DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR

HAWAII BIOGENICS, LIMITED
HAWI, NORTH KOHALA, HI

September 1973

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DRAFT

ENVIRONMENTAL IMPACT STATEMENT

FOR

HAWAII BIOGENICS, LTD

HAWI, NORTH KOHALA, HAWAII

PREPARED BY
THE STAFF & CONSULTANTS OF
EL-PAC RANCH, INC
SEPTEMBER 1973

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Draft
Environmental Impact Statement
For
Hawaii Biogenics, LTD
Hawi, North Kohala, Hawaii
County of Hawaii

Introduction:

With the annoucement by Castle & Cook Inc. on March 1, 1971 of the closing of Kohala Sugar Company and the resulting economic dilemma faced by the people of Kohala, the Hawaii State Legislature, The House of Representatives, with the Senate concurring, passed House Concurrent Resolution No. 60 (Appendix A) requesting Governor John A. Burns " to appoint an Action Task Force to recommend a plan of action to save the Kohala community." By June 1971 the Governor had completed his appointments and the Kohala Task Force was created.

In February of 1973 the author and his staff were requested by Mr. Frederick C. Erskine, Director, State Department of Agriculture, to do a feasibility study for the possibilities of creating an integrated Agricultural and Aquacultural program to utilize the basic resources of land and labor in the North Kohala area.

An Iowa Corporation composed of Iowa farmers, the author, Mr. Richard Metcalf-President of Metcalf Farms Hawaii Inc, Mr. Kenneth Butters Sr., and the Law Firm of Stewart, Heartney, Garrnett, Jones and Brodsky was formed to finance the feasibility study and if the project was deamed feasibile to institute said project in cooperation with the Department of Agriculture, and the people of the State of Hawaii.

The feasibility study was prepared and submitted to the Task Force on June 13th 1973. The Task Force approved the project and committed approximatly 1,000,000 dollars of Task Force funds to be used for the project subject to other financing and equity capital (See Appendix B)

In August of 1973 a preliminary Environmental Impact Statement was filed with the OEQC. (Form PE-01 Appendix C)

On September 14 the Land Board of the Department of Land and Natural Resources was petitioned to put up for auction 1,053 acres of state owned land lying South of Upolu Point Airport. Such land to be used for construction of the proposed complex and the growing and harvesting of various forage and grain crops to feed the cattle and calves in the complex.

The Land Board approved the proposal for auction and are presently surveying, appraising and writing the lease through the Attorney Generals Office for the auction.

In keeping with the Agricultural concepts of the area, the resultant employment generated, the needs of the local ranchers, the resultant products produced broadening the agricultural economy of the state.

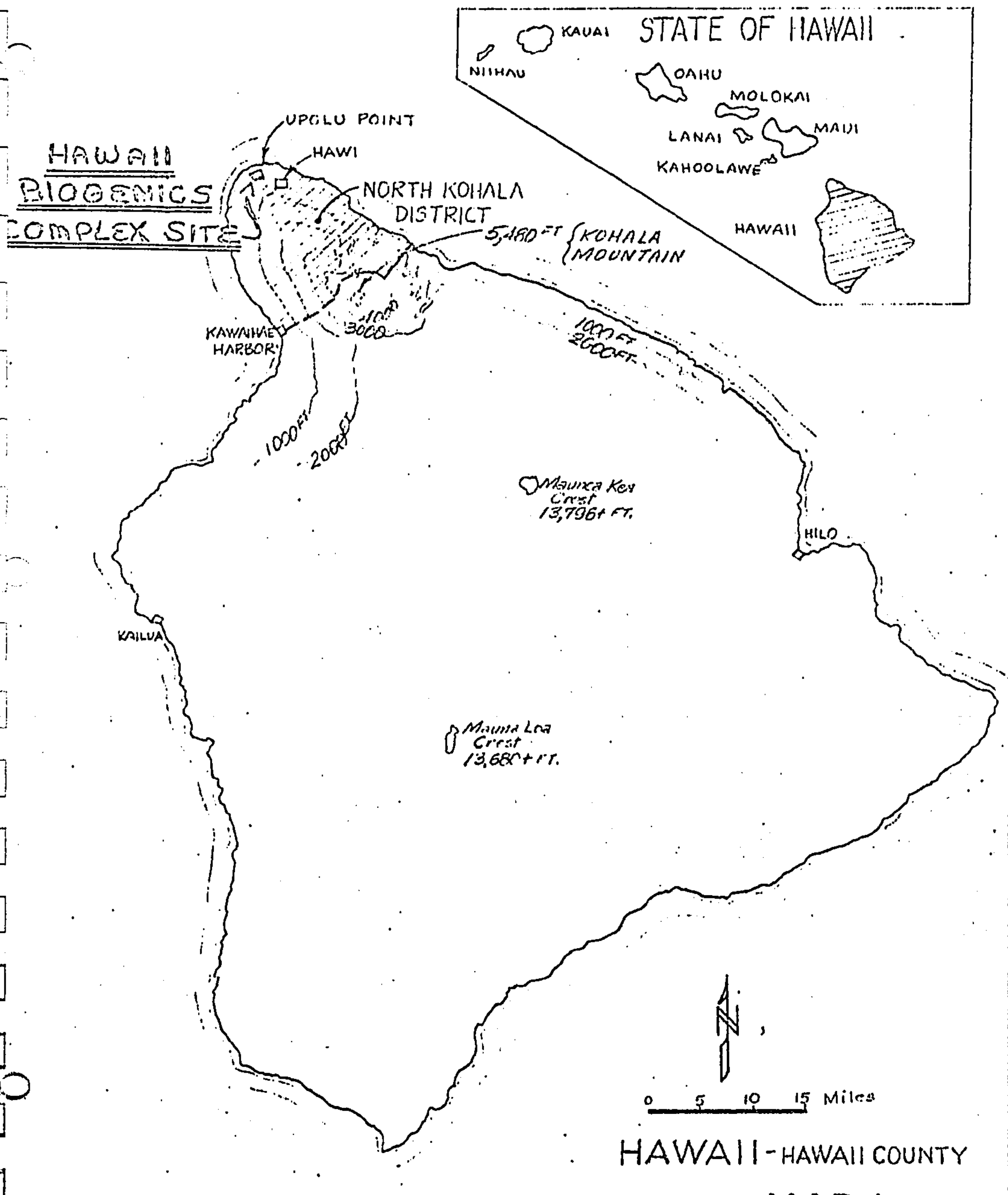
The proposed complex and project will help fullfill the needs and will be a great plus to the State and the area and people.

Project Description & Location

The area that will be affected and basically enhanced by this project is the North Kohala district, County of Hawaii (See maps 1 & 2)

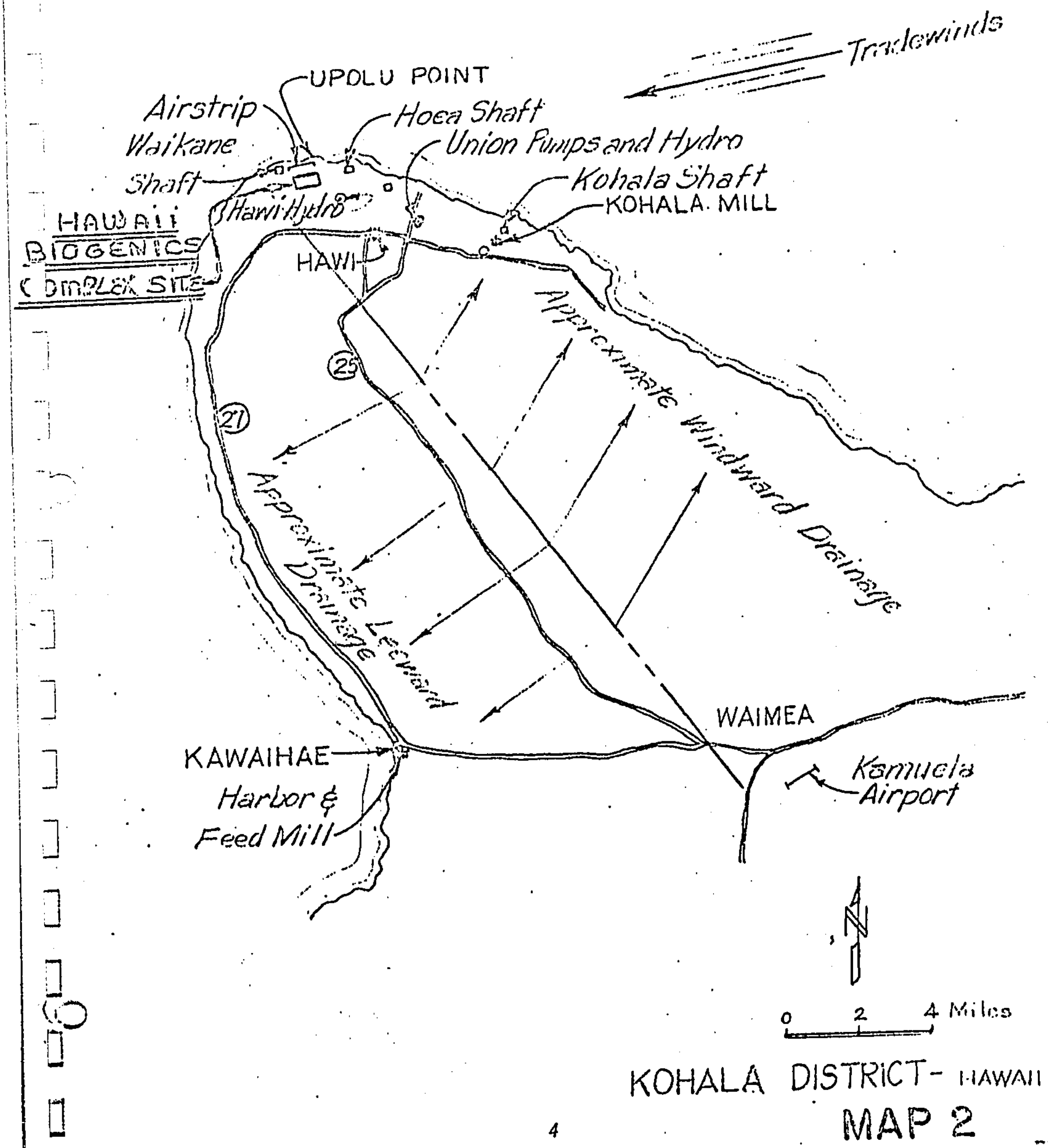
More specifically the complex will be built in Kohala Sugar Co. field known as number Upolu #8 consisting of 86 acres more or less. The complex will consist of a confined Holstein steer operation from birth to table, a custom Holstein heifer operation, a custom confined feedlot for ranchers cattle, a swine farrowing and rearing operation and a Aquacultural unit for catfish and Malaysian prawns. The future will also call for a slaughtering, rendering and processing facility. The balance of the State land and lands leased from Kohala Corp. will comprise an Agricultural buffer to the complex on which forage and grain crops will be grown.

A more detailed description follows in excerpts I - XI from the Preliminary Feasibility Study instituted for Hawaii Biogenics, LTD dated June 4, 1973



HAWAII - HAWAII COUNTY

MAP I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KOHALA DISTRICT- HAWAII
MAP 2

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PRELIMINARY FEASIBILITY STUDY

NORTH KOHALA PROJECT

This study concerns an integrated Agriculture and Aquaculture operation in the North Kohala District, County of Hawaii, State of Hawaii.

This study was instituted for Hawaii Biogenics, Limited, of which the author is a director to determine if it is feasible for this company to institute a large confined Agricultural and Aquacultural complex in the above stated area.

This study constitutes the main theme of our feasibility study. It is based upon the writers evaluation of interviews and information collected to date from sources listed on the following pages.

It is important to note that this study will be supplemented by additional evaluated information as it becomes available.

The following is the writers personal opinion at this time, based upon the listed interviews plus his experience in Holstein Dairy Beef programs and Aquaculture.

Author - Jack E. Caple

I HARD GRAIN RAISING AND PURCHASING

Many studies pro and con have been made and much has been written relating to hard grain farming in Hawaii. The people who have preformed the above are tremendously more informed technically than the writer, however because I see a pattern being formed I shall from a cattle feeder standpoint illustrate our position.

A. Raising

Metcalf Farms Hawaii Inc. shipped 2,441 tons[1] from its operation on Kilauea, Kauai, Hawaii during the period July 1971 through Oct. 1973, with tonage as high as 300 tons in the months of July, Aug, Sept, October and drastically reduced tonage of 15 - 20 tons during November through June.

"Twice on field #2 consisting of 20 acres they harvested 3 tons/acre of 10% dry grain sorgham during 1972 and in October of 1972 on 134.7 acres in field #29 they averaged 2 ton per acre on the entire 134.7 acres."[2]

Kohala Grain Co., Inc. of North Kohala, Hawaii indicates a yield average of 1.4[3] tons per acre of 10% grain sorgham during the past three months on approximately 300 acres in production.

The College of Tropical Agriculture, University of Hawaii in their memo of Oct 5, 1972 to Lt. Governor Ariyoshi, Chairman Kohala Task Force, stipulates the following under targets of performance, "First year production dry grain sorgham 2 tons per acre per crop with 3 crops per year. Third year production of dry grain sorgham of 3 tons per acre per crop with 3 crops per year. The above based on 160 acres of production.[4]

Guthrie states that, "Growing grain sorgham in Kohala is restrictive due to the costs of production with respect to projected yields.

1. Records received from Richard Metcalf (5-16-73).
2 Record received from Metcalf Farms (4-30-73
3 Letter from Charles Ritter, Manager Kohala Grain Co., Inc. dated 5-11-73
4 Memo from C. Peairs Wilson, Dean & Director College of Tropical Ag. 10-5-72

Irrigated sorgham production does not offer enough profit potential to justify the required capital investment."[1]

Guthrie also states, "Sorgham production will not be competitive with yellow corn under irrigated conditions at Kohala."[1]

Metcalf observes that, "Raising grain sorgham is much further advanced in Hawaii than yellow corn and that yellow corn production faces many problems before economical production is accomplished."[2]

1 Page # 8 Feasibility Study of Kohala Farming & Feedlot Project for State of Hawaii, Board of Agriculture, Fredrick C. Erskine by John Guthrie & J. Les Guthrie November 1972.
2 Interview with Richard Metcalf of Metcalf Farms Hawaii May 3, 1973

I

B. Raising Costs

There is a considerable difference of opinion concerning costs for hard grain sorgham production on Kohala.

The following TABLE # 1 indicates these differences.

(TABLE #1) Per Ton Crop Costs delivered to Feedlot

Crop	Guthrie[1]	Metcalf[2]	College of Tropical Ag[3]	Kohala Grain Co.[4]	Grain Costs Kohala Feed Tests[5]	Average Costs
Dry Grain Sorgham	$78.90	$81.07	$70.00	$114.88	$60.00	$80.97*
Head Chop Sorgham	35.55*	40.54		57.44		45.51
Silage Sorgham	12.40	17.85	15.00	25.28	16.00	17.31
Yellow Corn	78.82					78.82
Yellow Corn Silage	11.42					11.42
Alfalfa	48.36					48.36

The above tables are based on interpolation of figures presented to the writer and are used for information only.

1 Guthries Feasibility Study, Dept. of Agriculture, State of Hawaii pages # 32 & #*12 based on interpolation between 5 - 10 ton per acre.
2 Metcalf Farm Reports.
3 Memo to Kohala Task Force from College of Tropical Ag., U.H.
4 Letter from Kohala Grain Co. 5-11-73.
5 Kohala Feed Task Report.

In conclusion we find an average reported cost of $80.87 per ton for grain sorgham. Feedwell Inc. "Is presently paying (5-5-73) $83.00 per ton for 10% grain sorgham delivered in Hilo to Kohala Grain Co."[1]

The above indicates a grain sorgham cost on todays production of approximately $80 - 83.00 per ton. For the purpose of this study we shall use the balance of average figures as shown in Table # 1 realizing that in yellow corn and alfalfa we are only using a portion of Guthries figures.

1 Interview with Raymond Tanouye May 5, 1973 in Hilo, Hawaii.

SELECTED GRAIN PRICES 1962 - 1971 [1]

DOLLARS PER CWT.

(TABLE #2)

Description	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	10 Year Price Average	Estimated Freight To Hawaii	Estimated Price FOB Hawaii	10 yr avg F. /ton plus .1 To Kohala
Barley Io. 2 Western 46 Lbs.														
FOB Los Angeles	2.59	2.65	2.68	2.72	2.85	2.69	2.55	2.78	2.72	3.07	2.73	1.00	3.73	76.60
FOB Stockton	2.48	2.56	2.58	2.54	2.74	2.68	2.43	2.71	2.64	2.98	2.63	1.00	3.63	74.60
Grain Sorgham Io. 2 Yellow														
FOB Los Angeles	2.42	2.47	2.56	2.59	2.50	2.54	2.45	2.59	2.69	2.95	2.58	1.00	3.58	73.60
FOB Stockton	2.38	2.43	2.49	2.47	2.44	2.52	2.43	2.49	2.66	2.83	2.51	1.00	3.51	72.20
Corn Io. 2 Yellow														
FOB Los Angeles	2.61	2.78	2.86	2.91	2.93	2.79	2.70	2.81	2.98	3.15	2.85	1.00	3.85	79.00
FOB Stockton	2.58	2.75	2.81	2.81	2.87	2.71	2.56	2.71	2.88	3.04	2.77	1.00	3.77	77.40

1 Reproduced in entirety from Guthries Feasibility Study, November 1972 for Dept. of Agriculture, State of Hawaii with the exception of average delivered price/ton to Kohala column.

I

C. <u>Hard Grain Purchasing</u>

In referring to Table # 2 from Guthries report, Selected Grain Prices 1962-1971, the indication is that it is cheaper to buy grain from the Mainland than to grow them on Kohala.

However let us now consider some other items not shown in the 10 year table.

1973 commodities contracts closed with Chicago May corn at $2.03 to $2.04 a bushel or $3.63/cwt. which is 48¢ higher than Los Angeles highest 10 year price. This does not reflect freight to L.A., therefore your # 2 yellow corn cost is up now by $17.60 per ton.

The next item is that present corn and all grain reserves with the exception of oats is at an all time low and it is predicated that the C.C.C. will not have any stored reserves at the beginning of harvest 1973.

Although millions of acres are being released by the Government Feed Grain Program, extremely wet weather in the Midwest and slow receeding of flooded major rivers and unusually low temperatures has many experts fearing that large numbers of corn and soybean acres will not be planted.

May futures for 1974 for Chicago corn closed on May 20 at $1.81 per bushel.

All of the above is exemplified where the world grain needs and U.S.A. exportation of grain is ballooning plus the Mainland cattleman is expanding his herds and the feedlots are full causing a high demand for hard grains.

Other areas of consideration when relying on Mainland grains are frieght costs, dock strikes and the tremendous reserves for storage needed to protect against shortages.

All of the preceding shows us that total reliance upon Mainland grain is not sound business practice.

Sugar is going out of production on North Kohala. A cattle feeding and related swine culture by necessity require an agricultural buffer surrounding it. for protection from futrue problems. Because of the high cost of the surrounding land plus the need for employment in the area, the land should be put to use. Also fertilizing the land by application of the valuable by-product, processed liquid manure for crop or pasture production gives the complex an additional $10.00 per animal unit.

I

D. Conclusion

Our initial study, through necessity, has been based on the use of Mainland grains. Our reasons being, low and uncertain yeilds and high costs of production. The future of our operation lies in an even balance between farming for hard grains fed as high moisture, silage and alfalfa production, purchase of supplements and partial back up of grains from Mainlands, improved pasture for cull animals and the dairy heifer program.

An integrated operation feeding both beef and hogs offers the best chance for survial of hard grain farming as the present market for hard grains is too narrow in the North Kohala area. There is no doubt that this market can improve drastically. Being able to market your product through livestock has kept many a Midwest grain farmer solvent during hard times. With this, guaranteed base marketing and further expansion of hard grain farming can be accomplished.

Let us take a lesson from Mainland history. Crop farming was instituted on the Mainland and elsewhere to supply basic needs of man and beast. The learning process was enhanced due to self consumption. As our story farmer increased his education and production he found himself with an excess of product over and above his own basic needs.

At this point in time grain farming as we know it today had its beginning.

The learning process in Hawaii can be greatly helped by an integrated operation of livestock consumption of what is grown on the Islands while having Mainland rations available during this learning process. Once the needs of the livestock have been fulfilled on a regular basis and as more land use and production is accomplished, we can look to producing products for outside consumption.

II SILAGE AND FORAGE PRODUCTION

Much of the silage and forage production costs and reports were discussed in section I and table I.

The secret to success in North Kohala for integrated operations is the effective use of quality sorgham or corn silage, sorgham head chop and alfalfa hay. Along with this a good pasture program to utilize marginal crop land will make the integratable operation more effective. These methods will be explained later on in this report.

Successful storing and ensilage of silage and head chop along with high moisture grain ranks number one in importance in obtaining needed answers.

A program must be initated to experiment with storing in and feeding from oxygen free type structures and or proper trench type ground silos with proper packing, covering and use.

The writer suggests an immediate test of an A.O. Smith Harvestor unit to find these needed answers.

Having the ability to grow, harvest, store and feed high moisture grains, silage and head chop is one of the key factors to successful beef, dairy beef, dairy heifer and hog feeding programs. This factor enhances total utilization of land, labor and environment for the North Kohala Project.

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III HOLSTEIN STEER - BIRTH TO DEATH

It is a fact that 52% of the beef demands of the Islands of Hawaii are met by importation. This amounts to roughly 35.3 million pounds per year. Island production is approximately 32.2 million pounds per year.

Hawaii has approximately 10,000 Holstein milk cows producing fluid milk. Using the figure of 90%, the calf crop with ½ of the crop born as bulls and allowing 10% death loss produces approximately 4,000 bull calves born each year.

Presently this 4,000 head by-product of the Dairy Industry has very minimal value on the Islands. He is with good reason, highly desired on the Mainland, hence is exported. This exportation gives very little return to the Hawaii dairyman. There is no employment generated for Hawaiian workers by his removal from the Islands. Thus this by-product has no opportunity to produce any economic benefits for Hawaii.

Let us consider keeping this valuable by-product at home in Hawaii.

Through proper, tried and proven management programs these 4,000 head of bull calves can be raised from 100 pounds to 1,050 pounds thus creating 2 million 520 thousand pounds of lean tender, low-choice beef for Hawaii. This would DECREASE the importation of beef by about 7%.

By using this Hawaiian by-product in and for Hawaii, the calf will create employment through his need to be cared for, employment through the necessary slaughter and processing phase and employment in producing the feed he requires. In addition to the employment he will generate, he also will make good use of Hawaiian land and resources.

The calf's end product, lean and tender meat will be welcomed in the Islands supermarkets and on the table of any Hawaiian homemaker.

With controlled environment facilities, proper management and cooperation with the Island Dairymen we can change an unused by-product into an economically beneficial product.

Since the large majority of the Holstein dairy cattle are located on the Island of Oahu, a pick-up phase will be instituted and a storage or nursery facility will be constructed for the calves. This will allow the baby calf, which has had three days of colostrum milk, to be removed from the dairy in a well bedded truck and placed in an environmentally controlled atmosphere where he will receive proper care until a group of approximately 80 calves are collected.

After a group of 80 calves are assembled, they will be transported to the airport and loaded aboard a chartered aircraft. They are then flown to Upolu Point Airport. They are then taken to the calf facilities proposed for construction in that area. Their journey by air requires about one hour as compared to the normal 20 to 30 hours by barge.

Safe and dry in his new home at North Kohala; the young Holstein baby calf will be given plenty of T.L.C. (Tender Loving Care) Here he is raised to about 200 pounds on milk and grain.

At 200 pounds he is sorted by size and temperment and moved to a weaner barn which puts the calf on steel slates, under roof with natural ventilation. He now receives free choice of grain and water as his diet.

Our huskie calf stays in this home until he weighs 400 pounds. He then walks over to the big feedlot where he joins other calves on concrete slates, under roof and natural ventilation. Here he is fed free choice of grain and water plus a small percentage of silage.

At about 1,050 pounds he can then walk to the proposed slaughtering facility and be processed into packages of steak, roasts and hamburger.

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And now his round trip ticket returns him to Honolulu in the form of a needed and desired Hawaiian commodity.

CRADLE TO TABLE - 350 DAYS

IV HOLSTEIN DAIRY HEIFER REPLACEMENT PROGRAM

The following is the method by which the Hawaii Dairyman is presently solving his heifer replacement needs:

The Hawaii Dairy Industry presently requires approximately 3,000 head of replacement springing heifers annually. This need is met by 60% being raised on the Islands and 40% being imported. The figure of 40% represents about 1,200. The writer has been informed that up to 2,000 head per year have been imported.

Considering that 4,000 heifer calves are born in Hawaii each year we must look at why Hawaii must import. The reason is: Heifer calf death loss runs approximately 30% or 1,200 calves per year. In the writers opinion this is due to improper or unavailable calf raising facilities and/or methods, nutrition and management. This is brought on in great part by the dairymans tremendous work load and in an age of specialication, lack of experience and capital

The heifers now being imported weigh from 800 to 1,000 pounds. The cost of the animal freight included ranges from $750 to $800.00 each. Inclusive in this price is approximately a cost of $200.00 per animal for freight.

In order to strengthen the Hawaii Dairy industry and lower the dairymans costs we feel that a system must be instituted, to within a realistic time phase out springing heifer imports.

This problem should be attacked from two sides simultaneously.

One step is to set up a program which will cut baby heifer mortality and reduce the over-all costs of heifer raising. This can be accomplished through utilization of virtually the same system outlined for the birth to 400 pound cycle of the baby bull calf.

From birth to 250 pounds the heifer and bull calf facilities and management are the same. From 250 to 400 pounds the facilities and program are the same with the addition of the introduction of roughage to the heifers ration.

At approximately 400 pounds the heifer will be placed in a properly managed pasture. Here she can be raised to breeding age and size. This pasturing method can be accomplished by the existing Ranchers on his own ranch and/or by placing the animal on the buffer zone pasture adjacent to the feedlot. This buffer zone pasture will be realized from marginal crop land.

This program can be instituted by two methods. We can purchase the baby heifer and sell her back to the dairyman on contract or we can preform this program on custom basis.

The other step in solving the heifer replacement problem would be to contract with Midwestern calf raisers to custom raise baby heifers from birth to 400 pounds. Advantages of this procedure are: You will be certain of the breeding background of the heifer; you will be certain that you are not purchasing a cull type animal and most important, if this is done on a cooperative basis a represention of the Hawaii Dairy Association can personally select the animals desired for importation. An additional important consideration is of course the reduced shipping cost of a 400 pound animal in relation to the now imported 800-1,000 pound animal.

Should this two fold plan be started now, you would see a decline in imports in eighteen months, naturally followed by an elimination of same. An exception might arise through an increased fluid milk demand hence creating a need for increased size of the Islands dairy herds.

All of the above proposed programs are designed to help the Island dairymen cut their costs. Benefits to the consumer will naturally follow.

V CUSTOM FEED LOT FOR RANCHERS CATTLE

As pointed out in Guthries Study, a 10,000 head capacity feedlot is far more economical per animal unit construction cost than a 5,000 head capacity unit. Overhead of operation is also less costly in the larger unit.

The same economic theories are true in the raising of forage and hard grains.

A larger capacity feedlot allows slaughter and processing facilities to become feasible.

Since Hawaii imports 52% of its beef we can readily see that an additional feedlot is needed.

Thus custom feeding of Ranchers cattle in conjunction with our own dairy beef and the dairyman's heifer program is a natural.

The ability to custom feed Ranchers cattle increases our capacity. It helps the rancher by providing him a place to feed his cattle hence allowing him more usable grass to expand his cow herds.

The program helps the meat purveyor and the entire state by increasing the amount of local beef produced.

An additional benefit goes to the state and the employee consumer through the creation of more jobs and the use of local resources.

Our presently proposed facility for feeding out ranchers cattle from 400 to 1,000 pounds has a one time capacity of 4,000 head i.e. 8,000 head per year.

The feedlot barns would be constructed right along side the dairy beef units. They would be built and used in the same way.

The beef animal could use a higher percent of silage in his ration. This will increase the amount of acres to be farmed.

The units are designed so that any ration can be fed to any pen of cattle and the amounts fed can be weighed on a daily basis. The unit is also designed so that water monitoring and/or treatment can be performed on an individual pen or lots basis.

Any test the College of Tropical Agriculture, University of Hawaii desires to perform on feeding beef cattle could be done on a custom basis utilizing these facilities with the cost set just as the rancher would pay. This would give a true indication of results on a commercial basis.

Commercial scales would be available for any test weighing that is required.

At the present time approximately 28,000 head are grass fattened and consumed and 3,000 to 7,000 are exported out of the Islands. Assuming that we could attact a large percentage of these cattle to the proposed facility our one time capacity of cattle would be 15,000 to 20,000 head. The capacity of the feedlot could be increased by an increase in beef cow numbers. On the other hand, Hawaiian feedlots may desire to expand hence reducing our proposed capacity. We must also consider other outer island facilities which could limit us to the Big Island born cattle.

Through custom feeding of present grass fattened cattle and higher weight pasture cattle in the proposed facility, more grass will be available to increase beef cow numbers.

The writer realizes that objections could be raised in regard to eliminating grass fatten cattle and moving lighter cattle to feedlots. The obvious objection is of course cost of gain per pound. Let us consider that grass produces X number of pounds of beef per acre. Allowing more grass for additional numbers of cows will give us increased numbers of beef. Also having the use of the same grass

Lands for increased numbers of cows will lower operational and equipment cost per cow unit.

The proposed facility will provide an out of the rain and out of the mud environment for the ranchers cattle. This is a big step in increasing the production of beef on the Islands.

Using the proposed operations, ranchers cattle and dairy beef comlement each other in reducing beef imports.

VI SWINE RAISING

Hawaii presently imports 63% of the pork consumed in the Islands. Thus, as with beef, increased island production of pork is a necessity.

An integrated swine and cattle operation is economically sound from the standpoint of capital costs and operational costs.

Capital costs are lessened by using the same shop, office, grain storage, mill facilities, trucks, tractors, tools, grain harvesting equipment etc. as are used for the cattle. The manure handling and disposal can be integrated with the beef unit.

Operational costs are cut in dual use of management, clerical, accounting, utilities, maintenance, crop raising etc.

An additional advantage is the possible use of screened processed solid waste of the beef cattle as a partial feed for the sows and gilts in their farrowing phase.

The slaughtering and processing facility used for the beef can be used for the swine thus lowering costs and making the capital expenditure more elastic and feasible.

As in cattle our swine project is housed in confinement. This reduces Pollution and increases efficiency.

The swine raising should be done in steps. The first step is to construct feeding facilities for pigs 40 pounds up to 180 pounds. Next nursery and farrowing facilities will be added.

Effective utilization of top swine management and efficient use of beef facilities and beef waste next calls for a 1,000 to 1,200 head sow herd. This would produce "10,400 to 12,500 head"[1] of marketable 175 pound and up hogs per year.

1 Memo from Richard E. Sievers, Farm Loan Representative. Dated 1/20/70 to Richard T. Morimoto, Farm Loan Division Head. Subject: Swine Production.

The writer feels that the preceding estimate is very conservative. Projections based upon conservative estimates have a way of not produsing unpleasant surprises. Should any surprises arise they are, under these circumstances generally pleasant.

These production figures would realize roughly one and one third to one and two thirds million pounds of fresh pork per year. This would reduce the importation of pork by about 11%. "This amount of pork could be slaughtered by local slaughters with about 4,000 head being consumed locally and the balance sold on Oahu."[1]

The swine operation should be instituted on a phase basis in units of 100 sows started at a time and with facilities based upon these numbers.

The above in no way infers that a 1,000 head unit is maximum. It is a good solid operating unit which enhances the desirability of slaughter and processing facilities.

Swine production unlike beef production can be increased very rapidly.

A successful swine unit in conjunction with the beef and farm units would go a long way towards eliminating pork imports into the Islands.

1 Interview with James T. Yagi, Vice President Kulana Foods LTD

VII CATTLE AND SWINE GRAIN HANDLING, STORAGE AND PROCESSING FACILITIES

A large complex such as we are studying requires extensive grain, silage and supplement storage and processing facilities. The holstein operation requires storage for bagged or bulk milk powder. The farming operation requires storage for seed and fertilizer.

Storage accommodations for the above items must be designed. Methods of efficient material handling must be formulated. Consideration should be given for adequate space for reserve storage to combat such problems as dock strikes, bad weather and/or crop failure.

Considering a unit of this magnitude calls for careful management of storage facilities. Unlike the Mainland, there are not virtually unlimited sources of supply.

A very strong plus to the above is the fact that Feedwell Inc. of Hilo, Hawaii is constructing and rejuvenating a large grain handling, storage and processing center at Kawaihae, Hawaii. This plant is only 16 miles from our proposed site. This center has storage capacity of 11,000 tons and milling capacity of 20 tons per hour. Using Feedwell Inc. for our storage and processing greatly reduces our initial need for capital expenditures.

It may be feasible through the above methods and cost savings developed in our large complex, to secure Mainland grains an Kawaihae just above the costs of grains going into Imperial Valley feedlots in California. If this can be accomplished then Hawaii meat can become competitive with Mainland grown.

Presently, storage and processing for forage crops is not available. Thus methods for large forage production must be refined and large storage constructed to cover the needs during extremely wet conditions of harvesting and/or crop failure.

To the writers knowledge, although forage storage and handling has made considerable progress on the Mainland, not much has been done in Hawaii. There is no reason to believe that Mainland practices will not work in Hawaii, however these practices have not been tried on a large scale.

It is vital that considerable attention be given to forage raising, storage, handling and processing, NOW.

The capital cost of grain and forage storage, handling and process facilities are greatly reduced per animal unit through an integrated beef, dairy beef and swine operation.

Until such time as successful grain farming is accomplished our initial attention should be concentrated on forage with basic attention being given to small storage of hard grains and supplements, bagged milk, seed and fertilizer.

We eventually will partially phase out the need for Mainland grains hence creating the need for additional hard grain storage and processing at our facility.

VIII PASTURE PROGRAM

With the news of Kohala Corporation closing its sugar operation on North Kohala, comes the idleness of some 14,000 acres of land. Approximately 5,000 to 7,000 acres of this can be used for grain and forage production. This leaves 7,000 to 9,000 acres of potenial good pasture.

In our integrated operations as discussed previously some of the pasture can be used for the dairy heifer replacement program. Some can be used by local ranchers to increase their cow herds and some must be used as explained below.

The only way to make our proposed dairy beef and dairy heifer replacement program feasible is to contract to purchase all of the bull calves born and all the heifer calves born except those needed by the individual dairyman for his own replacement program. Since we can not selectively purchase we know that we will have a percent of cull animals.

In doing this past experience has shown us that at least 20% of all the calves born will be small and/or cross bred.

With the cost of feed as high as it is and with no market for potential cull calves or cattle a program must be devised using an Intensive Care Calf Facility plus an integrated pasture and finish program to handle these calves and cattle.

Pasturing with creep feeding is a necessity for these calves from 200 to 400 pounds and pasturing from 400 to 800 pounds with a short stay in the feedlot to finish the cattle is a necessity.

Thus the agricultural buffer for the feedlot encompasses many facets. Grain and Forage Production for Feed and Pasture Management for Dairy Heifer and Potential Culls.

IX AQUACULTURE

Very little has been done on a commercial basis in Hawaii in Aquaculture and less has been done in confined aquaculture facilities.

Aquaculture and Agriculture share one common need - water. Water for Aquaculture is the basic environment for fish as air is in our environment.

Water for calves, cattle and swine is for drinking to increase feed gains and water for crops is for growth.

The supply, storage and use of water in a large Aquaculture or Agriculture operation is necessary and expensive. Water is an extremely valuable resource that is limited in supply.

To have the best utilization of this resource is reason #1 for the sharing of and reuse of water between fish, cattle, swine and crops.

This sharing is accomplished as follows:

Develope this resource and move the water to the site to be dispersed in the following manner - First introduce the water into the fish facility dividing it between trout, catfish and prawn.

The water for the trout is cooled from 70^0 to 60^0 degrees by a heat pump and the energy from this is used to heat the water for the catfish and prawns from 70^0 to 80^0.

An alternative to the preceding approach as outlined in Section XIII Water and Power is to use diesel generators for power and heat the water for the catfish and prawns from the cooling water of these generators.

Both modules handle the water by reuse and filtering. The water is then returned to the system clean and fresh, either cooled or heated. The cool reused trout water then is moved in total, less evaporation of about 3% to the cattle and swine unit for drinking and what is not consumed is put into irrigation for crops. The cooler water is beneficial to gains.

The catfish and prawn water at 80° is moved fresh and clean in total, less 3% evaporation to the baby calf unit which requires 105° water to mix milk. The portion not consumed is moved on out for irrigation of crops.

Thus the Aquaculture unit does not consume water except by evaporation. Aquaculture makes use of this resource as it passes by creating valuable food protein to be consumed by Hawaiians and Tourists alike.

The advantages of cost sharing of capital and operating costs works with confined Aquaculture Modules as it does with the cattle and swine.

The waste from the fish can be profitably used as it is in the cattle and hogs, rendering it a valuable by-product.

Conclusion: Total resource use of land, people, market and water requires total integration of Agricultural and Aquacultural programs.

X SLAUGHTERING, RENDERING AND PROCESSING

In a large complex that we are considering a necessary addition is slaughtering, rendering and processing.

Much has been written in the preceding pages concerning this phase of the complex so we shall not dwell on it now, except to point out the following:

When the complex is at a capacity of 5,000 head of cattle, and 12,000 hogs per unit, consideration should be given to the introduction of this phase in cooperation or joint venture with the ranchers and meat purveyors.

Meetings have been held with Kahua Beef Sales, Vice President, Mr. Alex Napier and preliminary agreements have been reached for his group of ranchers to custom feed in our facilities and to market our dairy beef through their organization, Kahua Beef Sales. They are considering working with or joint venturing slaughtering facilities once our unit is up to capacity.

Being able to walk the cattle or hogs from the facilities to the slaughter plant and shipping them in packages eliminates freight on from 25% to 50% thus reducing costs.

Slaughtering, rendering and processing also increases employment.

Rendering allows for by-products.

Conclusion: Slaughtering and related industries are a must in the future of the complex.

XI MARKETING

In all agricultural operations marketing is one of the most important facets.

A market for beef, pork and fish exists in Hawaii. The present sales system could be successfully used in the dispersment of products from the proposed project. Mr. Alex Napier, Kahua Beef Sales, has indicated a desire to market our dairy beef and pork along with their own cattle, custom fed in our lots.

Mr. James T. Yagi, Kulana Foods, has also indicated a desire to market hogs produced in the operations.

Marketing of fresh water fish in Hawaii is not established on a large scale at this time, therefore the market for this product must be created. The writer feels that a market exists however he is not sure of the method to procure same.

Experience in Mainland marketing indicates that with Hawaii's population a market for 300,000 pounds of trout or catfish would be available. However there are more facets to marketing fish in Hawaii than population alone. Therefore in the Aquacultural enterprise a ¼ module approach to raising and test marketing should be instituted.

The marketing of land grains and silage can be initially accomplished by feeding it to the livestock in the complex. Once yields and costs are under control, with a constant supply to handle complex livestock, then increasing production and crop marketing can be accomplished with less cost and a lower degree of risk than presently being experienced.

Probable Impacts of The Proposed Project

Earth Impact

Soil type here is semi-arid to sub-humid, ranging in elevation from about 300 to 1,000 feet. Predominate soils are of the Hawi series, deep moderately fine in texture, well drained, the rainfall ranges from 25 to 40 inches annually and requires irrigation. The land is easily tilled. Slope in the area is less than 5 to as much as 20 percent.

Careful selection of sites for any waste handling, water treatment, and irrigation will be required. Also some minimum leveling and grading will be required and road access to property will be improved.

Water, Land, Atmosphere, Power Impact

See enclosed Section XII Land Needs and Section XIII Water & Power from Feasibility Study of North Kohala District.

XII LAND NEEDS

The accumualation of land for the proposed complex increases as the size and need of the complex increases. The following is and approximate need shown by stages as the modules and phases are constructed and instituted. However we must consider initially that to allow this project to reach its total potential in the future, certain basic acreage must be ear-marked for future use in the project.

Table #3 is based on an average projected yield as used in Table #1, based on todays situation in North Kohala.

Sorgham Silage	20 ton/acre/year
Sorgham Grain	4.2 ton/acre/year
Pasture	500 lbs grain/acre/year

The following figures are in no way ultimate. Substituting corn and corn silage if practical, would reduce acerage needed to feed livestock and allow more grain and silage to be marketed.

A well managed pasture program could produce twice the stated gains using irrigation, fertilizer and total rotation of animals.

LE 3)

LAND NEEDS

ACRES PER PROGRAM

Description	Dairy Beef Program (1)	Dairy Heifer Program (2)	Custom Feeding 8,000 head (3)	Swine-100 Sow Farrow & Finish (4)	Aquaculture Program (5)	Add. Land Need per 1,000 Head per Year: Beef	Add. Land Need per 1,000 Head per Year: Swine	Present Need Total (6)	Future Need Total
or Facility including office & confined ngs	10	10	15	Note 1	Note 2	2	2	35	129
Manure Storage	8	2	15	"	"	.1	None	25	50
& Forage Storage cessing	5	1	2	1	"	¼	"	9	76
Land for Grain & Production	2076	375	1000	110	"	125	110	3561	5000
e for Dairy Heifer Program	960	2800	-	-	"	-	-	3760	4000
Acres Per Program	3059	3188	1032	111	0	128¼	112	7390	9255

1 No additional if built with either 1,2 or 3.
2 No additional if built with 1.

NOTES:

(1) Dairy Beef Program is 4,000 head of baby bulls raised to 1,050 lbs on 90% grain ration, 10% silage. Acreage based on raising the grain and assuming a 20% cull rate to put on pasture.

(2) Dairy Heifer Program is 3,000 head of baby heifers raised to 400 lbs on grain & silage, then pastured to springing heifers.

(3) Custom feeding of 8,000 head per year on a silage and grain ration.

(4) Swine based on 100 sows-6.5 pigs per litter-1.6 litters per year.

(5) Aquaculture Program based on modules of 300,000 lbs of fresh fish per year for each species raised.

(6) Present needs based on combination of Dairy Beef, Heifers, 8,000 per year beef custom fed, 100 head sow & finish operation & ¼ module Aquacultural facility.

(7) Future needs based on 10 year need of Dairy Beef, Dairy Heifers, 40,000 head per year beef custom feeding operation, 2,000 sow operation & feeding, 4 full modules of Aquaculture. Future needs for crop land based on increased production of the following:
Corn ..8 ton/acre/year Corn Silage ..60 ton/acre/year Pasture..1,000 lb beef/acre/year

CONCLUSION:

A 150 acre area must be set aside and developed for total future use as the site for the physical plant and heart of the operation. A minmum 2,000 acre buffer zone should surround this 150 acre site. This buffer can be pasture and crop land. The balance of the needed land can be developed as needed, either by our development or outsiders. Outsiders could mean present land owners such as Kohala Corp. or they may desire smaller individual operations who could develope smaller tracts with built-in customer for there products.

Once the basic needs of the complex are satisfied, excess production and/or grain can be marketed.

It is the writers understanding that Kohala Corp. desires to up-grade all marginal crop land as it comes out of sugar production. After improving pastures with good fencing, water and fertilzer, they in turn would rent this pasture to local ranchers or the complex on an animal unit basis. This can also be done by Kohala Corp. within the Agricultural buffer zone surrounding the complex with the complex being the renter of this land.

The enclosed map # 1 and 2 shows the basic area where the writer feels the complex should be built.

The advantages of this area of the North Kohala District are as follows:

Close proximity to a 4,000 ft long, 150 ft wide land surface public airport, to be able to fly the baby calves in to and remove the finish products of beef, pork, and fish to Oahu.

The projected area is at the extreme North tip of the Island of Hawaii, on the windward and on the leeward side of the Island.

Access by highway is good, over improved roads connecting the area with the Village of Kamuela (Route 25) and with the Harbor of Kawaihae (Route 27) to the Southwest. The U.S. Army Engineers have dock facilities at the Kawaihae Harbor about 16 miles from the center of the projected area.

Annual rainfall varies with the elevation above sea level and the locations relative to the tradewinds which strike the Island from the Northeast. The alignment of the afore mentioned airstrip at Upolu Point is parallel with the direction of the prevailing winds. Land on the west of Hawi receives less rainfall than land east of Havi. (Approximately 30 - 50 inches per year) Making this area better suited for cattle mainly due to rainfall and the tradewinds, moving any odor back to the sea.

Just 13 miles from Hawi, on the upper slopes of Kohala Volcano, annual rainfall averages about 175 inches per year, thus helping provide water for irrigation and power via the Kohala ditch. (See map)

The projected area also lies between two existing shafts that can provide water for the complex and is close to the Hawi Hydroelectric Plant, which could be used to supply power to the complex.

All of the above items with the plus of good crop land and good potenial pasture ground for the Agriculture buffer needed for the complex makes the selection of this area plausible.

SECTION XIII. - WATER AND POWER

A. Rainfall and Resources. - Summary Conclusions.

1. Irrigation water will be needed for grain crops.

2. Storage facilities adequate for at least three months supply of livestock feed will be needed.

3. Structures and livestock must be protected against sheet runoff to depths of 18 inches and lasting for several hours.

4. If the present water collection and distribution system is maintained, the total firm supply of water for all uses from the Kohala Ditch is about 9 million gallons per day. Irrigation water for grain crops would come from that firm supply.

5. Water conveyed by the Kohala Ditch system is adequate in all respects as irrigation water.

6. Surface water is not suitable for use in fish facilities or for consumption by livestock because of the presence of nematodes.

7. All pumped groundwater from the basal aquifer located east from the east end of the Upolu Point Airport will be satisfactory for livestock and for indoor fish growing.

8. Pumped groundwater from the basal aquifer located west from the east end of the Upolu Point Airport will be satisfactory for livestock but may, depending on the distance from the ocean, be less than optimum for indoor production of Catfish.

9. All Project structures should be located at least above 65 feet higher than sea level and preferably higher than the airport. Drainage and waste disposal considerations will probably cause selection of sites at considerably higher elevations.

B. Power and Water - Summary Conclusions.

1. Initial Project water requirements for the livestock and aquaculture will be about 500 gallons per minute. That water should be pumped from the basal aquifer in wells newly developed at the most advantageous location for the Project.

2. Feed grain water supply will be primarily rainfall and that supply may be supplemented with water delivered via the Kohala Ditch system. Presently developed sources of water and present water storage facilities do not have sufficient capacity to provide a reliable supply of irrigation water during prolonged drought periods.

3. The cost of providing a firm supply of irrigation water either by storing excesses during wet periods or by pumping groundwater and delivering it to the fields is prohibitively high. Therefore, there will be times when feed grains will not be harvested in sufficient quantity for Project needs because of inadequate water supply for the crops.

4. If only a feedlot is contemplated, annual costs will be about the same with electricity purchased from the Hilo Electric Light Company, Ltd. and with electricity generated at a Project-owned Diesel-electric plant.

5. If aquaculture is part of the Project, then the initial electricity supply and the future supply should be furnished by a Project-owned Diesel-electric plant.

6. The cost of owning and rehabilitating the Hawi Hydroelectric plant as a replacement source instead of consuming Diesel fuel oil may be less than the cost of Diesel fuel oil saved thereby. A guarantee of reasonable supply of water most of the time must be obtained and guaranteed maintenance of the Kohala Ditch system must be assured.

C. Rainfall and Water Resources.

Annual rainfall varies with the elevation above sea level and the location relative to the tradewinds, which strike the island from the northeast. The alignment of the State of Hawaii-owned 4000 feet long Upolu Point Airport is parallel with the direction of the prevailing winds. The amount of rainfall averages about 51.62 inches per year at Hawi, but variations from the average are large. Annual maximum for the same station is over 101 inches per year and annual minimum is less than 26 inches. In general, land at higher elevations receives more rainfall than land at lower elevations. The area east from Hawi, and closer to the tradewinds, receives more rainfall than the area west from Hawi. Average annual fall at the Mauna Kea Beach Hotel, south from Kawaihae Harbor, is only 7 inches per year. Just thirteen miles from Hawi, on the upper slopes of Kohala Volcano, annual rainfall averages about 175 inches per year.

Rainfall was analyzed since it may significantly affect the choice of the site for the proposed integrated livestock, aquaculture, grain production complex. In areas where drought is likely to occur, such as the area close to the Pacific Ocean and west from a line connecting Upölu Point and the crest of Kohala Volcano (see Map 2), there may be entire months with no rainfall whatsoever. Further, in those areas, there may be consecutive two month periods with only an inch total rainfall and even at Hawi there were consecutive three month periods with less than two and one half inches rainfall. Such periods occurred more than one time in the past 66 to 67 years.

Substantial irrigation water supply will be needed if grain crops are to be grown during dry periods. Rights to use of an adequate amount of irrigation water should be secured and arrangements for maintaining the irrigation water supply system should be made before developing the area for growing grains. As will be discussed later in this Section, there is more than one possible source of water for irrigation.

High rainfall periods were also analyzed. A summary is given on Table 4. Hawi, about average for an area where rainfall may be higher to the east and at higher elevations and lower to the west and at lower elevations, had a record high rainfall of more than 28 inches in one month. Total rainfall in two consecutive months exceeded 25 inches three times and was almost 35 inches in one two month period. The highest rainfall in a three month consecutive period was more than 45 inches. It is likely that grain crops will not grow during periods of excessive rainfall. Therefore, provisions should be made for storing portions of previous harvests or for purchasing and storing grain sufficient for three or more months feed.

During extremely intense rain, there is a hazard of flooding caused by sheet runoff from the Kohala slopes toward the Pacific Ocean. The flooding hazard is greater in the area east from Havi than in the area to the west. However, the basalt lava to the west is less weathered and less porous, so a smaller rainfall is required in the west for the same amount of sheet runoff as in the east. Difference in location of the facilities within the Project area should not significantly affect the amount of sheet runoff expected or the amount of protection required for avoiding damage to buildings and livestock. From preliminary analyses, it appears likely that protecting against a flood wave of about 18 inches depth and lasting for a few hours should be adequate.

The only supply of water in the Kohala area which is immediately responsive to differences in rainfall are the Honokane and the Pololu streams. Other sources are also responsive to rainfall, but not immediately or directly so. Since only two perennial streams exist within reach of the Kohala Ditch and their flow is not sufficient for the irrigation of the large amount of land cultivated by the Kohala Corporation, large investments have been made over a period of about 80 years for developing an adequate and reliable supply of irrigation water. Because much of the developed supply must be pumped and does not reach the system by gravity, a reliable supply of power for the pumping was also necessary. Thus, power and water requirements for the area cannot be separated and examined apart.

Briefly, the existing system for supplying irrigation water diverts water from the Honokane and Pololu Streams, when it is available. That supply is augmented by water pumped from wells, tunnel drifts into perched water tables, and springs. An additional supply of water for irrigation comes by pumping from vertical shafts (maui) near the ocean shore. Kohala Corporation presently pumps from three of four such shafts, using the water from one shaft (Kohala) for cooling water supply for the sugar mill steam plant and water from the other two shafts (Hoea and Waikane) for irrigation.

There are 37 tunnels into water tables perched on older basalt surfaces which weathered sufficiently that they became relatively impermeable and can hold water. The supply (recharge) for those perched water sources comes from percolation of rainfall down from the porous basalt above. Ultimately, those perched supplies now reaching the principal irrigation water conveyance, the Kohala Ditch, do come from the rainfall. The perched sources reached via the tunnel drifts are not likely so extensive that they could be counted on for a reliable supply of water after a period of prolonged drought.

The water from eleven springs is also delivered to the Kohala Ditch. Two other springs are now dry. The largest spring is situated in the East Fork of the Honokane Nui Canyon below the Kohala Ditch. That spring yields about one and one quarter million gallons per day. The entire system is estimated to have a firm supply of about nine million gallons per day of good quality water. At times, the supply has been as great as forty-three million gallons per day.

The surface water and the water coming from the perched tables and the springs are generally low in total dissolved solids. The mineral content of the water appears to be balanced between chlorides and sulfates. While the water delivered from the shafts is relatively high in dissolved solids, most of the Project area can be supplied with water of a quality suitable for the proposed uses. The quality of the water is discussed in more detail below, because that information may be useful in choosing the Project site.

The groundwater generally comes from two different kinds of sources. Perched sources and springs will have low total solids, because the water is rain water which has percolated only a short distance through the rock, dissolving minerals on its way to its place of diversion into the Kohala Ditch system. Some of the shallow wells in the area also reach perched sources with low total dissolved solids. However, in dry times, those high quality waters coming from shallow sources will not be recharged and they are not a reliable source of water. It is the deeper wells and the shafts which provide the reliable quantities of groundwater for irrigation and other uses.

The deeper wells and the shafts skim water from what is called the basal aquifer. Ocean water permeates the vessicles in the basalt. Rainfall percolates downward from the surface and eventually rests on the sea water which permeated laterally from the island margin. Because there is only a small difference in specific gravity between the sea water and the fresh water, it is believed that the depth of fresh water will be many times as much below sea level as it is above sea level. Thus, we can picture a skewed double convex lens of fresh water above the sea water. Those water masses occupy the small voids in the larger mass of basalt which flowed from the Kohala volcano and formed the northern part of the Island of Hawaii.

It seems reasonable to expect that where the recharge from percolating rainfall is greater (that is, where the rainfall is greater), the dimensions of the fresh water lens above the sea water (the basal aquifer) will be greater. That supposition is confirmed by plotting the elevation above sea level at which fresh water is first encountered from above, along a line extending from east to west, as was done on Map 3. In the east, where rainfall and recharge are greater, the surface of the basal aquifer is about eight feet above sea level. In the west, at Waikane Shaft (at the western end of the airstrip) the upper surface of the basal aquifer is only one foot above sea level.

The sea water and the fresh water mix in the voids in the basalt masses at the edge of the Island. The mixing occurs nearest the ocean and also occurs where the recharge is least. Thus, water near the ocean and west from Hawi will be saltier than water near the ocean and east from Hawi. Water taken from wells skimming the basal aquifer a mile from the ocean and east from Hawi has low total dissolved solids. It would probably be necessary to locate wells three or four miles from the ocean, and consequently wells of much greater depth, to obtain water of similar quality west from Upolu Point. Present numbers which may be used as a general guide are the following:

> Wells from Hawi east at about the same elevation as Highway Route 27 yield water of about 150 to 200 ppm solids.
>
> Wells west from Hawi and about the same elevation as Route 27 will probably yield 500 to 700 ppm solids.
>
> Shafts near the ocean east from Hawi yield water of 1200 ppm solids or less.
>
> Shafts near the ocean and west from Upolu Point will probably yield water of 3000 ppm and more solids.

The salinity of the pumped water will be affected by changes in both the quantities of pumpage and in the amount of water diverted from other places and used for irrigation on fields where the water percolates to the basal aquifer near the wells and shafts. As the Kohala Corporation finally ceases diverting water from upper levels and to the east toward the present cultivated area, the recharge to the basal aquifer in the neighborhood of the wells and shafts will diminish. Salt water will intrude into rock vessicles further inland and the total dissolved solids should increase, in time. That effect would be further augmented if the rate of pumpage from the wells and shafts were increased, since evaporation exceeds rainfall in the area and since the pressure of fresh water holding back the salt water would be decreased.

However, it is more likely that even with development of the proposed livestock, aquaculture, agriculture complex, the rate of pumpage may be reduced. Reducing the amount of water withdrawn from the basal aquifer will act toward diminishing the extent of salt water intrusion. With less intrusion and less evaporation, the total dissolved solids should tend to decrease. It is not worth the effort of trying to predict the long term salinities because so many of the factors determining the salinity are either unknown or insufficiently known.

While the mineral content and turbidity of the surface water supply appear usable for the proposed Project (salts can easily be added to the catfish water if they are required), the biological quality of the water taken from surface sources or conveyed in open ditches and tunnels is a matter for concern. Nematodes are a present menace and measures must be taken to avoid their invading the Project facilities. Pinworms, hookworms, and the trichinae are not desirable guests for the cattle, the fish, or the swine. All water for Project livestock and aquaculture should be pumped groundwater from the basal aquifer, conveyed in closed pipes. Cattle will have no trouble drinking water with considerably higher salts than any obtainable in the Project area. Catfish supply water should be kept below 2500 ppm solids for best growth. On the other hand, catfish growth will be faster in water having 1200 ppm solids or more than in water with less dissolved solids.

D. Tsunamis.

One additional water-related consideration is protecting Project structures from damage and protecting livestock from Tsunamis, or waves generated by earthquakes in the Pacific Basin. The highest recorded runup from Tsunamis in the Hawaiian Islands is about 65 feet. On the Island of Hawaii, at a place near Akakoa Bay, runup was measured to an elevation of 16.7 meters (54.8 feet) during the Tsunami of April 1, 1946. Runups from Tsunamis recently recorded near the Upolu Point Airport are:

April 1, 1946	6.0 meters (19.7 feet)
March 9, 1957	3.3 meters (10.8 feet)
May 22, 1960	2.7 meters (8.9 feet)

The airport is more than 80 feet above sea level. Unless there is some overriding reason, the Project facilities should not be situated at a lower elevation.

Principal water supply sources of concern for siting the proposed Project are shown on Map 3. A general correlation showing that Kohala Corporation annual pumpage increased during periods of low rainfall and decreased during periods of high rainfall is on Chart 1. It is not worth the effort to try to further refine that correlation, because the amount and location of irrigation supply to the cane fields, the seasons of the year , and operation of the sugar mill steam plant affect the amount of water pumped.

E. Water Requirements.

Both the surface water and the groundwater will be used in the Project. Surface water will be used for irrigating grain crops and the groundwater will be used for all livestock and aquaculture purposes. The surface water will be delivered to the grain fields via the Kohala Ditch Company system and the on-farm water distribution ditches and pipelines. Groundwater will be delivered to the livestock and fish facilities by pumping from new wells into the basal aquifer and transporting the water to point of use in a closed pipeline system. By that means, contamination and losses will be minimized.

Water requirements for the various proposed uses are given on Table 5. An initial feedlot with 4,000 Holsteins and 6,000 to 8,000 steer feeders will require about 500 gallons per minute water.

The groundwater temperature is about 72 degrees fahrenheit, which is fine for the larger animals. Calves will require water heated to 105 degrees and when fish are added, the water will require heating (for catfish, to 76 degrees minimum) or cooling (for trout down to about 58 degrees). No additional water will be required for fish growing facilities producing 200,000 pounds or less annually.

Water will also be required if Project power is generated at site rather than purchased from the Hilo Electric Light Company, Ltd. If Diesel-electric units are installed, about 0.4 gallons per minute per turbocharged kilowatt hour will flow through the radiators. Total radiator cooling water quantity will depend on the size of livestock facility and the total Project power requirements. If peak load is about 300 kilowatts, as it will be with the initial feedlot mentioned above and with addition in the near future of about 100,000 pounds annual live weight of fish, then the cooling water circulated would amount to 120 gallons per minute, but most would be recirculated in a closed system. Any system supplying the water needs of the livestock will also supply the water needs of the Diesel-electric units. Alternatively, the jacket cooling water can be used to heat the water supply for the rest of the system. In that manner, all water for the fish and drinking water for calves can be heated without additional power expense.

Surface water requirements will vary with the amount of land on which feed grains are grown. It has been supposed that two crops per year can normally be grown. Each crop will require about three acre-feet of water per acre. However, crop water requirements are not uniform in time. Relatively large quantities of water are required for producing healthy stems and leaves and for forcing grain heads to grow to a uniform elevation, which eases harvesting. Relatively small quantities of water are needed at times when the flowers should develop, when the grain heads are maturing, and before and during harvesting, when the fields should be dry. Thus, the water load factor will be between one third and one half. Peak water supply rate will be two to three times the average rate. During periods of little or no rainfall, either the crop will fail in the absence of water or very large quantities of water will be taken from the combination of the Kohala Ditch system and from other storage, which does not now exist. Even with the initial quantity of land, about 3500 acres after conversion from importing grain to using Project-grown grain (see Table 3), one month storage to avoid crop failure would require about 5000 acre-feet of usable reservoir capacity. Even a reservoir for daily storage for all the crop land would cost more than half a million dollars and would occupy more than one hundred acres of land.

The existing system of the Kohala Ditch Company has supplemented the supply of water from natural rainfall. The system does not have developed resources to function as a primary source of water for a large irrigated area 100 percent of the time. When water is available from the Kohala Ditch for irrigation, it can be supplied to the grain crops via existing channels and pipelines distributing ditch water to the fields.

The existing Kohala Ditch Company water system does not have any substantial holdover storage from which water could be withdrawn during periods of low water supply. While the system flow averages about 27 million gallons per day, the firm supply during periods of drought is only about 9 million gallons per day. If a drought lasts for a long period, many of the shallow water sources dry up.

F. Water Sources.

The groundwater sources already developed are mentioned here in relation to their utility for the proposed Project. Individual sources are shown on Map 3. Shaft No. 4, Kohala Shaft, is a water supply makeup for the sugar mill steam plant condenser cooling. Pumpage has been about 7½ million gallons per day at the times when the steam plant is processing the sugar cane. Power for that pumpage has come from the turbine-generators installed at the steam plant. The Kohala Shaft is far from areas where Project water will likely be consumed. Transportation and pumping costs will be very high when there is no process industry use for the steam plant.

The next working shaft, Hoea Shaft, No. 2, is near the existing feedlot and Hoea Camp. The shaft is at low elevation. Water pumped at the shaft is delivered by pipeline to higher elevations for irrigating existing cultivated fields. Power for that pumping comes from the Hawi Hydroelectric Plant. The water discharged from the Hawi Hydroelectric Plant is regulated in a small reservoir at about 300 feet above sea level and from there it is distributed to nearby fields. The Hawi Hydroelectric Plant discharges about 8.5 million gallons per day when operated at about 300 kilowatts output. That amount of water would be adequate for irrigating 500 to 750 acres during times of peak water requirements. Maximum output of the Hoea Shaft for supplying irrigation water has been about 2000 million gallons per year, or an average of 5.4 million gallons per day. The combined water (discharge from the hydro-electric plant and water pumped from the shaft) would be sufficient, with some daily pondage capacity already existing, for irrigating 800 to 1200 acres. Thus, the combination of the Hawi Hydroelectric Plant and the Hoea Shaft would be sufficient for irrigating

20 to 30 percent of the initial acreage for growing feed grain (see Table 3). It should be noted, however, that the Hawi Hydroelectric Plant would then consume almost all of the firm water supply from the Kohala Ditch and there would be almost none left for other users. Further, if the Hawi plant is used, the water will be discharged at a low elevation, where it cannot be used elsewhere, except for the local irrigation, without additional expense for pumping and transportation.

When pumped irrigation water would be needed, during periods when there is insufficient water in the Kohala Ditch, the pumping of that water from the Hoea Shaft would consume almost the entire available surface water supply.

Waikane Shaft (No. 1) is just west from Upolu Point Airport. Power for pumping water from the shaft to higher elevations, where it can be used for irrigation, is supplied from generation elsewhere. If the sugar mill steam plant is not in operation continuously, then pumping power would either come from Project generating plants or would be purchased from the Hilo Electric Light Company, Ltd. The cost of pumping large quantities of water with either source of power will be prohibitively high. Thus, while small quantities of water might be pumped and distributed to livestock and aquaculture facilities at a reasonable cost, crop irrigation water cannot be pumped from the shafts at a reasonable cost on a reliable basis, after the sugar mill is shut down.

Besides the shafts reaching the basal aquifer, wells have been drilled for special purposes. The Halaula Well (No. 2-1 on Map 3) supplies domestic and potable water. The pumping capacity is about 2 million gallons per day. The water is very low in total dissolved solids and high priority users will probably take all of its output.

Union Mill Wells Nos. 1 and 2 reach the basal aquifer and also produce water low in dissolved solids. Power for pumping comes from the Union Hydroelectric Plant. Water for operating the Union Hydroelectric Plant comes from the Kohala Ditch. During times of low water supply, there will not be sufficient water in the ditch system for operating both hydroelectric plants or, consequently, for pumping from both the Hoea Shaft and the deep wells. When the well pumps can be operated, the water will probably be used outside the proposed Project.

While water pumped from the shafts and the existing wells would be adequate for the livestock and the fish, the location of the water source may not be advantageous with respect to location of the proposed integrated operation. The cost of transporting the water a mile to its area of use will be about the same as the cost of developing new wells. Installing new pumps and motors is a cost which will be incurred whether new wells are developed or whether water is taken from the existing shafts. The existing pumps are too large and would soon need replacement with equipment sized for the job.

It is more favorable that new wells be developed at the site selected for the Project. Initial capacity will be about 500 gallons per minute. Since the supply must be reliable, two wells should be installed. Each well pump should be able to supply all of the water needs for the livestock, aquaculture facilities and the powerplant (if one is installed).

G. Power Requirements.

Project power requirements are summarized on Table 6. About 300 kilowatts are required for the initial facilities. A safe, reliable supply must be provided. Initial Project needs could be met either by a Diesel-electric plant or by purchasing electricity from the Hilo Electric Light Company, Ltd. Initial annual operating costs would be similar, on the order of $52,000. However, if aquaculture facilities are part of the initial Project or if they are added later, costs of heating or cooling water with electric energy would be high. Since there is a large heat rejection to Diesel engine jacket cooling water, sufficient for heating fish facility water and calf drinking water, Diesels are essential for economical expansion.

While it might be argued that it is better to begin with lower cost purchased energy, the economics actually favor a larger initial investment, if aquaculture is contemplated for the near future. As long as we must assume that the purchase cost for the generating plant equipment will increase annually at a rate greater than the rate of interest on the borrowed money, it is better to purchase equipment for a Diesel-electric plant initially than to wait and later purchase the same equipment at a much higher cost.

Primary power supply for the Project should be from a Project-owned Diesel-electric plant. Backup power should be available from the Hilo Electric Light Company, Ltd. by connecting to the utility transmission system and providing a stepdown substation.

H. Power Sources.

Existing and likely future power sources are those given on Table 7. They include the existing sugar mill steam plant, two hydroelectric plants (Hawi and Union), utility supply by the Hilo Electric Light Company, Ltd., and a new Diesel-electric plant in the site area.

The steam plant has boiler capacity sufficient to supply about 15,000 kilowatts of electricity. The plant now has two turbine-generator sets, a 2000 kilowatt unit and a newer 7500 kilowatt unit which has never been operated at much more than half its rated capacity. The steam plant's primary use is supplying process steam for making sugar. The fuel is bagasse. After the Kohala Corporation ceases growing cane in the North Kohala District, there will be no fuel for the steam plant. The chain grate stokers can easily be converted for other fiber fuels, such as pulverized and ground wood, ground stalks of grain crops, or ground manure. However, unless the fuel supply is adequate for generating about 65,000 pounds of steam per hour, the steam generator should not be operated.

The cost of transporting the necessary quantity of fuel to the plant, whether trucked fibers or pumped manure, will be as much or more than the plant output is worth as fuel replacement energy. That doesn't include the costs of growing the fiber, harvesting it, or operating the plant. If manure could be economically pumped from a nearby feedlot, it would require the feces from about 65,000 cattle to operate the plant at minimum capacity. That is far greater than the initial or near future capacity of the proposed feedlot, and would limit the selection of site to areas which may be otherwise undesirable. Fiber fuels cannot be considered a source of power for uses other than a seasonal process, such as the sugar mill. There will inevitably be drought periods during which there will be insufficient harvest of woody or plant crops. During such times, other power sources will be needed.

The two existing hydroelectric plants are not operated as year round primary power sources because they do not have a reliable supply of water. The Union Hydroelectric Plant (500 kilowatts capacity) will probably be maintained for uses other than in the proposed Project. The Hawi Hydroelectric Plant (350 kilowatts nameplate capacity) would have enough capacity for supplying the feedlot power, but then there could be no aquaculture unless additional power were supplied to heat the water (for catfish) or cool the water (for trout). Certain crustaceans and arthropods can be grown in water the temperature of the basal aquifer. Unfortunately, their culture is still in the developmental stage and they cannot now be counted on for a reliable commercial scale addition to the Project.

Either power purchased from the utility or power generated at a new Diesel-electric plant are the alternative means of obtaining a reliable supply of electricity for the Project.

Likely annual costs for purchasing electricity from the utility are given on Table 8 for several cases of Project development. Those costs were calculated using the rate schedule for large general service, Schedule P, and assuming that by the time the facilities are operating, or shortly thereafter, the Hilo Electric Light Company, Ltd. will be paying about $6.00 per barrel of Bunker oil and will therefore adjust its rates of sale accordingly. A sample calculation is given on Table 9. In addition to those costs, there will be the annual costs of a substation connecting the Project point of distribution with the utility transmission system. The major utility lines are shown on Map 4.

Likely annual costs for operating Project Diesel-electric plants are given on Table 10. The costs were calculated on the assumption that turbocharged Diesel engines would be used. Present costs for Diesel fuel oil are about 1½ times present costs for Bunker oil and that relationship is likely to continue in the future. For that reason, it was assumed that future cost of Diesel fuel oil will be about $9.00 per barrel. Plant superintendence and personnel costs, lubricating oil, parts, supplies, repairs, and miscellaneous costs were developed from American Society of Mechanical Engineers published data on costs of similar-sized plants used for general power supply. Those costs are included in the numbers given on Table 10. Substation costs for connection to the utility would be additional.

After examining the calculated annual costs, it appears that both purchased utility power and Diesel-generated power are close in cost for an initial installation without aquaculture. However, if aquaculture is part of the Project, annual cost for operating a Diesel-electric plant will be less than annual costs for purchased electricity. Total annual charges, including costs for owning the substations and the Diesel-electric plant, are given on Table 11.

Project power should be generated at a new Diesel-electric plant in which the total capacity is furnished by the combined outputs of several units, so that units may be maintained without interrupting the supply.

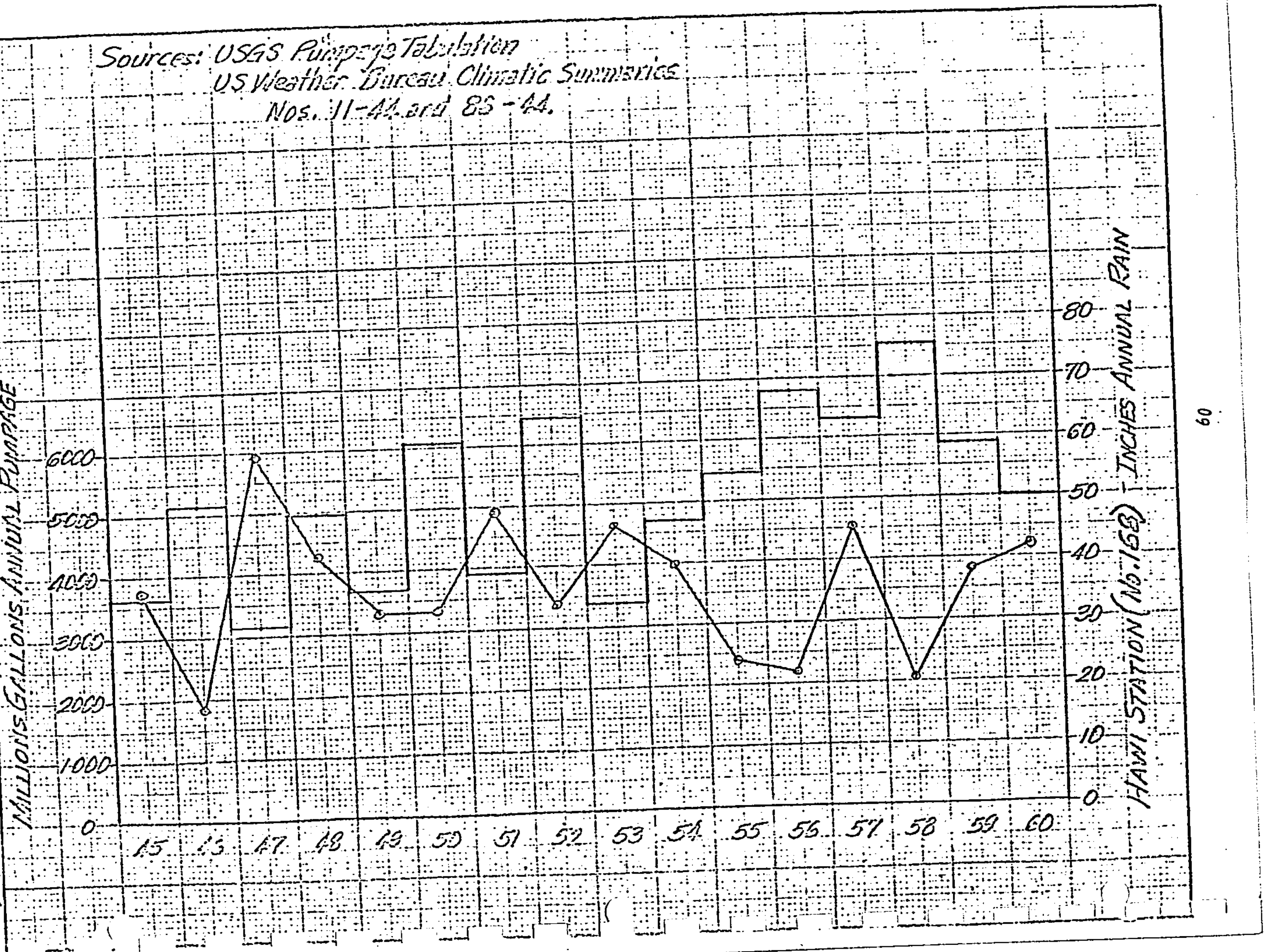
I. Rehabilitating the Hawi Hydroelectric Plant.

If a water supply adequate for operating the Hawi hydroelectric plant at half or more capacity on a continuous basis could ge guaranteed by the operators of the Kohala Ditch, then it might be worth rehabilitating the hydroelectric plant. Plant output could be delivered to the Project regardless of location, via the existing subtransmission system. The existing Pelton turbine can be renovated by replacing the governor with a dual control (needle and jet deflector) gate-shaft type governor and by dismantling and rehabilitating the turbine. The generator can be overhauled. The largest single cost would be furnishing a new penstock for delivering water from the Kohala Ditch to the machine. The existing penstock is buried and there is no way of determining its condition or remaining useful life. Its diameter is 30 inches, so it could be lined in place with concrete and steel. However, that is a job requiring specially trained crews and would be more expensive than providing a new penstock.

If system frequency regulation can be provided by the Hilo utility, then a 14-inch diameter penstock would be adequate, provided that a jet deflector operates so there are no rapid changes in the quantity of water flowing in the penstock. It is estimated that with a new steel penstock, protected with an adequate coating system, supported on concrete saddles, the rehabilitation can be accomplished for about $100,000. That is far more than the present value of the existing installation.

If rehabilitated, the Hawi Hydroelectric Plant would save about half the Diesel plant fuel costs and the cost of rehabilitation would be repaid in a few years. However, a nearly constant supply of water must be guaranteed for the plant -- about 5 million gallons per day or more.

CHART 1



Sources: USGS Pumpage Tabulation
US Weather Bureau Climatic Summaries
Nos. 11-44 and 85-44.
Millions Gallons Annual Pumpage
0
1000
2000
3000
4000
5000
6000
47
48
49
50
51
52
53
54
55
56
57
58
59
60
Hawi Station (No. 168) - Inches Annual Rain
0
10
20
30
40
50
60
70
80

TABLE

Month	Inches (Mean)	Number of Years Record	1900 - 1966 Minimum inches (yr)	Maximum (yr)
Jan	4.91	67	0.28(53)	18.00(59)
Feb	4.44	67	0.38(14)	14.16(37)
Mar	5.12	67	0.62(26)	28.20(02)
Apr	5.51	67	0.67(47)	19.22(18)
May	3.65	67	0.06(21)	12.32(16)
Jun	3.12	67	0.29(22)	10.07(14)
Jul	4.08	67	0.76(17)	14.18(14)
Aug	4.22	67	0.66(09)	18.20(14)
Sep	2.62	66	0.26(29)	6.69(14)
Oct	3.28	66	0.58(28)	10.92(41)
Nov	4.77	66	0.67(47)	13.82(30)
Dec	5.82	66	0.90(00)	14.79(50)
ANNUAL	51.62		25.66(62)	101.55(02)

Lowest month	0.06 inches May 1921
Lowest consecutive 2 months	1.44 inches Aug-Sep 1965
Lowest consecutive 3 months	2.41 inches Jul-Sep 1917
Highest month	28.20 inches Mar 1902
Highest consecutive 2 months	34.45 inches Mar-Apr 1902
Highest consecutive 3 months	45.27 inches Mar-May 1902

TABLE

LIVESTOCK*, AGRICULTURE, AQUACULTURE*	Maximum Cubic Feet/sec	Max. Gal/min	Gal/day
5,000 Head Feedlot	0.5+	250	180,000
With 1/2-Size Catfish nearby	0.5+	250	360,000
With 1/2-Size Catfish apart	1.0+	500	540,000
With Full Catfish nearby	1.0+	500	720,000
With Full Catfish apart	1.5+	750	900,000
10,000 Head Feedlot	1.0+	500	360,000
With 1/2-Size Catfish nearby	1.0+	500	360,000
With 1/2-Size Catfish apart	1.5+	750	720,000
With Full Catfish nearby	1.0+	500	720,000
With Full Catfish apart	2.0	1,000	1,080,000

* All livestock water and fish-growing water must be pumped from the basal aquifer.

TABLE

	Maximum kW	Monthly kWh	Load Factor
5,000 Head Feedlot	185.3	98,186	0.74
With 1/2-Size Catfish	210.3	110,098*	0.73
With Full Catfish	241.3	132,439*	0.76
10,000 Head Feedlot	277.7	138,178	0.69
With 1/4-Size Catfish	295.2	147,718*	0.69
With 1/2-Size Catfish	302.7	150,090*	0.69
Catfish Only - 1/2 Size	73.0 with Diesels*	33,512	0.64
Full Size	122.0 with Diesels	55,853	0.64
1/2 Size	213.0 with Elec.**	134,312	0.88
Full Size	402.0 with Elec.	257,453	0.88

* Using Diesel engine jacket cooling water to heat Catfish makeup water.

** Using electricity to heat Catfish makeup water.

TABLE

EXISTING POWER SOURCES

Unit	Hawi	Union	Mill	Mill
Type	Hydro	Hydro	Steam Turbine	Steam Turbine
Rated Kilowatts	350	500	2,000	7,500
Rated KVA	438	625	2,500	9,375
Voltage	2,300	2,300	2,400	11,500
rpm		514	3,600	3,600
Fuel	Water	Water	Steam from Boiler	Steam from Boiler
Fuel Source	Kohala Ditch	Kohala Ditch	Cane Bagasse	Cane Bagasse
Head	280 feet	500 feet	200 lbs.Steam at 480 deg.F.	440 lbs. Steam at 650 deg.F.
Year Installed	1923	1940	1936	1966
Age, years	50	33	37	7

OTHER EXISTING POWER SOURCE: Hilo Electric Light Company, Ltd.

FUTURE POWER SOURCE: Diesel-electric Plant at Site.

PRO[illegible]NS
P.O. Box [illegible]
El Paso, Texas 79912

Kohala - Likely Cost for Purchased Electricity

733A

DHR 29 May 73

TABLE

	Monthly Costs		Annual Costs	
	Now	Likely 1974	Now	Likely 1974
5,000 Head Feedlot	$2638.62	$3,095.29	$31,665.84	$37,143.48
plus 200,000#/yr fish		5,783.29		69,399.48
plus 400,000#/yr fish		8,471.29		101,655.48
10,000 Head Feedlot	3,707.34	4,349.73	44,488.08	52,196.76
plus 100,000#/yr fish		5,693.73		68,324.76
plus 200,000#/yr fish		7,037.73		84,452.76

PROTRANS
P. O. Box 12608
El Paso, Texas 79912
DATE 31 May 1973

Kohala -

TABLE [illegible] - SAMPLE CALCULATION COST OF PURCHASED ELECTRICITY

Monthly Rates from Schedule "P", Large General Service:

Demand:

First 100 kW or less	$425.00
Next 400 kW at	2.60/kW
All over 500 kW at	2.50/kW

Energy:

	Base Rate	Adjusted for $4.29/bbl fuel	Adjusted for $6.00/bbl fuel
First 100 kWh/kW	$0.02/kWh	$0.023401	$0.02805
Next 250 kWh/kW	0.017	0.020401	0.02505
All over 350 kWh/kW	0.015	0.018401	0.02305

For 10,000-head Feedlot plus 100,000 lbs Annual Catfish:

Demand = 295.2 kilowatts.
Energy = 147,718 kilowatt hours = 500.4 kWh/kW

Demand:	Monthly Charge
First 100 kW for	$425.00
Next 195.2 kW @ $2.60 =	507.52
	$932.52

Energy:	Now at $4.29/bbl	Future at $6.00/bbl
First 100 kWh/kW	$ 690.80	$ 828.04
Next 250 kWh/kW	1,505.59	1,848.69
Next 150.4 kWh/kW	816.97	1,023.38
	$3,013.36	$3,700.11
Add Demand	932.52	932.52
Monthly Bill:	$3,945.88	$4,632.63

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Kohala Diesel Power Supply
Fuel Costs + Lubricants
and Maintenance Parts
and Supplies.

733A

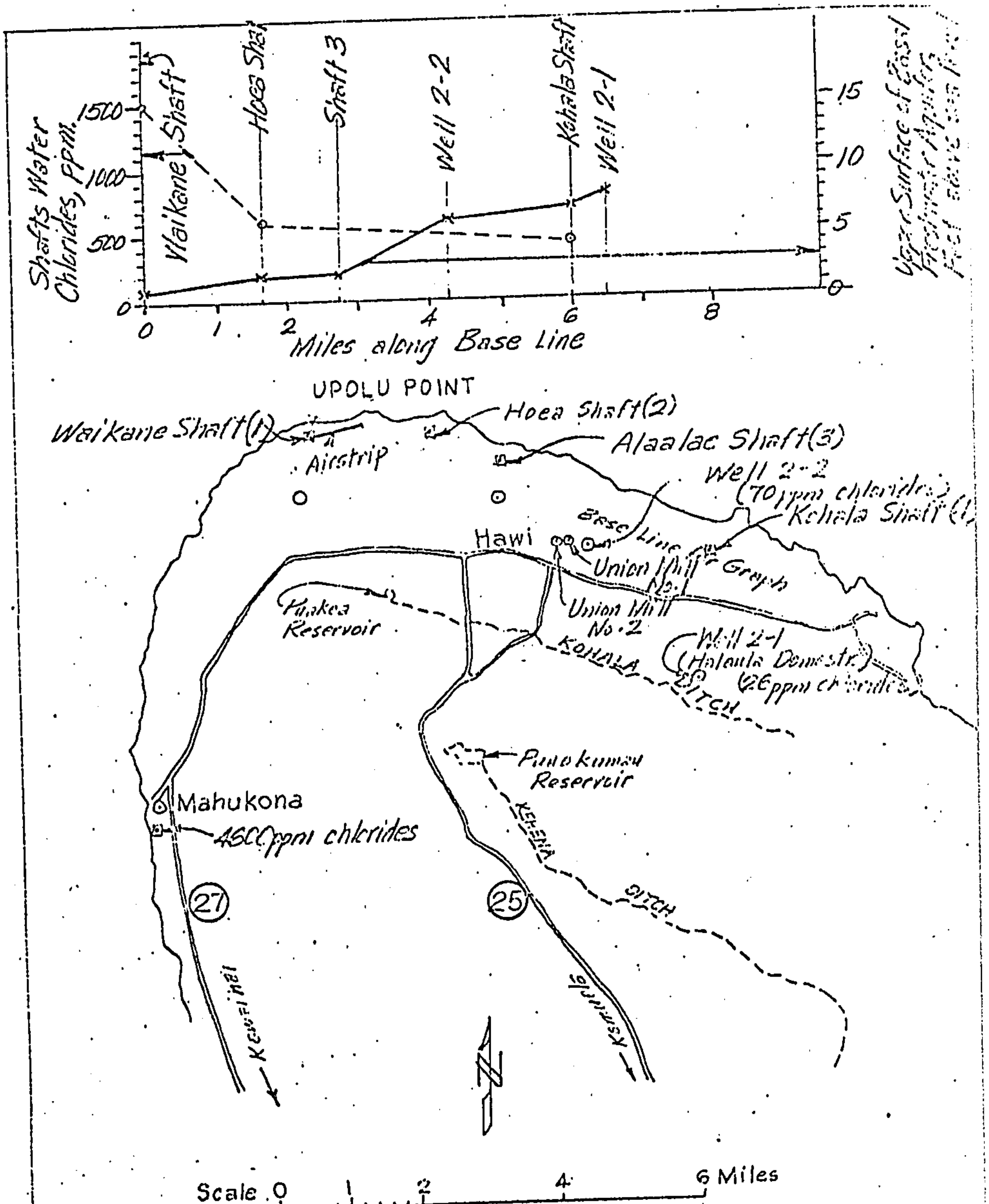
DNR 24 May 73 ✓ SMR

TABLE 10 - [illegible]

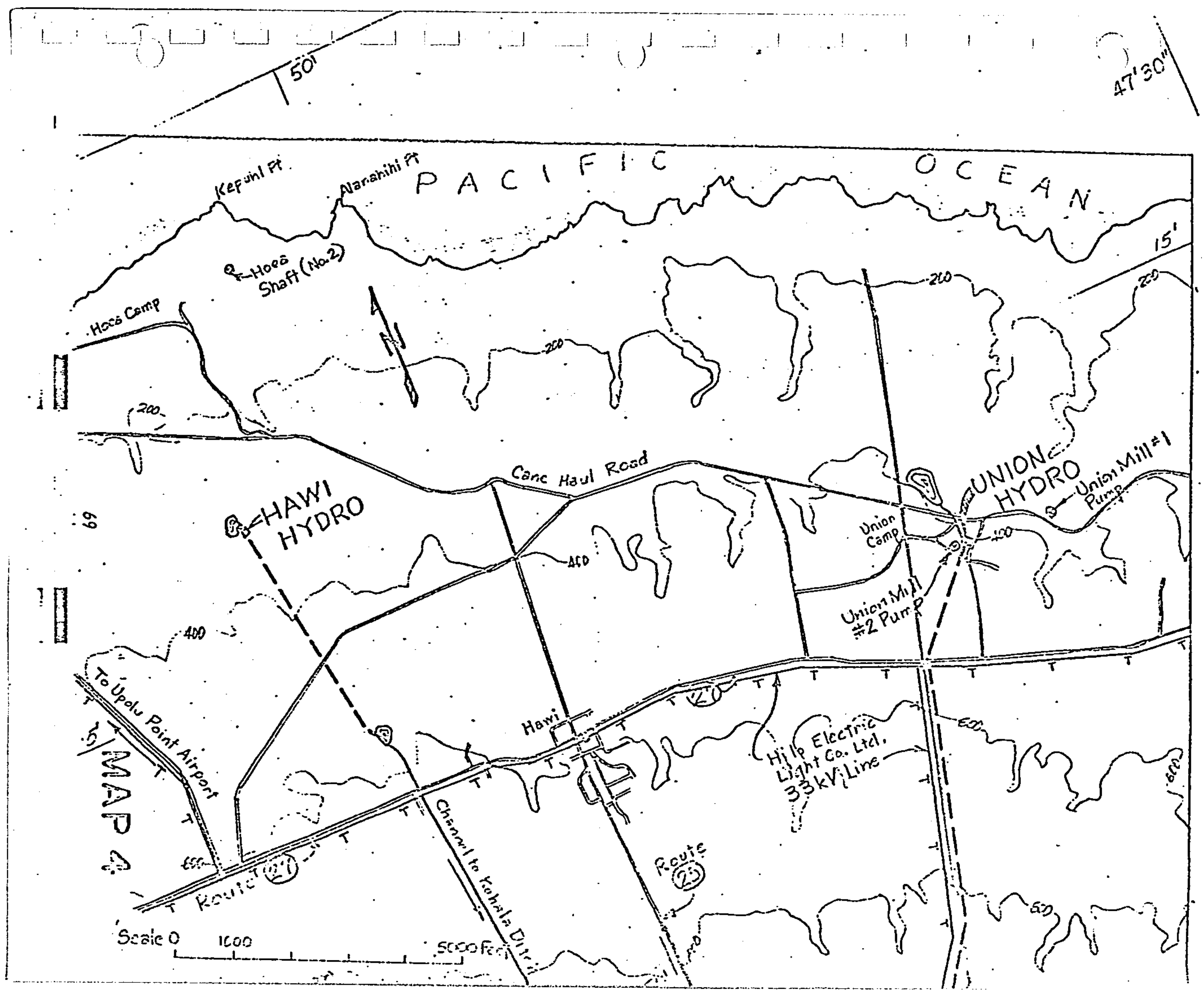
	Monthly kWh	Annual Cost (1974 costs) ×12 × $0.0309/kWh
5000 Head Feedlot	98,186	$ 36,407 *
With Swine X		
With ½-Size Catfish	110,096	$ 40,824
With Full Catfish	132,439	$ 49,108
With Swine & ½ Fish		
With Swine & Fish		
10,000 Head Feedlot	138,176	$ 51,236 *
With Swine X		
With ¼-Size Catfish	147,718	$ 54,773
With ½-Size Catfish	150,090	$ 55,653
With Swine & ½ Fish X		
With Swine & Fish X		
Catfish Only - ½ Size	33,512	$ 12,426
Full Size	55,853	$ 20,710

* ← Includes pumping costs to deliver water to the feedlot when there is no fish facility.

The calf drinking water could also be heated with jacket cooling water. There would be $774 reduction in cost that way, per year.



KOHALA WELLS AND SHAFTS
MAP 3



PACIFIC OCEAN
50'
47'30"
15'
Kepuhi Pt
Alanahihi Pt
Hoea Shaft (No. 2)
Hoea Camp
200
400
600
Cane Haul Road
HAWI HYDRO
UNION HYDRO
Union Mill #1 Pump
Union Camp
Union Mill #2 Pump
Hawi
Hilo Electric Light Co. Ltd. 33kV Line
Route 27
Route 23
Channel to Kohala Ditch
To Upolu Point Airport
Scale 0 1000 5000 Feet

MAP 4

Biological Impact

Of the flora in and around the prososed area there will be no adverse effect on trees, scrubs, grass & aquatic plants. The resultant charge will occur with the present sugar cane fields and following cane fields that will be replaced by forage and grain crops and small areas of pasture.

There will be no known impact on any flora of the rare and endangered species.

The fauna in and around the proposed area will not be adversly affected by the project and most of the habitat for rats, mongoose, birds, mina birds, etc. are man made and only a small fraction of it will be removed. A change will take place between cane fields to forage and grain fields. Microorganism - myriad - none introduced except in feedlot and waste system and these will be controlled. There will be no affect on marine animals and benthonic organisms or rare and endangered species of fauna. The fly population will tend to increase in and around the feedlot and will require control measures and good santtation and removal of the manure on a daily basis from under the cattle.

Cultural and Social Factors

The proposed project should have no affect on recreation nor is any recreation projects anticipated for the project with the possible exception being programs for employees of the complex.

There will be no affect on aesthetics and human interest factors.

There must be adequate protective measures taken in disposing of wastes from the complex and employee housing and providing sealed storage of liquid waste prior to utilization as field fertilization.

Economic Impact

The proposed project will inject over 7 million dollars into the economy in capitol assets over the next 10 years.

Operational dollars that will go into the economy in the form of employment and service will exceed over 1 million dollars per year.

For employment refer to Section XIV Employment - Feasibility Study.

XIV EMPLOYMENT

A major resource on North Kohala in addition to the land and water is the availability of a good work force. With the closing of the Kohala Sugar Company operation, the following Table #14 shows the unemployment which will result.

(Table 14[1]) Estimated Kohala Sugar Co. Layoffs By Year

Year	# Laid Off
1973	66
1974	178
1975	152
1976	1
Total	397

With the advent of our proposed complex and project we see by Table #15 what employment we intend to use as the project progresses.

At this time it is the intention of the management of Hawaii Biogenics Ltd., to import only top management and operational managers for each area. Therefore all assistant management, clerical, maintenance, calf feeders, cowboys, cattle feeders, truck drivers, tractor operators, and all help for related enterprises of slaughter and processing be drawn from the local labor market.

During the construction phases of the project, since we intend to build the complex ourselves we will use local labor and skills to help construct the unit. We will rely on contractors in the area for excavation and possibly plumbing. We expect only to bring in superintendents.

The above program will then rely totally on the skill and labor of the local population to construct and operate the complex and program.

1 The Kohala Task Force Progress Report to the 1973 Legislature 2-22-73 page #11

JOB CREATION ESTIMATES

(TABLE # 15)

PROJECT	1973	1974	1975	1976	Ultimate
Oahu Calf Pick-up & Care	3	3	3	3	4
Raising Grain & Forage	4	25	30	40	67
Holsteins from 100 - 400 pounds	7	15	15	20	20
Holstein & Custom Feedlot	3	5	6	8	10
Feed Storage, Processing & Feeding	1	3	4	5	10
Pasture Program	0	4	10	20	25
Swine Operation	0	2	6	10	20
Aquaculture	0	2	4	7	14
Water & Power Suppy	0	1	2	2	2
Manure By-Products	0	1	2	2	5
Maintenance for Above	2	3	3	4	10
Slaughtering, Processing & Rendering	0	0	12	25	75
Construction Personnel To Build Above	15	20	20	25	5
Totals	35	84	117	171	267

Thus as we can see employment in the complex can take up the slack in unemployment as it is constructed.

Possible Adverse Environmental Effects Which Cannot Be Avoided And Methods of Controlling Same

The construction of any major project such as the proposed Hawaii Biogenics integrated Agricultural and Aquacultural complex and farming will unavoidably have adverse effects on the environment. However these effects are short-term and with the proper controls and management and planning can virtually be eliminated and minimized where not eliminated.

The farming operation for forage and grain crops and the integrated pasture program will hardly change the present agricultural concepts of land use now in sugar except to change the name of the crop and the frequency of the harvest. Equipment used in the farming operation will have much less emission than present track equipment used in sugar cane operations and less equipment will be used thus a reduction of present emissions will take place.

The diesel power generators for the complex will be controlled for both noise and air emissions as explained in Section XIII Water & Power.

The feedlot complex by design and management will reduce odor and control of manure by twice daily removal will help eliminate objectionable odors and help control fly and insect and bacterial build up. The trade winds of the area will also remove any left over odor to the sea and dispense it.

Sanitation is the key word here and the design and manure handling built into the complex makes cleanliness an easy task.

A more detailed explaination of design and manure handling is contained in Section XV Preliminary Layouts and Basic Facility Design taken from the Feasibility Study of the North Kohala District that follows.

XV PRELIMINARY LAYOUTS AND BASIC FACILITY DESIGNS

The actual layout and design of the facility can accomplished only after the site selection is made and land agreement for lease and purchase are completed. This is due to terrain differences and relation of site to transmission lines, water, road, airport and wind direction factors.

The following is Hawaii Biogenics, LTD approach to layout and design of the complex. Illustration #1 is a basic site layout entailing very little detail.

It is the writers opinion that ultimate development of the complex's full potential will require 10 years of continuous phase type construction.

It must be noted that by designing the end product prior to any construction provides that when any one module of the phase approach is completed, it can function as a complete seperate unit and operate within itself on a profitable basis.

The only exceptions to this are the supportive units such as: shop, office, grain and forage storage. These units will be built to eventually handle the total complex.

In the following pages we will outline the basic types, sizes and uses of each facility in the complex.

A. SHOP

The first building to be erected on the proposed site will be a 40' x 100' shop. The shop will be fully equipped to handle maintenance of the complex.

Our approach to construction of the complex is this:

We intend to do all the basic construction, with the exception of excavation, using our superintendents and local labor.

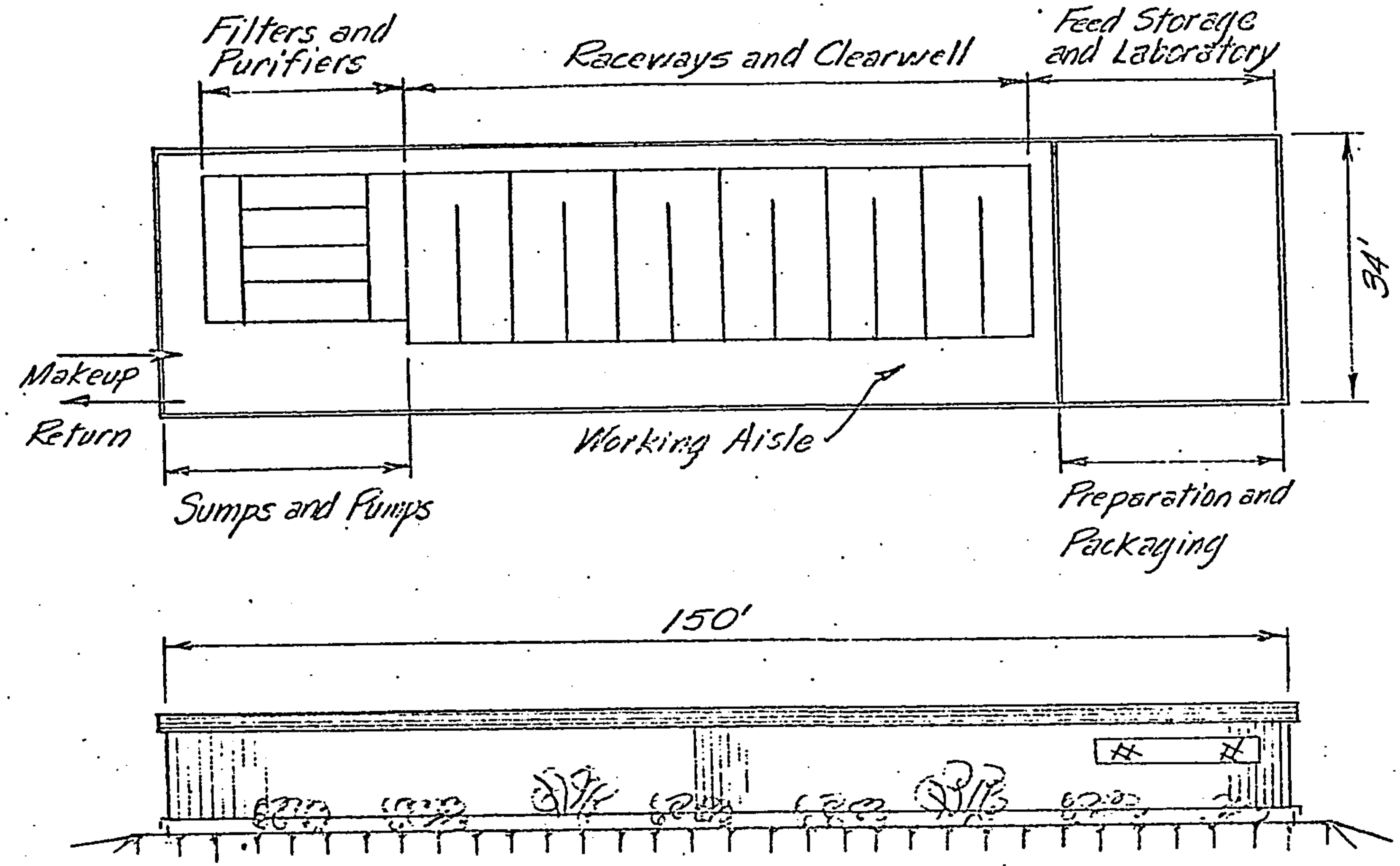
The initial use of the shop will be to fabricate forms for the concrete work. The shop will be used to build steel forms for the poured-in-place concrete slats and for the prestressed concrete feed bunks. We will also fabricate all steel calf pens, waters, feed bunks, gates, and cattle sorting and work area equipment. The scraper system and winch for manure removal will be fabricated in the shop.

Thus the shop becomes an integral part of the operation. Almost total construction of the complex will be centered within this unit.

Later on there will be an addition to the shop for equipment storage.

B. OFFICE

The office will be constructed at approximatley the same time as the shop. This office will serve initially for design work and a place for Mainland personnel to stay as the unit is being constructed. Its design will entail work and living areas.



FIRST AQUACULTURE UNIT

E. HOLSTEIN DAIRY BEEF AND CUSTOM FEEDING FACILITIES

The facilities for the Dairy Beef will be constructed in conjunction with the custom feeding facilities for ranchers cattle. These structures will be erected in three parts.

The first two units described are also used for the stage of birth to 400 pounds in the Holstein heifer replacement phase of our program.

The first unit will serve as a combination baby barn and gang barn. This structure will also be the initial wind break for the feedlot. This combination unit would be 40' wide and 1,200' long. This allows for the following:

RECEIVING AND TREATMENT AREA

Calves are placed here upon arrival where they are checked, given the preventative medication program and dispersed to proper sections.

At this point the small and/or crossbred calves are moved to the Intensive Care Unit.

The other calves are moved into their individual pens which are built on steel slats over a scraper. The scraper removes the waste twice per day. Here the calf is milk fed twice a day and receives free choice of grain and water. The design of this part of the facility allows for complete seperation of each weeks calves. At approximately four weeks of age they are moved to the gang barn area.

Now in the gang barn the calves receive milk, grain. and water. They are housed in groups of 16, in pens constructed on steel slats with a scraper underneath. About 225 pounds, these calves are moved into the weaner barn. Illustration #2

The weaner barn is 1,000' long with two scrapers and 36' wide with a 10' drive alley. Here the calves are on steel slats with a scraper underneath to remove manure. They have free choice of grain and water. This unit is called the weaner barn since the calves are weaned from milk at this time.

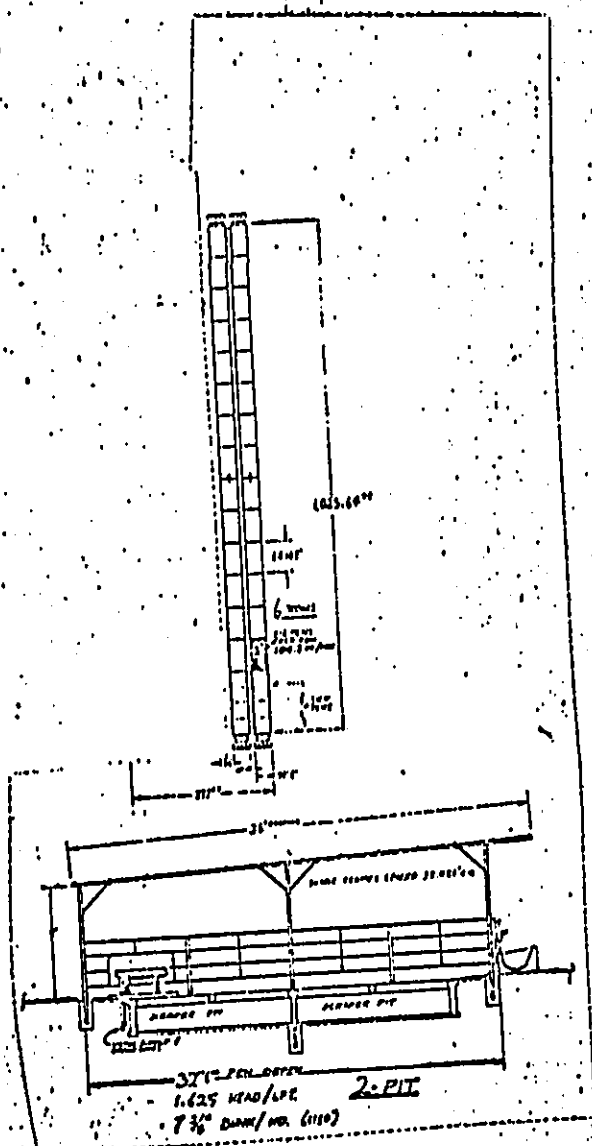


ILLUSTRATION # 2

In the weaner barn, the program of the dairy heifer changes from the steers as the heifer now receives a higher percentage of roughage in their ration.

At 400 pounds the calves move to the big feedlot barns. See Illustration # 3,4, & 5. This facility is the same for both Holstein and rancher cattle. From 400 pounds to market the cattle are on a 1,000' long barn on concrete slats and under roof. Here their balanced ration is free choice of grains, silage and water.

You can readily see that the calves and cattle are given special care and exist in an ideal environment.

F. GRAIN & FORAGE STROAGE AND PROCESSING

Total facility design for this part of the program is not as yet complete. This is due to the lack of tried information on silage storage and processing in Hawaii. Cost estimates based on Mainland costs and freight have been used for the purpose of this study.

G. SWINE

The four swine units are designed using the same methods of housing and feeding as the calves and cattle. First are small farrowing units of about 15 sows. These are connected together to form one structure for manure handling. Here the sow and her litter stay until the newborns are weaned. After weaning the babies go to the nursery and the sows are moved to holding pens to be fed and bred. In the nursery the baby pigs are housed under roof on steel slats. Here they grow to 40 pounds.

At 40 pounds they are moved to the finishing floor and fed to a marketable weight of 180 pounds.

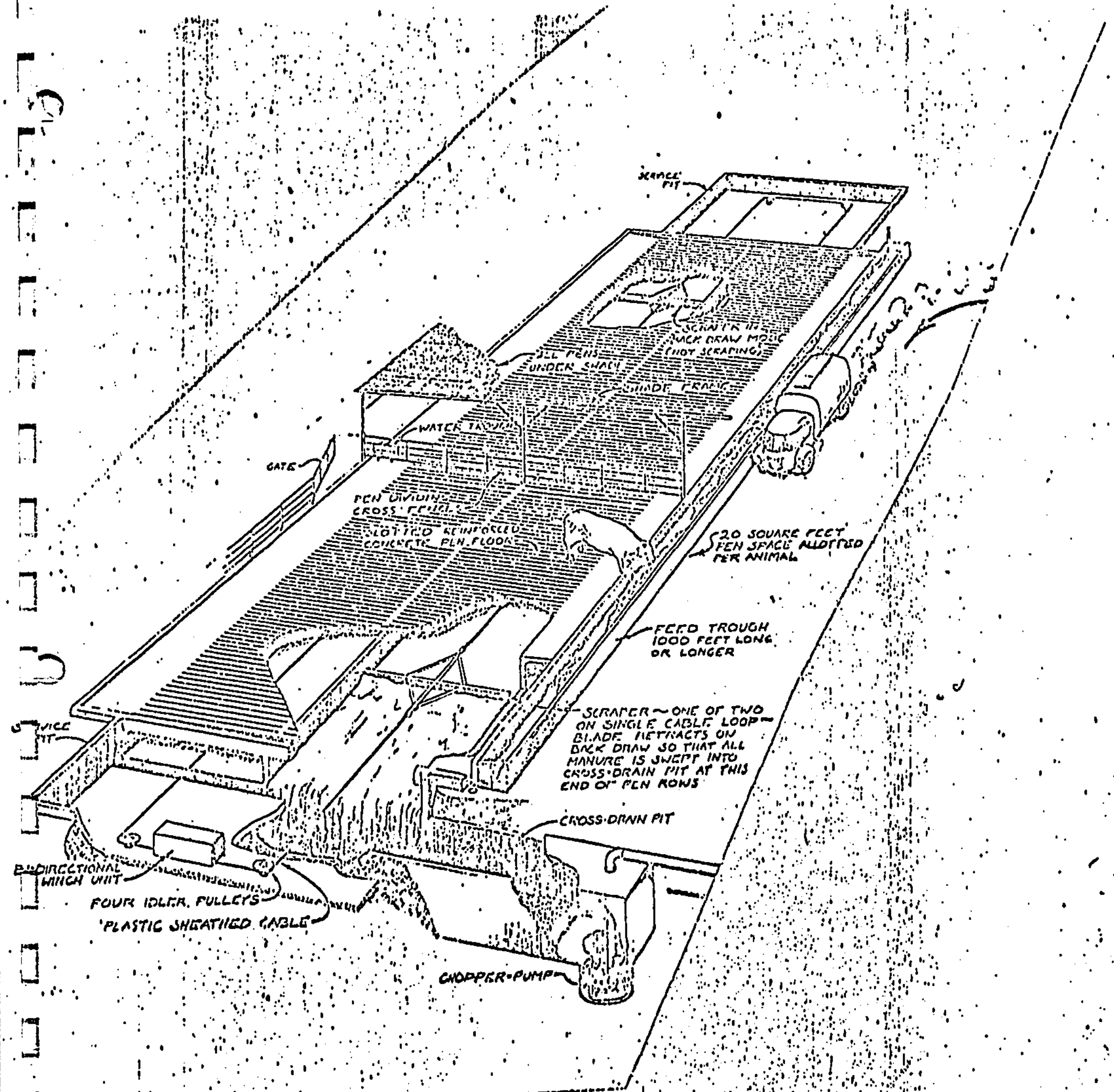


ILLUSTRATION # 3

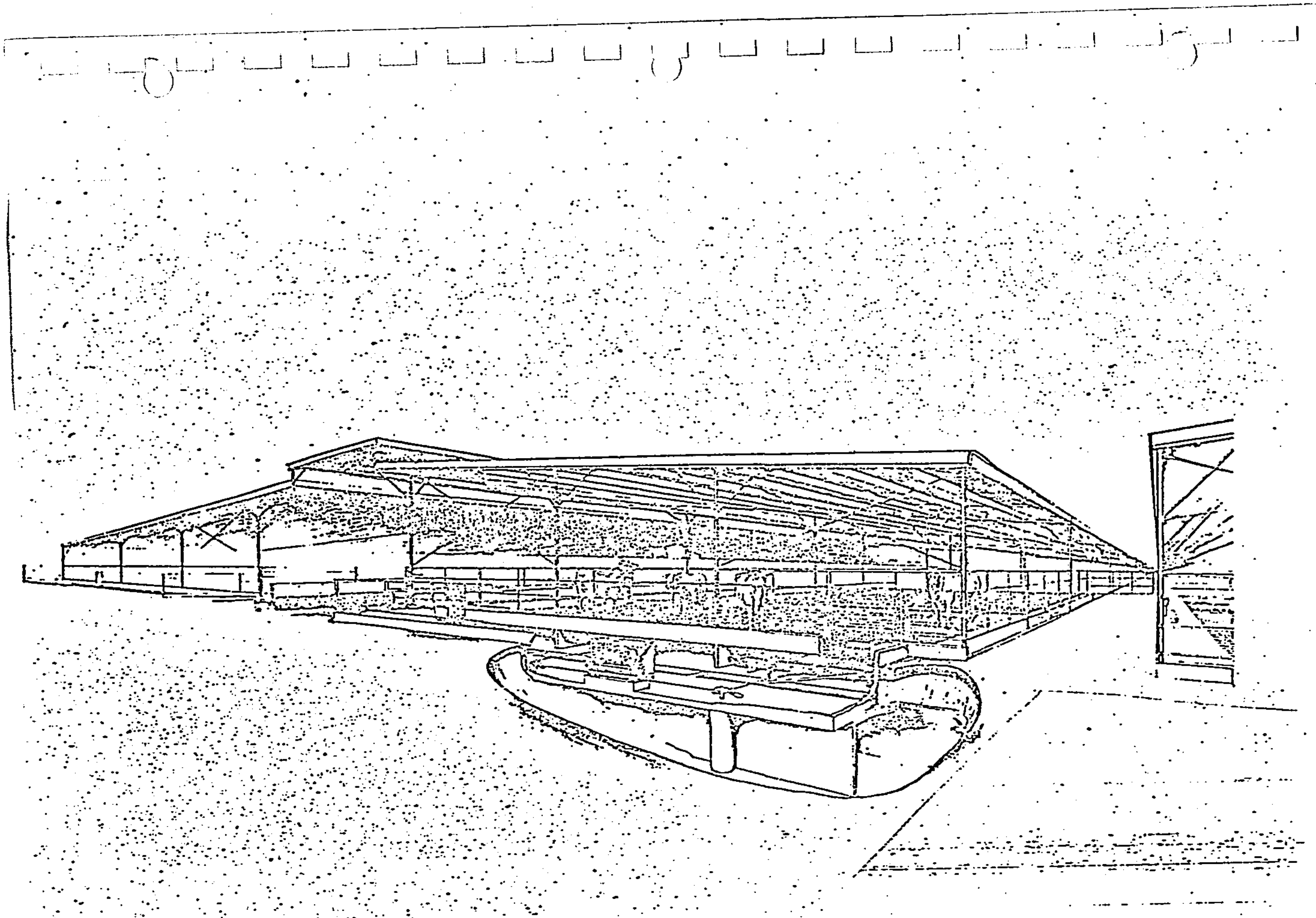


ILLUSTRATION # 4

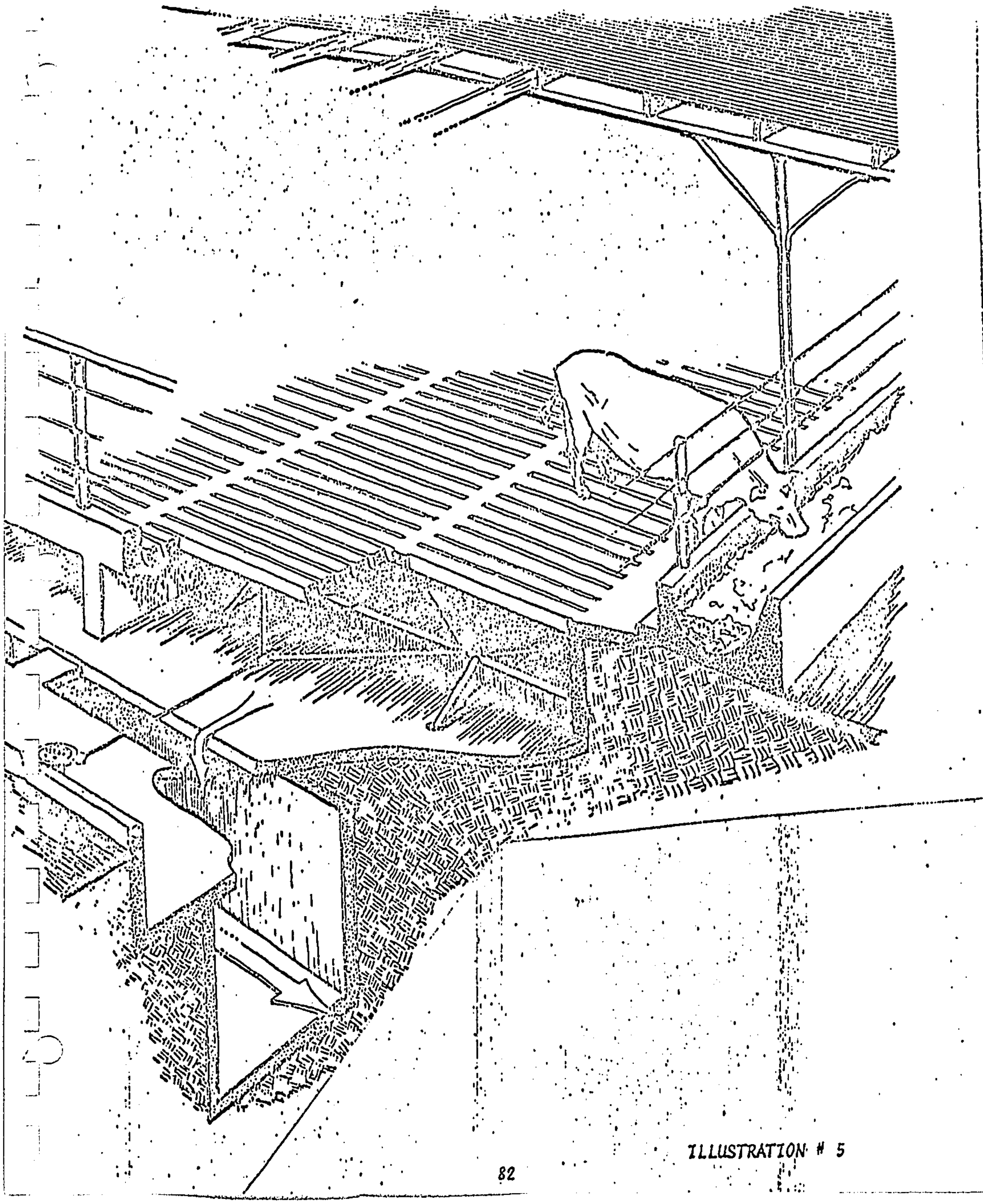


ILLUSTRATION # 5

I. MANURE HANDLING & DISPOSAL

Scrapers used for the calves, cattle and swine move the liquid manure to a common concrete trench. This trench runs perpendicular to the building and the manure flows by gravity to the chopper pump. This pump shreds it and runs it over a hydrasieve (Illustration #6&7) This screens out the solids for future use.

The remaining liquid flows to the collection pits for future injection into the irrigation system as fertilizer for crops and pasture.

The solids are dried for sow feed and/or fertilizer.

The value of this effluent is shown in the following letters and statements. (Illustrations #8 &.9)

J. SLAUGHTERING, PROCESSING AND RENDERING

At this time no attempt has been made to design a plant for the above processes. However, discussions have taken place concerning basic needs, costs and design. Being contemplated are facilitees for slaughtering, processing, meat packaging and rendering for 10,000 head of cattle a year and 12,000 hog, as an initial package. The unit will be designed for future expansion.

This part of the complex is extremely important in the over-all operation.

ILLUSTRATION # 6

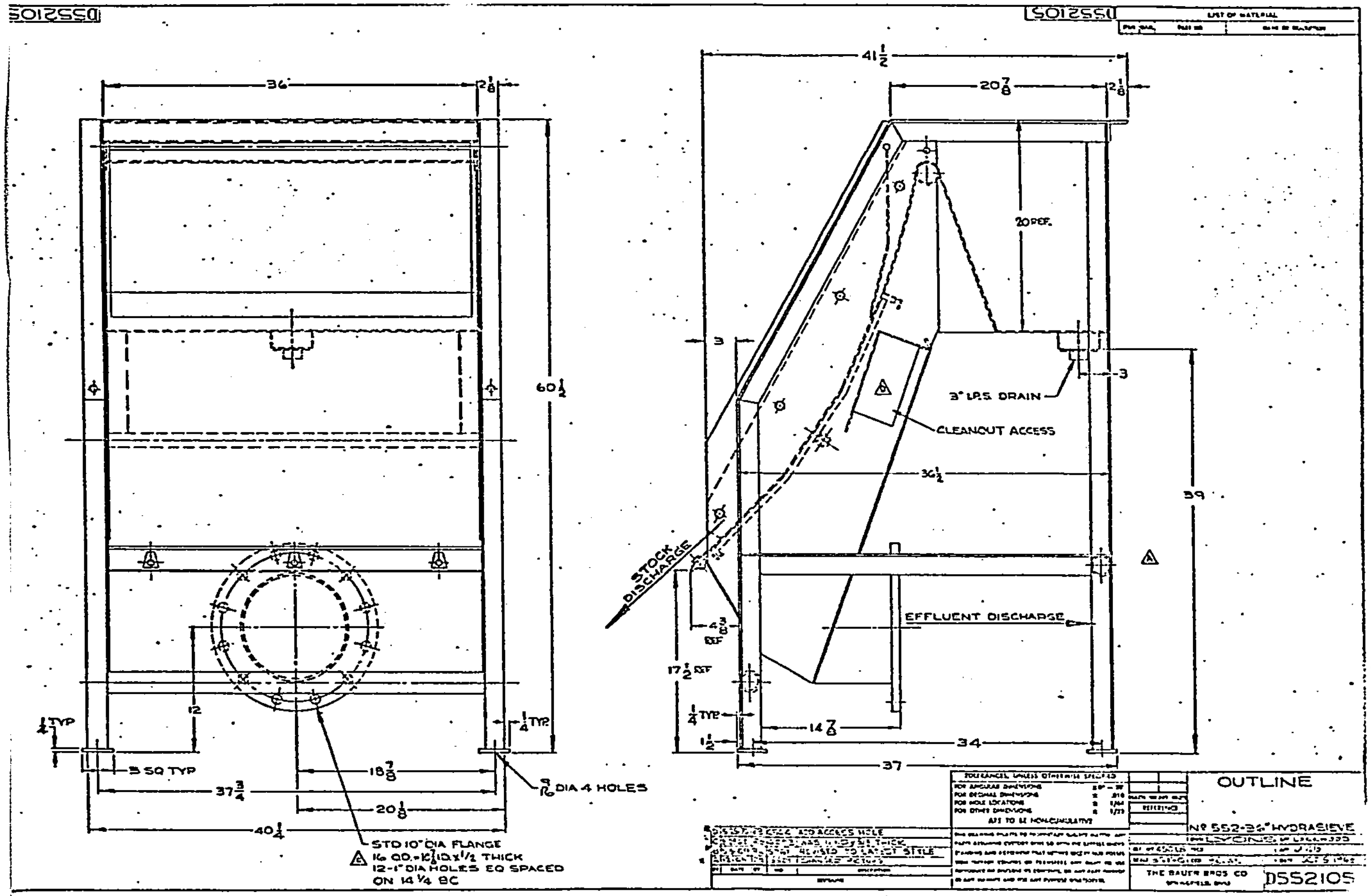


ILLUSTRATION # 7

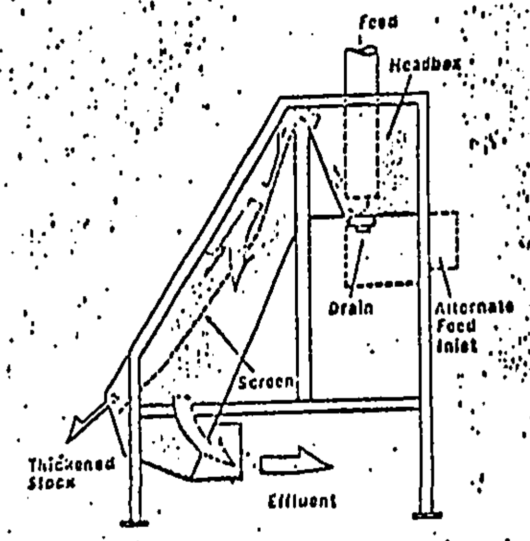


Fig. 3. A Schematic Drawing Showing the Essential Features of the Patented Hydrasieve.

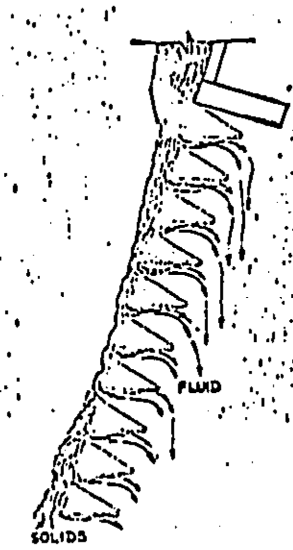


Fig. 4. This Enlarged Sectional View of the "Marvel" Wedge-Wire Screen of the Hydrasieve Illustrates how the Fluid is Withdrawn from the Stratified Slurry Fed onto the Flat Surface. The fluid is Wall-Attached to the Bars and Deflected through the Openings.

APR 8 Recd

Texas Tech University

College of Agricultural Sciences
Department of Agronomy P.O. Box 4169 Lubbock, Texas 79409 Phone (806) 742-7291

April 7, 1972

Mr. Richard Bunger, Pres.
Corral Industries
5202 E. Washington
Phoenix, Arizona 85034

Dear Mr. Bunger:

Your question concerning the value of animal wastes coming from cattle in completely confined feedlot operations is very timely. We have just finished our annual report of the research with Bob Cooper's Green Valley Feedlot at San Marcos.

You know that Bob was previously operating a conventional feedlot. He had an injunction served against him by the Texas Water Quality Control Board which required a somewhat hurried and therefore less than organized move. However, we got most of the data we expected from the first year of operation.

First, we were surprised at the quantity of body wastes produced by the animals. In the first 249 days of operation of his feedlot he had 473,305 animal-day units which produced 2,572,000 gallons of waste with a specific gravity of .97 grams/liter. On the average, each animal produced 5.43 gallons or 43.96 pounds of waste per day.

Bob has an unusual operation in that he starts animals at about 300 pounds and sells them at about 700 pounds. If we assume an average weight of 500 pounds each, the daily waste production equals 8.79% of the body weight.

An analysis of the daily body wastes of 500 pound fattening cattle shows the following:

Total weight	43.96 pounds
Volumn	5.43 gallons
Dry Matter	6.16 pounds
Nitrogen	.169 pounds
Phosphorus	.059 pounds
Potassium	.157 pounds
Calcium	.088 pounds
Magnesium	.036 pounds
Sodium	.069 pounds
Chloride	.170 pounds

This means that Bob will be getting 54,000 gallons per day when he gets to his expected 10,000 head capacity. In the 54,000 gallons will be thirty tons of dry matter, 1690 pounds of nitrogen, 590 pounds of phosphorous, and 1570 pounds of potassium. If one uses the value estimates of eight cents per pound of N, six cents per pound of P_2O_5 (not P), and 3.5 cents per pound of K_2O (not K) then the 54,000 gallons daily contains $282.60 worth of N, P_2O_5, and K_2O.

This figure does not include anything for either the organic matter or the secondary and micro nutrients involved. Also let me emphasize that these are 500 pound animals. For conventional feeding operations where 800 pounds is nearer the average, we should be getting very near 60% more waste produced or about 4.5 cents per animal per day. That is $165,000 worth of N, P_2O_5, and K_2O per year from a typical 10,000 head feedlot.

This value of course depends upon the proper utilization of the manure involved. It is typically 14.02% dry matter and can be sprinkled onto crops or cropland with currently available equipment. Therefore the only real bottleneck is land.

I believe we can apply 10,000 gallons of the material per acre for optimum utilization on most grass forage or other high production crops. That would give approximately 300 pounds nitrogen, 240 pounds P_2O_5, and 340 pounds K_2O. Each of Bob's 500 pound animals provides for 1/5 acre and a typical 800 pound animal will provide for approximately 1/3 acre.

For a 10,000 head feedlot then we need 3300 acres for optimum utilization of the manure. If we go with less acres we'll get less than the best use of our recyclable resource but could possibly come down to 2000 acres without seriously hurting our soil or crops depending upon both our soils and crops. If we have a medium textured, high exchange capacity irrigated soil and a somewhat salt tolerant, heavy nutrient use crop I feel the 2000 acres will be quite acceptable, but only time and research will tell. In our search for maximum application rates, we have applied up to 180,000 gallons per acre per year for three years here at Tech with no damage to Bermudagrass, cotton or sorghum, and no appreciable salt buildup in the soil. We have been looking at optimum rates only with Bob's land and 4000 gallon rates have increased Bermudagrass dry matter yields tremendously. We had a very dry summer followed by a wet early fall and produced 4700 pounds of dry matter in thirty days on some treated Bermudagrass compared to 659 pounds on untreated. As you know Bermudagrass is a voracious feeder and will use up to 500 pounds of nitrogen and 400 pounds of potassium per year under optimum conditions. It's an excellent crop for feedlot waste utilization.

We have taken three sets of soil samples at depths down to

60 inches at Bob's but it's too early to see any effect from our applications. So far we've had no soil build-up. Crops have taken it out as rapidly as we've put it in.

For a quick statement of my evaluation of the confined feedlot, I shall include a copy of the summary of my report on the Bob Cooper Feedlot. It tells what I think of this kind of feedlot.

Sincerely,

Eugene A. Coleman

Eugene A. Coleman
Assoc. Prof. of Agronomy

Enclosure

EAC/cr

VIII. General Desirability of The Slotted Floor, Concrete Pit and Apron Feedlot

We have visited this feedlot five times in the last 14 months in extremes of temperature and moisture with the observations that odor and flies are never an apparent problem. The manure is removed before anaerobic conditions can cause objectional odors.

Even during heavy rainfall periods the operator has complete control of the entire feedlot with no loss of animal wastes. The major disadvantage of this type of feedlot is initial cost. However if one considers the above advantages plus the value of the crop fertilizers he can capture this cost.

Summary

The data from the first years experimentation indicate:

1. We are getting more waste per animal than we had anticipated.
2. Livestock waste is quite dilute in all suspected pollutants when the total waste is captured because of the high quantity of water passed per animal.
3. Livestock waste serves as an excellent fertilizer for field crop production. A typical 500 pound animal will produce approximately 62 pounds of Nitrogen, 20 pounds of Phosphorus and 57 pounds of Potassium per year if all wastes are captured and used.
4. From manure application rates based upon optimum crop production there is little or no accumulation of NO_3, P_2O_5, K_2O, CaO, Soluble Salts, Na, Zn, Fe, Mn, or Cu following one or two applications.
5. The slotted floor, concrete pit and apron feedlot is a very effec-

ILLUSTRATION # 9

runoff.

6. While practically elimating pollution the slotted floor, concret pit and apron feedlot permit the operator to capture approximately $10.0(per animal per year in crop fertilizer.

Possible Adverse Environment Effects Cont.

The roads, feed alleys and cattle drive alleys within the facility will all be paved and thus dust and dirt control will be very effective.

During the construction period the site can be kept wet to control dust and after excavation and construction immediate attention to land scraping will control errosion and washing.

The latest techniques will be used in sanitation and insect control that will result in this sanitation. Also all efforts will be to turn a waste product of fecal material from the complex into a useable resource.

Sheet flow runoff and water contamination will be eliminated from contamination and problems by protecting the site with diversions and permanent dams and water ways thus all waste material that is moved, handled and stored in the complex will be protected from surface runoff and all waste material will be handled in sealed gutters, trenches and retention tanks.

Alternatives to The Proposed Action

The only alternative proposal for this type of concept was proposed in a feasibility study prepared for the Department of Agriculture by Gutheries dated November of 1972 using the same basic areas and crops however using conventional feedlot construction which by the nature of the area would have caused considerable more extreme environmental effects.

The other alternatives would be not to build the unit at all however this would not be in keeping with the needs of the State, the people, the Ranchers nor the consumers of the resultant products produced.

Also this concept will be a trial and a model for future expansion on other neighbor islands to broaden even further their agriculture economic base.

The site that has been selected is one of only two possible acceptable locations and it has the advantage of a more central location to the farmable land, a better source of water for the complex and a broader agricultural buffer surrounding it.

The Relationship Between Local Short Term Uses of Man's Environment And The Maintenance And Enhancement of Long Term Productivity

The proposed integrated Agriculture & Aquacultural complex will benefit long term environmental concerns. By virture of 86 acres designated for the complex and its future expansion a need is presented to keep the basic agricultural concept in force in the North Kohala area in order to insure the crop production necessary to feed all livestock confined in the complex. Agricultural farming provides open space, greenery, natural haditat for natures animals and a basic style of living that has been enjoyed in the area by the population for many years. The use of the project will provide an increasing number of jobs to allow families to stay in the area and a plan for Ranchers to move cattle off of grass and increase their beef herds.

The short term use of the project ties in with the long term needs of the community and allows the area to stay agricultural for years to come.

Irreversible And Irretrievable Commitments Of Reources Which Would Be Involved In The Proposed Actions

Of the approximately 2,000 acres of land that will be committed to this land in Phase I about 86 acres will be changed to any amount. Thus the resource of this 86 acres will be changed from basic farm land to an agricultural complex and many buildings and structures will be constructed on this site. Future generations will be able to use portions or all of the facilities if desired however the structures can be removed and the land could revert back to its orginal form. Thus the resource of the land will not to irreversibly harmed. The balance of the land will remain much the same as it is now.

Other resources are use of land, labor, and water for irrigation however this does not deplete the resources only uses it. The construction materails used in the complex may be irretrievable, but could in the future be possibly used for reclaiming marginal land as land fill material in the advent of future abondonment of the site.

Economic And Social Analysis

Economically speaking as has been stated in the past this project will bring into the state, county and community about 15-20 million dollars during the next 10 years. It will help take up the slack in unemployment produced by closing the sugar plantation in North Kohala. The project will produce increased income in the form of lease rent for higher use to the state for a long term (55 years) The project will pay taxes and will not require needs from the county and state in the way of water, power, transportation, hospitals, fire protection, sewer systems, postal, educational facilities, housing, and recreational facilities.

Any employee housing required not available in the area will be built inside the project area by the company.

Thus little if any additional government expenditure will be required on any long term basis.

Public acceptance has been sought and received by the company through the Kohala Task Force, the Department of Agriculture, the Land Board of The Department of Lands & Natural Resources, The Department of Health, The Department of Transportation and a public hearing was held September 13, 1973 in Kohala with over 300 people attending and a Senate Interim Committee received the proposed project and expressed little if any criticism to its merits and usage. (Copy of report Appendix D and copy of letter from Chairman of Senate Committee.)

Many meeting have been held with both small and large ranchers in the area and their support and use of the facility has been sought and gained.

A desirable community growth should exist with this new basic agricultural industry - which is desirable by the state, county and locally.

SOURCES OF DATA

1. Dan Davis's Manuscript on Groundwater Reources of the Island of Hawaii

2. State of Hawaii Department of Land and Natural Resources Report R34, Basic Water Resources Data, Island of Hawaii, Feb 1970.

3. US Geological Survey Well Master Cards.

4. Monthly Water Reports, Kohala Ditch Company, Jan 1,1971 to Apr 21, 1973.

5. State of Hawaii Department of Land and Natural Resources Report R37, Flood Hazard Information, Island of Hawaii, Sep 1970.

6. State of Hawaii Department of Land and Natural Resources Circular C14, Preliminary Report on the Water Resources of Kohala Mountain and Mauna Kea, Hawaii, by Dan A. Davis and George Yamanaga, Jan 1963.

7. Rainfall of the Hawaiian Islands, State of Hawaii, Hawaii Water Authority, Sep 1959.

8. US Department of Commerce, Climatography of the United States Nos. 11-44 (1919 through 1952) and 86-44 (1951 through 1960)

9. State of Hawaii Department of Land and Natural Resources, Pan Evaporation Data, State of Hawaii, Sep 1961.

10. US Geological Survey Progress Report Number 15, An Investigation of Floods in Hawaii - Through September 30, 1972, by R.H. Nakahara, Mar 1973.

11. State of Hawaii Department of Land and Natural Resources Report R36, Flood Frequencies for Selected Streams in Hawaii, Jul 1970.

12. US Geological Survey Water Resources Data for Hawaii and other Pacific Areas for Water Years 1969 and 1970.

13. Geology of The Hawaiian Islands, by H.T. Stearns, Bulletin 8, Territory of Hawaii.

14. Catalog of Tsunamis in The Hawaiian Islands, by George Pararas-Carayannis, World Data Center A, Tsunami, May 1969.

15. Kohala Task Force Report to the 1973 Legislature 2-22-73.

16. Equipment to Apply Ammonia-Water to Corn Silage, Paper from Department of Dairy Science, Michigan State University.

17. Protein Content of Corn Silage Treated With Ammonia, Michigan State University.

18. Beef Cattle Guide Lines, Dr. H.D. Ritchie, Michigan State University.

19. Results of Kohala Feedlot Experiment.

20. Feasibility Study, Kohala Farming Feedlot Project, by John H. & Less Guthrie, November 1972.

21. Kohala Feedlot Farm Proposal by C. Peairs Wilson, Dean & Director College of Tropical Agriculture, University of Hawaii.

22. Swine Production in Kohala Area, Richard E. Sievers, Farm Loan Representative, Department of Agriculture, State of Hawaii.

23. Statistics of Hawaiian Agriculture 1971, Department of Agriculture, State of Hawaii.

INTERVIEWS TO DATE

1. The State of Hawaii, Dept. of Agriculture
   - A. Frederick C. Erskine, Chairman
   - B. Roy S. Matsuura, Commissioner Division of Milk Control
   - C. Max Smith D.V.M. Head of Meat Inspection
   - D. Richard T. Morimoto, Farm Loan Division Head
   - E. Paul P. Wallrabenstein, Statistician in charge
   - F. Dr. Mel Dollar and various other employees and members of the Ag. Dept.
2. The State of Hawaii, Executive Branch
   - A. Lt. Governor George R. Ariyashi
3. County of Hawaii
   - A. Honorable Shunichi Kimura, Mayor
   - B. The water dept.
   - C. Planning dept.
4. Board of Health, State of Hawaii
5. Dept. of Natural Reources, Mr. Walter O. Watson
6. The United States Geological Survey Staff
   - A. Dan A. Davis
   - B. George Yamanga
7. The U.S. Climatology Department
   - A. Ms. Nancy Saiki
   - B. Commander Samuel Moses
8. The Federal Aviation Administration
9. Admiral E. Alvey Wright, Deputy Director Transportation Dept.
10. The Hilo Electric Co.
11. Christopher Cobb,. General Manager Kohala Co-op.
12. Charles Ritter, Manager Kohala Grain Co.
13. Clarance Garacie, Kohala Corp.
14. Ray Giannini, Kohala Corp
15. Raymond Tanouye, Feedwell Inc.
16. Harry Clark, President Genavco Corp.
17. Alex Napier, V.P. Kahua Beef Sales
18. Peter Kama, Asst. Manager Kahua Beef Sales
19. Monti Richards, Manager Kahua Ranch LTD
20. James T. Yagi, V.P. Kulana Foods LTD

21. Gorden J. Lent, Manager Parker Ranch
22. Irwin M. Higashi, General Manager 50th State Dairy Co-op
23. Robert Toledo, Owner Toledo-Twin Pine Dairy
24. Foremost Dairies
25. Meadow Gold Dairies
26. The Board of Directors of 50th State Dairy Co-op
27. Representatives of the Oahu Dairy Co-op
28. John W. Anderson, V.P. Hawaiian Agronomics Co.
29. Del E. Carter, Trans-Pacific Instrument Co.
30. John C. Hance, Director Research & Development Amfac Inc.
31. Mrs. Woody Pelfrey, Rancher
32. Richard Metcalf, President Metcalf Farms Hawaii
33. Trans International Airways
34. Francis Morgan, Kaula Ranch & Davis Co.
35. Northwest Marine Lines
36. George Jinkins, Mechanical Engineer
37. Walter Slater, Livestock Mgr. Parker Ranch
38. Stephen P. Bowles, Consulting Engineer, Honolulu
39. Jim Deaton, Department of Land & Natural Resources
40. Herbert K. Yanamura, Department of Land & Natural Resources
41. David Hega, O.E.Q.C.

Study Collaborators & Consultants

The writers collaboration with the following people has made this study possible. These same people will continue working to provide the finalized information to be included in this study.

Mrs. Polly L. Caple, Vice President
El-Pac Ranch, Inc.
Viola, Wisconsin

Mr. David Raffel, Director
Protrans Inc.
El Paso, Texas

Dr. Robert Cook, P.H.D. Nutritionist
Department of Dairy Science
Michigan State University
East Lansing, Michigan

Dr. John T. Huber, P.H.D.
Professor Dairy Cattle Nutrition
Michigan State University
East Lansing, Michigan

Mr. H.R. Lathrop III
Chicago, Illinois

Mr. Wayne Dearborn, Ranch Manager
El-Pac Ranch, Inc.
Viola, Wisconsin

Mr. Richard F. Nagel, Owner
Nagel Engineering
Chicago, Illinois

Dr. R.L. Schnepper D.V.M.
Lancaster, Wisconsin

Mrs. Marjorie Hinkle, Operations Manager
El-Pac Ranch, Inc.
Viola, Wisconsin

Mr. Kenneth Butters, Director
Hawaii Biogenics, LTD
Hawi, Hawaii

Mr. Richard Metcalf, President
Metcalf Farms Hawaii
Kilauea, Kauai, Hawaii

Agencies & Organizations That Either Have Been Consulted Or Will Be Consulted On The Project

A. County of Hawaii
B. State of Hawaii
C. Department of Agriculture - State of Hawaii
D. Department of Land & Natural Resources
E. Office of Environmental Quality Control - State of Hawaii
F. State Department of Health
G. Department of Transportation
H. Helo Electric Company
I. Kohala Corporation
J. Bishop Estate
K. Oceaniac Properties
L. Kohua Beef Sales & Ranchers
M. Parker Ranch
N. Hawaiian Homes Ranchers
O. 50th State Dairy Co-op
P. Ohau Dairy Co-op
Q. Hanna Ranch
R. Kohala Task Force
S. University of Hawaii
T. I.L.W.U.
U. Kukaiau Ranch
V. Feedwell Inc.
W. Carnation Albers
X. Michigan State University
Y. Kohala Community Association
Z. State Department of Labor & Industrial Relations

Coordinating Agencies And Or Individuals

A. Kohala Task Force Executive Committee
B. Department of Agriculture
C. Mr. Frederick Erskine
D. Mr. Jack Caple for Hawaii Biogenics

Appendix

HOUSE CONCURRENT RESOLUTION NO. 60

REQUESTING THE GOVERNOR TO APPOINT AN ACTION TASK FORCE TO SAVE KOHALA SUGAR COMPANY.

WHEREAS, the directors of Castle and Cooke have announced plans to terminate sugar operations at its Kohala Sugar Company subsidiary on the Big Island at the close of the 1973 grinding season; and

WHEREAS, the closing was attributed to projections for the future which "clearly indicate the futility of continuing. . . efforts to turn the activity into one that is even reasonably profitable"; and

WHEREAS, Kohala has 13,600 acres under sugar cane cultivation at the north end of the Big Island, half of which would be released from cultivation in 1972 and the rest in 1973; and

WHEREAS, Kohala Sugar Company currently employs 425 bargaining unit members and 91 salaried personnel, all of whom will be job displaced by the closing of the sugar operations; and

WHEREAS, this job displacement will not only contribute significantly to the rising rate of unemployment and increase the welfare rolls when unemployment compensation benefits are exhausted, but will reverberate psychologically, sociologically, and economically throughout the entire community and may lead to an eventual deterioration of the community; and

WHEREAS, although the closing of Kohala Sugar Company is deemed to be economically feasible from the standpoint of a business venture, its insidious effects and the possible deterioration of an entire community warrants an examination into the possibilities of saving Kohala Sugar Company and the community; now, therefore,

BE IT RESOLVED by the House of Representatives of the Sixth Legislature of the State of Hawaii, Regular Session of 1971, the Senate concurring, that the Governor of the State of Hawaii be, and hereby is, requested to appoint an action task force to recommend a plan of action to save the Kohala Sugar Company and the community and to stimulate the growth and prosperity of the Kohala Sugar Company and the community; and

BE IT FURTHER RESOLVED that the Governor include in this action task force, but which is not limited to, the following: the Directors, or their designated representatives, of the state departments of Planning and Economic Development, Agriculture, Land and Natural Resources, Labor, Taxation, and Health, the Director of the Department of Research and Development of the County of Hawaii, representatives from the University of Hawaii, the Hawaiian Sugar Planters' Association, the Kohala Sugar Company, and the International Longshoremen's and Warehousemen's Union; and

BE IT FURTHER RESOLVED, that certified copies of this Concurrent Resolution be transmitted to the Governor, to the Mayor of the County of Hawaii, to the directors of Castle and Cooke, to the Hawaiian Sugar Planters' Association, and to the International Longshoremen's and Warehousemen's Union.

JOHN A. BURNS
GOVERNOR

FREDERICK C. ERSKINE
CHAIRMAN, BOARD OF AGRICULTURE

WILLIAM E. FERNANDES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO KING STREET
HONOLULU, HAWAII 96814

June 27, 1973

Mr. Jack E. Caple
El-Pac Ranch
Route 2, Box 129
Viola, Wisconsin 54664

Dear Jack:

The Kohala Task Force approved the preliminary study on Integrated Livestock, Animal Feed and Aquaculture Complex of Hawaii Biogenics, Ltd. and has turned over your proposal to their Executive Committee to work out financing and to make their recommendations to the Governor.

The approval by the Kohala Task Force is conditioned on the ability of Hawaii Biogenics, Ltd. to raise the necessary funds for completion of Phase I as presented in their preliminary studies.

We are willing to assist you in any way we can to facilitate this project.

Sincerely,

Frederick C. Erskine
Chairman, Board of Agriculture

cc: Farm Loan
Milk

Attachment B

OFFICE OF THE LIEUTENANT GOVERNOR
STATE CAPITOL
HONOLULU, HAWAII 96813

GEORGE R. ARIYOSHI
LIEUTENANT GOVERNOR

September 24, 1973

Hawaii Biogenics, Ltd.
Hāwi, Hawaii 96719

Attention: Mr. Jack Caple
Director

Gentlemen:

The Kohala Task Force at its meeting of June 13, 1973, approved in concept your preliminary proposal for an integrated livestock, aquaculture, and agricultural complex in North Kohala. Members of the Task Force, after deliberation and discussion, have placed a very high priority for this project as it will not only benefit the North Kohala region but will also aid the State of Hawaii in reaching its overall goal of self-sufficiency. The Task Force has forwarded your proposal to its Executive Committee.

Under the regulations adopted for the North Kohala Loan and Grant Program, no loan is final until it is approved by the Governor. At this time, the Executive Committee is conducting further analysis on your proposal to determine the proposed terms and conditions of the State loan. Subject to such analysis, the Executive Committee is considering recommending to the Governor a financial package of approximately $3,000,000 for financing. Of this figure, Hawaii Biogenics, Ltd., will be expected to provide $1,000,000 in cash from equity capital and approximately $1,000,000 from private financial institutions. The remaining $1,000,000 is to be loaned from the North Kohala Loan and Grant Program and will be conditioned upon your being able to raise the other $2,000,000. As soon as we are able to set forth the additional requirements for the loan we will notify you.

Yours very truly,

George R. Ariyoshi

GEORGE R. ARIYOSHI

cc: Hon. Frederick Erskine

Office of Environmental Quality Control
Form PE-01

Attachment C

Submit two (2) copies of this form to OEQC

Preliminary Evaluation From

Title of the proposed project: Hawaii Biogenics, Ltd. North Kohala Integrated Agricultural and Aquacultural Complex

Originating Department/County: Department of Agriculture
Hawaii County

Division:

. . . .

HAWAII BIOGENICS, LTD.	By:	319-425-3612	8/16/1973
Originator	Signature	Phone	Date
Jack E. Caple	[signature]	608-538-3871	8/16/1973
Liaison	Signature	Phone	Date

. . . .

Funds:

Type: ______ Federal __X__ State __X__ County __X__ Other

Amount: $2,086,000.00 Remarks: (Indicate if these funds are available or tentative)

$1,075,000.00 tentative from Kohala Task Force
600,000.00 tentative from First Hawaiian Bank
600,000.00 from Hawaii Biogenics

- -

In the completion of the following, please be brief but concise. If information cannot be provided, please indicate the reason (s) for omission. If the space provided is inadequate, continue the evaluation on a separate sheet.

I. Description

1. Location: Field Upolu #8 North Kohala Hawaii, Hawaii

2. Present stage of development: Plans & Specifications, Financing & Surveying

3. Size, Site: Complex site is 86 acres.

   Structure (s): a. Enclosures over well pumps and controls 2 required, approx. 8 ft. x 12 ft.

Title of the proposed project: Hawaii Biogenics, Ltd.

b. Building housing Diesel-electric plant
   (1) Building 22 ft. x 25 ft. (approx.)
   (2) Storage tank 12 ft. dia. x 20 ft. long
   (3) Substation, outdoors, approx. 40 ft. x 60 ft.

c. Indoor Aquaculture Facility 34 ft. x 150 ft.

d. Workshop

e. Office and Guest House

f. Baby Barn

g. Weaner and Gang Barn

h. Cattle Barns

i. Sow Barn

4. Activities to be undertaken:
Custom cattle feeding, holstein dairy beef raising, Custom holstein heifer rearing, Malaysian prawn rearing and swine raising and crop production

5. Existing conditions and/or characteristics of the site.
The site has been used for growing sugar cane. The land is rolling and slopes toward the Pacific Ocean, at the northern toe of Kohala Volcano. There are no existing building or permanent structures at the site.

II. Objectives (List)
Create employment for North Kohala, Hawaii residents; custom fed rancher cattle; reduce Hawaiian imports of beef, pork, fresh water fish; increase quality of Hawaii's dairy cows through custom heifer rearing program.

III. Possible alternatives (those that are or have been considered and possible other alternatives)
Alternative water sources considered were supply from the Kohala Ditch Company system. However, need for surface reservoir storage and consequent surface defacement together with unsatisfactory biological quality of the surface water were the principal reasons it was decided to pump water for the Project from the basal aquifer. Alternative sources of electric power considered were supply from the existing hydroelectric units owned by the Kohala Corporation (not sufficiently reliable due to varying supply of water and not desirable from a community standpoint because the discharge location precludes economical utilization after discharge), supply from the Kohala Corporation Steam plant (neither sufficiently reliable nor practical from an economical viewpoint), and supply from the Hilo Electric

Title of the proposed project: Hawaii Biogenics, Ltd.

Light Company, Ltd. transmission system (economical if there were to be no Aquaculture Unit but not economical if there is to be an Aquaculture unit and consequent need for changing temperature of the water). There will be a tie to the utility transmission system for emergency power supply and for electric power during construction. Alternative sites were considered within the North Kohala District but none had the advantages of the proposed site in terms of avoiding detrimental environmental impacts on possible future homesites; location near the Upolu Point Airport; ready access to existing roads; ready access to existing telephone and electric utility transmission lines; avoiding allocation of land and water resources in such manner as to preclude maximum community utilization of those resources.

IV. Major environmental impacts (list)

1. Increased employment during construction and thereafter.
2. Maintenance of economic base for retaining the existing community and social and governmental services in and near Hawi.
3. Adequate control measures will be taken to prevent contaminating the soil, water, air and avoiding public eyesores.
4. Adequate control measures will be taken to avoid noise pollution.
5. There will be no depletion of non-renewable resources.
6. There will be no requirements for additional governmental expenditures over those which are now being made without the proposed Project.

V. Other Information

1. Anticipated date of construction: October 1, 1973
2. Anticipated date of project's completion: Phase 1, Spring 1974
3. Permits required. (List)
   a. Permit to operate the Diesel-electric plant.
   b. Permit to drill and pump from wells as a private enterprise (not as a public utility).
   c. Permit to operate a feedlot.
4. Approvals needed by State and/or City and County agencies, commissions, or boards. (List)
   a. State Department of Agriculture
   b. State Department of Public Health
   c. County Department of Public Health
   d. State Department of Land and Natural Resources
   e. Office of Environmental Quality Control

Attachment C

Title of the proposed project: Hawaii Biogenics, Ltd.

5. Coordinating agencies and/or individuals:
   a. Kohala Task Force Committee
   b. Department of Agriculture, Fred Erskine
   c. Mr. Jack E. Caple of El-Pac Ranch for Hawaii Biogenics, Ltd.

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Da food, da comfort and da service—("no ka oi")

A Kohala Task Force progress report on page 26 includes a cattle 'apartment house'

State to open requested lands

The State Board of Land and Natural Resources yesterday agreed to make available the 1,053-acre Kohala lands requested by Hawaii Biogenics, Ltd., for an "intensive livestock and aquaculture" industry.

Hawaii Biogenics will have to bid on the lease at public auction.

BOARD APPROVAL came only a day after Hawaii Biogenics' proposal was first made public at a hearing on the Big Island. Jack Caple, a director of the company, said it would invest $2.1 million in the operation within two years. Of that, $1 million will come from the Kohala Task Force.

Caple said Hawaii Biogenics is made up mostly of Iowa farmer-investors and a Des Moines law firm, who have put up $500,000 to start the company. The only Hawaii stockholder is Dick Metcalf of Metcalf Farms, an old friend of Caple.

Caple is owner of El-Pac Ranch in Viola, Wis.

He said Hawaii Biogenics not only would lease the 1,053-acre State property but would lease an additional 1,000 acres from the Kohala Corp. The land is now in sugar cane and would be taken over as Kohala sugar operations are phased out, he said.

It would employ 216 persons within 10 years, and would have a capacity to feed and process 40,000 head of cattle at any one time.

INITIAL CAPACITY will be 8,100 head of ranchers' cattle, which will be fattened in a 101-acre complex all under roof. In addition, it would feed 4,000 head of bull Holsteins as meat cattle and 3,000 head of Holstein heifers to be returned to dairymen when they reach 450 pounds.

Caple said the whole operation would be environmentally sound. Manure would be used to fertilize the land, on which silage would be grown. Heated water from the generator cooling system would be mixed with fresh water and used to raise channel catfish and Malaysian prawns.

Task Force finding Kohala jobs

KOHALA — A new economic base is at last starting to take shape for North Kohala, where a soon-to-be-abandoned sugar industry is the only livelihood most residents have ever known.

In developments following close upon each other over the past week:

—the governor released $100,000 for a Kohala water resources development study;

—the governor's Kohala Task Force presented far-reaching plans to match new employment to sugar layoffs, and

—the state land board approved putting up for auction 1,053 acres of land sought by Hawaii Biogenics to help create a multi-faceted livestock industry aimed at putting Kohala-finished beef on Hawaii tables.

AT LEAST 300 persons turned out last Thursday to hear the Task Force tell a State Senate interim committee about its progress in finding new jobs for Kohala. The Legislature has appropriated $4.7 million to help the Task Force do so.

The Task Force heard mostly praise for its own work despite some skepticism indicated about recently announced proposals for a refinery and medical research

Kohala Community Association President William McPeek praised the Task force's efforts in creating employment and questioned whether those who have left the community have really searched diligently for new jobs

The Kohala Task Force was created in 1971 to develop new jobs for workers who faced layoffs when Castle & Cooke that year announced it would close Kohala Sugar Co. in late 1973.

Since then Kohala Sugar's closing has been successively delayed to 1974 and then 1975. Now, Councilman Ikuo Hisaoka told Thursday's meeting, he is hopeful that the present reduced-scale sugar operation might be continued a little longer.

Hisaoka said he is "hoping" that with the current high price of sugar and mollasses, and with fewer employes, and since he is "pretty sure that they are making money" Kohala Sugar would make another extension of the closing date.

Task Force chairman Lt. Gov. George Ariyoshi told the Senate committee his panel had evaluated proposed projects in terms of:

—their impact on the community;

—keeping Kohala

—preserving the district's cultural heritage, and

—private financial participation instead of 100 per cent state and county funding.

State agricultural director Fred Erskine outlined the accepted and potential Kohala projects and their affect on employment, matching this up with plantation layoffs.

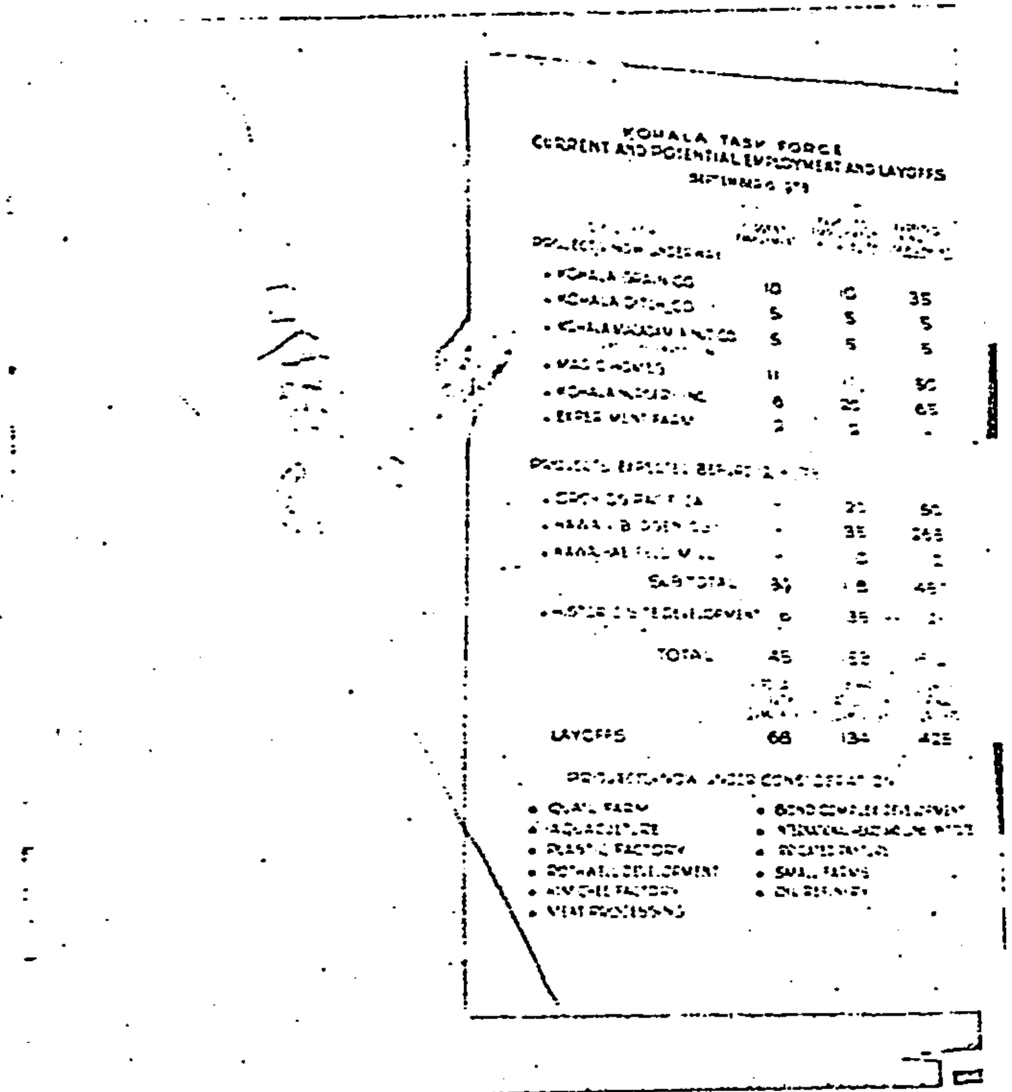
THE PROJECTS UNDER WAY

Kohala Grain Co., a sorghum-growing operation, employs 10 persons now and eventually will employ 35, Erskine said. Its expansion has been delayed by continued use of land for sugar, he said.

He said its grain growing efforts "have now passed the break-even point" in Kohala and is "looking forward to a promising future."

Magic Homes, a company the Task Force had offered to finance but "did not because the paperwork was never resolved," Erskine said, employs 11 and may eventually [illegible] workers.

Kohala Ditch Co., supplying the area with water, and Kohala Macadamia Nut Co. each employ five



THE JOBS projected to replace sugar in Kohala are displayed by state agriculture director Fred Erskine. Updated information presented at a meeting last Thursday includes two more experiment farm jobs and the fact that the Kawaihae Feed Mill has [illegible] gone into operation.

—WHT photos

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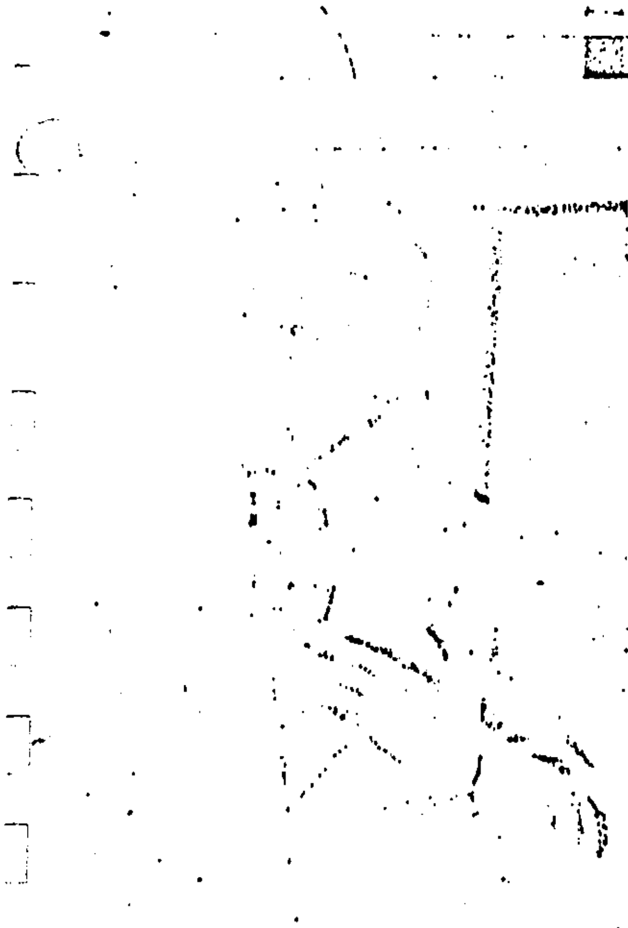

TA[illegible] FORCE CHAIRMAN George Ariyoshi said searching for new Kohala jobs has sometimes been frustrating but the panel feels it has now basically accomplished its go[illegible] of finding enough employment for laid off sugar wo[illegible]ers.

KOHALA NURSERY, the [illegible]rst project to receive Ta[illegible] Force funds, is now under construction, Erskin[illegible] noted. It now has 6 wo[illegible]ers, plans to hire 14 mo[illegible] by the end of the year, and its employment wil[illegible] reach 65 "when it is ful[illegible] operational."

The $1.5 million nursery project was funded with $1 mil[illegible]on from the Task For[illegible] (one-third from the county and two-thirds from the state), $350,000 from the Bank of Hawaii and Sm[illegible]ll Business Administration (SBA), and the remainder from the pri[illegible]ipals of the nursery.

A[illegible] experiment farm is also [illegible]r way and has two wo[illegible], with two more job[illegible] to be created by the end of the year. The farm eventually will be phased out.

K[illegible]waihae Feed Mill, now with 2 employes, will grow [illegible] 10 employes before 1974

The project is presently to be financed with $3

PROJECTS DUE BEFORE 1974

Orchids Pacifica, a second major nursery, will cost slightly over $1 million, with about $621,000 from the Task Force, $140,000 from the owners and $350,000 from a bank and the SBA. It will start with 20 employees and increase to 20, Erskine reported.

Hawaii Biogenics, the new livestock-feedlot operation, is expected to hire 35 employes as it goes into operation before the end of the year. It would employ 265 when fully operational, Erskine said.

million, Erskine said, one-third from the Task Force, one-third from a bank and one-third by the owners.

ERSKINE said these projects would ultimately provide a grand total of 487 jobs compared with 425 layoffs.

In addition, he said proposed state historic site development could serve as a "buffer" if layoffs preceded job openings. Historic site projects currently employ 6, and will ultimately have 25, but this could be expanded to 35 by the end of the year if the jobs are needed to keep people working, Erskine said.

His figures did not count jobs from proposed but less firm projects such as a medical research institute and resort complex, oil refinery and plastic factory.

He said so far the Task Force has spent under $200,000 in Kohala, but has committed roughly $2.5 million of its $4.7 million appropriation.

Kohala plan: cattle, catfish

KOHALA—Hawaii Biogenics Inc., a firm backed by a group of Iowa farmers, last week outlined in detail a proposed integrated agriculture and acquaculture operation for Kohala.

Included is an enclosed concrete feeding complex on a 101-acre site near Upolu Airport which spokesman Jack Caple called "an apartment house for cattle."

CAPLE said two-thirds of the complex capacity would be devoted to feeding cattle from Big Island and possibly Maui ranches, and the remainder for feeding bull calves from Holstein dairy cows for slaughter.

Raising dairy heifer replacements is also part of the proposal.

Caple said the operation should cut down Hawaii's beef imports, allow ranchers to increase their herds by sending them to the feedlot at lighter weight and give dairy ranchers a better price for their unwanted bull calves. The price break for dairymen could mean lower milk prices for consumer, Caple speculated.

In addition, feed grain and silage for the complex would be produced on land going out of sugar production. Caple said 2,000 acres would be required.

The State Land Board last week approved an auction of 1,053 acres of North Kohala state land sought by Hawaii Biogenics in North Kohala. The firm also plans to lease 1,000 acres from Kohala Corp.

THE FEEDLOT would include a small swine feeding operation, Caple said.

Caple said the feeding complex would provide its own water from wells, but would need Kohala Ditch water for irrigation of forage crops. Surplus heated water would "be used to run through" a catfish operation, Caple said, and then be refiltered to purity so it could be used for cattle again.

Hawaii Biogenics plans also call for a slaughterhouse and rendering facility, state agricultural director Fred Erskine pointed out. The development of the $7 million project would take place over a 10-year span.

The first phase is budgeted at $3 million.

The Senate
The Seventh Legislature
of the
State of Hawaii

HONOLULU, HAWAII

September 18, 1973

Mr. Jack Caple
Hawi, Hawaii 96719

Dear Mr. Caple:

Thank you for participating in the recent public meeting on the development of North Kohala.

Active and sincere involvement by people like you will make for a more responsive economic development of the North Kohala community.

Sincerely

John Ushijima, Chairman
Senate Interim Committee
on North Kohala

JU:dn