machinery - To gain basic skills and various techniques of agricultural machinery
(2) Contents:
i) Water resources and agriculture ii) Introduction to irrigation systems - Irrigation system planning and design - Irrigation system construction - Operation and maintenance of irrigation systems - Establishment of water user's group iii) Introduction to agricultural machinery iv) Practical Activities
(VII) Forestry/Agro-forestry/Farm trees
(1) Objectives:
- To gain a basic knowledge and skills for forestry/agro-forestry/farm trees - To gain various techniques of forestry/agro-forestry/farm tree management
(2) Contents:
i) Forestry resources science ii) Agro-forestry/farm trees/orchards - Bamboo, Rattan, Coffee, etc. - Trees for animal feed and browse iii) Conservation of watersheds iv) Forest management and control v) Practical Activities

Attachment II

Curricula for Entrepreneurs Development Training Program

Study Field (I): Entrepreneurial Quality/ Identity Development
(1) Objectives:
- To gain fundamental entrepreneurial skills and behavior for farm and agro-business operation and marketing - To learn risk taking behavior - To clarify enterprise goals and essential elements of enterprise set-up
(2) Contents:
1. Learning of Basic Elements in the Agro-business Activities and Marketing 1-1. Types and location advantages of producing, selling and buying in agriculture-related products 1-2. Types of customers and entrepreneurial skills and behavior in agro-business marketing 1-3. Types of supporting services in the agro- business (Loans & credits, laws, cooperatives and unions)
2. Learning of Fundamental Entrepreneurial Skills and Behavior for Farm and Agro-business Operation and Marketing 2-1. Conceptual images of entrepreneurs (Role of entrepreneurs in the society) 2-2. Types of Motivation in the Entrepreneurs 2-3. Required skills, tools and behavior for new entrepreneurs 2-4. Learning from farmers' success stories
3. Leaning of Risk Taking Behavior 3-1. Customers preference and marketing behavior 3-2. Business partner behavior 3-3. Political and law intervention 3-4. Learning from failure stories (How to cope with Fear of Failure)
4. Entrepreneur and Village Community 4-1. Entrepreneur commitment and villagers' support 4-2. Entrepreneurial value and local resource use 4-3. Entrepreneurial confidence and leadership ability
5. Entrepreneurial Goal Setting 5-1. Clarifying of entrepreneurial goal 5-2. Clarifying of elements of enterprise set-up 5-3. Clarifying of benefits and risks of enterprise 5-4. Identifying supporting village leader, group and organization
Study Field (2): Enterprise Set-up and Resource Appraisal
(1) Objectives:
- To understand entrepreneurial processes and enterprise building - To understand government support policy and promotion strategy for farm and agro-business operation - To identify agro-related projects and establish project formulation - To learn project appraisal technique, financial analysis and cash flow

Attachment II

(2) Contents:
I. Environmental Analysis for Enterprise Set-up
1. Entrepreneurial Processes and Enterprise Building 1-1. Characteristics and contents 1-2. Decision making in farm and agro-based enterprise building 1-3. Types of agro- related enterprises
2. Environmental Scanning and Analysis 2-1. Government policy, i.e. agricultural development policy, environmental preservation regulation 2-2. Reservation of products for development of small enterprises 2-3. Promotional and support policy
3. Institutions and their Role 3-1. Statutory and promotional 3-2. Role and functions
4. Government Assistance and Incentives 4-1. Scope 4-2. Benefits 4-3. Limitations
5. Sources of Information 5-1. Classification, documentation and use
6. Procedures for Setting Up Small Enterprises 6-1. Formalities to be completed of checklist
II. Project Selection/Formulation
1. Project Identification 1-1. Generating agricultural project ideas 1-2. Short listing 1-3. Final selection 1-4. Broad project category, specific sector and sub-sector
2. Project Selection 2-1. Market segmentation 2-2. Market survey, market alternatives, an overview of the future product development, marketing strategy overtime 2-3. Methodology of updating market survey 2-4. Product selection
3. Feasibility 3-1. Industry level feasibility 3-2. Study of typical project report writing 3-3. Financial institutions availability
4. Determining Size 4-1. Manageability 4-2. Future investment opportunities 4-3. Implications of pre-break-even level of output

Attachment II

5. Choosing Appropriate Technology 5-1. Criteria of selection of technology 5-2. Alternatives to optimal choice 5-3. Selection of plant and machinery 5-4. Skill involved for technology 5-4. Labor and raw material requirement
6. Estimated Cost 6-1. Project cost estimates 6-2. Projection costs
7. Time Scheduling 7-1. Project monitoring and review techniques 7-2. Summary sessions of project selection
III. Project Appraisal
1. Technical, Economic, Financial Appraisal
2. Managerial and Marketing Feasibility
IV. Financial Analysis
1. Elements of Financial Analysis 1-1. Means of finance, concept of risk capital; Long-term and short-term loans; 1-2. Leasing hire-purchase; 1-3. Expectations of banks/financial institutions; 1-4. Precautions and procedures for preparing projected balance sheet, profit and loss A/C, cash flow statement; 1-5. Ratio analysis, Rate of return, etc.
2. Analysis of Cash Flow 2-1. Financing of working capital requirement, 2-2. Cost, 2-3. Volume, 2-4. Profit sensitivity analysis
Study Field 3: Enterprise Management
(1) Objectives:
- To learn basic management concepts - To learn personal management, product management, material management, financial management and marketing management - To learn problem solving and innovation - To understand business laws and tax practices.
(2) Contents:
I. Basic Management Concepts
1. Function of management, planning, organizing, directing, controlling, coordinating
2. Principles of sound organization, span of control, authority, responsibility, accountability
3. Introduction to business mathematics and statistics
4. Business communication, Barriers to communication, Written analysis, Oral and Written Communication

Attachment II

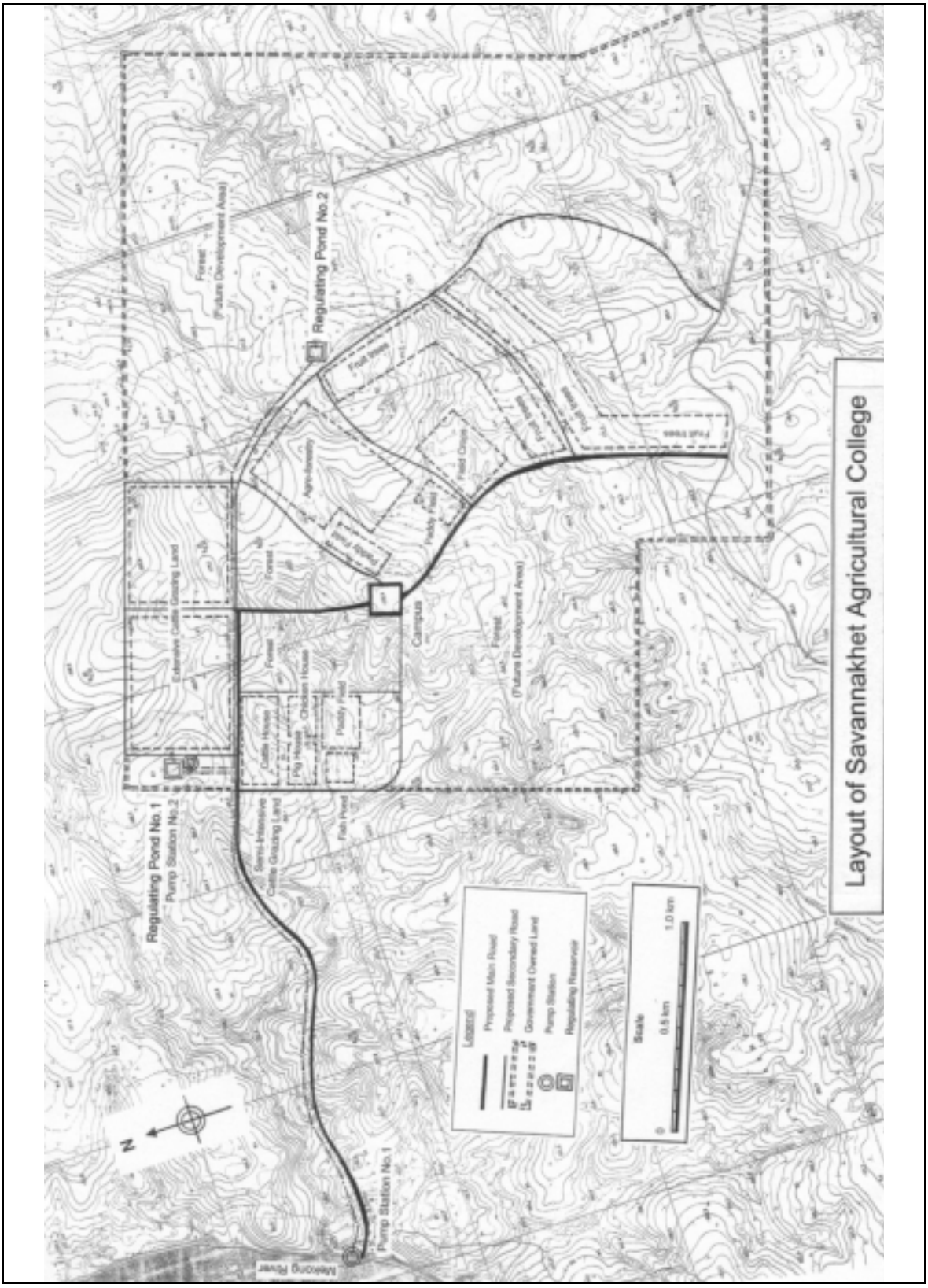
II. Personnel Management
1. Working Motivation, Labor Relations, Wages Administration, Incentives, etc.
III. Product Management
1. Production Planning and Control Routing, Scheduling, Dispatching, Expediting and Evaluating. Methods and Procedures in Production
2. Quality control- inspection standards and specifications
3. Systematic plant maintenance and lubrication
4. Methods improvement, work measurement and value analysis
5. Food safety
IV. Materials Management
1. Inventory Control 1-1. Definition of inventory, types of inventory, storage and issues, records inventory case
2. Materials Handling Equipment (Analysis and Selection)
3. Economic Order Quantity, Maximum Safety Stories, Recorder Points 3-1. Make or buy decision 3-2. Purchase policies and procedures
4. Classification and Modification; Standardization, Substitution, simplification
V. Financial Management Including Costing and Accounting Practices
1. Tools of Financial Analysis 1-1. Ratio analysis relating to liquidity, leverage, activity & profitability, funds flow/cash flows analysis
2. Effects of Income Tax
3. Management of Working Capital 3-1. Size of working capita, Risk Factor, Management of Cash including Bank Credit, Management of Accounts, Receivables, Management of Inventory, Effects of Inflation on Working Capital Management
4. Financial Accounting 4-1. Double entry system, books of accounts, accounting principles, concept of business income, depreciation accounting, profit and loss appropriation and preparation of balance sheet
5. Cost Accounting 5-1. Cost of goods sold, direct cost-labor, material, over-heads, price determination, profit margins, cost control, budgeting as a means of cost control, marginal costing
6. Risk Taking and Insurance 6-1. Essentially against destruction, natural calamities, strikes, law & order, etc.
VI. Marketing Management
1. Role of Marketing in Small Farm and Agro-based Business 1-1. Importance of consumer's point of view, consumer's behavior, buying habits 1-2. Marketing 1-3. Product policies, Brand 1-4. Policies
2. Packaging
3. Channels of Distribution Government Purchases

Attachment II

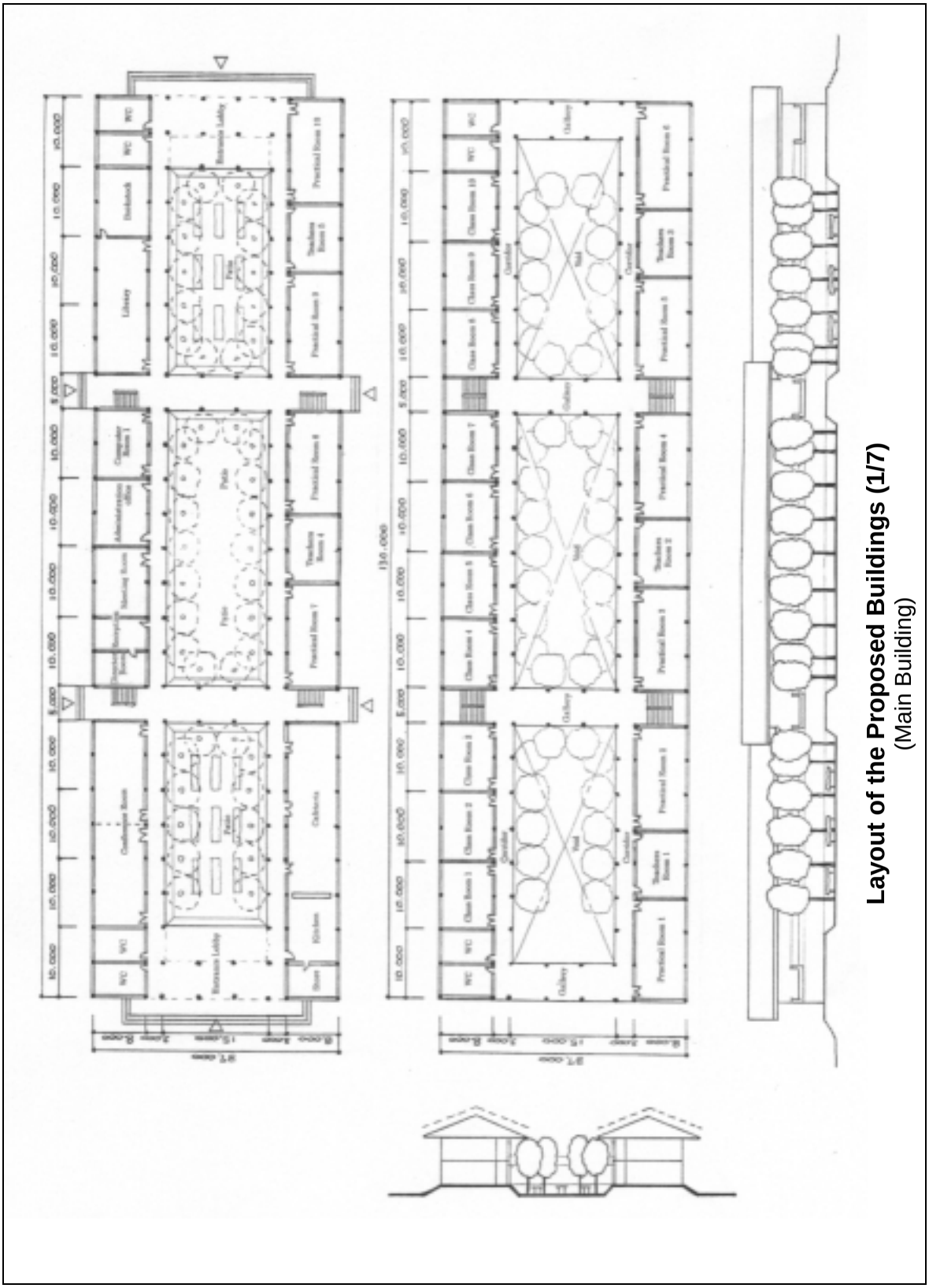
4. Role of Government Agencies in Marketing
5. Pricing Policies and Practices
6. Product Segmentation
7. Appraisal of Sales and Storage Control
8. Management of Receivables
9. Advertising and Sales Promotion
VII. Problem Solving and Innovation
1. Problem Identification, Analysis, Diagnosis
VIII. Agro-related Industrial & Business Laws
1. Laws governing Business Operation 1-1. Contract act-sale of goods act, negotiable instruments act
2. Laws Governing Taxation 2-1. Sales tax rules (Central/federal and states), income tax rules, excise, customs
3. Laws Governing Personnel 3-1. Factories act, Industrial Disputes act, Workman Compensation act, Trade unions act, Payment of wages act, Minimum Wages act, Industrial employment standing order act, Shop act, Payment of Bonus act, etc.

Savannakhet Agricultural College

Attachment III

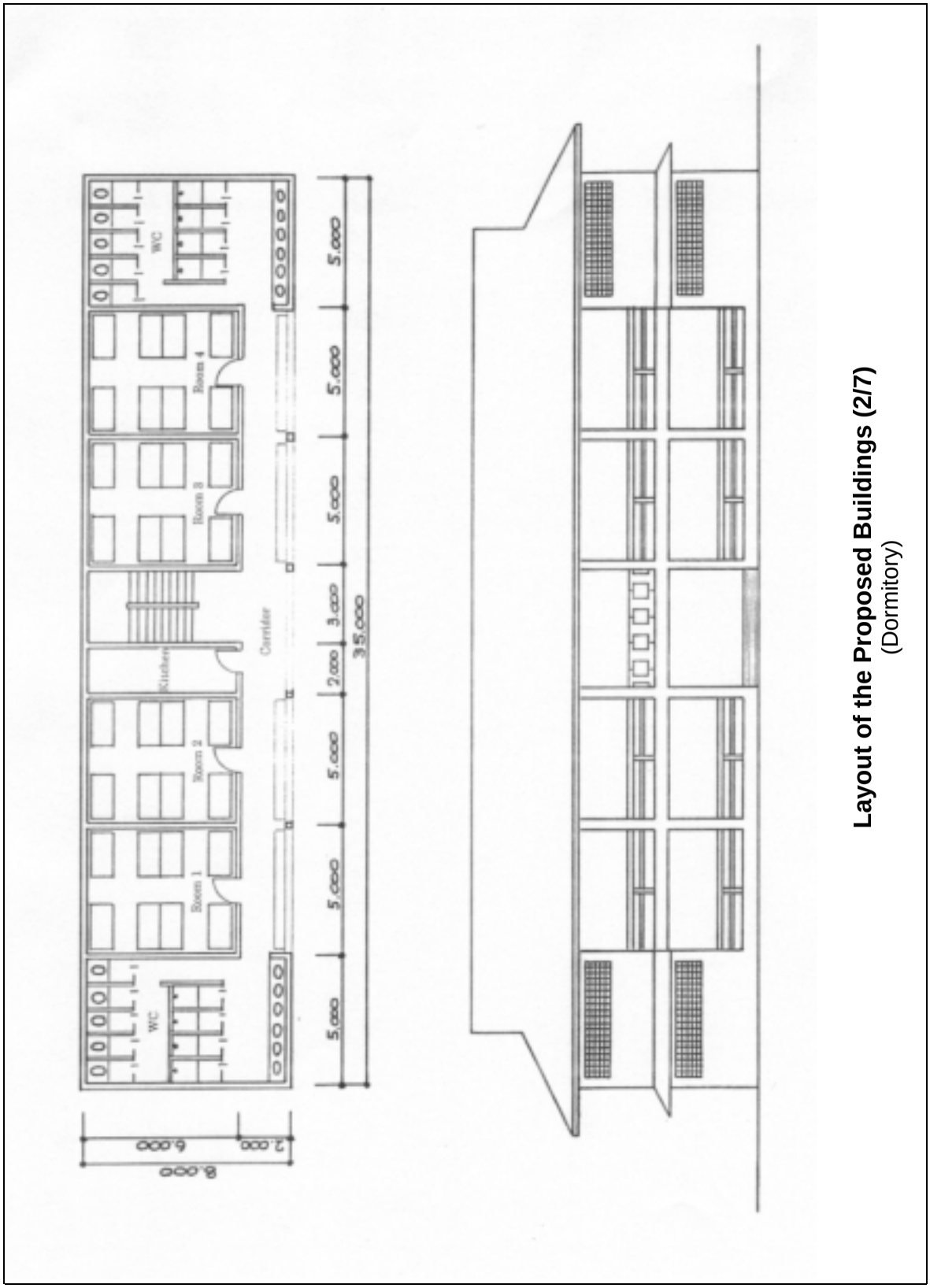


Attachment IV



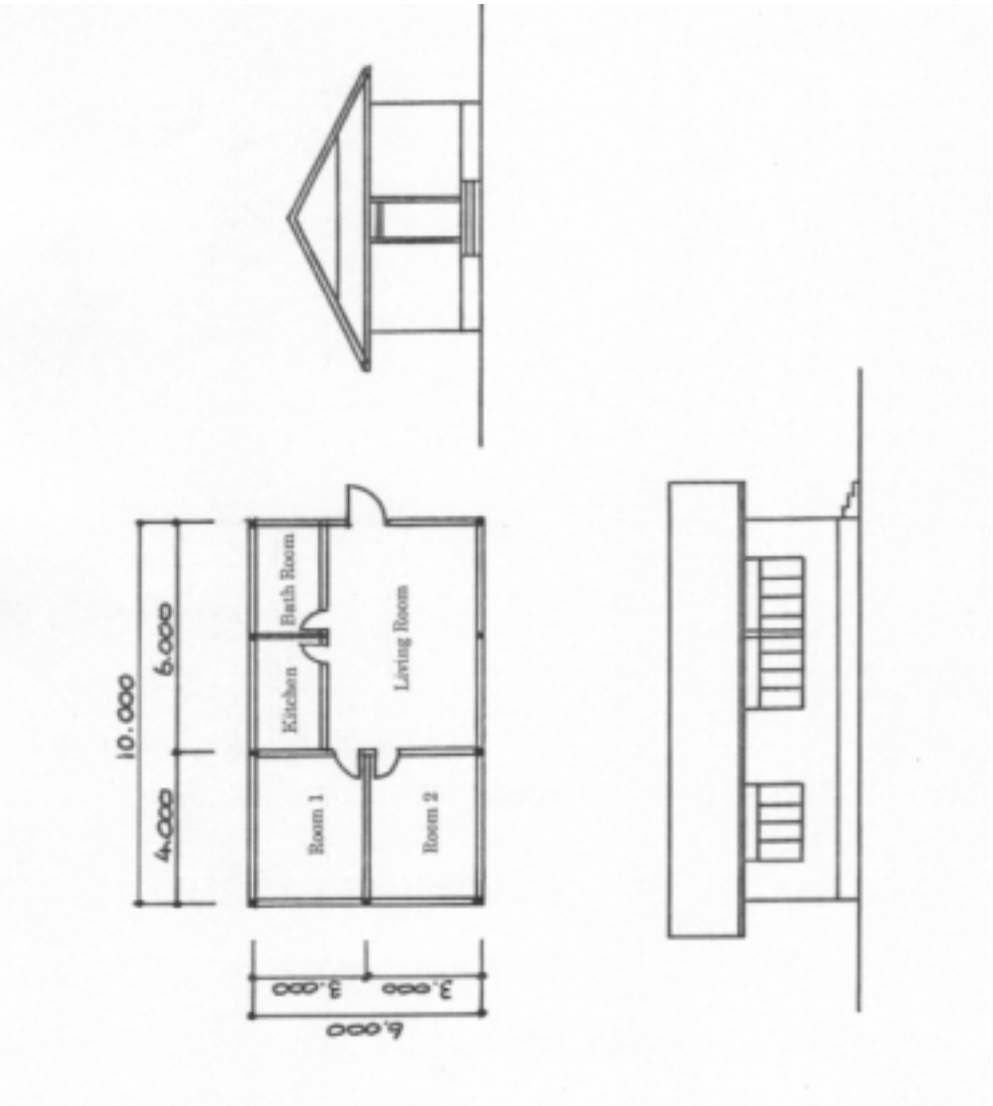
Layout of the Proposed Buildings (1/7)
(Main Building)

Attachment IV



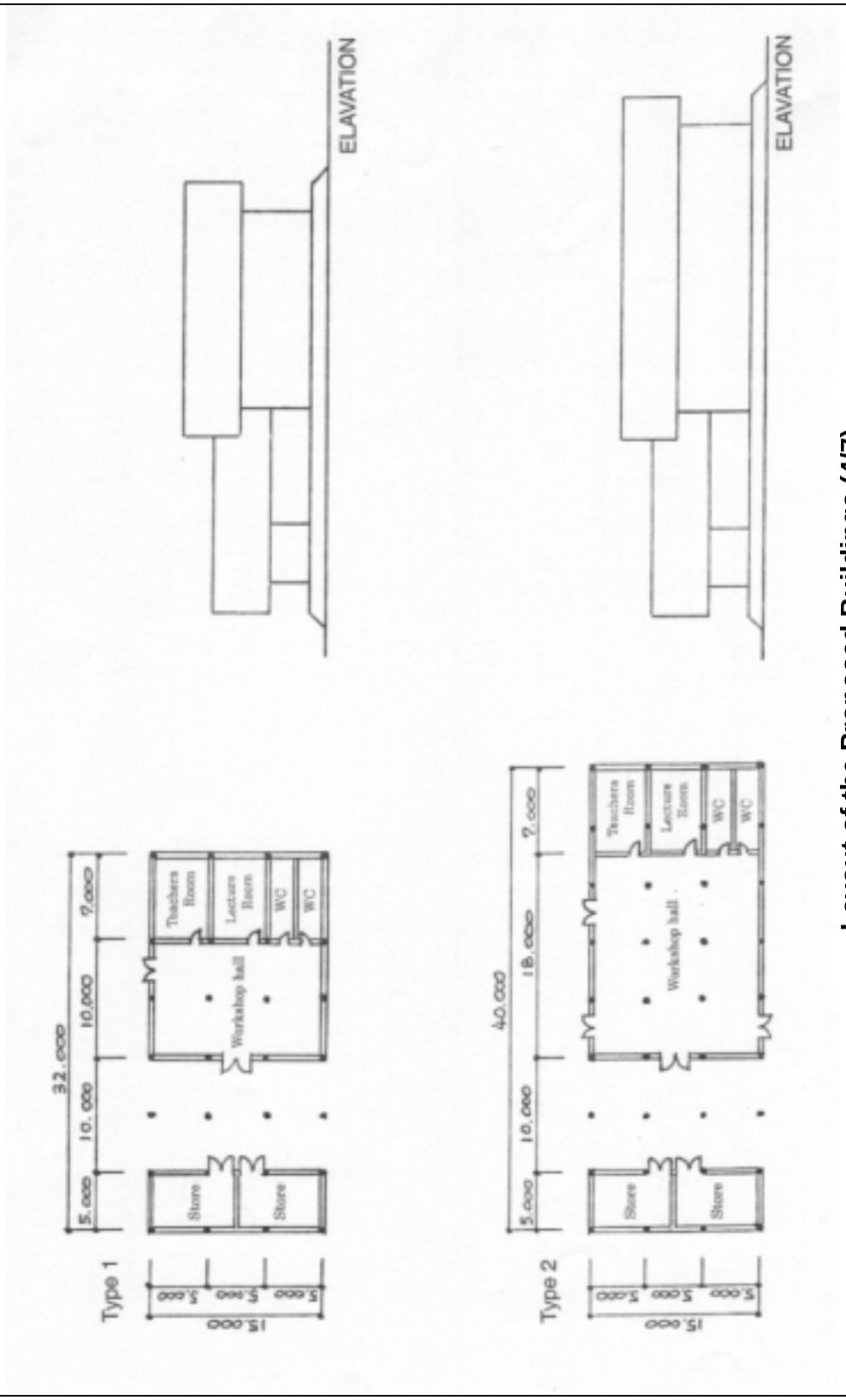
Layout of the Proposed Buildings (2/7)
(Dormitory)

Attachment IV



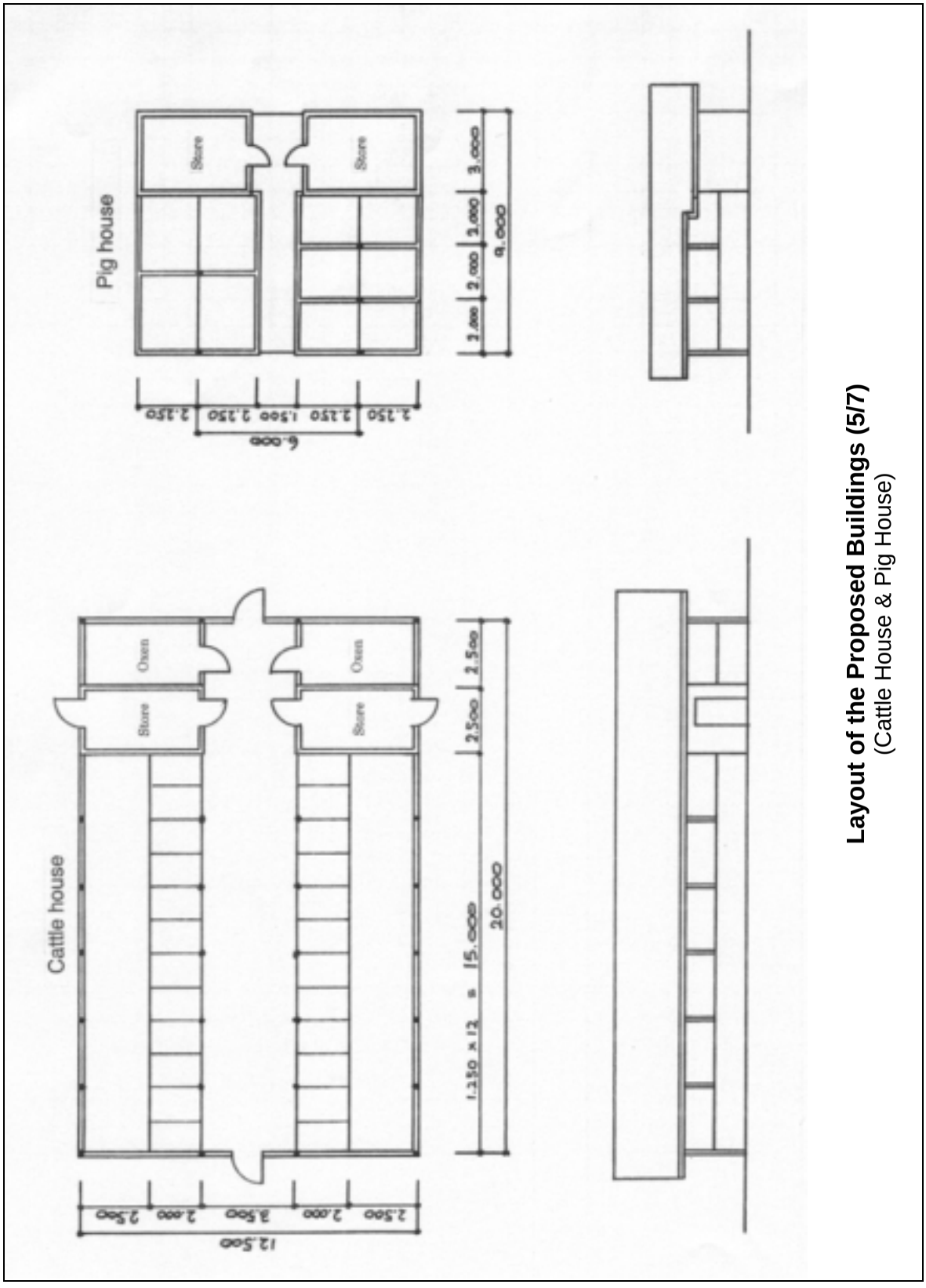
Layout of the Proposed Buildings (3/7)
(Staff Residence)

Attachment IV



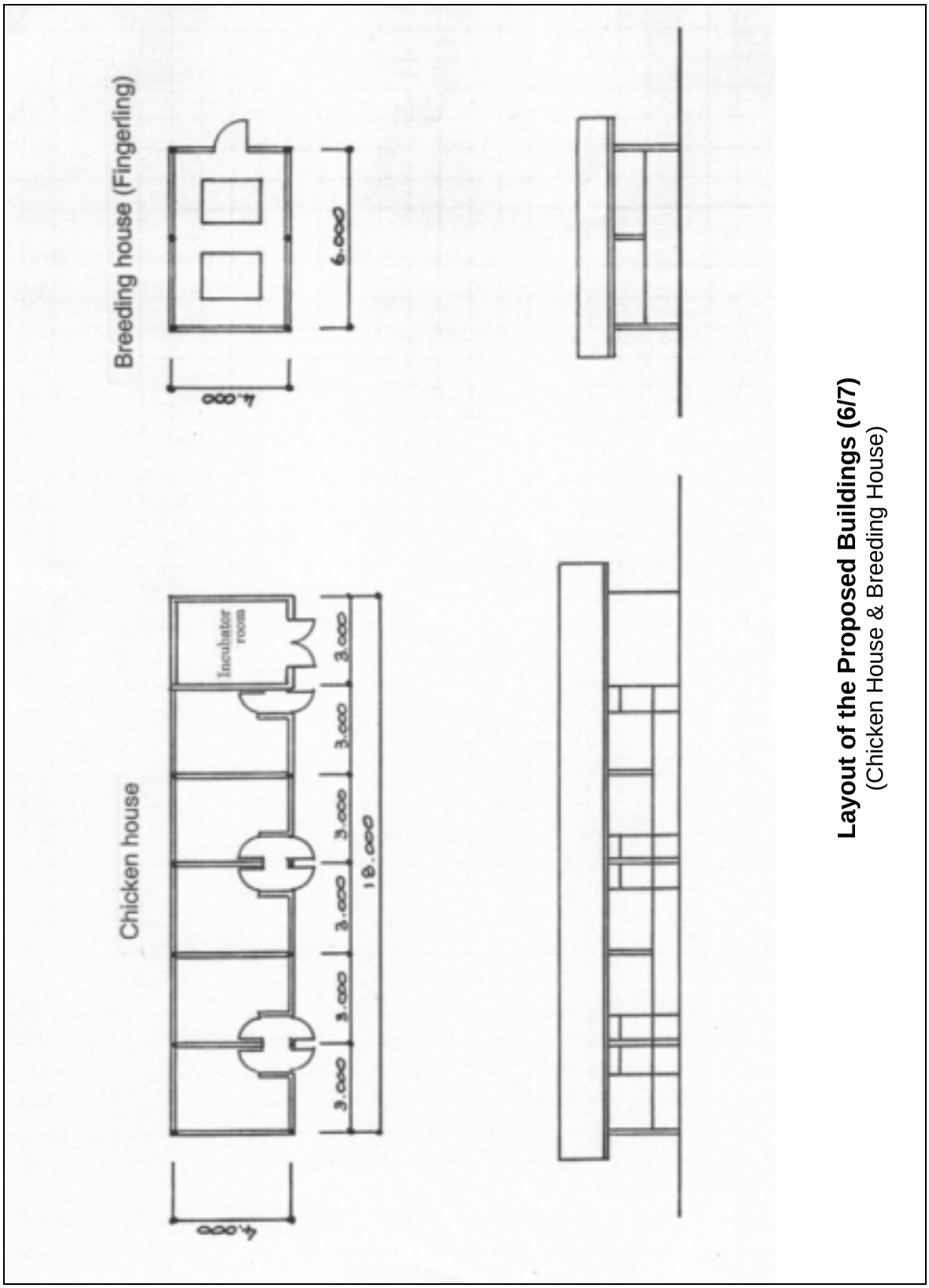
Layout of the Proposed Buildings (4/7)
(Workshop Building)

Attachment IV



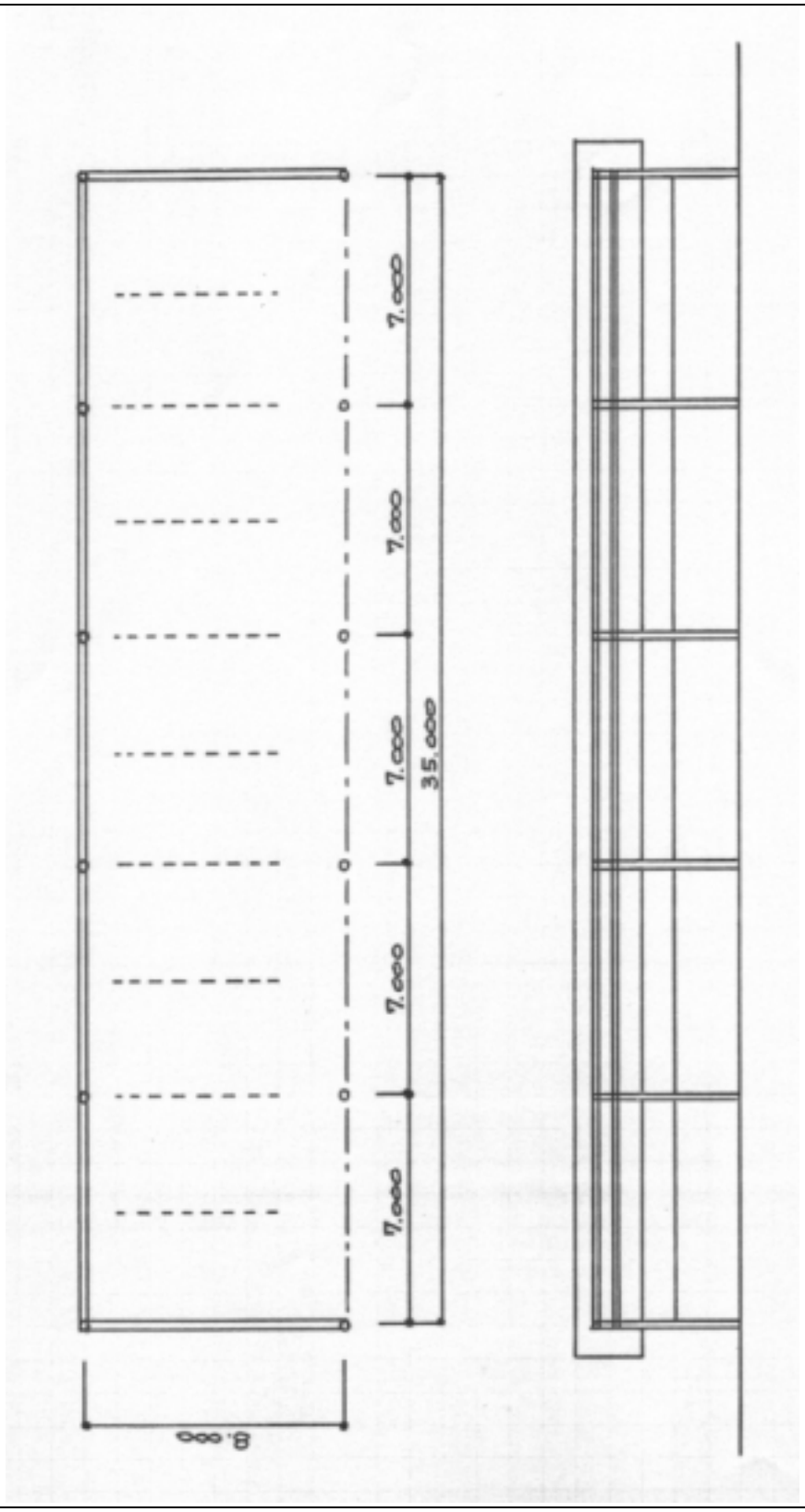
Layout of the Proposed Buildings (5/7)
(Cattle House & Pig House)

Attachment IV



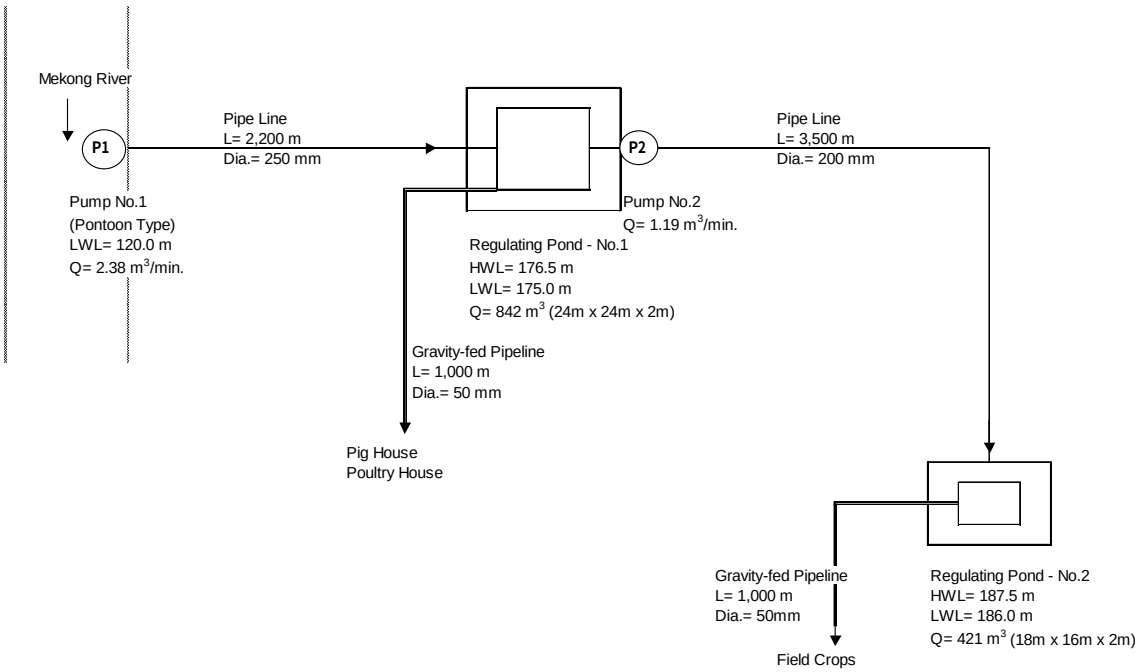
Layout of the Proposed Buildings (6/7)
(Chicken House & Breeding House)

Attachment IV



Layout of the Proposed Buildings (7/7)
(Repairshop & Garage)

Attachment V



Irrigation and Domestic Water Supply Facilities

Attachment VI

Estimate f Initial Investment Costs

	Unit	Q'ty	Amount ($)	Remarks
I. Buildings				
1) Campus				
- Main building, 1/	nos.	1	1,580,000	6,320 m^2
- Dormitory	nos.	2	224,000	560 m^2 x 2
2) Teacher's Compound				
- Staff residence	nos.	40	240,000	60 m^2 x 40
3) Farm				
- Workshop building (Type 1)	nos.	2	144,000	480 m^2 x 2
- Workshop building (Type 2)	nos.	3	270,000	600 m^2 x 3
- Cattle house	nos.	1	30,000	250 m^2 x 1
- Pig house	nos.	2	12,960	54m^2 x 2
- Chicken house	nos.	2	17,280	72m^2 x 2
- Breeding house (fingerling)	nos.	1	8,640	72 m^2 x 1
4) Machinery center				
- Repair shop	nos.	1	28,000	280 m^2 x 1
- Garage	nos.	3	84,000	280 m^2 x 3
5) Earth Work and Pavement	L.S.		300,000	
Sub-total of (1)~(5)			2,938,880	
Preconstruction and Management Services (30% of above)			881,664	
Sub-total of (I)			**3,820,544**	
II. Farm Infrastructure				
1) Road				
- Main (total road width=7.5m)	km	7	280,000	4.5 m width of gravel pavement
- Secondary (total road width=5.5m)	km	11	275,000	3.0 m width of gravel pavement
2) Farm land				
- Paddy fields	ha	30	54,000	Land reclamation
- Sloping crop fields	ha	30	54,000	Clearing
- Orchards (Fruit trees)	ha	5	9,000	Clearing
- Pasture (Cattle raising)	ha	50	86,429	Fencing
- Field for mulberry trees	ha	1	1,800	Clearing
3) Irrigation/domestic water supply				
- Pump	nos.	2	396,000	Pump No.1and No.2
- Pipelines	km	7.7	1,286,000	Dia.= 250mm, 200mm, 50mm
- Regulating pond	nos.	2	142,664	Regulating pond-A and -B
4) Potable water supply				
- Water supply for campus	nos.	1	300,000	
- Water supply for each workshop in the farm	nos.	1	300,000	
5) Fish pond	nos.	4	6,720	0.25 ha x 4 ponds
6) Power line				
- 22 kv line	km	7	107,995	
- 0.4 kv line	km	2	39,144	
Sub-total of (1)~(6)			3,338,752	
Preconstruction and Management Services (30% of above)			1,001,625	
Sub-total of (II)			**4,340,377**	
III. Equipment/Vehicles/Farm machinery, etc.				
1) Heavy equipment				
- Bull dozer	nos.	1	220,000	180 PS
- Motor grader	nos.	1	130,000	115 PS, W = 3.1m
- Wheel loader	nos.	1	93,000	85 PS, 1.2 m^3
- Backhoe	nos.	1	260,000	0.5 m^3
- Roller	nos.	1	65,000	4t
2) Vehicles				
- Pick-up	nos.	3	75,000	4WD, 2500~3000cc
- Micro bus	nos.	1	35,000	12 sheets, 3000~4000cc
- 4WD wagon	nos.	1	35,000	3000~4000cc
- Cargo truck	nos.	1	40,000	8t
- Dump truck	nos.	2	100,000	8t
- Water tanker	nos.	1	70,000	6000 lit.
- Motorcycle	nos.	10	20,000	125cc
3) Farm machinery				
- Farm tractor w/trailer, attachments	nos.	2	300,000	65PS
- Hand tractor w/trailer, attachments	nos.	5	25,000	12PS
- Rice mill	nos.	1	5,000	0.3 ton/h
4) Training equipment/materials				
- Computer	nos.	20	30,000	including printer and accessories
- Meteorological observation equipment, etc.	set	5	7,500	1 set each, 5 kinds of equipment
- Hatching equipment, soil mixer, etc.	set	5	7,500	1 set each, 5 kinds of equipment
Sub-total of (1)~(4)			1,518,000	
Preconstruction and Management Services (approx. 15% of above)			227,700	
Sub-total of (III)			**1,745,700**	
IV. Engineering Services (15% of I+II+III)			**1,493,379**	
(Total)			**11,400,000**	

Note: 1/ including 10 classes, 10 practical classes, 5 terchers rooms, 1 administration room, 1 library, 1 cafeteria and 1 conference room.

Source: JICA Study Team

Attachment VII

Breakdown of Building Cost

	Item	Total Floor area (m^2)	Unit Price (US$/$m^2$)	Total Unit Price (US$)	Unit	Total Cost (US$)
I	**Technical School Building**					
	1. Main building	6,320	250	1,580,000	1	1,580,000
	2. Domitory	560	200	112,000	2	224,000
	3. Staff residence	60	100	6,000	40	240,000
	4. Workshop building (Type 1)	480	150	72,000	2	144,000
	5. Workshop building (Type 2)	600	150	90,000	3	270,000
	6. Cattle house	250	120	30,000	1	30,000
	7. Pig house	54	120	6,480	2	12,960
	8. Chicken house	72	120	8,640	2	17,280
	9. Breeding house (Fingerling)	72	120	8,640	1	8,640
	10. Repair shop	280	100	28,000	1	28,000
	11. Garage	280	100	28,000	3	84,000
	TOTAL COST for Building					2,638,880
II	Earth Work and Pavement					300,000
III	Pre Construction Work and Management (30%)					881,664
	GRAND TOTAL					3,820,544