4.3.5 Equipment Plan:

The detailed list is attached as Appendix V-4. The major items of research, and production equipment and material are outlined below:

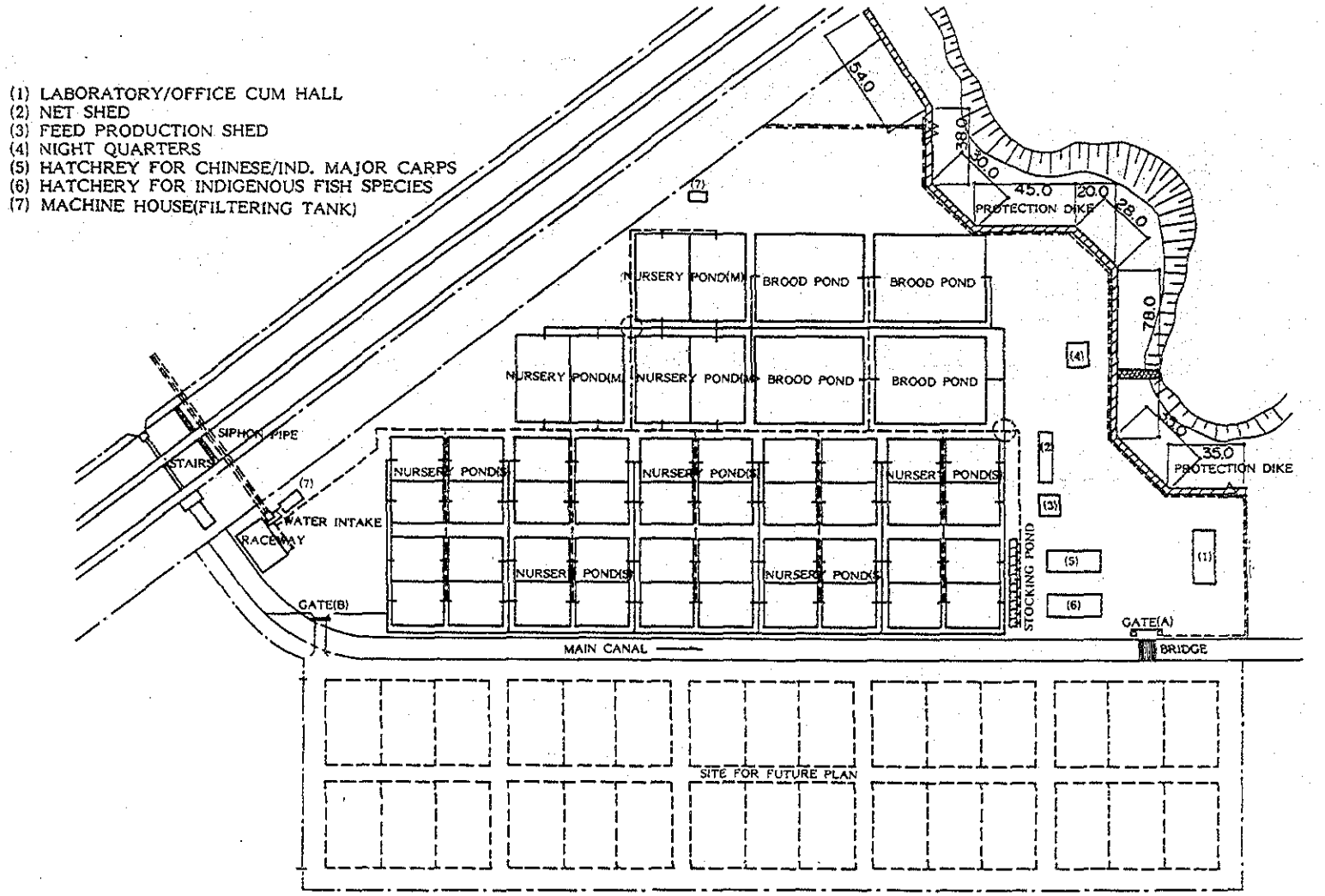
(1) Equipment :

a) Ice making facility	500 kg/ 24 hours
b) Draft chambers	2 units
c) Emergency generator	35 KVA

(2) Materials for Aquaculture and Fishery Use:

a) Materials for cage culture	1 lot
b) Materials for penculture	1 lot
c) Materials for Gillnet	1 lot

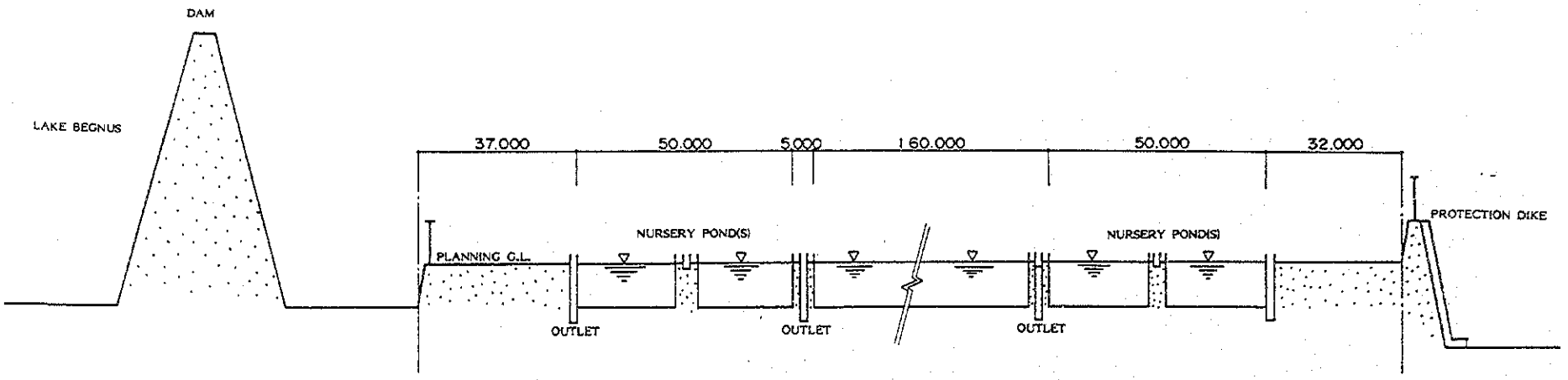
4.3.6 Basic Design Drawing:



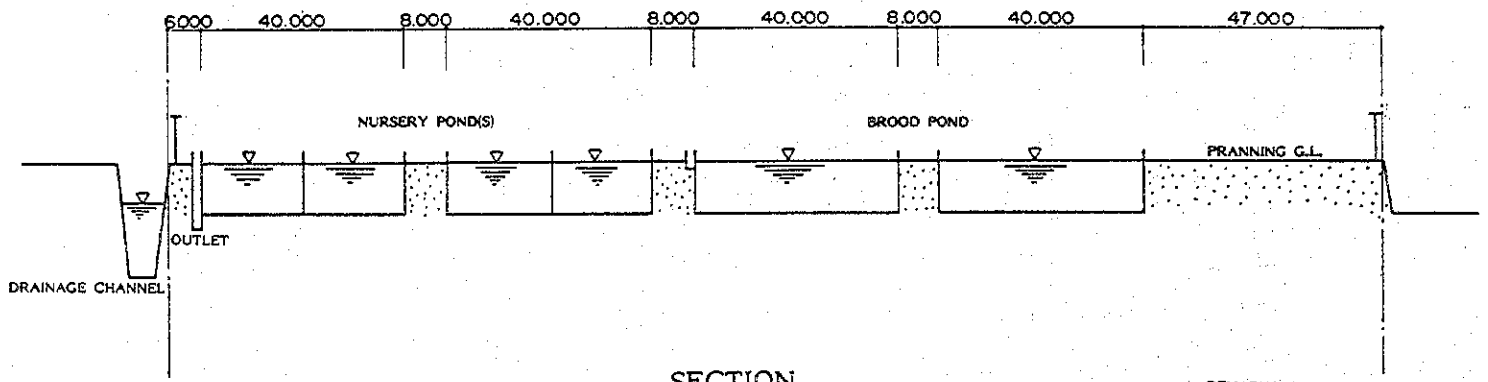
REMARKS: (S); SMALL, (M); MEDIUM, (L); LARGE

LOCATION PLAN
BEGNAS SEED PRODUCTION CENTER

0 20 40 60m



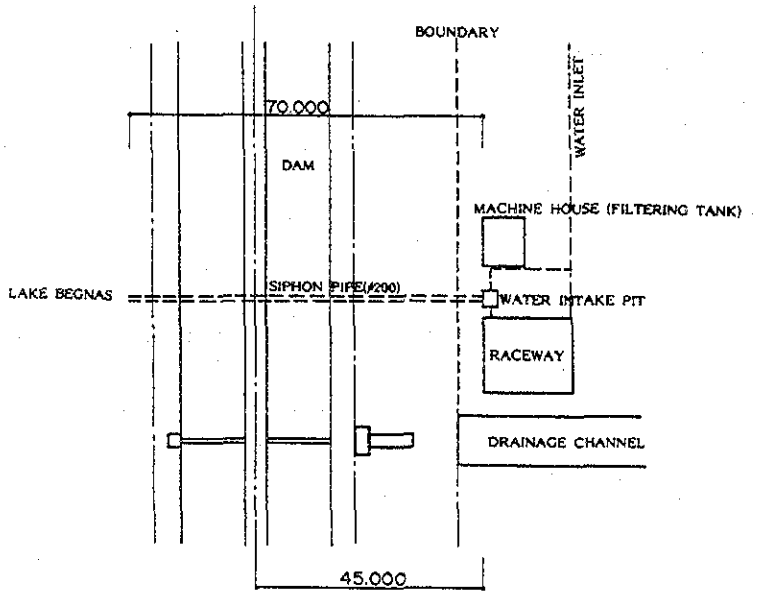
SECTION



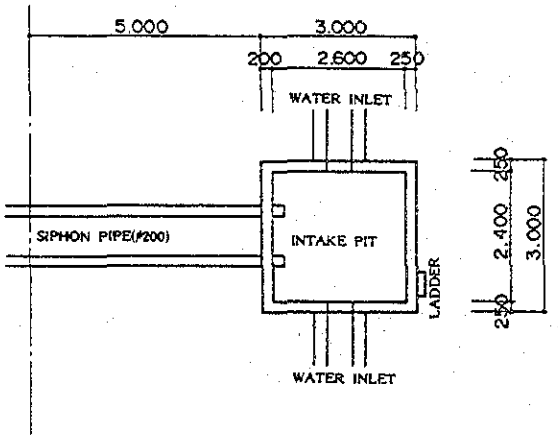
SECTION

REMARKS: (S); SMALL, (M); MEDIUM, (L); LARGE

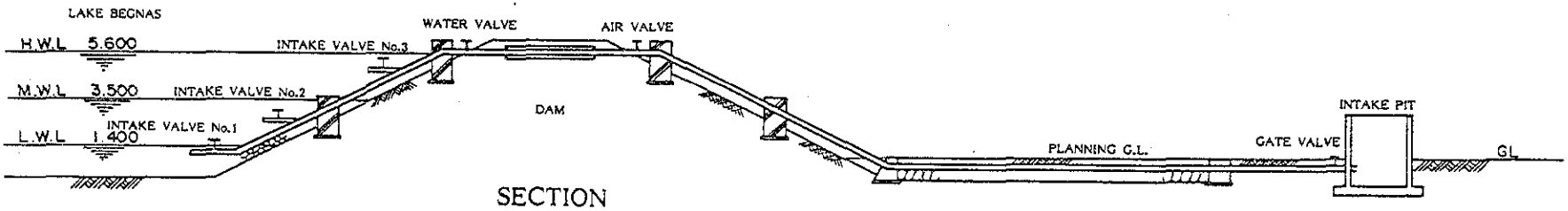
NURSERY PONDS AND BROOD PONDS
BEGNAS SEED PRODUCTION CENTER



PLAN

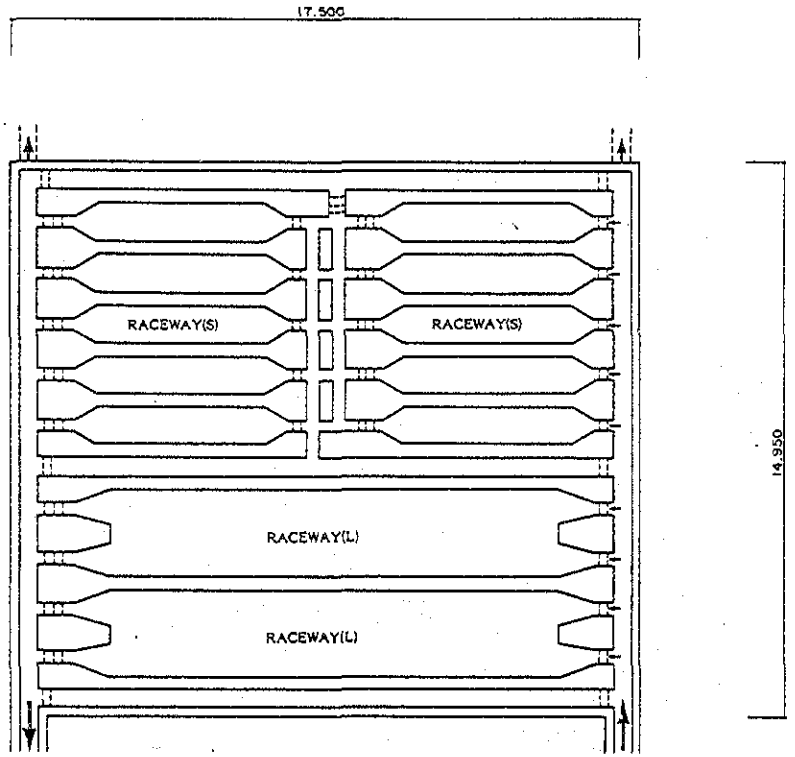


PLAN

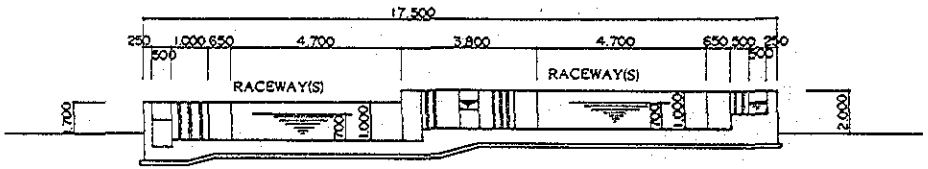


SECTION

WATER INTAKE SYSTEM
BEGNAS SEED PRODUCTION CENTER



PLAN



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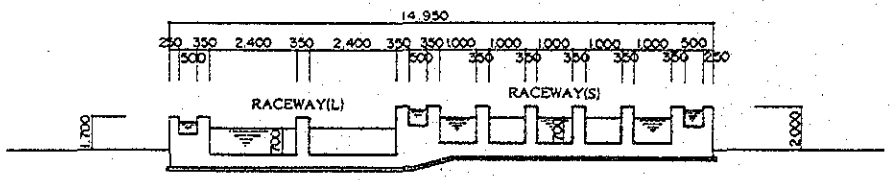
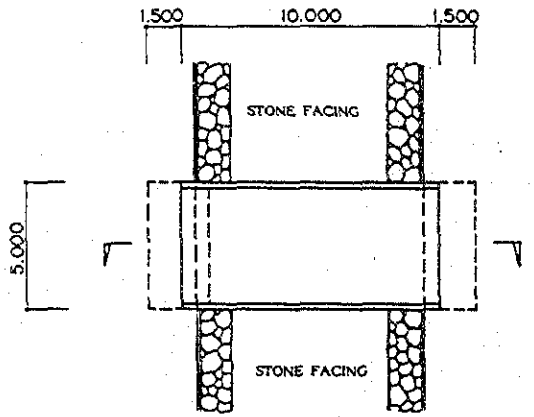
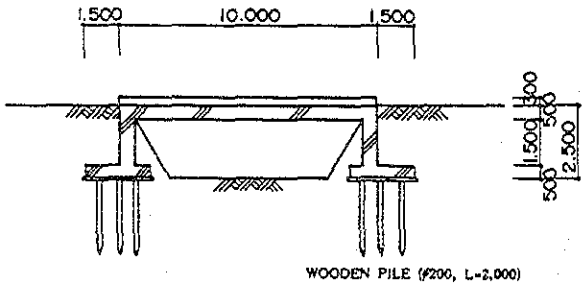


SECTION

RACEWAY
BEGNAS SEED PRODUCTION CENTER

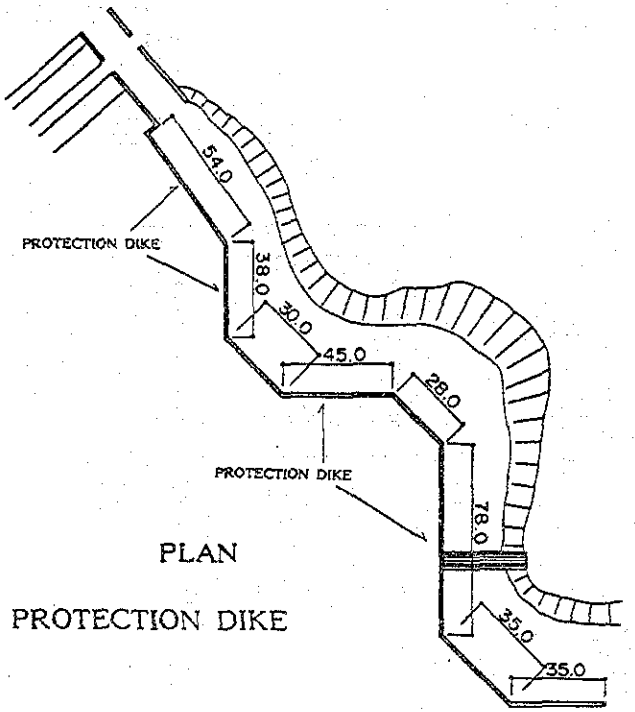


PLAN



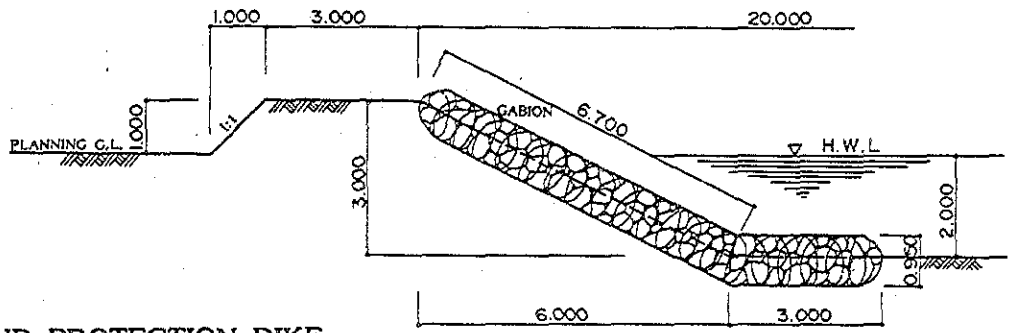
SECTION

BRIDGE



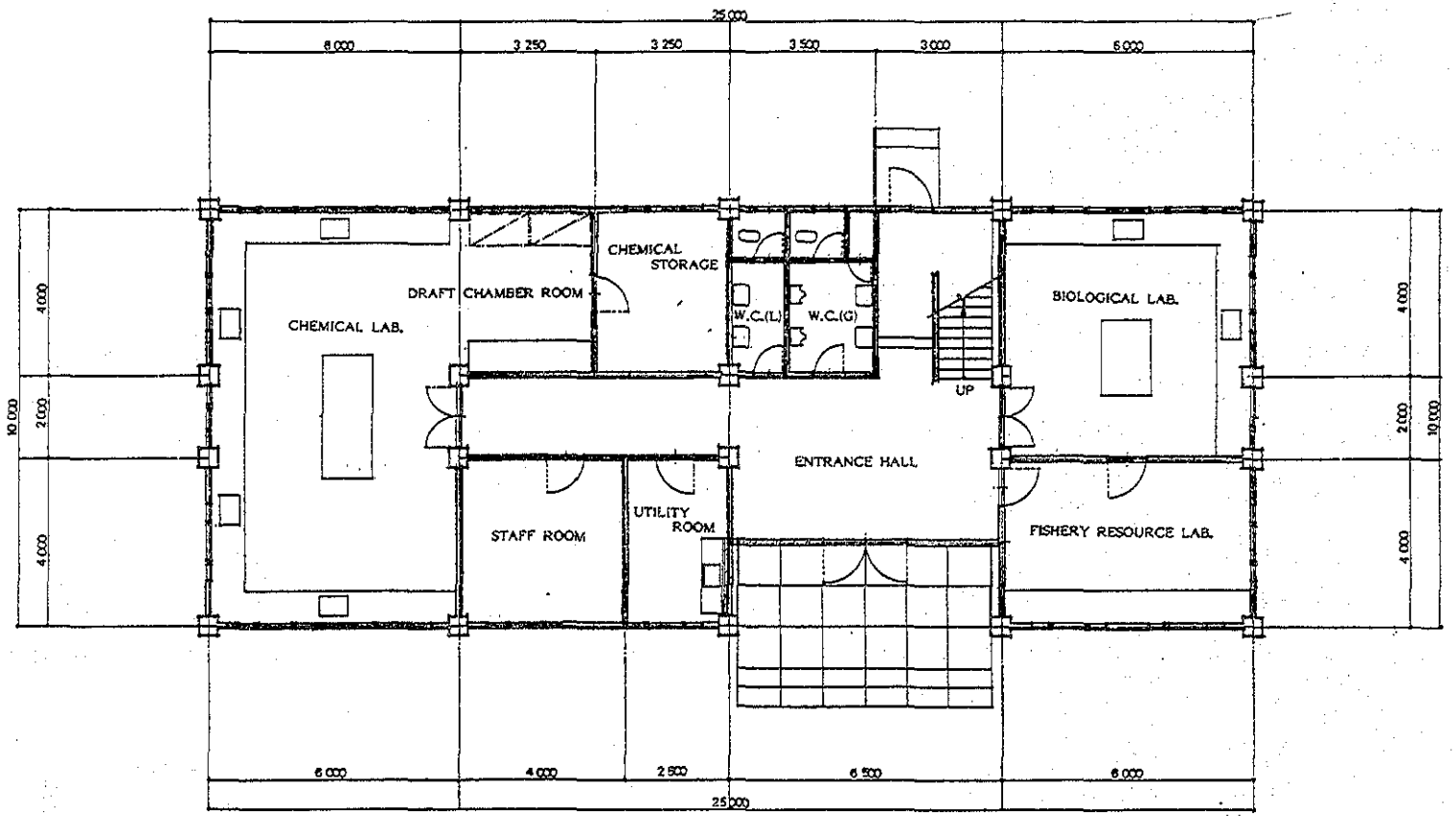
PLAN

PROTECTION DIKE



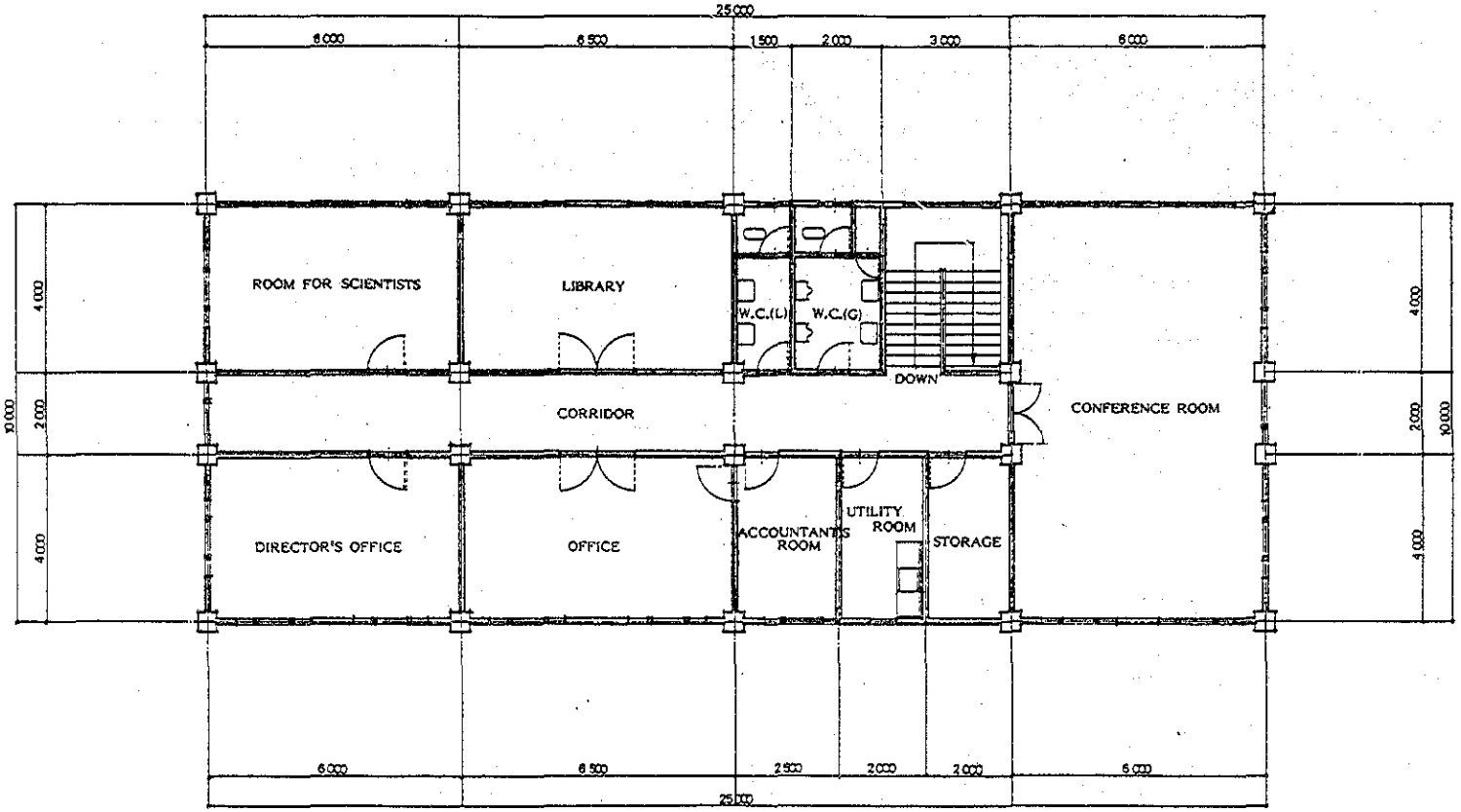
SECTION

BRIDGE AND PROTECTION DIKE
BEGNAS SEED PRODUCTION CENTER



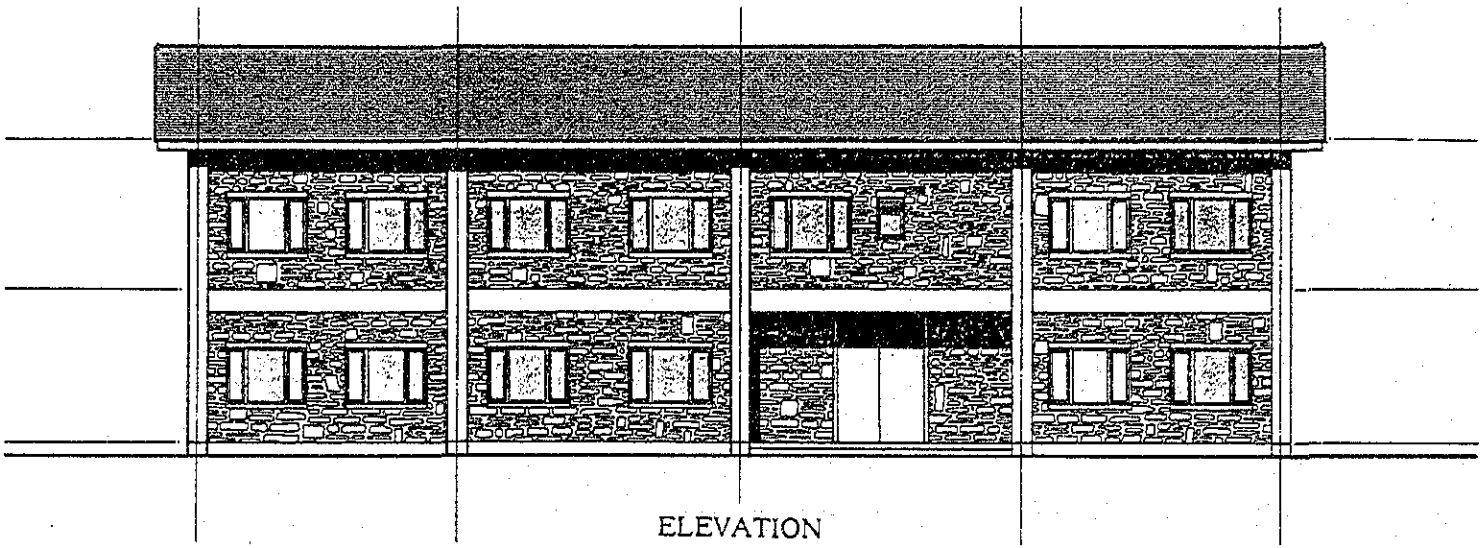
GROUND FLOOR PLAN

LABORATORY/OFFICE CUM MEETING HALL
BEGNAS SEED PRODUCTION CENTER

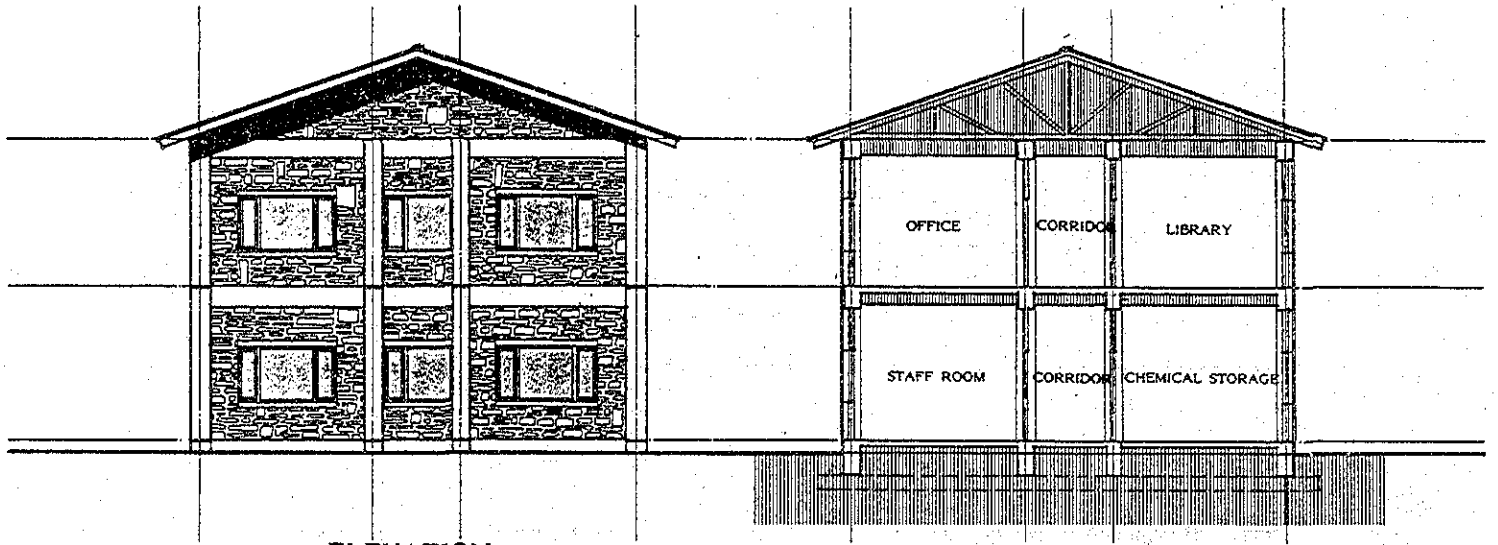


1ST FLOOR PLAN

LABORATORY/OFFICE CUM MEETING HALL
BEGNAS SEED PRODUCTION CENTER

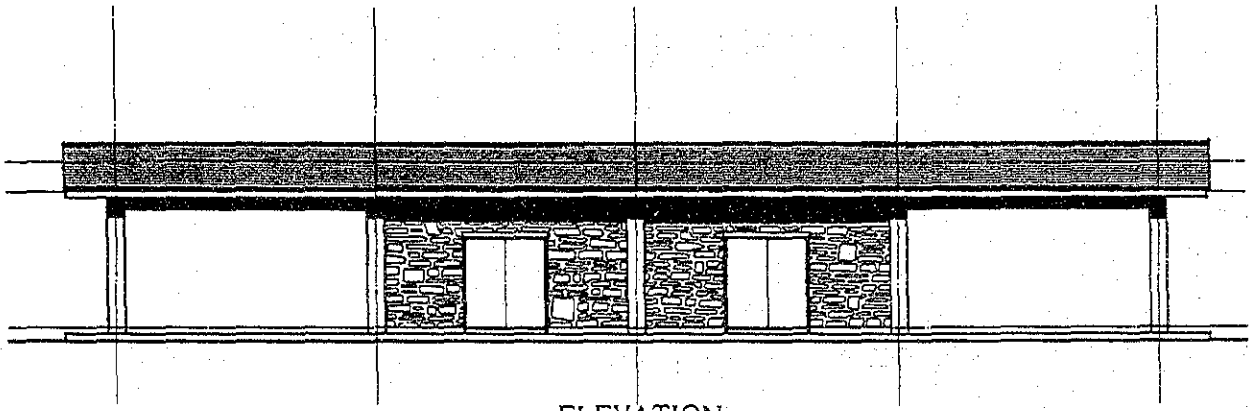


ELEVATION



ELEVATION SECTION

LABORATORY/OFFICE CUM MEETING HALL
BEGNAS SEED PRODUCTION CENTER



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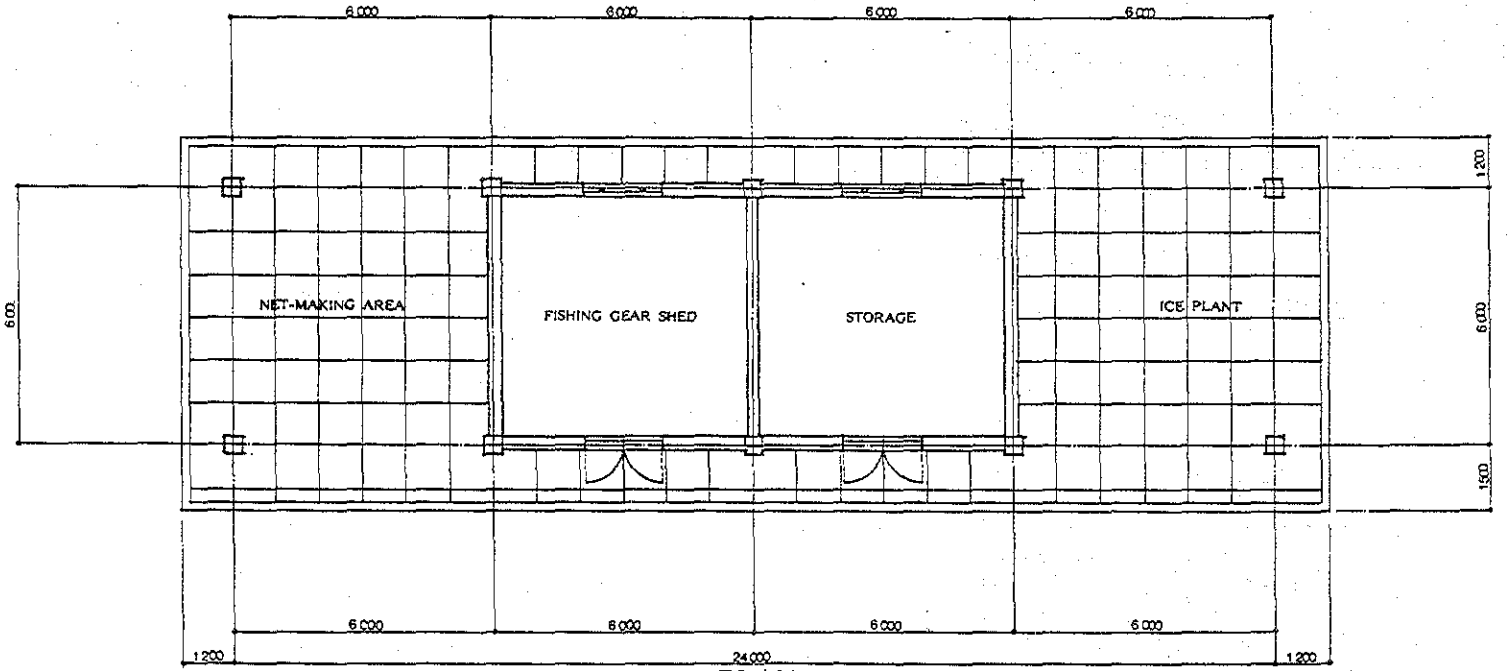
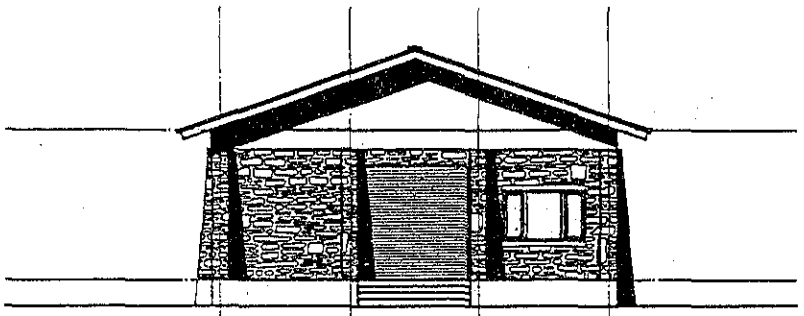


PLAN

WAREHOUSE
BEGNAS SEED PRODUCTION CENTER



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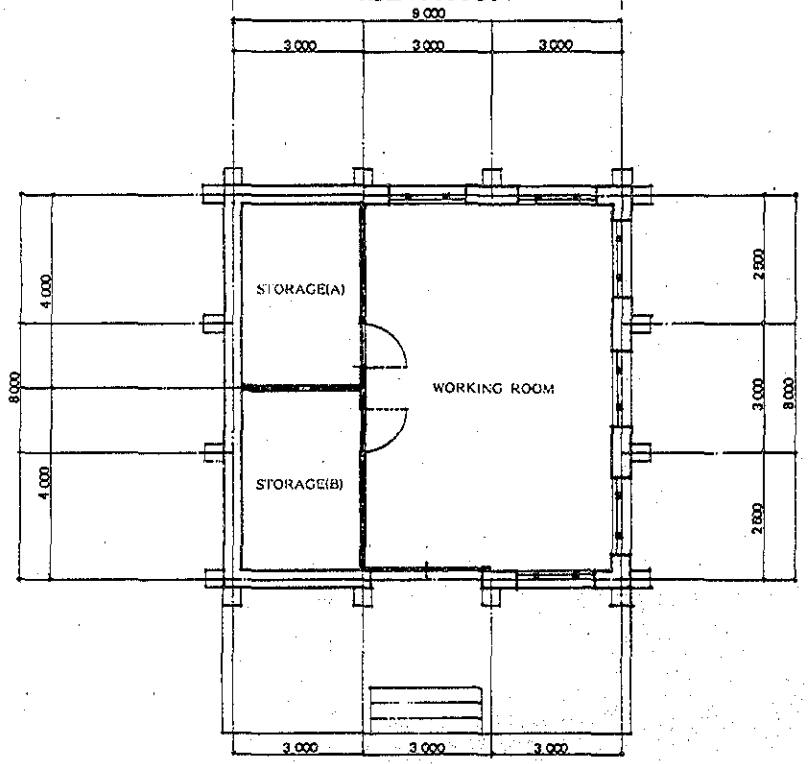
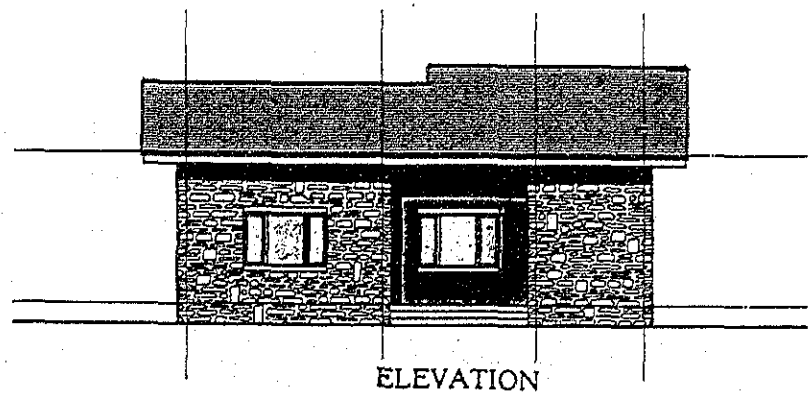


PLAN
FEED PRODUCTION SHED



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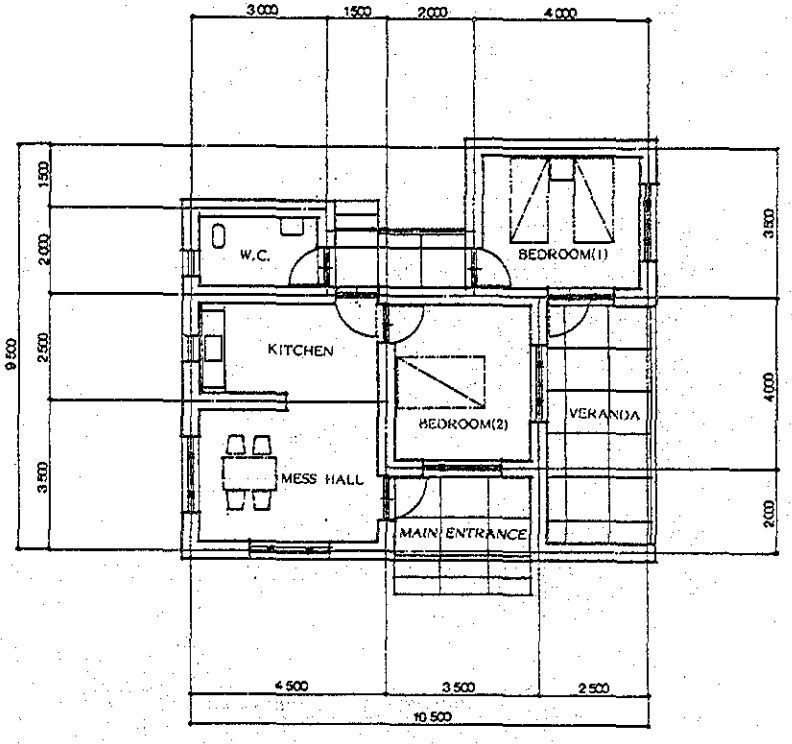
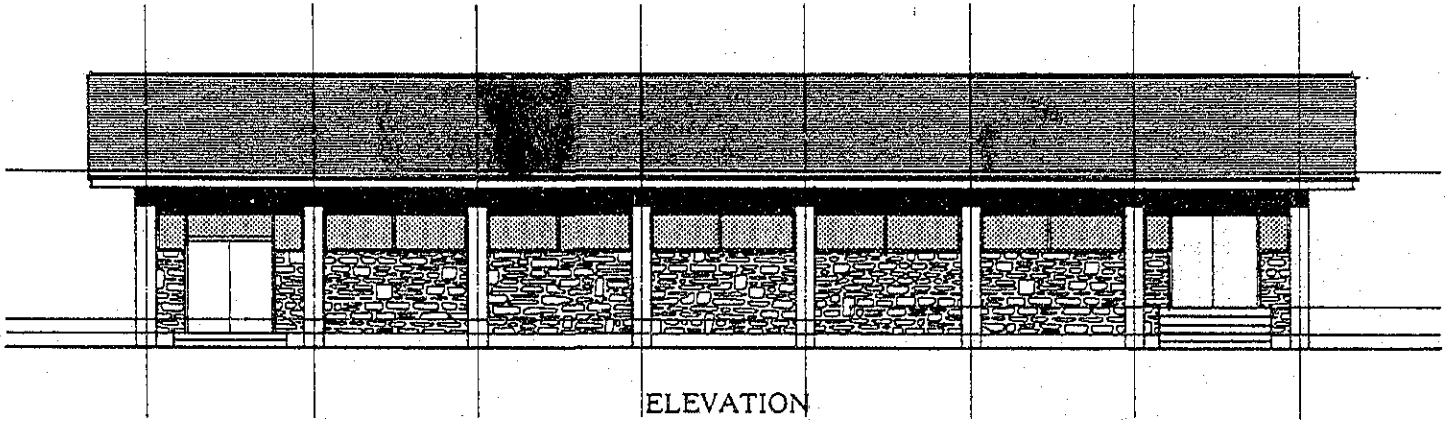


PLAN
NIGHT QUARTERS

FEED PRODUCTION SHED AND NIGHT QUARTERS
BEGNAS SEED PRODUCTION CENTER



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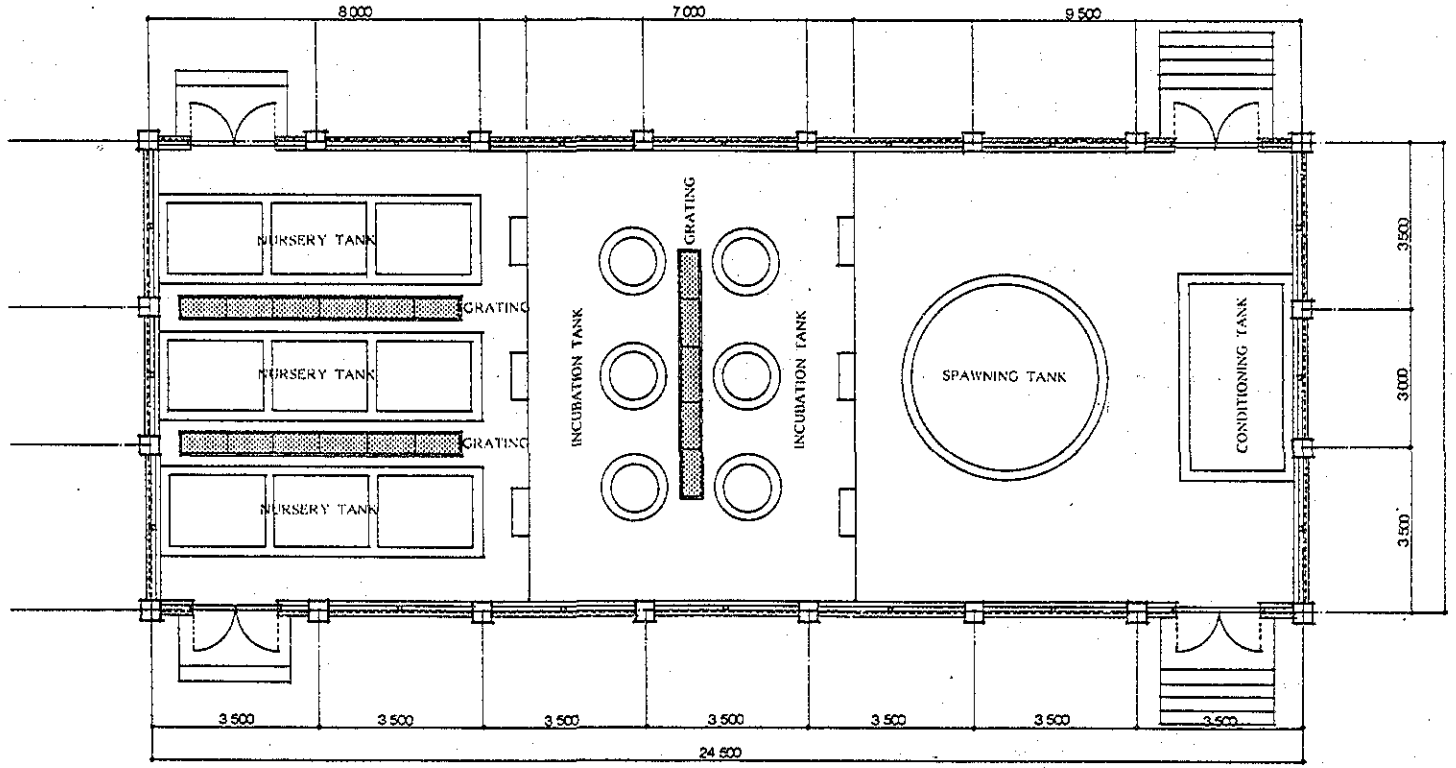
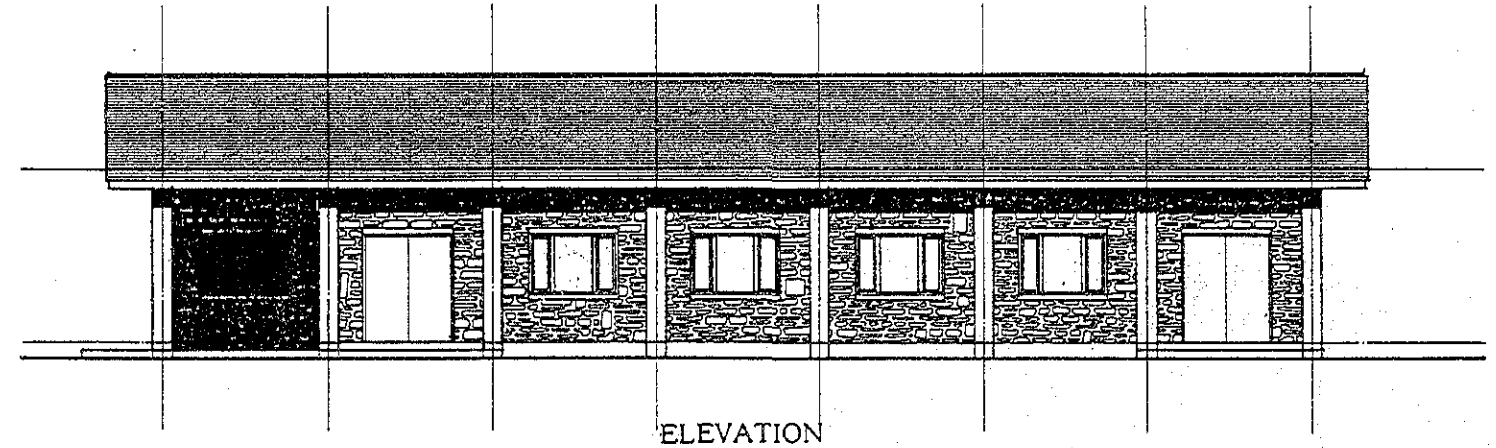


PLAN

HATCHERY FOR CHINESE AND IND. MAJOR CARPS
BEGNAS SEED PRODUCTION CENTER



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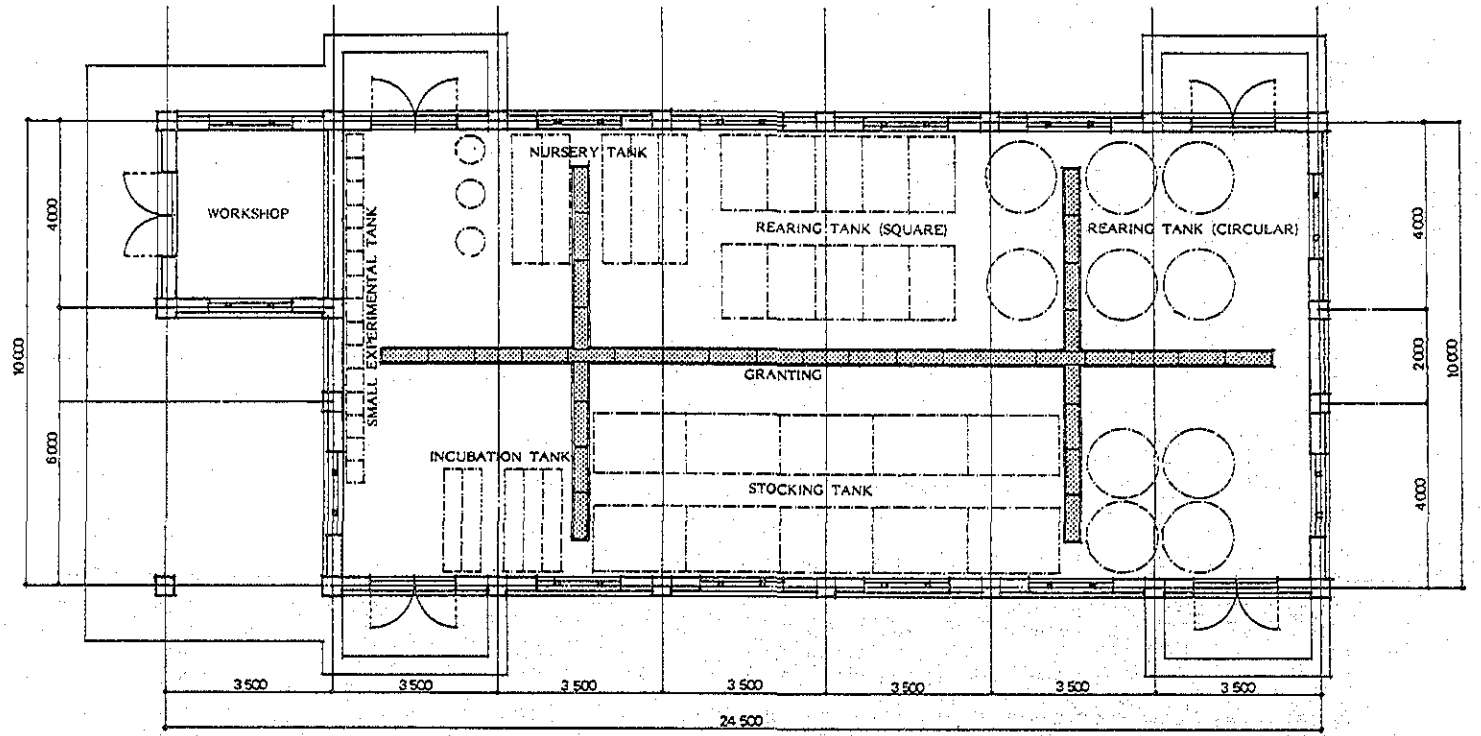
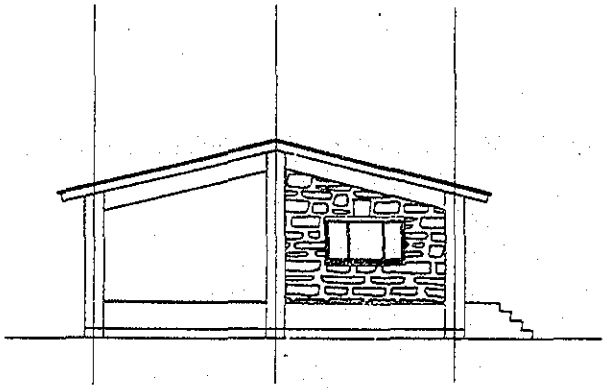


PLAN

HATCHERY FOR INDIGENOUS FISH SPECIES
BEGNAS SEED PRODUCTION CENTER



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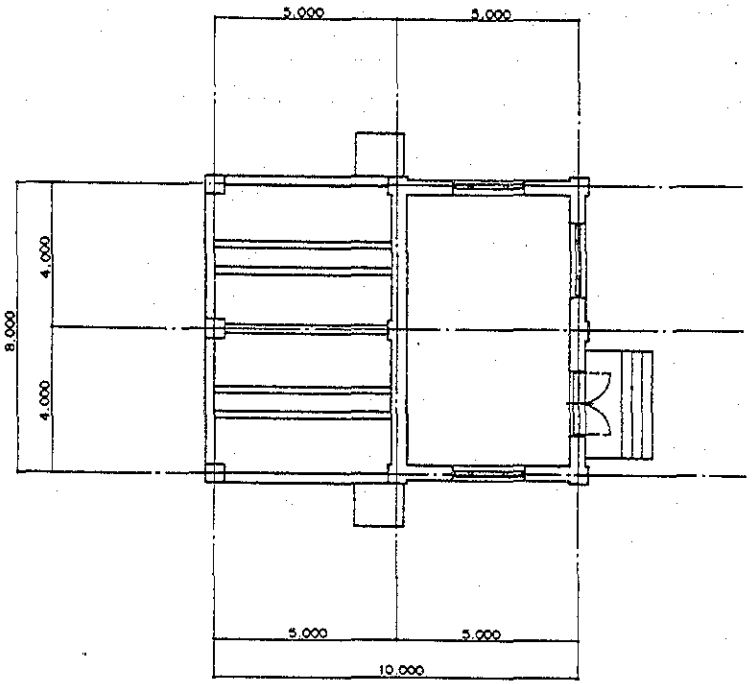
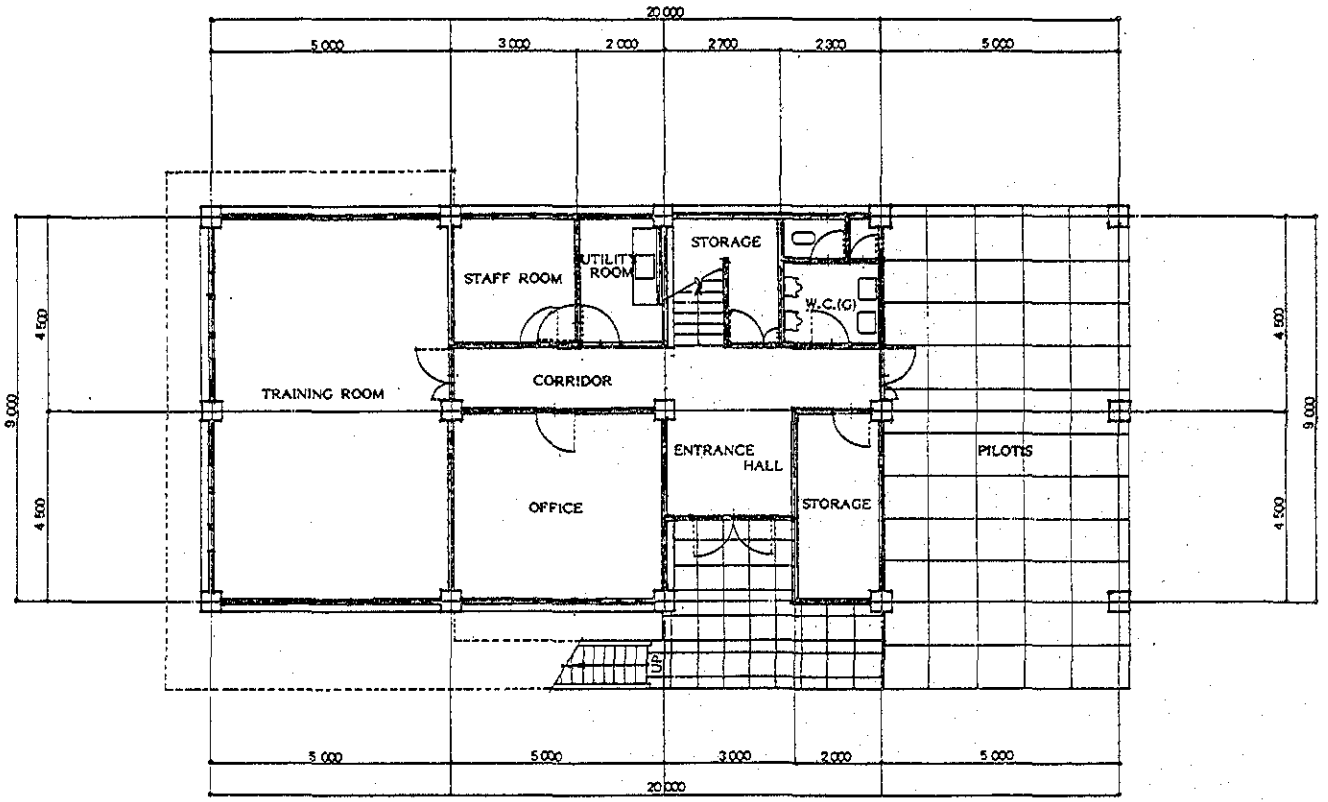


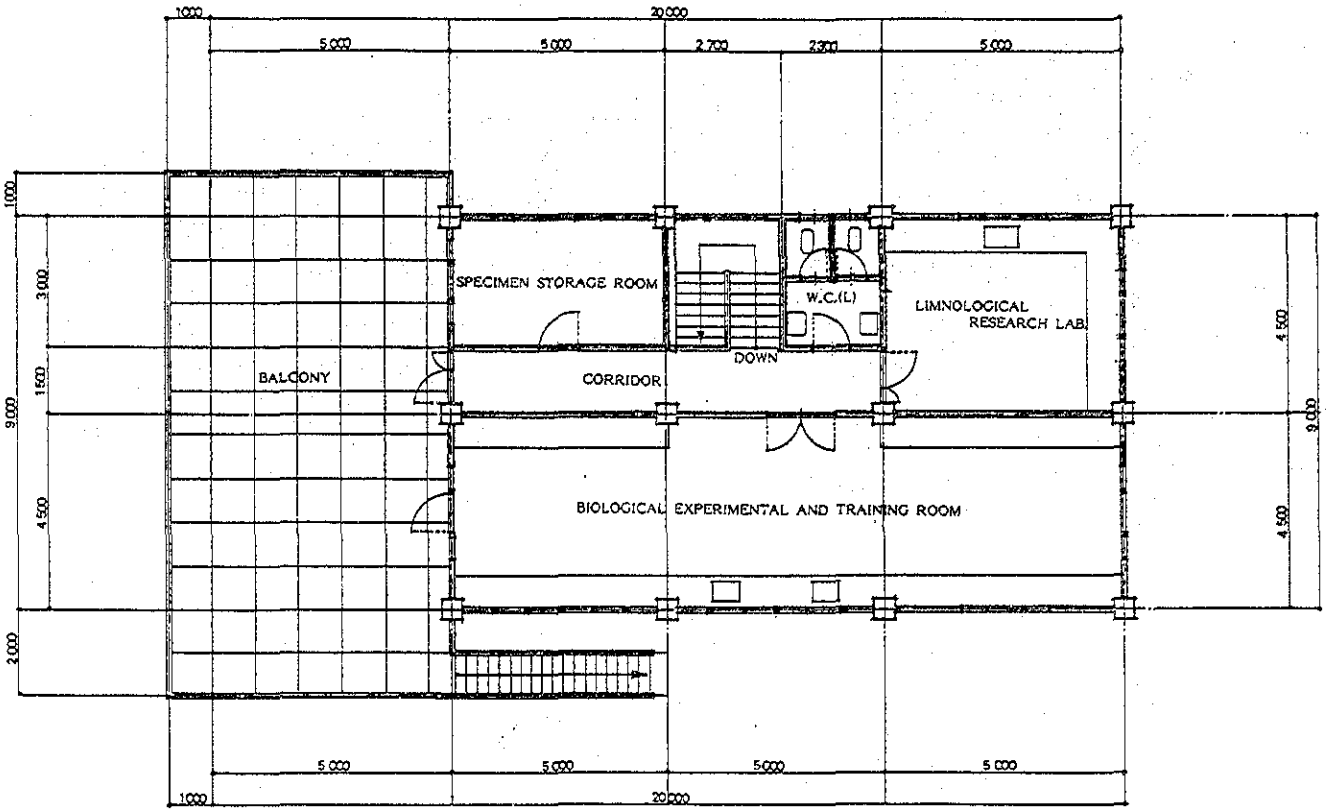
PLAN

MACHINE HOUSE (FILTERING TANK)
BEGNAS SEED PRODUCTION CENTER



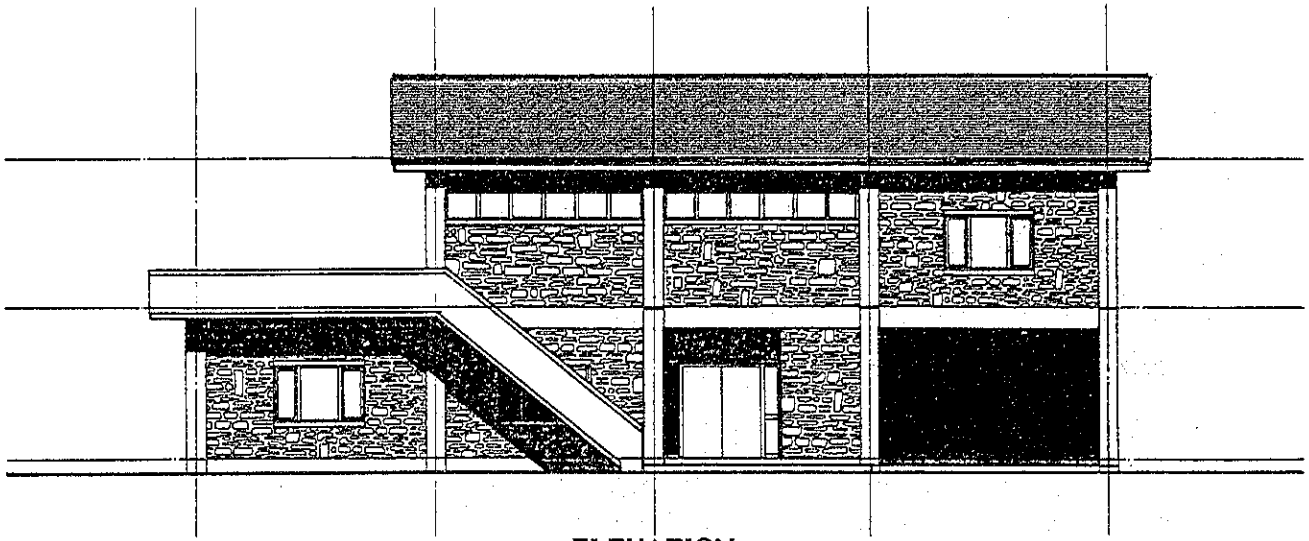
GROUND FLOOR PLAN

TRAINING FACILITY FOR FISH FARMERS AT PHEWA

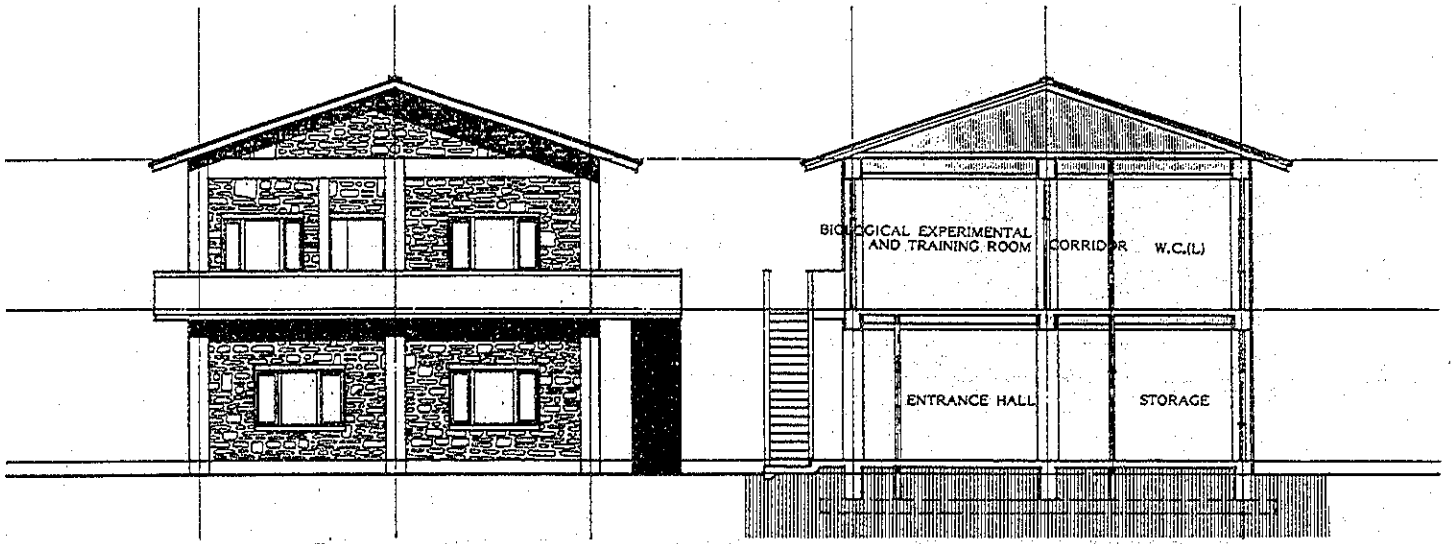


1ST FLOOR PLAN

TRAINING FACILITY FOR FISH FARMERS AT PHEWA

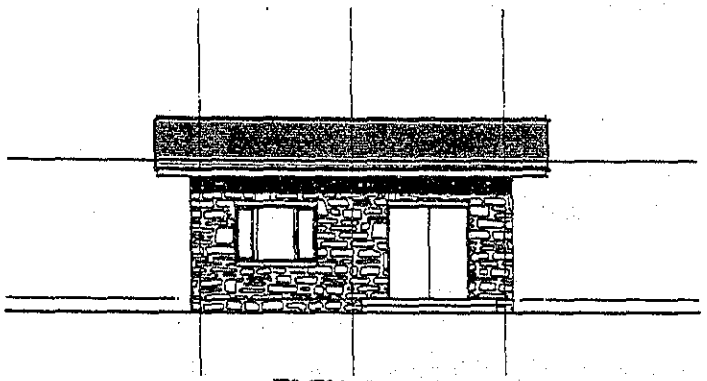


ELEVATION

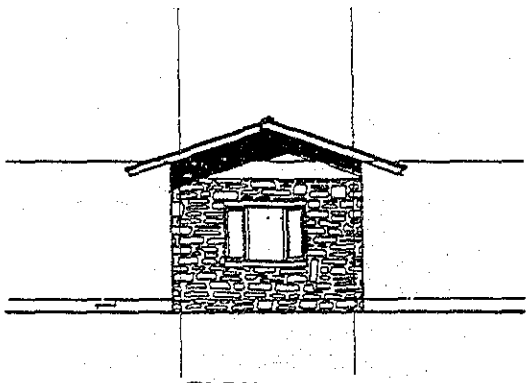


ELEVATION SECTION

TRAINING FACILITY FOR FISH FARMERS AT PHEWA



ELEVATION



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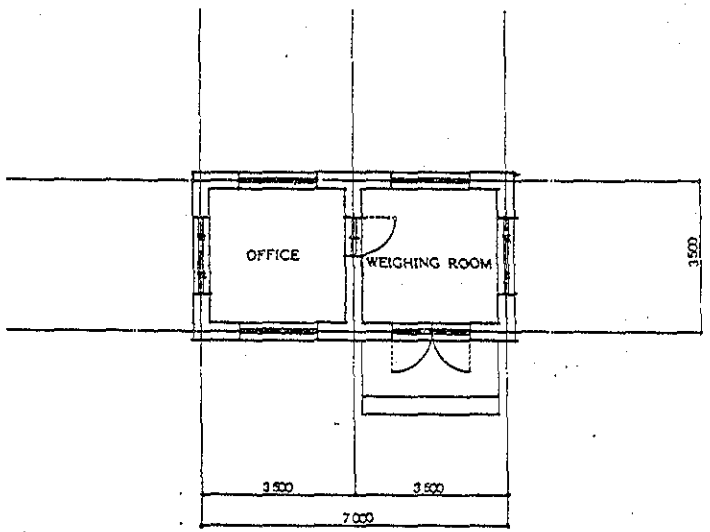
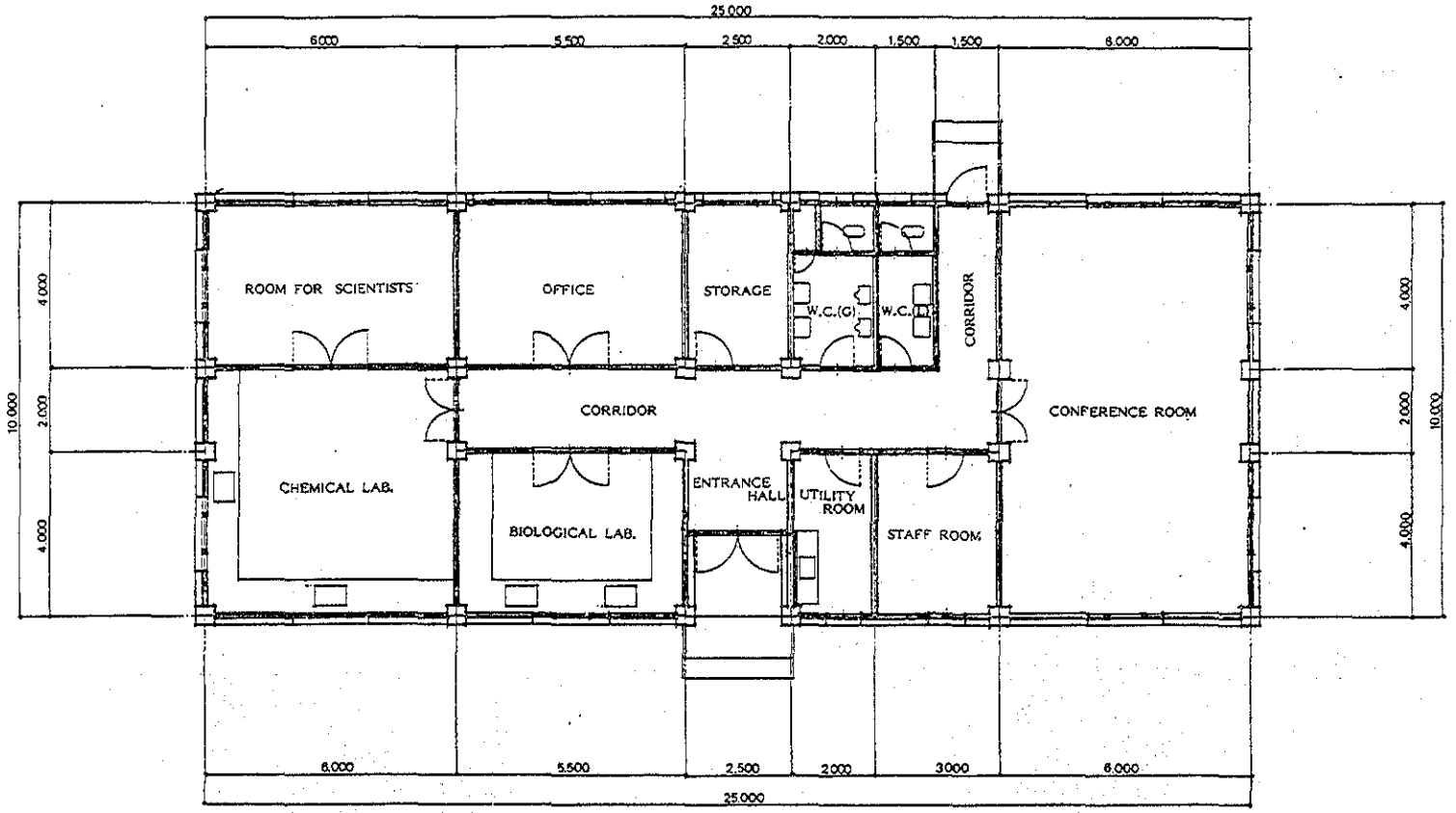


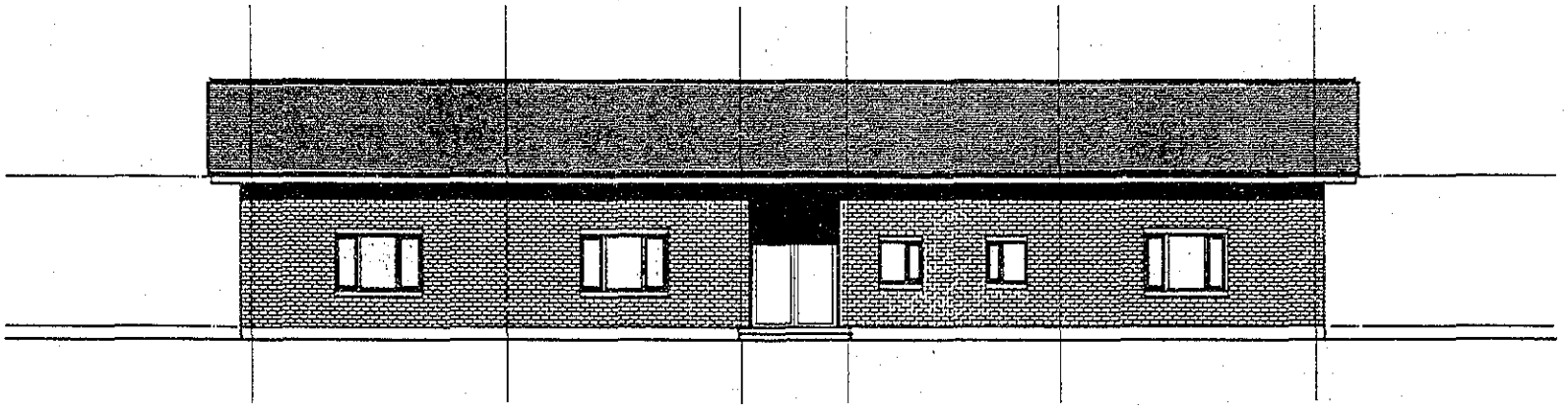
PLAN

SMALL FISH COLLECTION SHED AT RUPA



PLAN

LABORATORY
GODAWARI FISHERIES DEVELOPMENT CENTER



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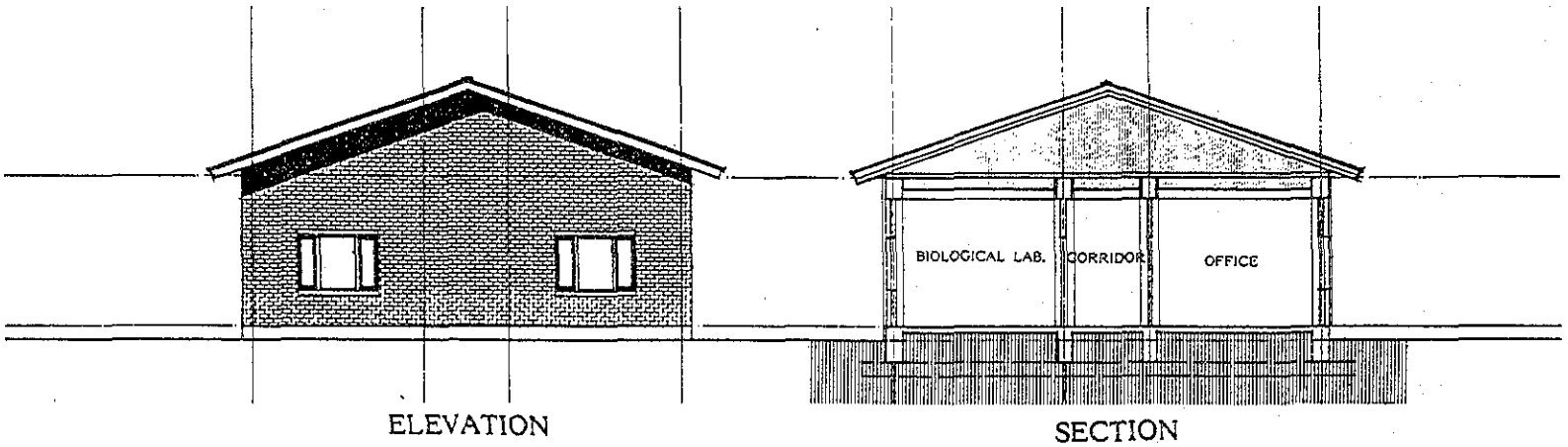


ELEVATION

SECTION

LABORATORY
GODAWARI FISHERIES DEVELOPMENT CENTER

4.4 Execution Plan:

4.4.1 Execution Policy:

The Plan sites cover four areas: Begnas, Rupa, Phewa, and Godawari.

At Begnas, the main facility under this program, a site of approximately 6.2 ha has been procured for the Seed Production Center in a rice paddy area extending downstream from the Begnas Irrigation Dam.

The Godawari and Phewa Plan sites are both adjacent to existing facilities and have already been leveled. The site that has been secured at Rupa is flat and lies in an area of paddies.

The facility construction plan will fully incorporate local construction methods, proceeding sequentially from basic construction to building construction, finishing, and delivery of materials and equipment

The engineering phase will comprise, sequentially, site preparation, laying of waterproof sheets, dike construction, water supply and drainage channels, a related road, and a connecting bridge.

The following points should, we feel, be considered in connection with the execution plan:

(1) With respect to labor supply, unskilled workers can be recruiting locally in the required numbers but, in the case of facility technicians, steel workers, and other specialized categories, particularly in the case of Begnas, where a large pool of skilled workers will be required over a short space of time, special care is called for in filling the skilled labor requirements.

(2) With regard to materials, the great bulk can be procured locally. The main items to be sourced include concrete, stone, slate tile, and soil for site preparation. While we foresee no particular problems in obtaining any of these materials within the construction period, in order to avoid any material shortages owing to the placing of a large

volume of orders at one time, the procurement process must be carefully planned.

(3) The Plan site is in an area of heavy precipitation, with annual rainfall in excess of 4,000 mm, 80% of which is concentrated in the months of June - September. Careful consideration will have to be given to rainfall patterns in formulating progress plans for foudation work, the finishing work of the buildings, and the civil works, all of which are affected by weather conditions.

4.4.2 Construction Plan and Supervisory Plan:

The construction will utilize local construction methods. The bulk of the building materials, excluding waterproof membrane, and labor will be locally procured. Since this project will be implemented through grant-aid program of Japan, the understanding of local cooperators will be indispensable with respect to conformance, quality requirements, precision in execution, and construction schedule, and proper liaison and coordination will be required to this end. The organizational structure for local supervision will provide for the dispatch of a project manager cum civil engineer, a resident architectural engineer, and the dispatch of mechanical engineers for a short period.

In implementing the subject project, following the Exchange of Notes between the Government of Japan and HMG, a Consultant Contract will be concluded between HMG and a consultant of Japanese nationals.

The consultants will prepare a detailed design drawing, specification sheets, cost estimates and tender documents, and contract documents. The consultant will also select the general contractor, subject to the approval of HMG, on the basis of a pre-qualifications, tenders, negotiations with a successful tenderer, and other procedures.

Following the signing of the construction contracts, a check will be made in Japan of the shop drawings along with an inspection of equipment assembly, while construction will be carefully supervised in Nepal. Engineers of the Consultant will be dispatched to Nepal in order to assure smooth progress and accuracy in the construction program.

4.4.3 Procurement Plan for Materials and equipment:

(1) Construction Materials and Equipment:

1) Principal Materials

In principle, all construction materials for this Plan which are available in Nepal will be locally procured.

The major share of the required materials -- cement, building stone, slate tile, aggregate, and certain facility materials -- are produced in Nepal. It has been established that, if preparations are properly planned, it should be possible to obtain the required supplies and quality for this scale of project.

The materials to be imported from Japan will include items that are not locally produced as well as products for which quality, supply stability, or price dictate procurement from Japan, such as waterproof membrane for pond construction, switchboards, pumps, lighting fixtures, and equipment for certain of the facilities.

The procurement source for the main construction materials used in this project is shown below:

Main construction materials	Source
Sand	Nepal
Gravel	Nepal
Stone	Nepal
Cement	Nepal
R-bars	Nepal
Steel frames	Nepal
Bricks, blocks	Nepal
Timber	Nepal
Veneers	Japan
Fittings	Nepal
Paint	Nepal
Tiles, slate	Nepal

Other tiles	Nepal

Main facility equipment/materials

Electric wire	Nepal/ Japan
Lighting fixtures	Japan
Swtiches and wall sockets	Nepal/ Japan
Switchboards	Japan
Freezer	Japan
Standby generator	Japan
Water supply and drainage pipes	Nepal/ Japan
Plumbing fixtures	Nepal
Pumps	Japan
Valves	Japan

2) Principal Construction Equipment:

Although construction equipment is owned and leased by local firms, the types and number of the available equipment will not be adequate to meet the needs of the construction program. Thus, the requisite construction equipment for this project will be procured both in Nepal and from Japan.

The types and sources of the main items of construction equipment required for the program are shown below:

Main Items of Construction Equipment	Source
Dump trucks	Nepal/Japan
Bulldozers	Nepal/Japan
Back hoe	Nepal/Japan
Generators	Nepal/Japan

(2) Laboratory Equipment and Material for Aquaculture Production:

This type of equipment and material will, in principle, be procured entirely from Japan.

4.4.4 Implementation Schedule:

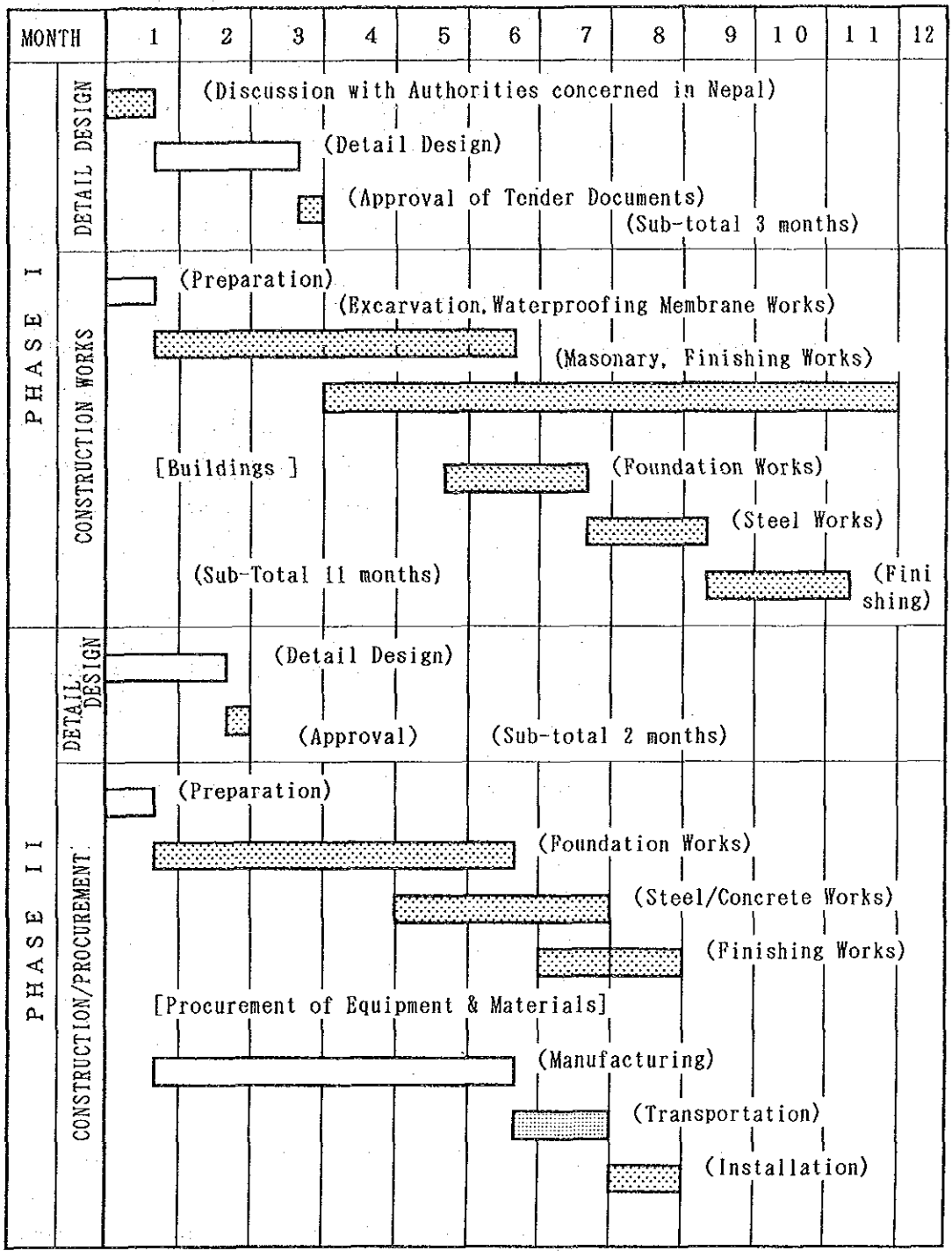
The subject Plan comprises implementation design, including tenders, facility construction, and procurement of equipment and materials.

In connection with the preparation of the implementation schedule, the optimum construction period has been determined on the basis of an evaluation of the implementation schedules for the various phases. The construction work has been classified into work that must be completed in advance, work that can be carried out in parallel or independently, a temporary construction plan, material procurement, and the final construction phases.

The Project will be divided into two phases, the first phase comprises construction of Brood Ponds, Nursery Ponds, Water Intake, Water Supply and Drainage Channels and Hatchery for Chinese and Indian Major carp, and the second phase comprises construction of Hatchery for indigenous species, Administrative office, Feed Production Shed, Storage House, Night Quarters, Raceways, Stocking Ponds, Filtration Tank, Road, Connecting Bridge and Dike at Begnas, Training Building at Phewa, Fish Collection Shed at Rupa, and Research & Administration Building and Raceways at Godawari, and procurement of Equipment and Materials.

The Implementation Schedule is shown on the following page.

IMPLEMENTATION SCHEDULE



4.4.5 Construction Responsibility:

(1) Area of responsiblity of the Government of Japan:

Assuming this project is carried out on the basis of a grant-aid from Japan, the Government of Japanese will be responsible for the following phases:

1) Construction of the following facilities, as required for seed production:

brood ponds, nursery ponds, hatchery for chinese and indian major carp, hatchery for indigenous species, water intake facilities ,filtration tank, water supply and drainage channels, administration/research building, feed production shed, stocking pond, dikes, connecting bridge, storage house, ice-making plant, night quarters, and exterior construction at Begnas, training building at Phewa, and fish collection shed at Rupa.

1) Construction of the following facilities, as required for research of natural water bodies :

research & administration building, and raceways at Godawari.

2) Construction incidental to the facilities:

Electrical work; construction work related to water supply , drainage, and sewage system; ventilation.

3) Provision of material for aquaculture and fishery production.

4) Ocean and inland transport of project-related materials and equipment.

5) Consulting services, including implementing design, support on tender, and construction supervision.

(2) Areas that will be the responsibility of HMG:

1) Procurement of Plan sites, removal of existing facilities or obstructions, and any necessary improvements.

2) exemption or payment of all customs duties and taxes in Nepal in connection with the clearance of imported materials and equipment.

3) Providing exemptions from all taxes and surcharges levied on equipment and materials required for plan implementation and on Japanese nationals rendering project services in Nepal.

4) Obtaining and granting approvals, permits, authorizations, and other privileges, as required for Plan implementation.

5) Effective maintenance and supervision of the facilities and equipment constructed with this grant-aid; preparation of all necessary fittings and fixtures; budgetary appropriations to cover project running costs.

6) Should equipment provided through this grant-aid be sold to fishermen, HMG will obtain advance approval from the Government of Japan with regard to the use of funds generated from these sales and make a follow-up report to the Japanese government.

CHAPTER FIVE PROJECT EVALUATION AND CONCLUSIONS

5.1 Project Evaluation:

5.1.1 Benefits from Plan Implementation:

(1) Seed Marketing Plan:

The seeds to be produced at the Begnas Seed Production Center are to be sold to fishermen.

From a budgetary standpoint, revenue from these seed sales cannot be directly applied to operating expenses of the Center, but, in this section, we will consider the extent to which seed sales can subsidize operating costs.

The seeds to be sold by the Center include: 84,000 fry (3-5g) and 360,000 advanced fingerlings of Chinese and Indian Major carps and 150,000 fry of common carp.

80% of the advanced fingerlings Chinese and Indian Major carp (288,000) will be reared to a size of 20-25g in fry cages. Assuming the remaining 20% are sold at 6-10g, seed sales would be as shown below. The fish prices applied were as of the time of the Basic Design Survey (March, 1990).

Chinese/ Indian	3-5g	45Rs/100 seeds	84,000 seed	37,800 Rs
Major Carp	6-10g	55Rs/100 seeds	72,000 seed	39,600 Rs
	20-25g	80Rs/100 seeds	288,000 seed	230,400 Rs
Common carp	1-2g	22Rs/100 seeds	150,000 seed	33,000 Rs
TOTAL				340,800 Rs

This sum would exceed the 307,350 Rs budgeted for utilities and feed at the Center, and so it may be presumed that the seed sales would directly offset all costs other than labor.

(2) Revenues from Cage Culture:

The following estimates have been developed on the benefits accruing from cage culture, based on the assumption that fishermen in the various lakes of the Pokhara area raise fish in 5 cages of 50 m^3 each. (Cf. D.B. Swar & T. B. Gurung, 1988.)

Item	Lake Phewa	Lake Begnas	Lake Rupa
		(in Rs)	
Initial Investment:			
5 cages (@ 4,000)	20,000	20,000	20,000
Rope, anchors	1,000	1,000	1,000
Total Investment	21,000	21,000	21,000
Annual Operating Costs:			
Depreciation	4,000	4,000	4,000
Seed purchases	99	1,650	1,650
Materials (bamboo)	500	500	500
Labor (75 man-days @ 40/day)	3,000	3,000	3,000
Bank interest (12%)	659	659	659
Other costs	1,000	1,000	1,000
Total Annual Costs	10,149	10,888	10,888
Annual Revenue from Fish Sales	19,550	23,600	25,000
Annual Expenses	10,149	10,888	10,888
Net Earnings	9,401	12,712	14,112

While current price levels may differ slightly from those prevailing in 1988, assuming that any increase in prices would have been offset by a commensurate increase in fish prices, average annual earnings for the 3 lakes combined , based on the above pattern of cage usage, would amount to 12,075 Rs. Taking only the cages to be produced under this Plan, 152 are to be used for adult fish. Extrapolating the above figures, based on the use of just 5 cages, fishermen would derive an income from this activity of:

152 / 5 x 12,075 = 367,080 Rs/year

(3) Benefits from Pen Culture and the Lake Stocking:

This Plan also includes seeds production for use in cage culture and the lake stocking. Pen culture will be undertaken in a 9.5 ha area, with a projected productivity of 2 tons/ha per year, indicating an annual production volume of 19 tons.

The production volume from lake stocking is estimated at 83 tons, yielding a total potential harvest from both activities of 102 tons per annum. The benefit to be derived from this production volume, even based on the lowest value species (silver carp and big head carp), would be an increase in fish production of:

102 tons x 30 Rs/kg = 3,060,000 Rs

The combined benefits, then, to be produced by cage culture, pen culture, and stocking operations would be far in excess of the operating costs of the Begnas Seed Production Center.

5.1.2 *Other Benefits from Project Implementation:*

Aquaculture in Nepal plays an important role in the nation's likelihood, and the high expectations for its future growth are expressed in the 8th 5-Year National Plan. However, since the rapid expansion that has occurred to date in aquaculture in Terai cannot be expected to continue, it is imperative that aquaculture development be expedited in the natural water bodies of the Midland.

The following benefits may be expected from implementation of the subject Plan:

(1) If the Begnas Seed Production Center is inaugurated and the required volume of seeds is produced to support cage and pen culture in the Pokhara Valley, there will be a significant increase in aquaculture ouput, while fish production can also be expected to grow, based on the lake stocking. This expansion of fish production would provide a new supply of animal protein, thereby contributing to an improvement in the nation's nutritional standards.

(2) If the Phewa Fishermen's Training Center is built and the necessary materials are furnished for use in cage culture, pen culture, and captured fisheries, people who have traditionally been relegated to the lowest stratum of society will be encouraged to enter the aquaculture and fishing industries, thereby gaining new employment and income opportunities. And, if fishermen already engaged in aquaculture can acquire more effective technical skills, their productivity can be raised.

(3) With the establishment of the Rupa Fish Collection Shed, it should be possible to develop a fuller understanding of the fish resources and fisheries production in Lake Rupa, which has proved difficult in the past due to the poor access to the lake, as well as of the benefits to be derived from the future development of the lake stocking. This will, in turn, facilitate the formulation of more effective seed production plans.

(4) When a research facility is added to the Godawari Fisheries Development Center, permitting the coordination of the limnological and riverine research activities, as well as aquacultural research programs for indigenous species, conducted by the Fisheries Development Centers at Pokhara and Trisuli, it will become possible to strengthen the overall research structure in these areas and expedite the diffusion of research findings.

Based on the above considerations, the implementation of this program can be expected to lead to a growth in fish production in the Pokhara Valley and to more rapid fishery development in the natural water bodies of the Midland. Accordingly, this Plan should contribute in a major way to improving the living standards of the Nepalese people.

5.2 Conclusions and Recommendations:

Nepal has many rivers, lakes, and resorvoirs, and, although the present volume of fish production in the country is not large, high hopes are held for development of the fishing industry. This is because this industry, particularly aquaculture, permits resources to be used in a form which

harmonizes with the ecology, without harming the natural environment, and is also a source of high- quality, low-cost protein.

But, despite the deep-seated demand for fish in Nepal, since the growth in fishery production in natural water bodies has been stymied by natural conditions, future increases in production will depend on expanding output in the aquaculture sector. The growth to date in aquaculture production has been due largely to an expansion of cultivated village ponds in Terai. However, since the bulk of the usable aquaculture areas in Terai are said to be already under cultivation, in terms of increasing production, there is a manifest need to raise productivity and develop new water areas. To this end, HMG attaches urgent priority to fishery development in the vast natural water bodies of the Midland.

In the Pokhara Valley in particular, despite a rapid growth in aquaculture production in recent years, the productive capacity of natural water bodies cannot be fully mobilized, owing to a chronic shortage of seed supplies. The Project for Natural Water Aquaculture Development is intended to supply adequate quantities of high-quality seeds for aquaculture use in for the Pokhara Valley as well as to promote more efficient development of limnological research and aquaculture research on indigenous species in natural water bodies, which has previously been pursued individually by several Fisheries Development Centers. We are confident that the present Project will contribute greatly, both directly and indirectly, to the future development of Nepalese aquaculture, through the medium of seed production, research, and training.

The Plan site for the Seed Center at Begnas is located between Lakes Phewa, Begnas, and Rupa in the Pokhara Valley. An irrigation dam and waterways have been developed, and the area is well endowed environmentally for seed production and distribution. The site is flat and the foundation conditions present no problems, provided waterproof treatment is provided in the bottom of ponds.

The Phewa Fishermen's Training Center is to be built within the existing Pokhara Fisheries Development Center and will utilize its present culture ponds, cages, and hatchery. The site is, therefore, ideal for fishermen training, and no problems exist with regard to site foundations. Lake Rupa

has the highest productivity of the 3 Pokhara lakes and so is an obvious choice as a site for a fish collection shed to promote the future development of aquaculture and recapture fisheries.

The Plan site at Godawari, designed to consolidate research activity on natural water bodies, is richly endowed with spring water and is located in the suburbs of at Kathmandu. It is, therefore, well suited as the site for a coordinating facility. No problems exist with respect to either the site or its foundations.

The Begnas Seed Production Center, the Phewa Fisheries Training Center, and the Rupa Fish Collection Shed will all be under the supervision of the Pokhara Fisheries Development Center, while the Godawari facilities will be under the control of the Godawari Fisheries Development Center. Both Centers are, turn, operated and administered by the FDD of the Ministry of Agriculture. The budgets for operating costs and manpower additions, as required to operate the various Plan facilities, have been included in the 8th 5-Year Plan, and so it has been determined that there will be no problems in securing this funding.

The materials for aquaculture and fishery production are to be sold to the fishermen who receive training, under the supervision of the FDD. The income from these sales will be placed in a fishery development fund and used to replenish the subject materials, subject to the prior authorization of the Government of Japan. Regulations are presently being drawn up for this purpose.

Implementation of this project, including construction of the Begnas Seed Production Center, the Phewa Fishermen's Training Center, and the Rupa Fish Collection Shed, should lead to a growth in seed production and an improvement in aquacultural productivity in the Pokhara Valley, which, in turn, would generate increased supplies of animal protein for the people of Nepal. Although the revenues from seed sales cannot be directly applied to operating costs of the Seed Production Center, the benefits from this seed production are expected to exceed the running costs of the Pokhara Fisheries Development Center.

If a coordinated research facility is built at the Godawari Fisheries Development Center to foster research work on fishery development in natural water bodies, the research findings from the Trisuli and Pokhara centers can be more effectively reflected in fishery development. This facility is, therefore, expected to contribute significantly to an expansion of fish and aquaculture production in natural water bodies.

Finally, the concurrent supply of aquaculture and fishery materials should also serve to expand fish and aquacultural production along with fishermen's incomes.

Based on the key role that technical cooperation from Japan has played to date in the fishery development of the Midland, the Project can be viewed as further extending and developing this foundation. It has, therefore, been concluded that there would be considerable significance in implementing the subject project via a grant-aid program of Japan.

The Basic Design Study Team wishes to make the following recommendations with respect to Plan implementation to the Fisheries Development Division and the concerned Fisheries Development Centers.

(1) The scale of the seed production facility under this Plan has been set at a level that will enable it to satisfy the annual requirements in the Pokhara valley of approximately 1.8 million seeds by 1995/96. However, it is quite feasible to raise productivity per unit of area and produce an even large volume of seeds, based on improvements in aquaculture technology. Proper size sorting of seedling, along with the upgrading of seed quality, can help to achieve this productivity gain, and so we feel that this technology should definitely be incorporated in future operations.

(2) From a long-term standpoint, the selection of superior seedling for breeding purposes will be of major importance in producing high-quality seed. Major benefits can be derived in this area through the control of spawning periods on the basis of breeding methods and the fixation of prolific strains. It is, therefore, hoped that a proper infusion of basic technology can be effected during the technical cooperation program by Japan.

(3) The additional annual operating budgets that will be required in connection with Plan implementation may be estimated as follows:

Pokhara Fisheries Development Center	
Begnas Seed Production Center	835,260 Rs
Phewa Fishermen's Training Center	31,638 Rs
Rupa Fish Collection Shed	27,600 Rs
Total	894,498 Rs

Godawari Fisheries Development Center	
Power cost	4,733 Rs
Personnel cost	46,800 Rs
Total	51,533 Rs

Including an appropriate reserve, it may be anticipated that the annual additional funding requirement for the Pokhara Fisheries Development Center will be in the order of one million rupees and that for the Godawari Fisheries Development Center about 0.1 million rupees. Accordingly, budgetary appropriations for the additional funding will be required.

APPENDIX

I. Minutes of Discussions

MINUTES OF DISCUSSIONS
ON
THE PROJECT FOR NATURAL WATER FISHERIES DEVELOPMENT
IN
NEPAL

In response to the request of His Majesty's Government of Nepal (HMG), the Japan International Cooperation Agency (JICA) sent to Nepal the Project Formulation Team from November 28 to December 10, 1989. In accordance with the recommendations of the Team, the Government of Japan decided to conduct a basic design study on the Project for Natural Water Fisheries Development and entrusted the study to JICA. JICA sent to Nepal the Study Team headed by Naoyoshi SASAKI, Deputy Director of Fisheries Technical Cooperation Division, Forestry & Fisheries Development Cooperation Department, JICA, from March 18 to April 6, 1990.

The Study Team had a series of discussions on the Project with the officials concerned of the HMG headed by Mr. Rameshwor Bahadur SINGH, Joint Secretary, Ministry of Agriculture, HMG of Nepal and conducted a field survey in Pokhara, Trisuli and Godawari.

As a result of the study, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Kathmandu, March 27, 1990

N. Sasaki

Naoyoshi SASAKI
Team Leader,
JICA

Rameshwor Bahadur SINGH
Joint Secretary,
Ministry of Agriculture
HMG of Nepal

N.S

Attachment

1. Objective of the Project

The objective of the Project is to improve Pokhara Fisheries Development Centre for the center for seed production and supply to the Pokhara Valley and the central institute for limological study, to improve facilities and equipment of Godawari Fisheries Development Centre for the integration of research activities in Pokhara and Trisuli, and to improve facilities in Rupa to increase fish production, in line with the 8th National Development Plan of HMG having development policies to increase the fish production from lakes and reservoirs in the Mid-Land, and to promote the fisheries in the natural water bodies.

2. Executing Agency

Fisheries Development Division, Department of Agriculture is responsible for the implementation of the project as well as the operation and maintenance of the facilities and equipment.

3. Request for HMG

The contents of the Project required by the HMG are listed in Annex I. The Team will convey the request of the HMG to the Japanese Government that the latter will take the necessary measures to cooperate by providing the items listed in Annex I within the scope of the Japan's Grant Aid Program.

4. Project Site

The sites of the Project for the basic design study are located at Pokhara and Godawari as respectively shown in Annex II.

5. Undertaking of the HMG

The HMG will take necessary measures listed in Annex III on condition that the Grant Aid of the Government of Japan would be extended to the Project.

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6. Understanding of Japan's Grant Aid System

HMG side has understood Japan's Grant Aid System explained by the Team which includes a principle of use of a Japanese Consulting Firm and a Japanese firm(s) for construction and supply of equipment using as much as possible locally available material and resources.

7. The Final Report (10 copies in English) will be submitted to the Nepal side around August, 1990.

8. During the course of discussion, MOA mentioned about the minutes of first discussion held in 8th of December 1989, regarding objective No. 2 of the project and further consideration for expanding the scope of activities of the same, which appears in Annex IV. Besides, few problems related to the natural water resources development were also mentioned to be considered by the project. The Basic Design Team assured the MOA that it would convey the request to the authorities in Japan and that these matters could be further discussed and resolved with Preliminary Team for technical assistance which is scheduled to visit Nepal in June 1990.

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ANNEX I

ARTICLES REQUESTED BY HIS MAJESTY'S GOVERNMENT OF NEPAL IN PRIORITY ORDER

1. Pokhara/Begnas

1) Brood ponds/nursery ponds
2) Hatchery for Chinese and Indian Major Carp
3) Hatchery for indigenous fish species
4) Laboratory
5) Equipment for Laboratory
6) Office cum meeting room
7) Protection dike
8) Water supply and drainage canals
9) Feed production shed
10) Materials for cage fishculture & pen-culture
11) Materials for capture fisheries
12) FRP boats with outboard engine
13) Vehicles with fish container
14) Floating watch house
15) Ice making facility
16) Store room
17) Net shed
18) Motor cycles
19) Garrage

2. Godawari

1) Laboratory
2) Equipment for Laboratory
3) Race ways

3. Pokhara/Rupa

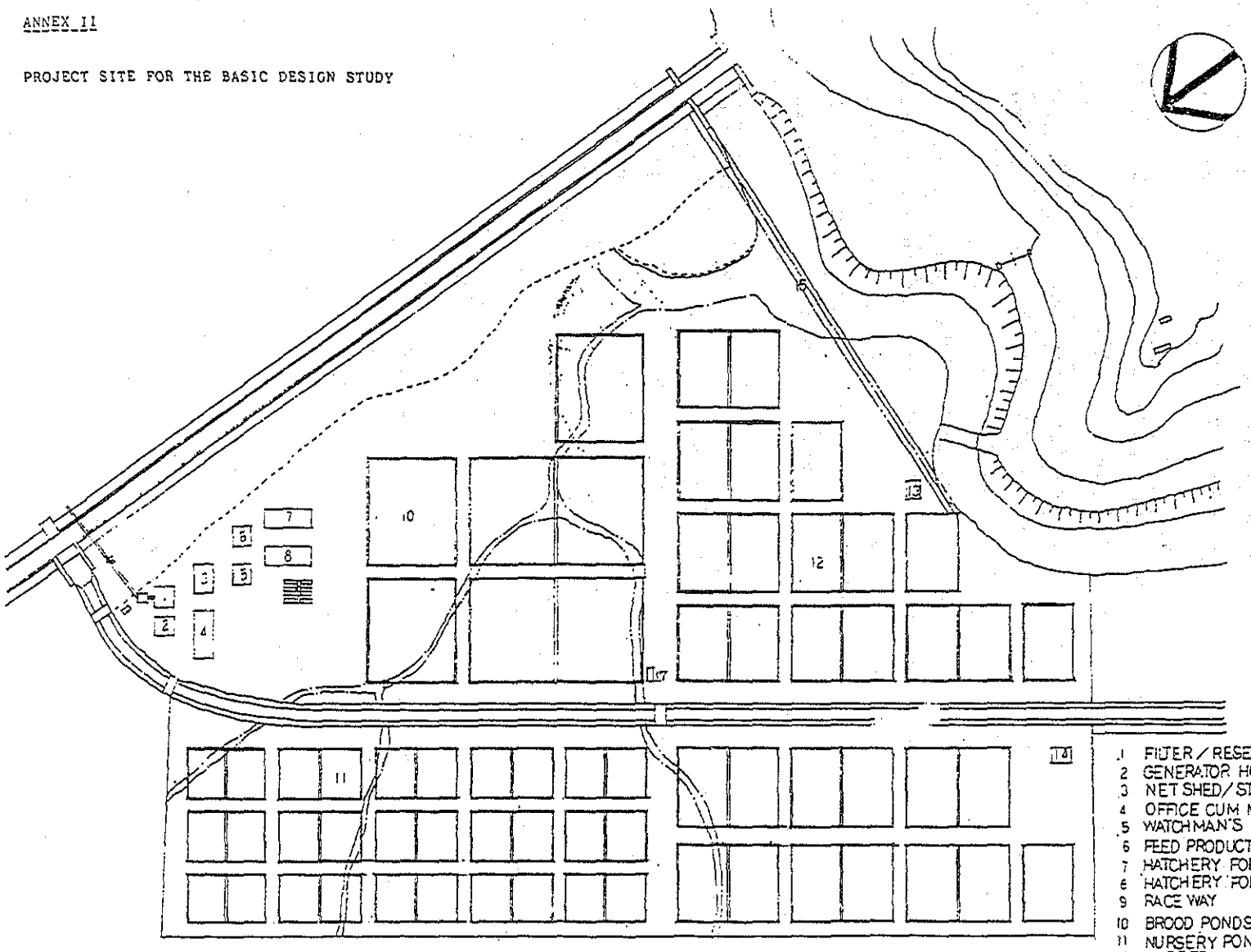
1) Small fish collection shed
2) Equipment for the above

4. Pokhara/Phewa

1) Training facility for fish farmers

ANNEX II

PROJECT SITE FOR THE BASIC DESIGN STUDY



APPENDIX-5

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ANNEX III

UNDERTAKING OF HIS MAJESTY'S GOVERNMENT OF NEPAL

1. To take administrative coordination necessary for ensuring support of the concerned authorities involved in the Project implementation.
2. To secure cleared 10 ha land necessary for constructing the facilities by the end of September, 1990
3. To provide facilities for distribution of electricity, water supply, sewage and other incidental facilities to the sites of the facilities construction.
4. To ensure prompt custom clearance at the port of entry in Nepal and to secure that the Japanese nationals shall not be subject to any custom duties, internal taxes and other fiscal levies imposed in Nepal, with respect to the supply of materials and services under the verified contracts.
5. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract and such facilities as may be necessary for their entry into Nepal and stay therein for the performance of their work.
6. To maintain and use properly and effectively the facilities purchased under the grant.
7. To ensure that the fund raised by selling material to fish farmers should be allocated for fisheries development, and to report the expenditure record of the fund to the Japanese Government.

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ANNEX IV

1. As river system comprises majority of natural water bodies therefore it should not only be concentrated in Trishuli river but also include one or two other possible rivers under the project activities.

2. Ways and means of solving siltation problems in order to check decreasing depth of lakes, reservoirs, etc.

3. To suggest techniques of increasing natural food for fish in natural water bodies.

4. Provide appropriate design of fish ladder to be constructed in the dam.

II. Team Members

The JICA basic design study team comprises following six members.

Mr. Naoyoshi SASAKI	Team Leader	Deputy Director, Fisheries Technical Cooperation Div., Forestry & Fisheries Development Cooperation Dep. Japan International Cooperation Agency
Mr. Tokio ITO	Freshwater Aquaculture Specialist	Chief Research Officer, Freshwater Research Div., National Research Institute of Fisheries Sciece, Fisheries Agency, Min. of Agriculture, Forestry and Fisheries
Mr. Kuniaki TAKAHASHI	Planning Specialist for Fisheries & Aquaculture	Fisheries Engineering Co., Ltd.
Mr. Shoji NAGAO	Architect	Fisheries Engineering Co., Ltd.
Mr. Michio TORII	Specialist for Aquaculture Facilities & Equipement	Fisheries Engineering Co., Ltd.
Mr. Michiyo KAWAGUCHI	Survey Specialist	Fisheries Engineering Co., Ltd.

III. Survey Itinerary

DAY	DATE	DESCRIPTION
1	Mar. 18 (Sun)	Lv. Narita TG-641 Ar. Bangkok Lv. Bangkok TG-311
2	Mar. 19 (Mon)	Ar. Kathmandu Courtesy call to JICA Office
3	Mar. 20 (Tue)	Visit to and discussion with Fisheries Development Division (FDD) and Department of Agriculture (DOA), Ministry of Agriculture
4	Mar. 21 (Wed)	Lv. Kathmandu Ar. Pokhara Visit to Pokhara Fisheries Development Center (FDC) and Begnas Branch Office Site reconnaissance in Begnas, Preparation of boring
5	Mar. 22 (Thu)	Visit to Rupa Branch Office, Road construction site reconnaissance, Survey for:the Plan site, Water Intake, water quality, pits for soil, water quality in Beganas Lake
6	Mar. 23 (Fri)	Mr. Sasaki, Mr. Itoh, Mr. Takahasi, Mr. Nagao and Mr. Torii: Discussion with Pokhara FDC Mr.Kawaguchi: Boring
7	Mar. 24 (Sat)	Mr. Sasaki, Mr. Itoh, Mr. Takahasi, Mr. Nagao and Mr. Torii: Visit to facilities donated by Japan in Pokhara Study for unit costs of construction, availability of materials, cpability of local contractors Lv. Pokhara Ar. Kathmandu Mr.Kawaguchi: Boring, Topographic Survey
8	Mar. 25 (Sun)	Mr. Sasaki, Mr. Itoh, Mr. Takahasi, Mr. Nagao and Mr. Torii: Visit to and discussion with Godawari FDC Site survey Mr.Kawaguchi: Boring, Topographic Survey
9	Mar. 26 (Mon)	Mr. Sasaki, Mr. Itoh, Mr. Takahasi, Mr. Nagao and Mr. Torii: Preparation of Minutes of Dicussions Mr.Kawaguchi: Boring, Topographic Survey

10	Mar. 27 (Tue)	Mr. Sasaki, Mr. Itoh, Mr. Takahasi, Mr. Nagao and Mr. Torii: Discussion at FDD and MOA on Minutes of Discussions, Report to Embassy of Japan, JICA Office, Conclusion of the Minutes of Discussions Mr.Kawaguchi: Boring, Topographic Survey
11	Mar. 28 (Wed)	Mr. Sasaki, Mr. Itoh: Lv. Kathmandu TG-312 Ar. Bangkok Lv. Bangkok TG-642 Mr. Takahashi,Mr. Nagao, Mr. Torii: Visit to Trisuli FDC Study for JOCV Mini Program Mr.Kawaguchi: Boring, Topographic Survey
12	Mar. 29 (Thu)	Mr. Sasaki, Mr. Itoh: Ar. Narita Mr. Takahashi, Mr. Torii: Lv. Torisuri Ar. Janakpur Mr. Nagao: Lv. Torisuri Ar. Pokhara Mr.Kawaguchi: Boring, Topographic Survey
13	Mar. 30 (Fri)	Mr. Takahashi, Mr. Torii: Visit to Janakpur FDC Study for the Aquaculture Development Project Lv. Janakpur Ar. Pokhara Mr.Kawaguchi, Mr.Nagao: Boring, Topographic Survey, Site Survey
14	Mar. 31 (Sat)	Mr. Takahashi, Mr. Torii: Site Survey at Beganas, Tographic Survey on Pokhara FDC Discussion with FDC Mr.Kawaguchi, Mr.Nagao: Boring, Topographic Survey,

15	Apr. 1 (Sun)	Mr. Takahashi, Mr. Torii: Site Survey at Beganas, Visit to and discussion with Regional Irrigation Office in Western Development Region Visit to and discussion with Pokhara FDC Mr.Kawaguchi, Mr.Nagao: Boring, Topographic Survey,
16	Apr. 2 (Mon)	Mr. Takahashi, Mr. Nagao, Mr. Torii, Mr. Kawaguchi: Lv. Pokhara Ar. Kathmandu Discussion with FDD
17	Apr. 3 (Tue)	Data collection for climate, earthquake, etc. Survey for building and construction industry
18	Apr. 4 (Wed)	Final discussion with FDD Report to JICA Office
19	Apr. 5 (Thu)	Lv. Kathmandu TG-312 Ar. Bangkok
20	Apr. 6 (Fri)	Lv. Bangkok TG-640 Ar. Narita

IV. Discussants

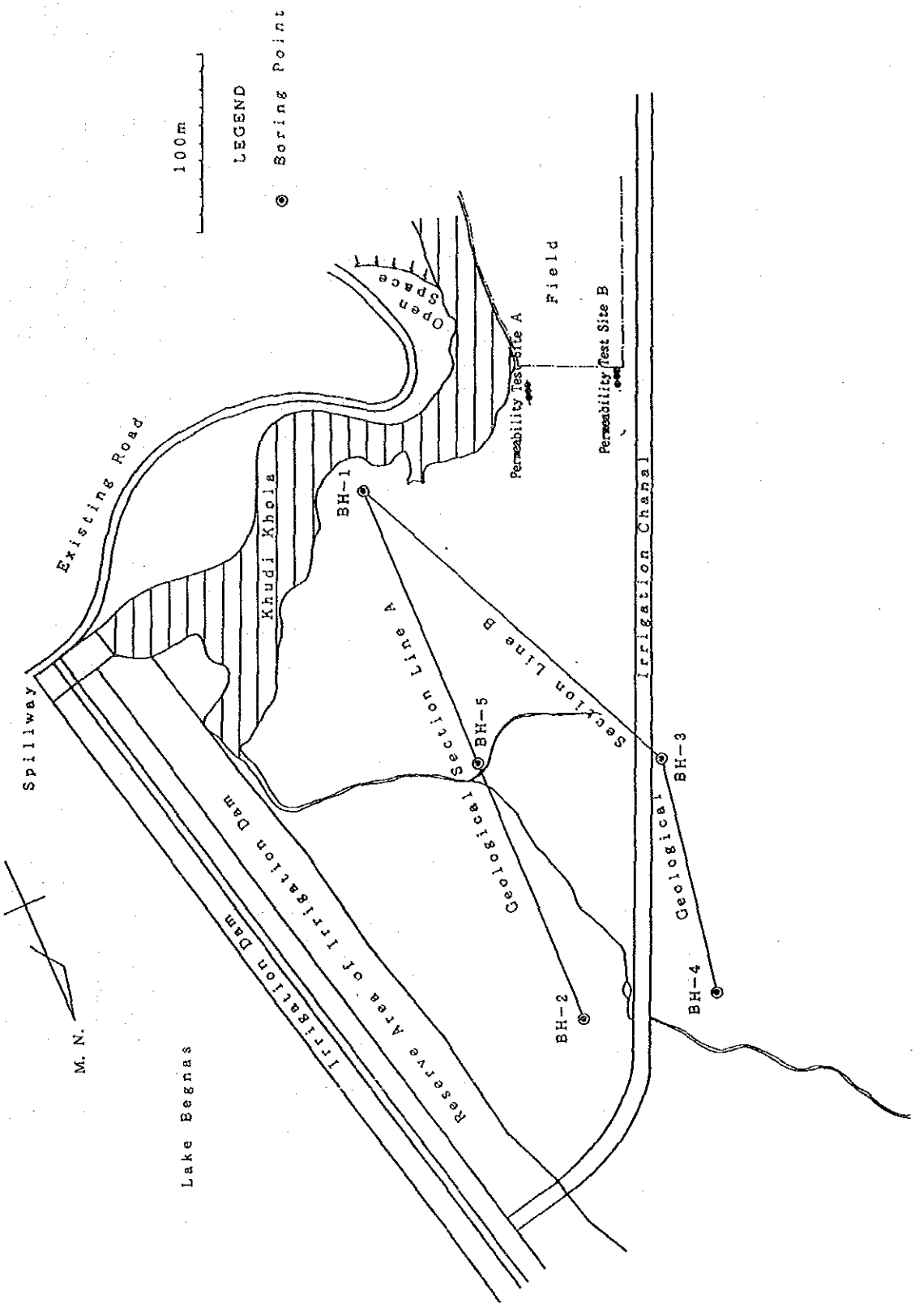
Mr. Akur Narsingh Rana	Secretary, Ministry of Agriculture (MOA)
Mr. Rameshwor Bahadur Singh	Joint Secretary, Planning Division, MOA
Mr.Dinesh B. Bista	Economist, Department of Agriculture (DOA), MOA
Mr.Siddhi Nath Regmi	Director General, DOA, MOA
Mr.Hari Prasad Gurung	Deputy Director General, DOA, MOA
Mr.Bharat Prasad Sharma	Chief Fisheries Development Officer, Fisheries Development Division (FDD), DOA, MOA
Mr. Madav Bahadur Pantha	Fisheries Development Officer Project Manager, Aquaculture Development Project
Mr. Ash Kumar Rai	Acting Fisheries Development Officer, Project Manager, Indrasarbar Fisheries Development Project
Mr. Purasotham Joshi	Assistant Fisheries Development Officer
Mr. Kishore Upadhyaya	Acting Fisheries Development Officer Farm Manager, Fatepur Fisheries Development Center
Mr. G.B.N. Pradhan	Acting Fisheries Development Officer Farm Manager, Hetauda Fisheries Development Center
Mr. Bikash Chand Shrestha	Acting Fisheries Development Officer Farm Manager Pokhara Fisheries Development Center
Mr. Tek Bahadur Gurung	Assistant Fisheries Development Officer Pokhara Fisheries Development Center
Mr. Sadha Ram Basmet	Assistant Fisheries Development Officer Manager, Begnas Branch Office, Pokhara Fisheries Development Center
Mr. Puspa Raj Adhikari	Junior Technician Pokhara Fisheries Development Center

Mr. Ram Chandra Lal Das	Assistant Fisheries Development Officer Manager, Rupa Branch Office, Pokhara Fisheries Development Center
Mr. Nhu Mhachoa Shrestha	Acting Fisheries Development Officer, Farm Manager, Godawari Fisheries Development Center
Ms. Sushil Kumar Chhetry	Assistant Fisheries Development Officer Godawari Fisheries Development Center
Mr. Sudarsan Raj Shrestha	Assistant Fisheries Development Officer Farm Manager, Trisuli Fisheries Development Center
Mr. Ganga Ram Pradhan	Engineer, Engineering Unit, Fisheries Development Division
Mr. Bhuban Prasad Ojha	Divisional Engineer, Western Regional Irrigation Directorate
Mr. Bharat Bhanstora	Site-in-charge Engineer, Begans Bijayapur Irrigation Project
Mr. Yukio Ohata	Adviser, MOA
Mr. Masao Wada	Team Leader, J.O.C.V. Fisheries Mini Program
Mr. Shoichi Mamiya	Volunteer, J.O.C.V.
Mr. Hideki Sasaki	Volunteer, J.O.C.V.
Mr. Akihiro Kawada	Volunteer, J.O.C.V.
Mr. Takashi Muromoto	Second Secretary, Embassy of Japan
Mr. Hidekazu Kumano	Resident Representative, JICA Nepal Office
Mr. Masatoshi Nagatomo	Deputy Resident Representative, JICA Nepal Office
Mr. S. Bhattachan	Senior Program Officer, JICA Nepal Office
Mr. Madav Bahadur Khadka	Program Officer, JOCV

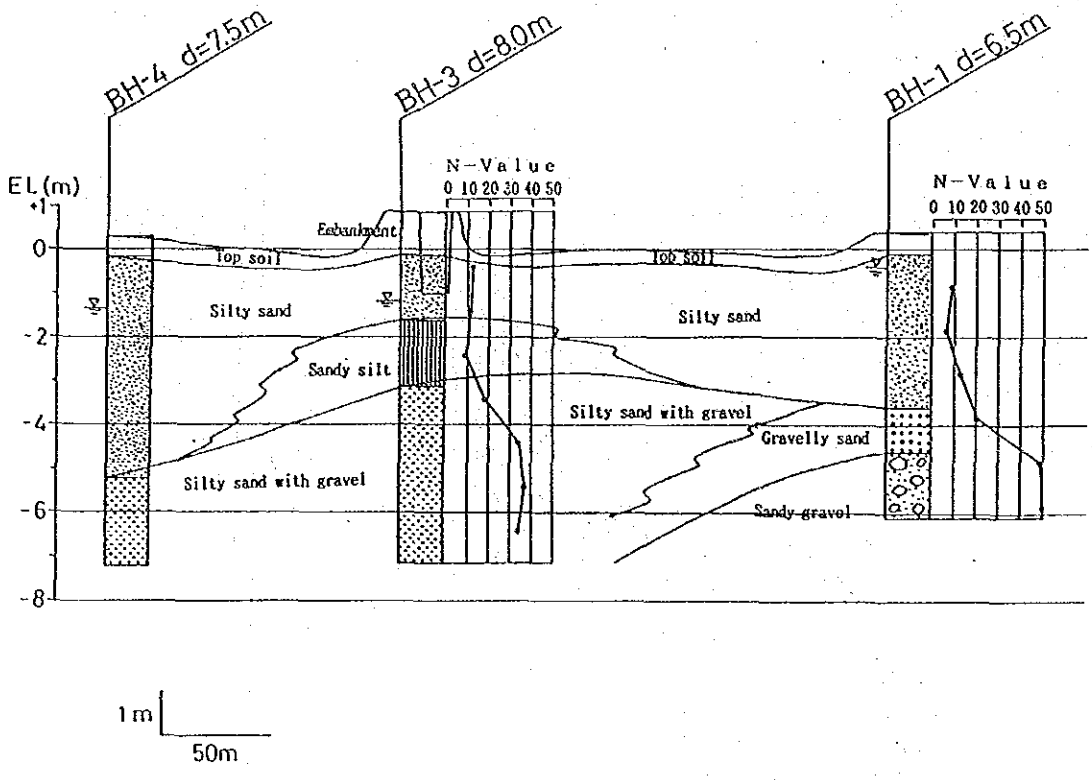
Ms. Yuriko Sato	Assistant Resident Representative, JICA Nepal Office
Ms. Fumiko Mukaigawara	Coordinator, JOCV

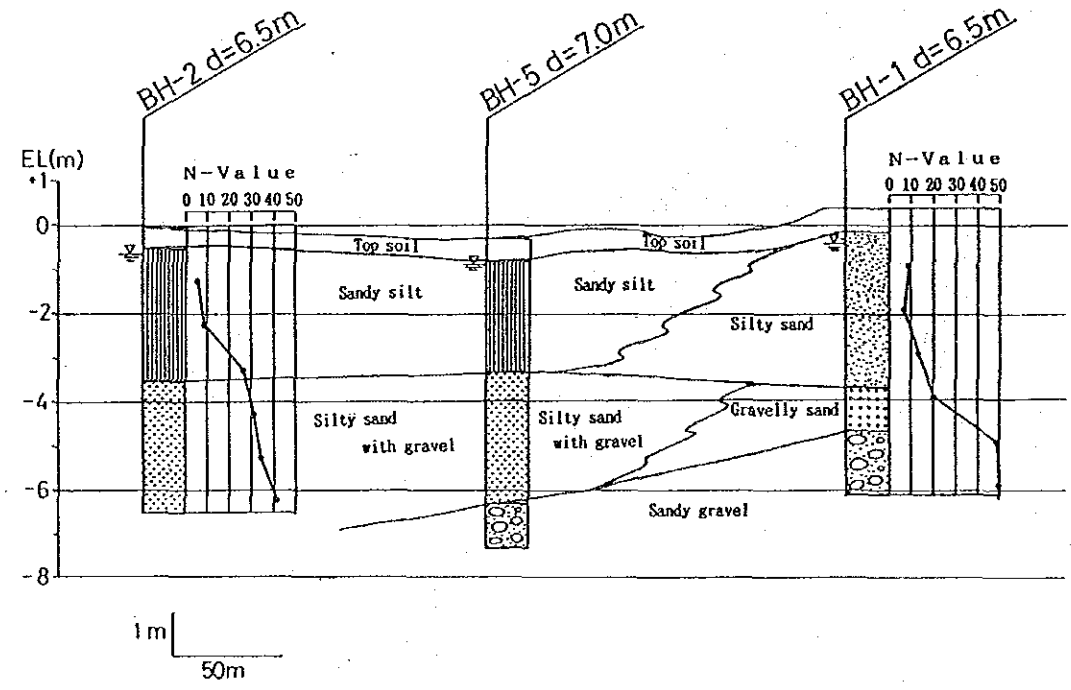
V. ANNEX

V-1 Location of Soil Analysis



V-2 Bore hole Log





V-3 Results of In-situ Permeability Test

V-3-1 Purpose; Methodology]

The in-situ permeability tests were conducted to assess permeability of soil and determine the necessity for water proof in the culture ponds. As test areas, relatively low levels of underground water were selected in the Plan site. Holes are dug at 2 locations to depths of 0.5m, 1.0m, and 1.5m and filled with water. The speed of water loss was then measured. The test sites, as shown in Figure V-3-1, were 50 m apart and set at 1.5m intervals to ensure that the centers of the 3 holes would be in a straight line. The test sites are shown in Appendix V-1:

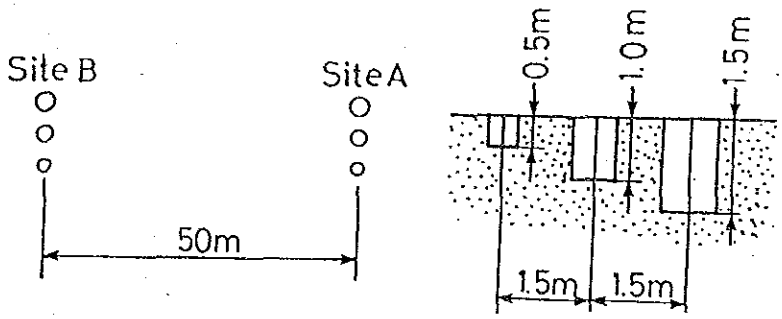


Figure V-3-1

V-3-2 Soil conditions of the Test Site:

After drilling the test holes, we recorded the soil conditions before starting the tests. At Site A, the soil composition showed a top layer of 10-15 cm, followed by a layer of sandy silt to 25-30 cm and one of silty sand with gravel below that.

At Site B, the top layer had a depth of 25-30 cm, followed respectively, by sandy silt to 40-50 cm and silty sand with gravel.

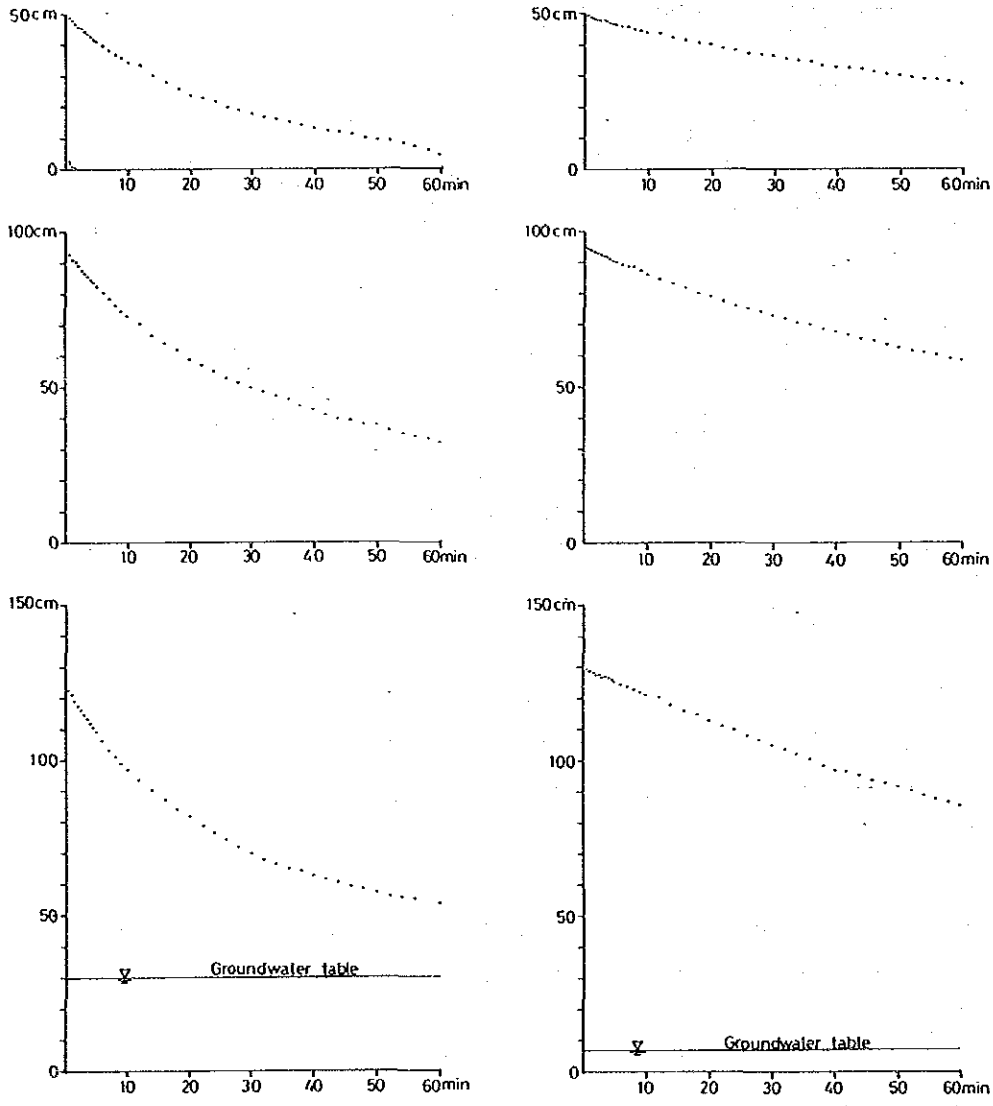
The bottom of the sandy silt layers were in all cases considerably shallower than the boring points.

V-3-3 Test Results:

The test results are shown in Figure V-3-2.

Conspicuous differences were observed in the rate of water depletion as between Sites A and B. The rate of Depletion was slow at Site B, evidencing a linear decrease. This demonstrates that the sandy gravel distributed in the vicinity of Site A has a larger content of fine grain sizes than in the area of Site B, with permeability reduced to that extent.

Based on these findings, the permeability of soil in the test areas is relatively high, at 10^{-3}-10^{-4}cm/sec at Site A and 10^{-4}cm/sec at Site B.



Site A Site B

Figure V-3-2

V-3-4 Estimated Permeability based on Grain-Size Distribution

The permeability coefficient is derived on the basis of the following formula from the grain size distribution.

$$k = CD_{10}^{2} \quad (cm/sec)$$

where:

k = permeability coefficient (cm/sec)

C = 50 - 100 (value)

D_{10} = Grain diameter (cm) on a 10% grain size distribution

Based on the above, the permeability coefficient in the sandy silt - silty sand layer may be estimated at about 10^{-4} - 10^{-5}cm/sec, and that of the top soil at about 10^{-5}cm/sec.

V-3-5 Water Proof Treatment at the Base of the Culture Ponds

Based on observation of the boring data and test holes for the permeability test, the bottom of the culture ponds in the vicinity of the Begnas Dam is a sandy silt - silty sand layer, becoming sandy gravel in areas distant from the dam.

At either of these layers, the permeability is, for the most part, about 10^{-4}cm/sec, and so there is a need for water proof treatment, in the form of impermeable soil material or waterproof membrane, at the base of the culture ponds.

V-4 List of Equipment and Material

(1) Equipment for Begnas Seed Production Center:

1) Ice making facility	1 set, 500 kg/ 24 hours with Ice Storage Bin 4.5 M^2
2) Draft chambers	2 units
3) Laboratory Table	4 units, 3000 X 1200
4) Air Blower	2 units, 0.5 M^3/min.
5) Emergency generator	1 unit, 35 KVA

(2) Materials for Aquaculture and Fishery Use:

1) Materials for cage and pen culture

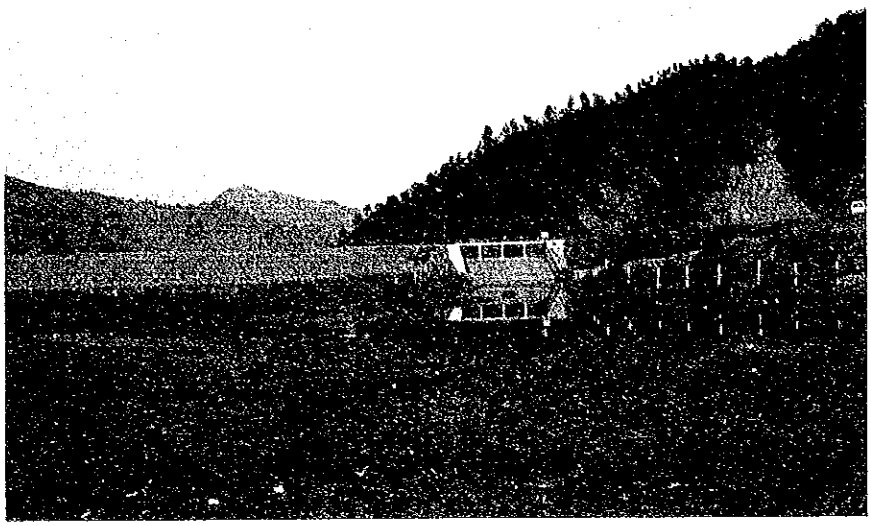
a. Netting for production cage	160 sets, polyethylene, 400D/30, 2", 5 X 18 M
b. Netting for nursery cage	40 sets, polyethylene, 200D/16, 1", 5 X 18 M
c. Netting for pen	30 sets, polyethylene, 400D/30, 2", 5 X 36 M
d. Mending twine	150 spools, polyethylene, 400D/30, 1 kg/spool
e. Mending twine	20 spools, polyethylene, 200D/16, 1 kg/spool
f. Rope	150 kg, PP, 4 mm dia
g. Rope	500 kg, PP, 10 mm dia
h. Assembling twine	100 kg, nylon, 210D/6

2) Materials for Gillnet

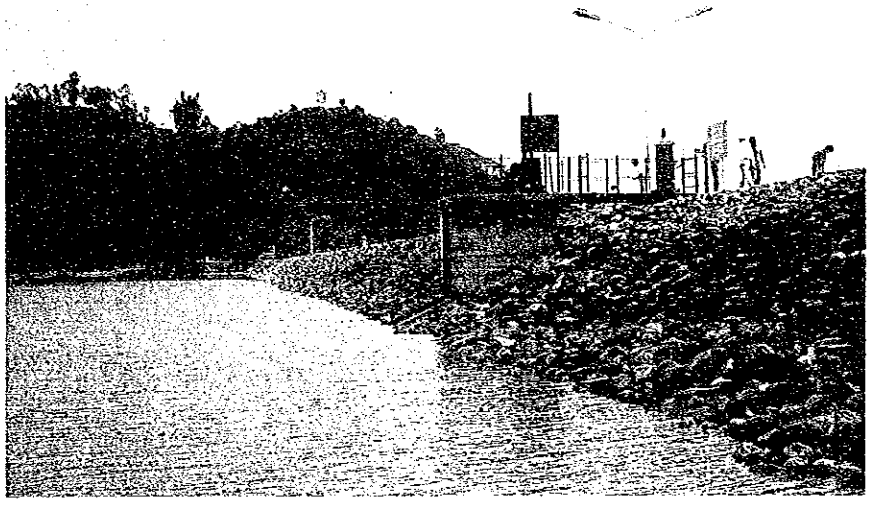
a. Netting for Gill net	175 kg, nylon, 210D/6, 1"
b. Netting for Gill net	150 kg, nylon, 210D/6, 2"
c. Netting for Gill net	110 kg, nylon, 210D/6, 3"
d. Netting for Gill net	70 kg, nylon, 210D/6, 4"
e. Mending twine	150 kg, nylon, 210D/6
f. Rope	1000 kg, PP, 5 mm dia
g. Rope	200 kg, PP, 10 mm dia
h. Float	3000 pcs, 200g buoyancy
i. Sinker	2000 pcs, 18 g weight

VI. Photographs

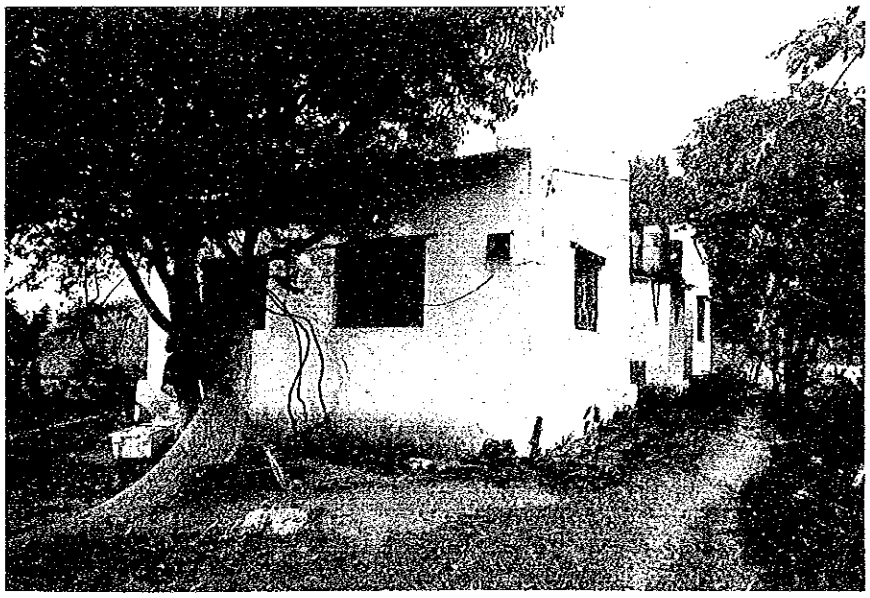
Plan Site for the Begnas Seed Production Center



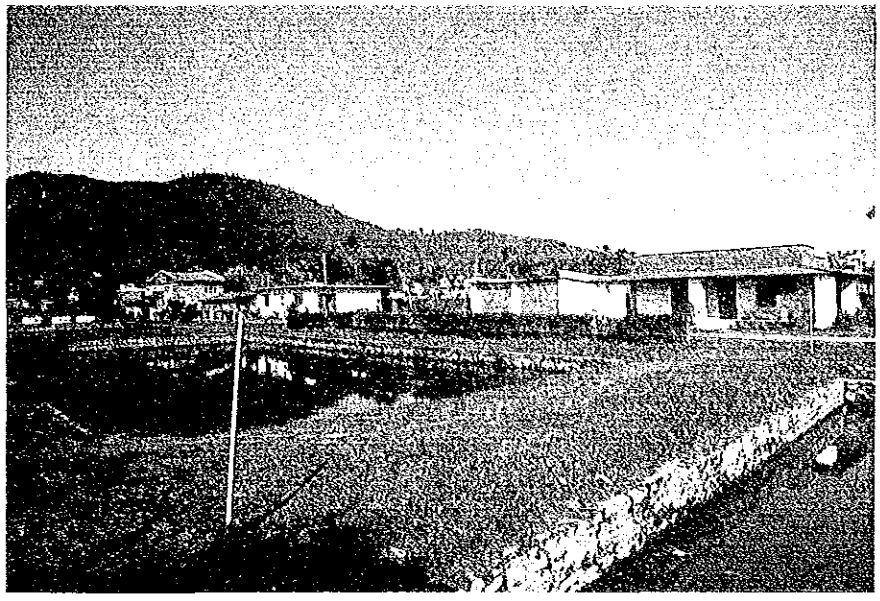
Begnas Irrigation Dam (Spillway)



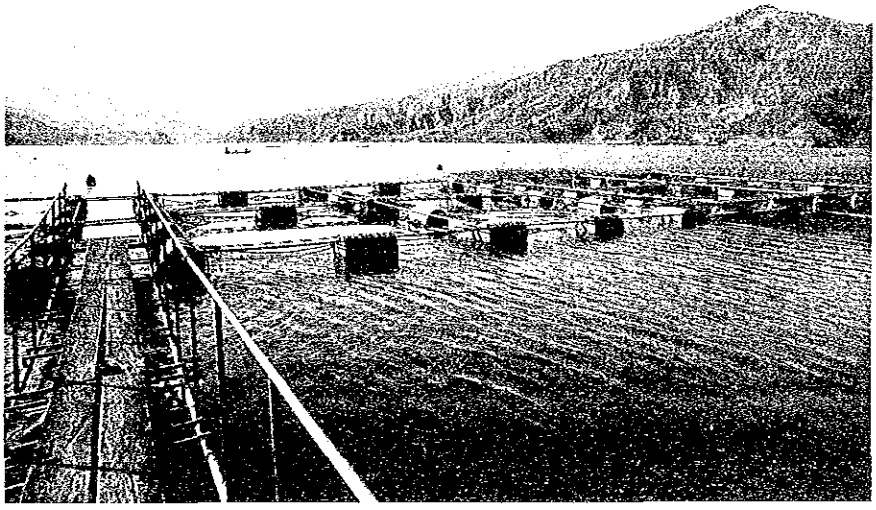
Inlet-outlet Works (Planned Water Intake)



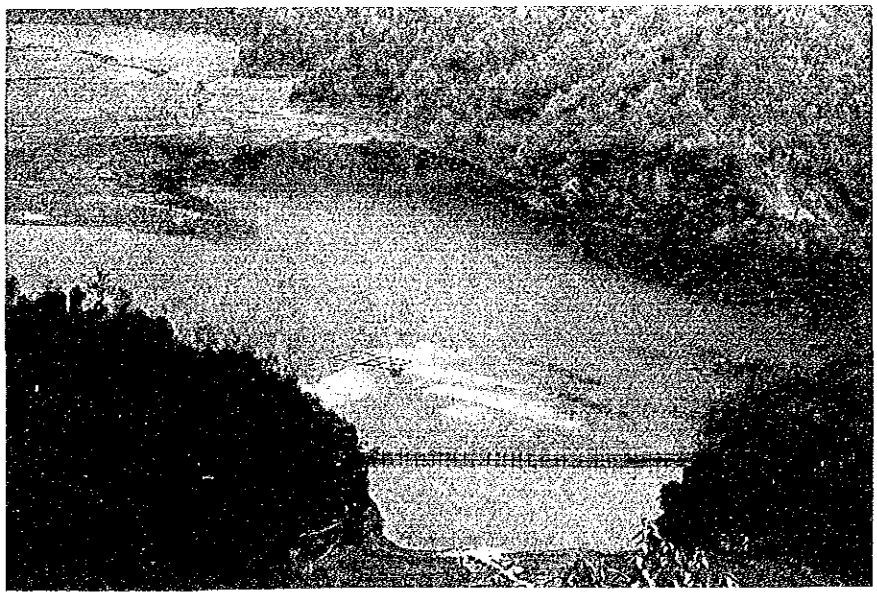
Begnas Branch Office Pokhara FDC



Pokhara FDC (Phewa)

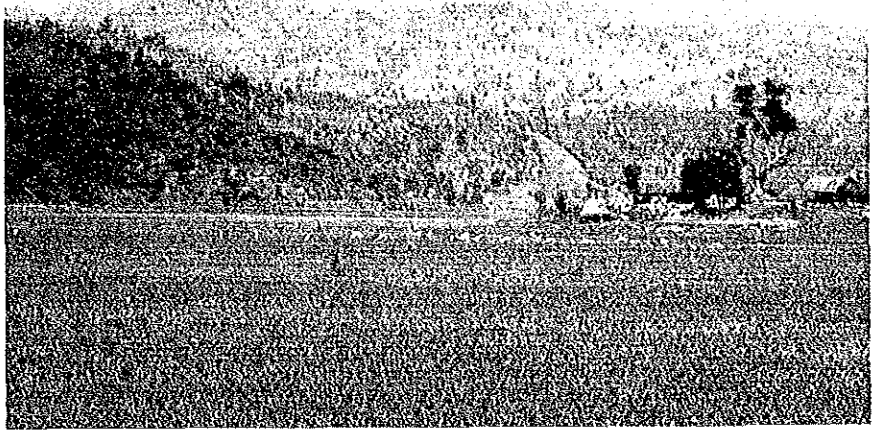


Cages in Lake Phewa

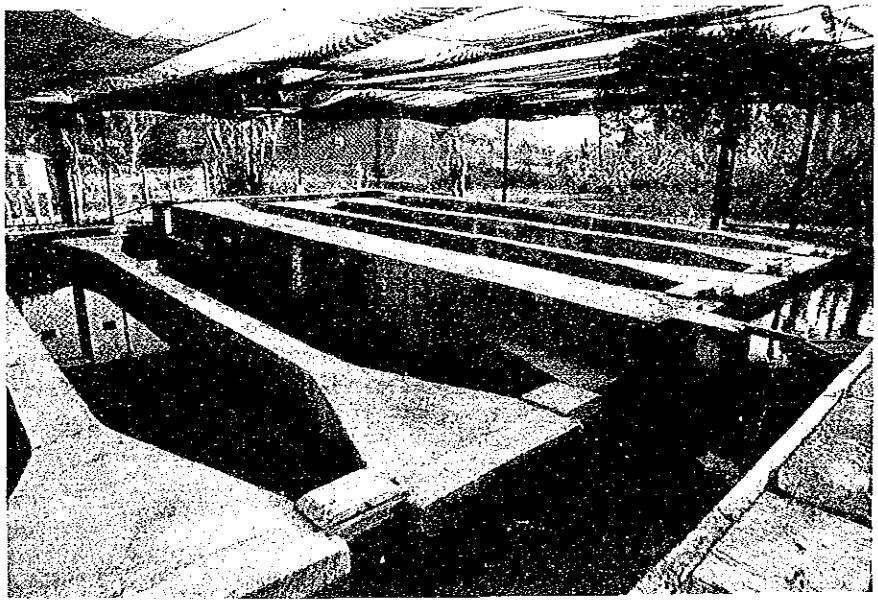


Cages & pen in Lake Rupa

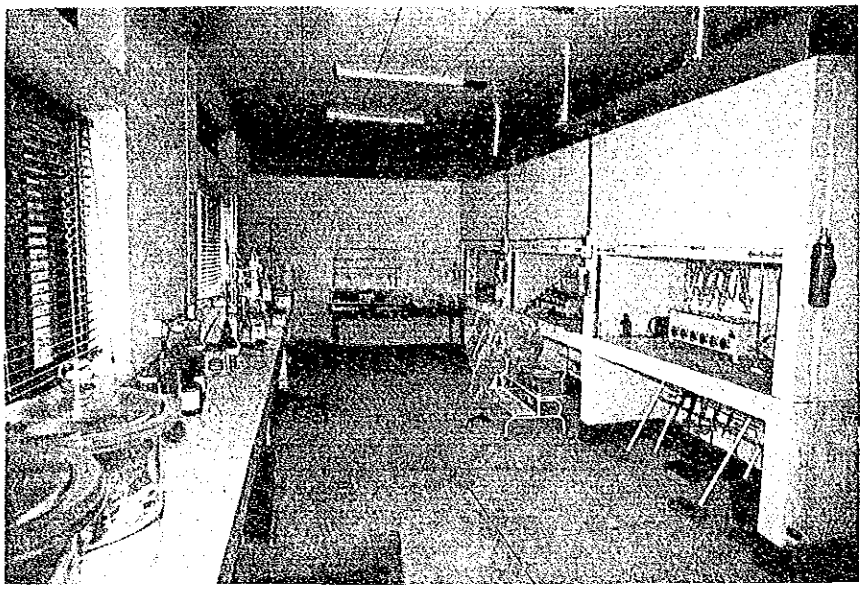
Southen tip of Lake Rupa



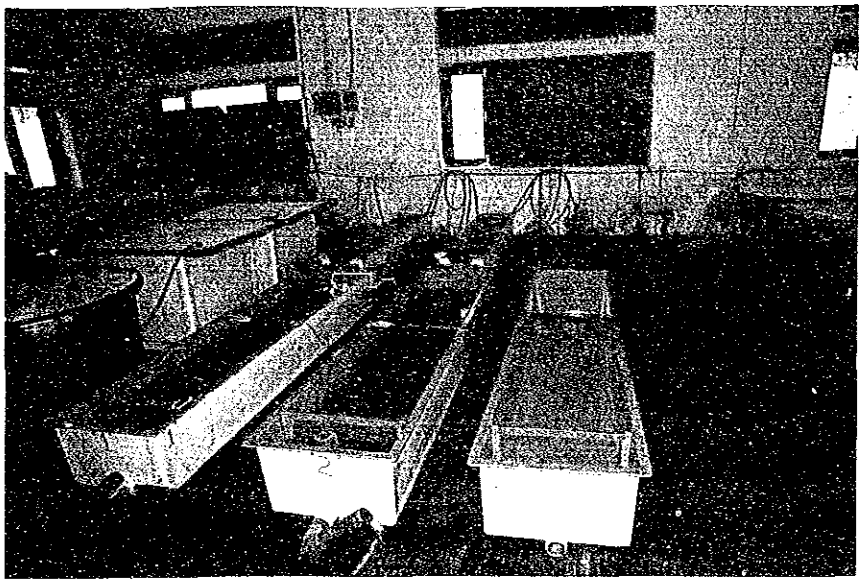
Godawari FDC



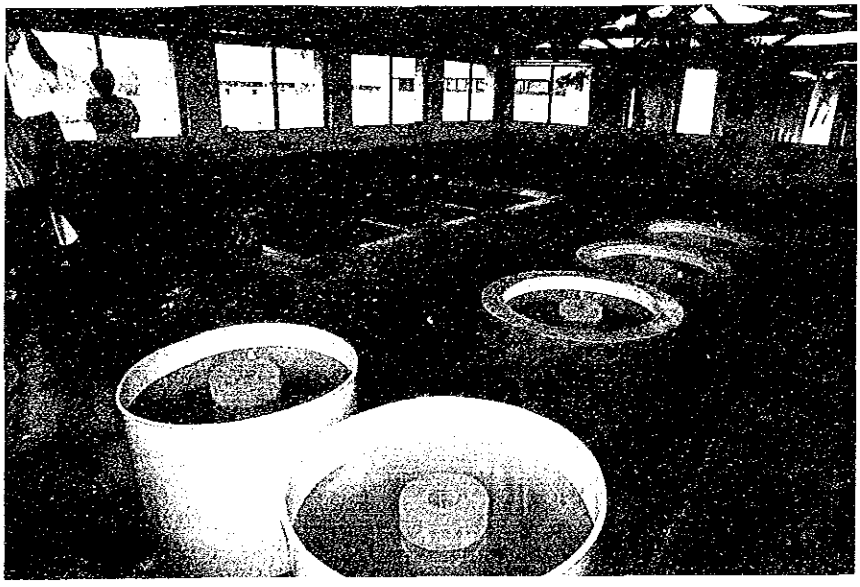
Trisuli FDC
(Raceways)



Draft Chamber Rm
Trisuli FDC



Hachery for
indigenous
species,
Trisuli FDC



Hatchery for
Chinese &
Indian major carp
Janakpur

JICA