REPORT ON THE DESIGN OF A BAITFISH CULTURE FACILITY FOR WESTERN SAMOA.

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In 1974 Western Samoa will import US $ 1,300,000 in fish and fishery products. At the same time, the substantial resource of skipjack tuna is virtually untapped. At present, small quantities are caught by trolling from local canoes powered either by small outboard engines, or by paddle. Purse seining for skipjack tuna in the Central Pacific area has so far been unsuccessful due to the absence of a marked thermocline. The only fishing method that at present offers the greatest promise for catching skipjack tuna in large enough quantities to satisfy the local demand for fish, is the Pole and Line method.

The crucial problem that faces the development of this fishery is the availability of large quantities of hardy, live bait fish. The traditional bait fish used in this fishery is the Nefu, or Nehu as it is called in Hawaii, but problems have been encountered due to the extreme frailty of this fish. It dies very soon after being placed in the bait wells aboard the vessel, and often most of the fish are dead by the time the first school of skipjack is sighted. The second major problem that is involved when one uses the Nefu as a primary bait source, is that there is a great deal of seasonal variation in abundance of the fish, and as a result, there are often times when one cannot obtain sufficient bait to carry out any fishing operations. If there is not an alternate source of bait, all skipjack fishing must stop and wait for the Nefu to return. The third problem is the overall availability of baitfish in Western Samoan waters. The present FAO Master fisherman, Capt. Walter H. Paulo from Hawaii, has been successful in catching sufficient bait for trial fishing, and has demonstrated the effectiveness of the pole and line fishing method once bait has been secured and kept alive. However, four months of bait survey so far have not revealed a bait fish resource that could form the basis for a commercial fishery. This baitfish survey is continuing in the hope that large quantities of baitfish may be found, but the frailty of the bait, and the seasonal variations will still present problems even if baitfish are found.

Realizing this problem, the members attending the SPC Seventh Technical Meeting on Fisheries in July 1974, put forward the rec ommendation that;

> "The Meeting recognizes that live bait is at present absolutely essential for development of skipjack fisheries in the Tropical Pacific. It is considered that the culture of hardy live bait species has the potential to assist substantially in the development of small boat skipjack fisheries, in the Islands. The Meeting therefore strongly recommends that every support be given to research and development into the culture of suitable hardy live bait species"

At present, an experimental baitfish culture project is being undertaken in American Samoa, in an effort to supply their boats with sufficiant bait to carry out fishing trials using the cultured bait. The result of these trials were sufficiently encouraging to justify a larger scale culture ofbaitfish.

This being the case, it was decided to develop a baitfish culture project here in Western Samoa, with the initial goal of supplying the FAO Tuna boat with sufficiant bait to carry out pole and line fishing for skipjack tuna. The economical importance of the skipjack tuna resource, conservatively estimated at over US $1,000,000 per year, is sufficient to justify the development of such a project.

The fish that is being considered for use in this project is the Mexican Mollie(Poecilia mexicana) which has been raised with quite some success in American Samoa. With the planned production of 1000 buckets (One bucket of Mollies is equivilent to approximately 6 pounds of 3,000 individuals at 3 months of age) of baitfish per year, the project has been designed using the criteria developed at the Hawaii Institute of Marine Biology through the work of Prof. Wayne Baldwin. (references)

The following is a description of the project:

The Site;

The site tha t has been selected for the location of the Baitfish project is a mangrove swamp, situated a few miles from the center of Apia, the capital city of Western Samoa. There is good access to the site by a road that leads to the rubbish tip which is located about 100 yards to the west of the site. The electric line extends for most of the length of the road, but it would have to be extended to reach the site. The soil in the area is of very good quality, with a high degree of water retention, and the ground water level is located just below the surface, varying slightly with the tides. A test hole was dug and several important facts were discovered. The first is that there is very little tidal variation in the level of water in the hole, most likely due to inflow of water from the surrounding soil as the tide level dropped. The second was that the soil is very easy to dig, thereby creating very few problems as far as excavation of the ponds is concerned. The third fact was that the water that filled the hole was brackish in nature, of a salinity around 17°/oo. This is due to the large fresh water stream that runs to the east, as well as another stream which flows in the west. The salinity of the water will no doubt vary depending upon runoff, and tidal effects, but this will not have any adverse effects upon the fish as was demonstrated by experiments conducted at the Hawaii Institute of Marine Biology. The design of the project calls for the large rearing ponds to be excavated three feet below ground level, and for walls to be built up around the ponds two to three feet high. The ponds will be filled by natural seepage from the ground water, and a siphon will remove water from the ponds which will be renewed through seepage. This way, there will be no need for pumping large quantities of water, thereby reducing the operating expences of the project. The area upon which the brood tank, small holding tanks, and workshed are to be constructed, will be filled with material brought in from outside, and compacted very firmly. This area will be the same height as the walls around the ponds.

The Rearing Ponds:

The rearing ponds consist of simple trenches dug out of the ground to a depth of three feet. The soil removed from the ponds will be placed along the outer edges of the ponds to help build up the walls. Any additional material that may be needed to complete the walls will be brought in from outside. The ponds will be 60 feet long, 15 feet wide, and with a water depth of 3 feet, giving them a total capacity of 20,000 US gallons, each. There will be three aerators placed in each pond, which by the airlift technique will both aerate the ponds as well as provide for circulation of water through the ponds. The water will be constantly renewed by a siphon which will draw the old water out of the ponds, being replaced by seepage into the ponds. The water will be completely changed once every three or four days, but this will have to be worked out once the ponds are in operation. Fish will be stocked into the large rearing ponds after they have been removed from the brood tank and held in the small holding tanks for one week. The young produced over a period of three weeks will be stocked in the same pond, with subsequent production being placed in the next pond, as is shown in the Harvesting Schedule(Chart LI). The main disadvantage with ponds constructed in this manner, is that they cannot be drained, which is an advantage in any fish farming enterprise. This fault is not very bad considering the many advantages of this type of construction, such as low cost of excavation, no pumping of large volumes of water required, and no problems involving sealing the ponds against leakage, as is the case with natural dirt ponds built above the ground water level.Due to very great expenses required, construction of large concrete rearing ponds were ruled out.

The Brood Tank:

The design of the brood tank is based upon the type rec ommended by Prof. Baldwin, and incorporated the simple, but effective fry capture technique of a perimeter trough in which the young fish congregate, and into which the adult fish cannot enter. The only changes that have been made involve the selection of dimensions to meet the needs of this particular project. The tank is 24 feet long, 8 feet wide, and with a water depth of 2 feet giving it a total capacity of 2700 gallons. The tank is divided into two, which provides the possibilty of isolating half of the brood stock in the event that a disease should occur.

Small Holding Tanks:

These four small concrete block tanks will hold the fish from the brood tank until they are placed in the large rearing ponds. At this stage they will begin to feed, and will be held for several days before being transferred to the large ponds. These tanks could also be used to maintain a reserve brood stock, to replace losses by natural mortality.

Workshed:

The small workshed will serve several purposes. The first will be as a storage place for all the tools and equiptment that will be used in the project. These will include such things as food, nets, buckets, and all other things that will be needed for the operation of the hatchery. Also in the workshed will be the air compressors that will supply the aerators in the tanks and ponds. Along the workbenches will be several 10 gallon aquaria that will be used for studies involving nutrition, disease, and improved techniques, for breeding of the fish.

It is initially intended that the fish be fed on a prepared food mixture consisting of 50% tuna fish meal and 50% chick mash. This will be used until a suitible local food source can be found. One promising possibility is the use of dry copra which is readily available in Western Samoa, but this must first be tried on an experimental basis to determine the proper method for processing the food, and whether or not it is a suitable diet for the fish. There are also other possible local feed sources that will need to be examined, but this can only be done once the project is in operation, and we have the facilities to carry out theses tests.

Due to the nature of the project, it is hoped that construction can get under way as soon as possible. It is seen from the harvesting schedule that once the project is in operation, it will take at least three months before any harvesting can take place. Add to this the time that will be required to build up a suitable breeding stock, and the time required for the actual construction of the site, and you can see that if delays occur which would prevent the project from beginning very soon, it may be quite some time before any benefits can be expected. The actual construction of the site, not including equiptment such asthe air compressors, aerators, tubing, initial feed supplies,and the other materials needed for the operation of the site, has been estimated to cost approximately $ 6,000 US (WS $3,600). Presently, there are two immediate sources for funding this project. The first is the Western Samoan Government. We have requested WS $ 5000 for this project, but how much of this request will be approved is not certain at this time, and secondly these funds will not become available before January 1975. The second source of funding is the United Nations who are providing support through the Western Samoa Local Tuna Project (WES 70/006/12). Approximately US $ 2,500 will be available this year, with an equal amount being made available next year, to be used for the baitfish project.

With these funds it is hoped that construction can begin very soon, but it is not certain whether or not there will be sufficient funds to purchase all the equiptment necessary to complete the project. It is for this reason that we are requesting some additional support from the Peace Corps to help with this project. These funds will be used to cover the costs of purchasing such items as harvesting nets, feed bins, sieves for the grading of the feed, and the small water pump that will be used to circulate water through the brood tank. Depending upon the costs of the compressors, the funds might be used to purchase these, so that the order can be placed now, to compensate for the long time it takes to have any sort of equiptment shipped in from out of the country.

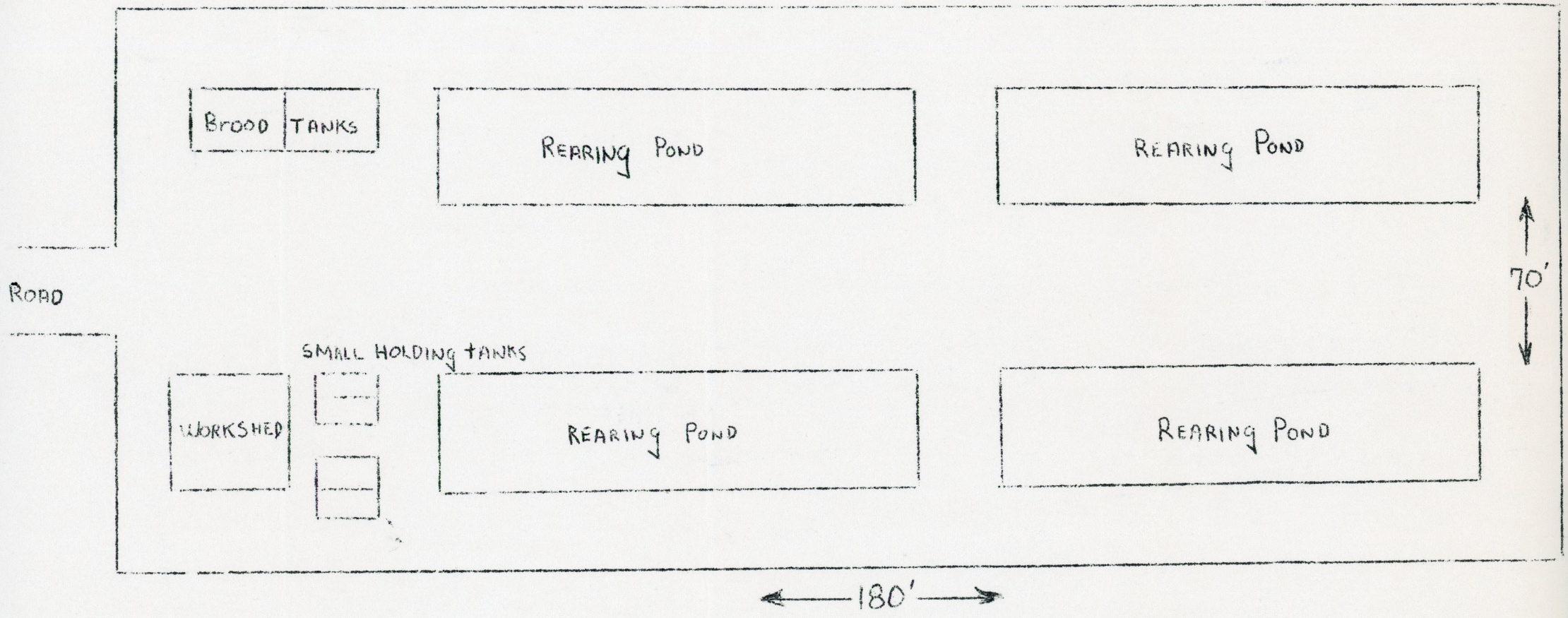
CHART I

TANK	WATER VOLUME	FISH PER GALLON	TOTAL NO. OF FISH
BROOD TANK			
EACH	1350 gallon	4	5,000
BOTH	2700 gallon	4	10,000
Rearing pond			
EACH	20,000 gallon	10	200,000
TOTAL	80,000 gallon	10	800,000
SMALL HOLDING TANK			
EACH	600 gallon	15	9,000
TOTAL	2400 gallon	15	36,000

HARVESTING SCHEDULE CHART II

age of fish in weeks

WEEK	POND I	POND II	POND III	POND IV
0	0	0	0	0
1	1	0	0	0
2	2	0	0	0
3	3	0	0	0
4	4	1	0	0
5	5	2	0	0
6	6	3	0	0
7	7	4	1	0
8	8	5	2	0
9	9	6	3	0
10	10	7	4	1
11	11	8	5	2
12	12	9	6	3
13	HARVEST	10	7	4
14	1	11	8	5
15	2	12	9	6
16	3	HARVEST	10	7
17	4	1	11	8
18	5	2	12	9
19	6	3	HARVEST	10
20	7	4	1	11
21	8	5	2	12
22	9	6	3	HARVEST
23	10	7	4	1
24	11	8	5	2
25	12	9	6	3
26	HARVEST	10	7	4
27	1	11	8	5
28	2	12	9	6
29	3	HARVEST	10	7
30	4	1	11	8
31	5	2	12	9
32	6	3	HARVEST	10
33	7	4	1	11
34	8	5	2	12
35	9	6	3	HARVEST
36	10	7	4	1
37	11	8	5	2
38	12	9	6	3
39	HARVEST	10	7	4
40	1	11	8	5
41	2	12	9	6
42	3	HARVEST	10	7
43	4	1	11	8
44	5	2	12	9
45	6	3	HARVEST	10
46	7	4	1	11
47	8	5	2	12
48	9	6	3	HARVEST
49	10	7	4	1
50	11	8	5	2
51	12	9	6	3
52	HARVEST	10	7	4



BAITFISH REARING FARM
(OVERALL PLAN)

APPROXIMATELY 1/4 ACRE

Figure I

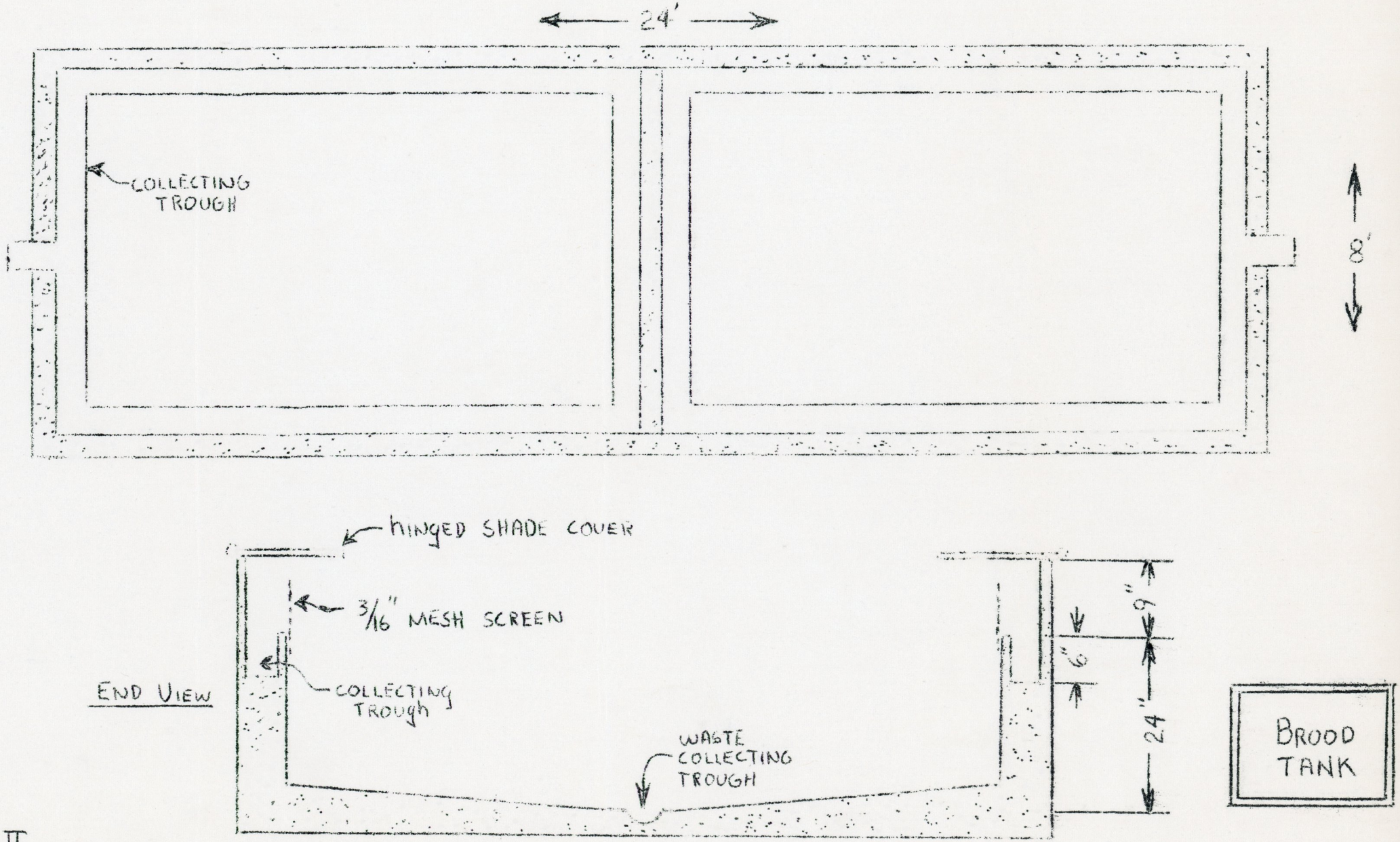
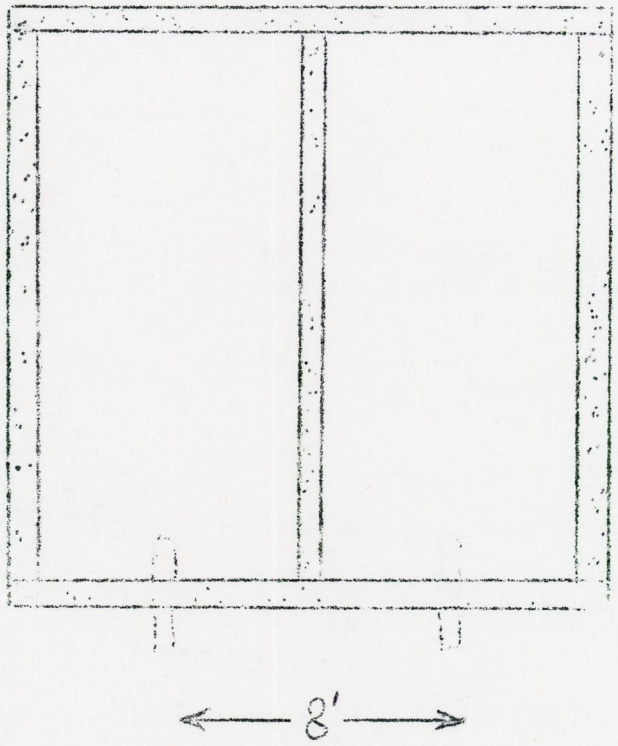
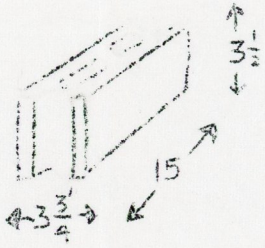

24'
TOP VIEW
COLLECTING TROUGH
8'
HINGED SHADE COVER
3/16" MESH SCREEN
END VIEW
COLLECTING TROUGH
WASTE COLLECTING TROUGH
9"
9"
24"
BROOD TANK

Figure II

TOP VIEW





CONCRETE BLOCK CONSTRUCTION

6 Bricks long x 6 Bricks wide x 8 Bricks High

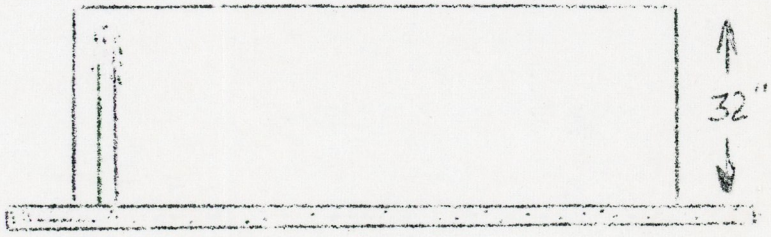
240 Bricks Per Tanks

Poured concrete floor with drain

Inside walls plastered to make watertight

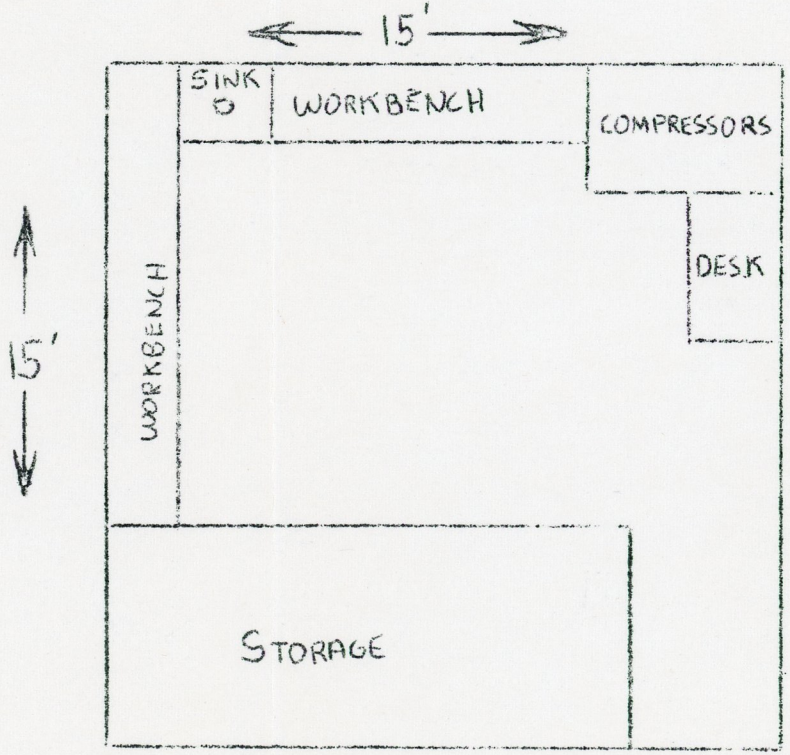
(200 sq. ft)

SMALL HOLDING TANKS

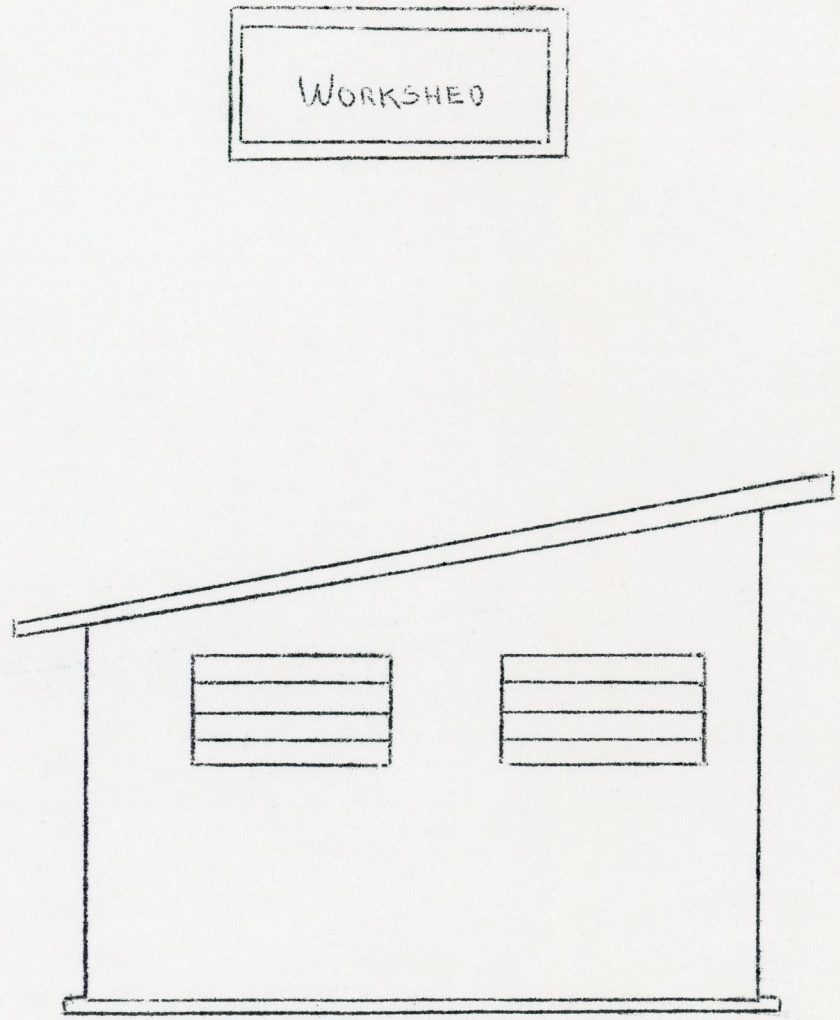


SIDE VIEW

Figure III



TOP VIEW



SIDE VIEW

Figure IV

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