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REPORT OF
FISHCULTURAL INVESTIGATIONS
IN EAST PAKISTAN

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by Improved Fishcultures

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REPORT OF FISHCULTURAL INVESTIGATIONS IN EAST PAKISTAN[1]

USAID-Auburn University Project (AID/csd-1581) Increasing Fish Production by Improved Fishcultures - Phase I

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D. D. Moss, Asst. Project Director, Auburn University

January 30, 1968

Introduction

Pakistan has a land area of 233,938,560 acres and a population of 120 million people. Approximately 70 million or 58 percent live in East Pakistan, which has an area of only 35,280,640 acres. Here the density of population of 1,300 people per square mile is one of the highest in Asia. At the current rate of population increase of 3 percent per year, the population of East Pakistan increases by 2 million people annually and will reach 93 million by 1980.

Average protein availability in Pakistan is 55.7 grams per person per day of which 10.9 grams is animal protein.[2] The average protein available is thus almost exactly the calculated daily protein requirement of 57 grams. However, losses during distribution and unequal distribution result in protein deficiencies in large segments of the population.

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1. This report is based on a survey made from November 23 through November 29, 1967.

2. World Food Problem, Vol. 2, p.55, Report of the Panel on World Food Supply, 1967.

Infant mortality, in considerable part due to protein deficiencies, averages 160 per thousand live births. Protein from animal sources is only approximately half that required for good nutrition. The requirement for dietary proteins (NPU of 60) is estimated to rise from the 1965 value of 4,956 metric tons per day to between 10,900 and 12,100 metric tons per day in 1985. This will require 2.2 to 2.4 times the 1965 production of protein from all sources.

In recent years increased emphasis has been placed on various livestock production programs as a means of increasing high quality protein. Climatic characteristics and topographic features of East Pakistan generally are not favorable for livestock production. Much of the land is flat and upwards to 60 percent of the total land area becomes inundated to a depth of several feet for periods of 3 to 5 months during the annual monsoons. After the monsoons, rainfall is almost non-existent for several months; the lands which previously were flooded, must then be irrigated to produce crops and food materials for livestock and human consumption.

Need for Increased Fish Production

Emphasis now is on increased fish production as a means of increasing the supply of protein. For 1965 the catch of fish for the entire country was 379,000 metric tons, of which

231,800 metric tons were taken from inland waters.[1] This is equivalent to 7.0 pounds of fish per person per year and supplies an average of 6.6 percent of the animal protein requirement. The catch of freshwater fish principally is from rivers and flooded portions of lowlands of East Pakistan where fish are harvested as flood waters recede.

Little can be done to increase production of fish in rivers. Yields from the flood-fisheries often can be increased by construction of low dams that retain the water for sufficiently long periods to raise satisfactory crops of fish.

Fish production in ponds can be increased dramatically. Ponds stocked with proper numbers and species of young fish can produce, within a period of 8 to 12 months, yields of 1000 pounds or more per acre by fertilization with phosphate only. With addition of supplemental feeds, productions of 3000 pounds or more per acre can be attained. Such productions with utilization of materials produced locally will require intensive research, and to place management recommendations growing out of such reasearch into general usage will require an effective demonstration program.

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1. Yearbook of Fishery Statistics 1965, FAO of the United Nations.

East Pakistan Department of Fisheries

East Pakistan is divided into 17 districts, each with a district fisheries officer and an aide. Districts are further subdivided into 56 divisions with a fisheries officer in each. In addition, 300 men are working in fisheries extension. The Department operates 16 hatcheries throughout the Province. The hatcheries have an average size of 3 acres and are operated to produce fry and fingerlings for distribution to fish farmers.

The Department also operates a research station at Chandpur and 4 centers for training fishermen in methods of fishing and use of fishing gear and equipment. The director and his administrative staff have offices in Dacca. A USAID fishery specialist works closely with the director and the research staff at the Chandpur Research Station.

Freshwater Fisheries Research Station at Chandpur

Chandpur is located approximately 40 miles south of Dacca about halfway to the Gulf of Bengal (Figure 1). It is rather inaccessible as 4 to 6 hours are required to reach the station by boat or automobile from Dacca. The research station has 43 acres of land with 24 ponds comprising 12.8 acres of water. There are 34 houses for senior staff, 30 houses for other workers and dormitories to accommodate 200 people.

Work at this station is divided into three phases: (1) Fisheries Biology, (2) Fisheries Technology, and (3) Fisheries Training. The Fisheries Training Institute is operated for the training of extension personnel employed by the Department of Fisheries. Extension workers are required to complete a training program of 18-months

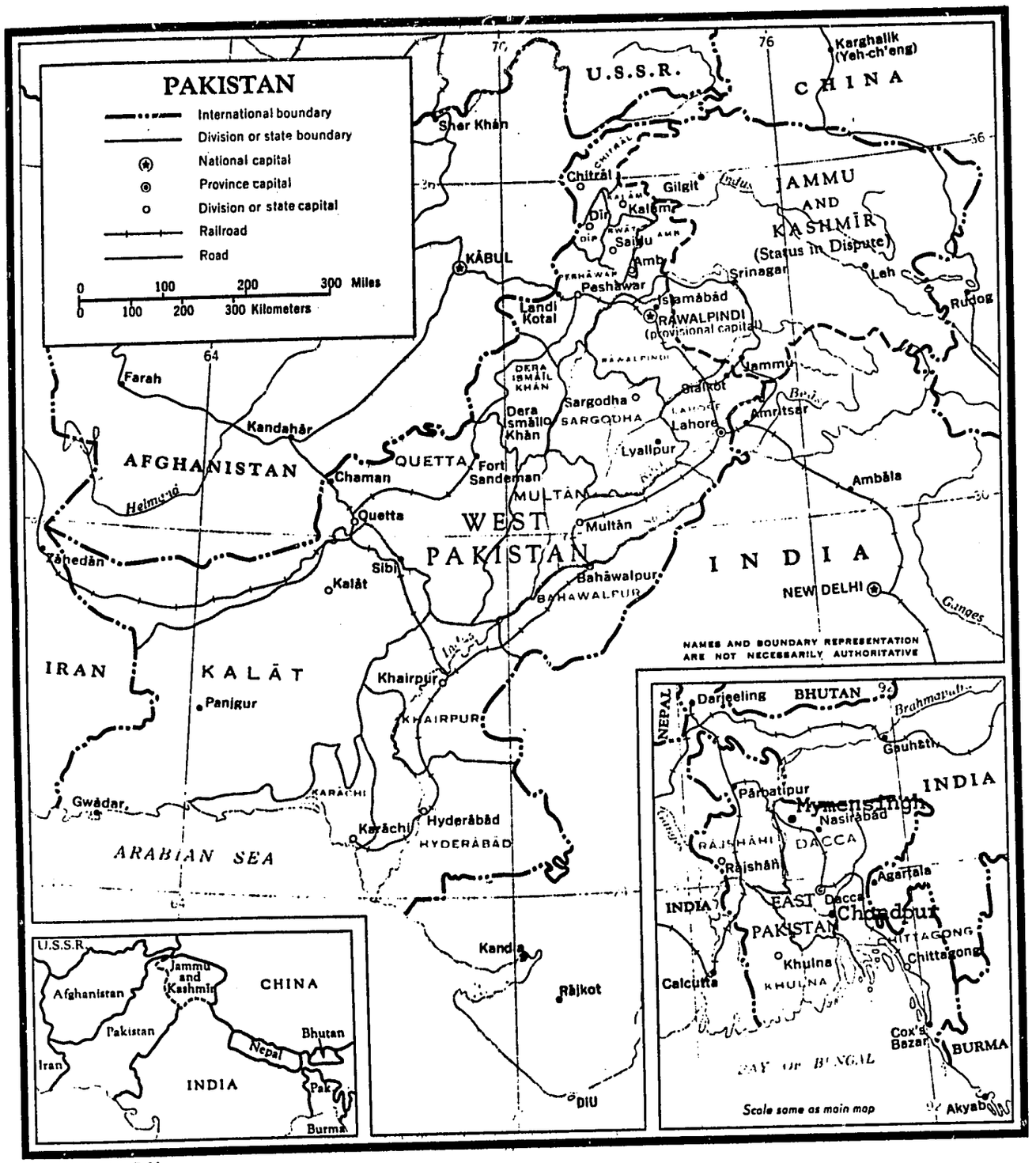

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Figure 1. Map of Pakistan

duration before they are assigned to the field. The Institute has its own building and a training staff of 6 teachers and 10 training aides.

The Fisheries Technological Division is housed in a good building with several moderately well-equipped laboratories. It has a staff of 15 research officers and 15 aides. Present emphasis is on refining shark oil for use as a vitamin concentrate, processing fish by salting and drying and production of fish flour.

The Fisheries Biology Division is housed in a separate building. It has a staff of 20 research biologists and 30 aides. Work in this division consists of research on pond fertilization, water chemistry, biology and life cycles of mussels and shrimp, pituitary spawning of fish, toxicity of insecticides to fish, taxonomy of fish and parasites of fish.

The research being carried out by research officers and biologists appeared to be of good quality, and the staff appeared eager to learn. However, many of these research personnel need additional training in fisheries. Most have B.S. or M.S. degrees in Botany and Zoology but have had no formal work in fisheries.

Suitability of Chandpur as Main Research Station

Major features that reduce the suitability of Chandpur as the main research station or central freshwater fisheries research station are: (1) remoteness of location, (2) limited number of experimental ponds, and (3) soil with inadequate clay to retain water. Of these, the poor quality of soil is the factor which most limits future expansion and development.

The entire area of East Pakistan is composed of alluvial deposits from the Brahmaputra and Ganges Rivers. The Brahmaputra River

carries immense loads of sand, gravel, clay and fine loamy materials downstream from the Himalayas. The Ganges River carries a considerable amount of sediments into East Pakistan from India. Since these rivers have meandered widely over the area, there are scattered deposits of sand and gravel, often intermingled with loam and clay. At the research station the topsoil of clay and loam extended to a depth of 1 foot. Under this was a loam-like soil which did not pack well, and underlying this were pockets of sand of unknown depths.

Ponds built on the station go dry during the dry season, except for a few which have a depth of approximately 12 feet. Ponds are filled entirely by rain water with some seepage through sandy soils. The ponds can be drained only by pumping. Another undesirable feature is that during years of extremely heavy rainfall, flood waters overtop the ponds resulting in damage to dams and premature termination of experiments.

Although undesirable features make establishment of a large research station for pond fishculture at Chandpur impractical, certain research facilities and equipment should be added. Personnel at this station have demonstrated that they would make good use of additional facilities. A large number of concrete ponds should be constructed on the 4 acres of land which are undeveloped at present. An additional 6 acres of private land adjacent to the station might be purchased if it is suitable for construction of earthen ponds. Also a dam of sufficient height to prevent flooding should be constructed around the perimeter of the existing pond complex.

Several ponds at this station should be utilized for research in methods of reducing seepage in ponds as this is a problem of

particular importance to Pakistan and other countries with sequential seasons of very heavy and very light rainfall.

While the Chandpur station lacks the necessary attributes for expansion into a large station for pondculture research, it is ideally located for research on fish population dynamics in riverine environments. Therefore, research relating to capture fisheries should be continued, and even expanded, at the Chandpur station. A site more suitable for construction of ponds should be located for development of a center for culture fisheries.

East Pakistan Agricultural University

The Agricultural University is located at Mymensingh approximately 100 miles north of Dacca (Figure 1). The city has daily train service to and from Dacca with a moderately good highway connecting the two cities. The current enrollment is 1,300 students. A School of Fisheries was organized recently, and there are 30 fishery students in their first year of training. A staff of 8 faculty members is anticipated, but only 2 are located at the University at present. Other staff members are on educational leave working on advanced degrees at American universities. Assisting in the development of this University through USAID is the Texas A and M Contract Team, which has provided for nearly two years, an advisor to the School of Fisheries.

Plans have been developed and money is available for construction of a very good fisheries building. In addition, one area was located on the 700-acre University farm which may be suitable for development of small experimental ponds. There are 14 ponds of various sizes

located on campus. These are excavated ponds and some dry up since their water supply is from rain and seepage. Catch records from one of these, a 1.3-acre pond, were maintained by the fishery advisor from Texas A and M. While opened to fishing in September, 1966, 1,700 pounds of carps were removed. It was again opened in August, 1967, and 2,400 pounds were removed by fishing. It was seined subsequently and an additional 1,000 pounds of fish removed. Although the rate of stocking and treatment for the pond is not known, this does demonstrate that significant productions of fish can be attained in this area.

Possible Site for Research Station

The University has one area that may be suitable for development into a freshwater fisheries research station. This consists of 50 acres of lowlands, most of which are covered with water hyacinths throughout the year (Figure 2). In this area, there appears to be sufficient clay for pond construction. There is an overlay of clay and loam from the surface to a depth of 6 inches to 2 feet. Extending to a depth of 5 feet below the overlay is very heavy, white clay. Soil in this area should be sampled to even greater depths to determine if pockets of sand are present.

The principal problem, if the soil is suitable, is that of an adequate supply of water to fill and maintain water levels of experimental ponds. Originally it was planned for the University to pump water from the river adjacent to the campus to supply water for the University farm. However, the river almost goes dry during the period from November until June. The Rice Research Division on campus now plans to drill deep wells to provide water for their

experimental plots. The present wells at the University are 200 feet deep and 6 inches in diameter. These furnish 300 gallons of water per minute by use of electrical pumps. This would be a very costly method to provide water for a research station.

There is a possibility of constructing a deep storage reservoir of approximately 17 surface acres on the upper portion of the site (Figure 2). If this can be done, water then could be supplied economically to experimental ponds constructed on the remaining area of 30 acres with a low-lift pump. Construction of this storage reservoir would reduce by approximately 30 percent the total area available for development into experimental ponds. Seepage water collected from excavations in the lowland area is satisfactory for fish production as is indicated by the following analyses:

pH	6.8 to 7.0
Phenolphthalein alkalinity	None
Methyl orange alkalinity	10 to 30 ppm

University officials have indicated that government-owned lands across the river from the campus could be secured for a research station if these are found to be suitable.

Some Disadvantages of the University

A sizeable investment is required to develop a center for research in freshwater pondcultures. Moreover, substantial sums must be made available on an annual basis for effective operation of the station. Most educational institutions experience difficulty in securing funds to support research. To partially overcome this problem, it is suggested that a commercial-demonstration pond area could be developed, possibly on government lands located across the river from the

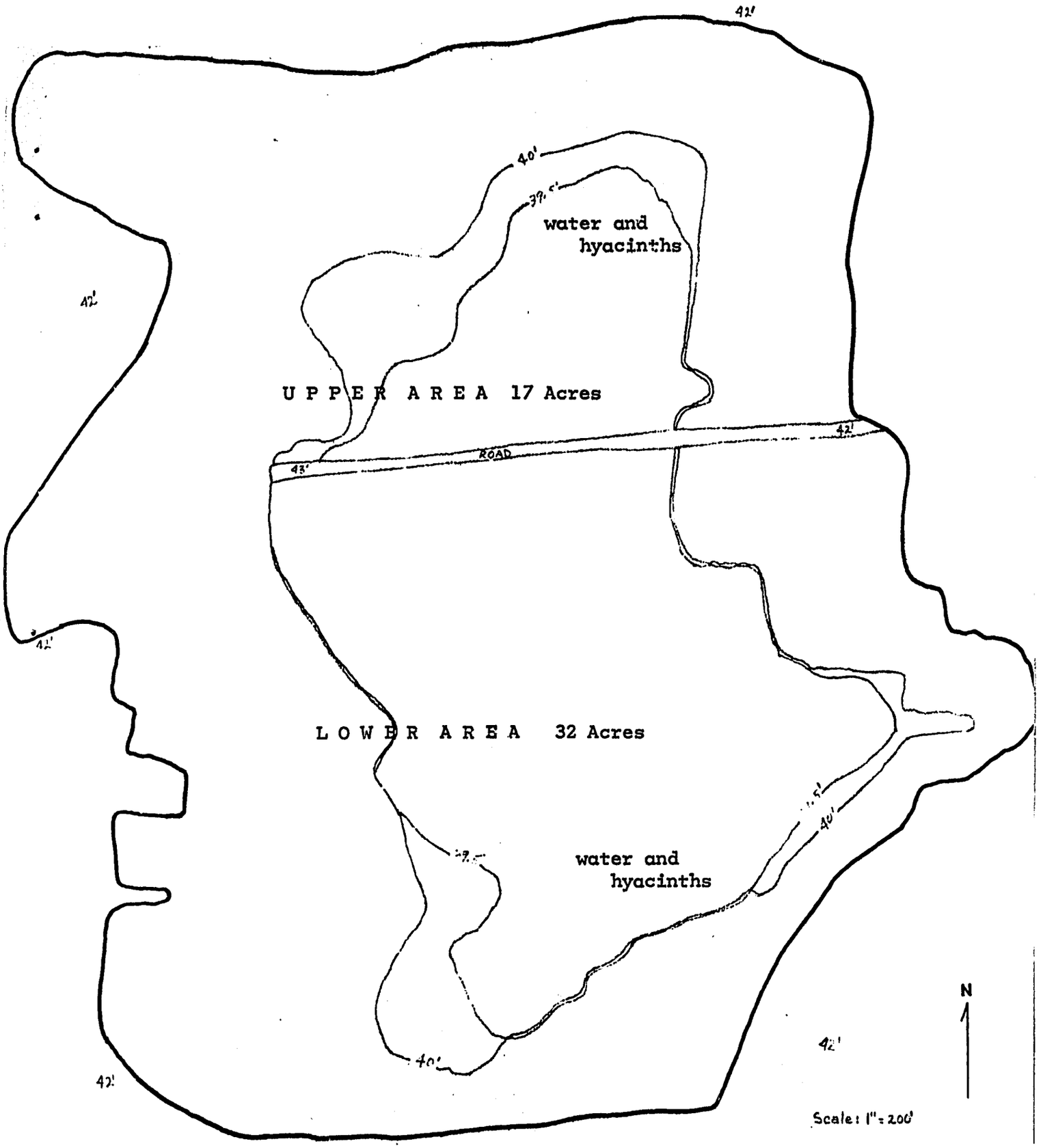

Figure 2. Site of Possible Development of Experimental Fish Pond Complex at the East Pakistan Agricultural University, Mymensingh.

campus. If funds derived from the sale of fish were ear-marked for future development and operation of the station, a degree of self-support would be available.

At the University it was found that purchases for various research divisions require approval by a committee of deans. This procedure frequently results in long delays, and supplies often arrive too late for use in the experiments. Arrangements should be made to bypass such a procedure in order that budgets may be submitted directly to the appropriate dean for approval. Work by faculty at the University in the past apparently has been limited to teaching with little emphasis on research. The present staff in fisheries, at least, has shown little interest in working with the 14 ponds available on campus. Effort must be made to personally involve professors in basic and applied research on fish production in order that they may become more effective in training students. It was thought that some of those undergoing training in the United States will develop into vigorous research men.

Brackishwater Fisheries Research Station

At present, there is no brackishwater research station in Pakistan. Officials of the Department of Fisheries and the Fisheries Development Corporation indicated that such a station was badly needed. The Department of Fisheries, in fact, had done some preliminary planning on a marine station. To develop methods of culturing shrimp, brackishwater fish and other seafoods on a commercial basis requires an adequate number of experimental ponds. Results elsewhere indicate productions from 1,000 to 3,000 pounds per acre can be attained annually with shrimp and seafish cultured in brackishwater ponds. Possibly

such a station could be established at Bajua Chalna, located above the Sunderbans area, or along the southeast coast near Cox's Bazar. There was insufficient time to investigate these areas on this trip, but a thorough investigation should be made of all possible sites before one is selected for development.

Fisheries Development Corporation of East Pakistan

The corporation is financed through investments by private individuals, businesses, FAO and government loans. It deals principally with marine fisheries with emphasis toward expanding the fleet of mechanized fishing vessels, developing ports with more adequate facilities for processing and the preservation and distribution of catches of marine fishes. The possibility of the Corporation contributing substantial financial support for research in the culture of commercially important brackishwater fish and shrimp should be investigated when a brackishwater research station is established.

Preliminary Recommendations for Fishculture Project in East Pakistan

On the basis of information acquired during discussions and field trips with USAID, government and university officials regarding need for a fishculture project in East Pakistan, the following recommendations are made:

1. To locate a suitable area for a freshwater fishculture research station at Mymensingh Agricultural University for combined research and training or at some similar location in the central or northern part of East Pakistan and to plan and establish said station.

2. To evaluate the desirability of establishing a brackishwater research station; and if one is needed, to locate and plan the station.

3. To assign 1 to 2 Auburn personnel to these stations to assist in planning research and assist in training personnel in research methods.

4. To send an advisory team of experts in fisheries from Auburn University approximately once yearly to assist the Department of Fisheries and/or to take part in training of research and extension personnel. (Estimated time 1 to 2 weeks per training session.)

5. To send a specialist at other times when requested by the host country and when this is considered advisable.

6. To investigate best methods for development and extension and demonstration of improved methods of fishcultures.

7. To make available fellowships for advanced training of research, teaching and extension personnel.

A period of 4 to 6 weeks will be required to locate suitable sites and develop plans for freshwater and brackishwater research stations. A survey team from Auburn University is available to carry out such a survey upon the approval of USAID/Washington and AID/Mission.