92462
PC-AAA-630

KITANGILA FARM PROJECT
FEASIBILITY STUDY

Prepared By:
John G. Carbonniere

July, 1984

New Systems Ltd
agricultural
Devel.

008660

NEW AG, INC.
8703 La Tijera Blvd., Suite 202
Los Angeles, California 90045
Telephone (213) 417-1649 - Telex 532188 CARNRES ELSD

TABLE OF CONTENTS

Section		Page
	SUMMARY	1
1.	INTRODUCTION	4
2.	ENVIRONMENTAL CONDITIONS	6
	2.2 Soils	6
3.	PROJECT CAPITAL COSTS AND FINANCING	12
	3.1 Land Investment	12
	3.2 Irrigation Equipment	12
	3.3 Agro Equipment and Vehicles	12
	3.4 Water Development	13
	3.5 Other Capital Costs	13
	3.6 Summary of Initial Capital Investment	14
	3.7 Project Financing	14
4.	CROP PRODUCTION	16
	4.1 Cropping Pattern	16
	4.2 French Beans (Phaseolus Vulgaris)	22
	4.3 Asparagus (White) Asparagus officinalis	22
	4.4 Asparagus (Green) Asparagus officinalis	22
	4.5 Charentais Melon (Cucumis melo)	23
	4.6 Strawberries (Rosaceae Fragaria Spp.)	23
	4.7 Avocados (Persea americana)	24
5.	NURSERY	25
	5.1 Management and Organization	26
	5.2 Description of Production Facilities	26
	5.3 Capital Cost Estimates	27
	5.4 Supply of Raw Materials	27
	5.5 The Production Process	27
	5.6 Products	28
	5.7 The Market: Present	28
	5.8 Marketing	33
	5.9 The Market: Future	33
	5.10 Impact Analysis of the Nursery Project	33

6. MANAGEMENT AND LABOR..... 35

6.1 Management..... 35
6.2 Labor..... 35

7. MARKETING..... 37

7.1 The Export Market..... 37
7.2 Middle East Market..... 40

8. FINANCIAL PROSPECTS OF THE PROJECT..... 41

8.1 Income Statements..... 41
8.2 Liquidity..... 42
8.3 Balance Sheets..... 42
8.4 Financial Rate of Return..... 42

9. INVESTMENT EVALUATION..... 43

9.1 Foreign Exchange Earnings..... 43
9.2 Financial Analysis..... 43
9.3 Crop Production and Marketing..... 43
9.4 Employment..... 43
9.5 Infrastructure..... 44
9.6 Sensitivity Analysis..... 44
9.7 Conclusion..... 44

Appendix

1. CAPITAL INVESTMENTS AND FINANCIAL ANALYSIS... 45
2. CROP PRODUCTION, INPUT-OUTPUT DATA, AND RELATIVE CROP PROFITABILITY..... 65A
3. MARKET RESEARCH PRICES ON CROP COMMODITIES... 81
4. WATER REQUIREMENTS DAM DATA AND SPECIFICATIONS..... 101
5. SOIL SAMPLE ANALYSIS..... 108

SUMMARY

1.1 Kitangila Limited is a locally incorporated company that wishes to develop a 627 hectare (1549 acre) farm (405 ha or 1000 acres of arable land) at Athi River through intensive agricultural irrigation systems. The project would produce horticultural and floricultural crops, 80% of which would be exported to West European markets and the balance would be sold locally, mainly to tourist hotels on contractual basis.

1.2 The proposed site for Kitangila Farms is situated some 30 km from Nairobi. It has an annual rainfall of about 600 mm (23.6 in.) with two peaks in April and November. Consequently the growing of crops can only be made possible through irrigation. It is proposed that a dam with a capacity of 2.5 million cubic meters of water be constructed along the tributary of the Athi River on the property of the proposed site for the purpose of storing water for irrigation. The project sponsors have already been granted a permit to utilize the river waters by the Ministry of Water Development. The permit was granted by the authorities as long as the dam is built. This dam, in addition to storing water, will also aid to the control of flooding of Kitangila land.

1.3 From a field survey carried out on the farm, the soils have been found to be well developed from alluvia of various rocks. The soils are moderately drained, very deep, friable to firm and silty clays to clay. The organic content was found to be moderate and well supplied with bases, while the topography is mainly flat. All these factors indicate that the farm is well suited for irrigation.

1.4 The project will produce 6 cash crops and 7 floricultural crops, the choice of which and levels of production have been based on their suitability of production under irrigation and their relative marketability and profitability. The annual cropping pattern would be divided into two seasons, according to the dictates of the export market requirements: the October - April season for the European export crops and the May - September season for the Middle East market crops. The export season is designed to coincide with the northern hemisphere winter months, a time when the European market has to depend on imports of horticultural and floricultural products. Most of the export crops would release land after harvesting, which can be planted to crops for the Middle East market. The export crops both to Europe and the Middle East would include French Beans, Asparagus (white), Asparagus (green), Charentais Melon, Strawberries and Avocados. It is also proposed that the farm will have an ornamental growth nursery for breeding ornamental plants

and cut flowers under an aeroponic growth system, mainly for export to the European market. New Ag, Inc., an American firm that is consulting for Kitangila Limited, is well versed in the application of the system to agricultural production.

1.5 The project is estimated to cost K Shs 115,479,593.00 or 10,945,933.00 U.S. dollars of which K Shs 21.1 million is the cost of the land. The sponsors of the farm have already paid K Shs 21.1 million towards the farm purchase. It is estimated that the land purchased for the farm at a cost of 21.1 million K Sh has now appreciated in value to 50 million. The final land loan is a long term loan with a pay back of twenty years. The balance of the project cost is estimated to be K Shs 94,379,593.00 or 8,945,933.00 U.S. dollars. This includes all irrigation equipment plus installation of that equipment, import duty payments, cost of agro-equipment, construction of dams and fences, staff houses, vehicles, land clearing and working capital. This feasibility study supports Kitangila Limited's application for a term loan amounting to K Shs 94,379,593.00 or 8,945,933.00 U.S. dollars. It is proposed that the loan(s) would be repaid over 10 years, including a two year grace period initially on the principal and bearing an interest rate of 14% per annum.

1.6 The project company, Kitangila Limited, has entered into a Management Agreement with the American Company New Ag, Inc., to provide management of the farm and marketing of all farm production both locally and for export to the European and Middle East markets. The management company would provide the necessary technical personnel, i.e: Farm manager, irrigation engineer and agronomist. Some or all of the expatriates would train local workers to eventually replace themselves. The management company has a wealth of knowledge and experience in management, production technology and international marketing of horticultural and floricultural crops. In marketing the company has outlets in the United Kingdom, France, Belgium, Germany, Switzerland and the Scandinavian countries. At present there is a great shortage of those crops selected in the European outlets, particularly since the production season in Kenya is the off season in Europe. The required skilled and semi-skilled labor will be readily available locally.

1.7 The entire farm production will be exported. Most of the crops will be shipped via air freight to the European and Middle East markets. However, some of the crops may be sent by sea if found to be feasible. Because New Ag, Inc. is linked with Kitangila Limited, this will assure the success of marketing horticultural crops in Europe.

1.8 The forecast financial prospects for the project are satisfactory. Annual sales are expected to average about K Shs 126.3 million per annum with profits after tax averaging over K Shs 44.0 million yearly. The economic financial rate of return for the project over a 10 year period at constant prices is calculated at 51.21 percent. The forecast cash flow position over the same period shows a surplus of funds. Economically, the project's foreign exchange earnings potential stands at over K Shs 105 million annually. The farm would employ 762 people which would be another economic advantage to the economy. The introduction of the aeroponic growth system in producing ornamental plants and flowers in Kenya would augur well for the country's technological progress.

1.9 The project company would offer as security for the loan the entire farm and all the immovable assets thereon. These would be shared on a pari-passu basis with all the term lenders.

1.10 In conclusion, the project is found to be technically well conceived, has sound financial prospects and is economically viable. It should easily attract reputable financial institutions searching for bankable investment opportunities.

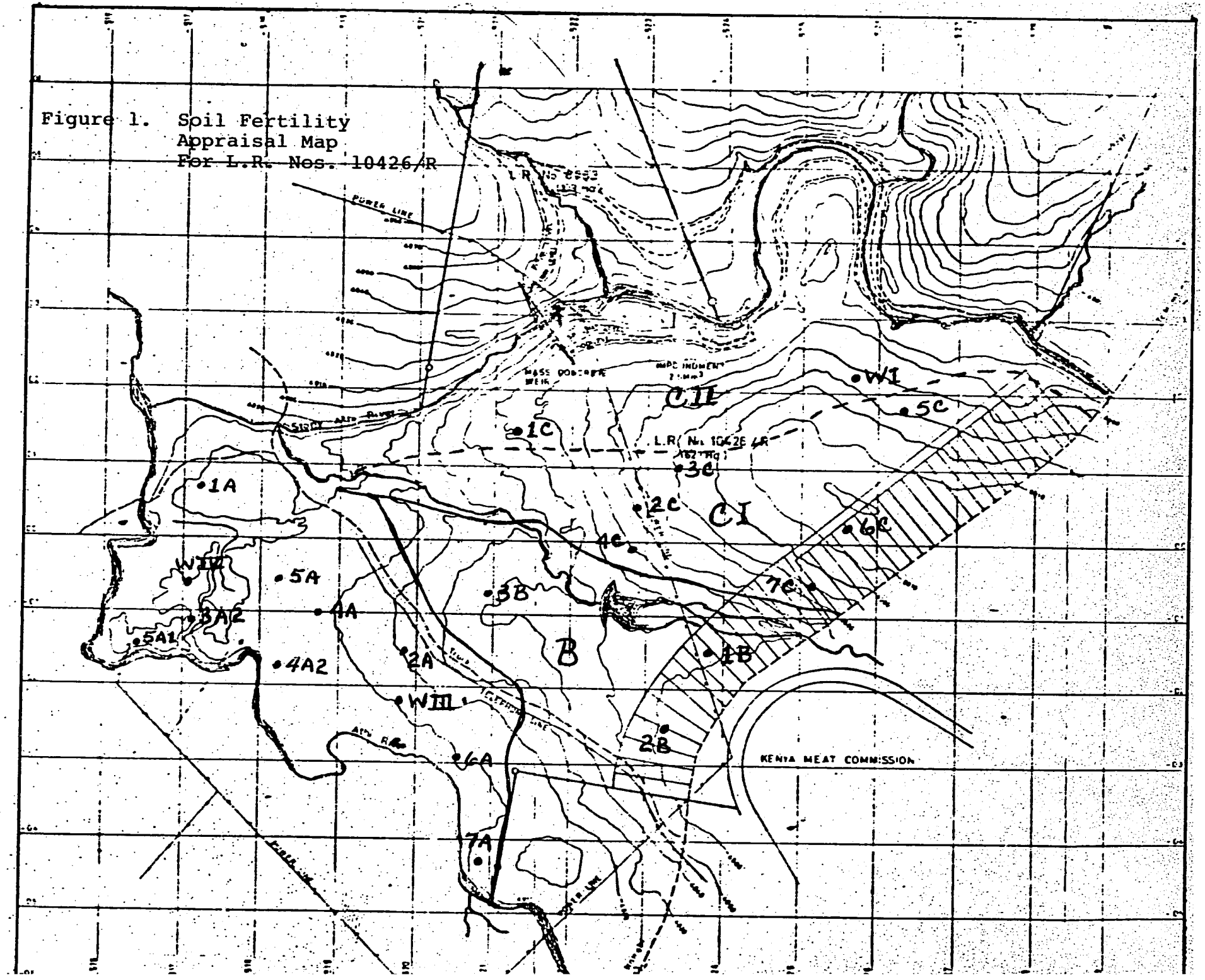
1.11 The project is very good for Kenya and any foreign lenders because the entire revenue received from sales is in foreign exchange. Since the project creates its own foreign exchange payments to foreign lenders will be no problem.

1. INTRODUCTION

The proposal by Kitangila Limited is to develop an intensive farming system on its 627 hectare farm at Athi River. The project would involve producing a variety of horticultural and floricultural crops under irrigation mainly for export to the European market to fill the winter gap requirements. Kitangila Farm, LR No. 1042/R, is located some 30 kilometers from the city of Nairobi, along the Nairobi-Mombasa Road, and directly opposite and North of the Kenya Meat Commission (Fig. 1).

The project company has been incorporated locally for the purpose of owning and developing the farm. The total project cost including the cost of the farm is estimated at K Shs 115,479,593 for which the sponsors are shopping for a term loan of K Shs 94.4 million. The balance has been contributed by the Company. The loan is expected to be repaid over 10 years which includes a moratorium period of two years and would bear an interest rate of 14 percent per annum. The project Company is collaborating with a foreign company New Ag, Inc. that would provide the technical knowhow in the production of the crops under intensive irrigation and will also be responsible for marketing the products overseas, where it has established strong market contacts.

Figure 1. Soil Fertility Appraisal Map For L.R. Nos. 10426/R



2. ENVIRONMENTAL CONDITIONS

2.1 CLIMATE

The farm falls in the medium potential agro-ecological zone in Machakos District. It has an altitude of about 1500 meters (4920 feet). The climate is characterized by three main seasons: the long rains, short rains and dry season.

The average annual rainfall is about 600 mm (23.6 in.) with two maxima in April and November. The long rains season is mid-March-May; the short rains season is mid-October-mid-December. The dry season occurs from June to mid-October and also from mid-December to mid-March.

The seasonal distribution of the average annual rainfall is about 315 mm (12.4 in.) during the long rains season and 169 mm during the short rains season. There are light showers in January-February and June-September months of about 65 mm (2.56 in.) and 24 mm (.94 in.) respectively (Table 1). There is a considerable variation of both monthly and annual rainfall.

The annual mean maximum and minimum temperature is about 24.9 degrees C (76.8 degrees F) and 13.3 degrees C (55.9 degrees F) respectively. The coolest months are July and August, with a mean temperature of about 11.6 degrees C (52.9 degrees F). The hottest Months are February and March with a mean temperature of about 27.7 degrees C (81.9 degrees F).

From Table 1, it is seen that the average annual potential evaporation (EO) is in the order of 1882 mm (74.1 in.). (EO figures were estimated with Woodhead's (1968) equation $EO = 2422 - 0.358h$ where, EO is potential evaporation of open water in mm and h is altitude in metres). The above table shows that except in April, the evaporation demand for most of the year exceeds the mean monthly rainfall. The implication is that most and especially horticultural crops cannot be grown successfully under the natural rainfall conditions. Supplementary irrigation is necessary in the greater part of the year, including the short rains October-December period. The irrigation method, the type of crop grown and the moisture content of the soil will determine the amount of water to be applied at any one given time.

2.2 SOILS

2.2.1 Soil Sampling

A field investigation was carried out on the site (farm). Three soil units, Unit A, B and C were identified (Figure 1). Unit C was sub-divided into two parts: CI and

Table 1. Climate Data of Athi River Station (all values in mm, over 59-year period)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
Mean Monthly Rainfall	28	37	90	153	72	23	6	8	10	35	85	49	596
Eo	207	188	188	151	132	113	94	113	169	188	151	188	1882
Et	138	125	125	101	88	75	63	75	113	125	101	125	1254

Eo = Potential Evaporation

Et = Potential Evaporation $Et = \frac{2}{3} Eo$

CII.

The distribution of observation points was based upon the three units. A total of 20 profile pits were dug and sampled for physical and chemical analysis. The profiles were dug at full depth (up to 100 cm), but sampling was concentrated in the upper 40 cm, i.e., 0-20 cm and 20-40 cm for most of the samples.

2.2.2 Geology, Geomorphology and Present Land Use

The farm area is covered by Tertiary volcanics in Units B and C. The main rocks are phonolite lava and tuff. Unit A, which lies along the Athi River, is mainly Alluvium deposites derived from various rocks.

The farm falls within the Athi plains in broader terms; and the topography is flat to gently undulating (slopes 0-4%).

Currently the great portion of this farm is used for grazing purposes, mainly in Units B and C. There is an experimental field in Unit A used by the Kenya Seed Company to grow a variety of crop seeds under sprinkler irrigation. There are also fallow fields in this unit which were previously cultivated. Most of the farm is covered by thorny bushes and isolated acacia trees especially along the Athi River.

2.2.3 Description of the Soils

As mentioned earlier, three soil units were identified on the farm. These units are basically situated in the Alluvial plain along the Athi River (Unit A) and on the Athi plains (Unit B and C). The following soil profile characteristics which affect the management and use of land were taken into account while separating the various units: soil depth, soil drainage and surface stoniness.

2.2.3.1 Soils of the Alluvial Plain (Unit A)

The soils are developed from alluvia derived from various rocks. These soils are moderately well drained to imperfectly drained, very deep (over 100 cm), dark brown to very dark grey, friable to firm, silty clay to clay soils.

These soils are well developed and crack upon drying. The structure is weak to moderately angular blocky for both topsoil and subsoil. The consistence is friable to firm when moist and sticky and plastic when wet.

The soils are slightly calcareus to

non-calcareus. In some cases Calcium Carbonate concentrations started to appear at 70 cm depth onwards. The concentration being mainly on the profiles which were closest to the Nairobi-Mombasa Road in this particular unit. In some parts of this unit, the soil reaction is moderately alkaline (pH 7.7 to 8.0) in the topsoil and (pH 8.2-8.5) in the subsoil. In these particular sections the available sodium (Na me%) is rather on the higher side in the subsoil (20-40 cm) in the range of 9.5 to 22. The electrical conductivity (EC mmhos/cm) is above 1, in the range of 1.2-2.2. The foregoing figures suggest some slight alkalinity and salinity in parts of Unit A. The organic matter content is moderate (%C = 1.3) but the nitrogen content is rather low (%N = 0.12). The soils are well supplied with bases calcium, magnesium, sodium and potassium. Phosphorus is adequately supplied in this unit. The topography is mainly flat (slopes 0-1%).

2.2.3.2 Soils of the Athi Plain (Units B and C)

All these soils are developed on phonolite and tuffs.

UNIT B

These soils are moderately well drained, moderately deep, friable clay to sandy clay. In most places unconsolidated quartz gravels start at 40 cm depth.

The soil reaction is moderately alkaline (pH 8.0-8.3) topsoil and (pH 7.9-8.3) subsoil. The available sodium (Na me%) is rather on the higher side for both topsoil and subsoil (0-40 cm) in the range of (8.0-13.0).

The organic matter content is moderate (%C 1.2) but the nitrogen content is low (%N = 0.1). Phosphorus is rather on the border line case at 3.0 ppm. The bases are in adequate supply (i.e., calcium, magnesium, sodium and potassium). The topography is flat to very gently undulating slopes 1-2%). Some few stones appear on the surface in this unit.

UNIT C

This unit consists of well drained, shallow to moderately deep, boulderly and exceedingly stony soils.

The bulk of the unit is covered by boulders and stones (see Unit C II on the map). It runs along the Stony Athi River, all along its boundary with the farm. In some places unconsolidated quartz gravels start at 30 cm from the surface.

The soil reaction is neutral (pH 6.9-7.3) in the

topsoil to mildly alkaline in the subsoil (pH 7.4-7.6). The organic matter content is moderate (%C 1.0-1.6) but the nitrogen content is rather low (%N = 0.1). Phosphorus is rather low 2.5 ppm. The soils are well supplied with bases calcium, magnesium, sodium and potassium. The topography is gently undulating (slopes 2-4%).

2.2.4 Soil Fertility Status

Few chemical and physical data obtained from two levels of profile pits form the basis of the discussion in the soil fertility status. Levels of sampling from the pits were 0-20 cm and 20-40 cm for most of the samples. In a few cases samples were taken from 0-15 cm and 15-30 cm. Profile pit positions are marked on the accompanying sketch of the farm.

Analytical data are reported in Appendix 4. Except in a few cases (particularly in lower levels, 20-40 cm where %C is below 1%) organic matter content is considered moderate. There is no distinct variation among the units. Nitrogen is generally very low and so is phosphate. Reasonable yields for horticultural crops would require appropriate additions of nitrogenous and phosphate fertilizers. Exchangeable bases calcium, magnesium and potash (see earlier sections for Na,) are sufficiently available, with all units showing rich supply of calcium. The amounts of calcium and magnesium in lower sampling levels of pit number 38 are rather high. This is thought to be a localized case as no such trend is observable anywhere else in the units.

It is observed from the analytical data that in a few cases there appears to be a notable difference between nutrient values obtained from samples of upper levels (0 - 20 cm) and those of lower levels (20 - 40 cm). The significance of this will depend on the type of crops to be grown. But again the trend is not restricted to any one unit.

Generally, from the data analysis, most nutrients are adequately available. However, to optimize on production of crops such as beans (e.g., French Beans), potatoes and some vegetables, addition of nitrogen and phosphate fertilizers will be necessary at the time of planting. For tree crops such as avocados, besides the fertilizers mentioned addition of composite or farmyear manures would be useful at the time of planting. Topdressing at a later stage with ASN is recommended.

The soils of Unit CII are very shallow, bouldery and exceedingly stony and are therefore considered suitable for tree crops only, such as avocado. This area constitutes about one-third (or 209 ha) of the total farm area. The

soils of Units B and CI, constituting about a half (or 314 ha) of the farm size, are suitable for shallow rooted crops (such as vegetables) irrigated agriculture. Lastly, the soils of Unit A, about 104.13 ha, are suitable for the irrigation of both shallow rooted and deep rooted (e.g., citrus) crops, with proper drainage system. Thus, out of a total farm area of 627.13 ha, 418.13 ha are arable under drip irrigation with tree crops only.

3. PROJECT CAPITAL COSTS AND FINANCING

As stated earlier, the project will involve an intensive production of six types of horticulturad and seven floricultural crops on 405 hectares (out of a total of 627) under drip irrigation. Most of the horticultural products produced have to be transported to Europe and the Middle East as fast and conveniently as possible for sale. The project as conceived therefore calls for heavy capital investment especially in land, irrigation systems, equipment and water development.

3.1 LAND INVESTMENT

The project company contributed K Shs 21.1 million, the price at which the farm was purchased. The purchase price works to about K Shs 33,652/- per hectare which is reasonable for Athi River considering its proximity to Nairobi. About one quarter of the farm has been developed by the previous owner and has some houses and irrigation installations which would be replaced. Since the land was purchased in March of 1982 it has appreciated to 50 million K Shs. The reason for this very high appreciated value is because of its location.

3.2 IRRIGATION EQUIPMENT

All the requisite irrigation equipment is listed in Appendix 1, Table 5. These can be conveniently divided into equipment for field crops, drip irrigation and equipment for the farm. These include such items like polyvinyl pipes of various dimensions, fillings and regulators, drip lines and spare parts. Another category of irrigation components would include all pumping units from the dams to various plots on the farm. Together with these, would go the main PVC line pipes. The total cost for all the equipments including installations, freights and forwarding amounts to about U.S. $1,976,750 which at the current exchange rate of 1 U.S. $ = 10.55 (mid-June 1982) works to about K Shs 20.85 million. Import duty on the various categories of irrigation equipment in Kenya is very low and in some cases non-existent. However, the costs of the equipment have been inflated by 10% to take care of any duties, sales tax and other likely contingencies. The provision for these items amounts to K Shs 2.05 million. The project would import these items directly.

3.3 AGRO EQUIPMENT AND VEHICLES

Several items of agro equipment would be required on the farm. These would include 1 D8L Caterpillar tractor,

2 tractors of 65 H.P. each, one bigger tractor (100 H.P.) a disc plow with 14 plates, a cultivator, planter, sprayer, chivel plow, spreader, plastic film layer and several other minor machines. These are estimated to cost a total of K Shs 6,217,031 including import duties and taxes at 10% on C&F value. The project would also require transport facilities, especially for the export products from the farm to Jomo Kenyatta International Airport. A refrigerated trailer as well as a truck tractor has therefore been icluded in the capital items required. A refrigerated trailer is required in order to keep all export crops under refrigeration at all times to insure freshness. There will also be need of a lorry for the transport of inputs i.e., fertilizers, chemicals and the laborers to and from the farm.

3.4 WATER DEVELOPMENT

It is estimated (see details on water requirements in Appendix 3) that the farm would require about 5 million gallons (22,727 m) of water per day to irrigate 1000 acres (405 ha). A dam will be constructed in the farm to supply the water requirement. An appropriate site on the farm has been identified for the construction of such a dam. The dam would draw water from the Athi River via a canal during the rainy season. The project sponsors through enquiries from prospective dam constructors (registered with the Ministry of Water Development) estimate that the dam and necessary water diversions would cost about K Shs 3.0 million.

3.5 OTHER CAPITAL COSTS

It is necessary that most of the technical personnel, especially those in charge of the irrigation systems stay on the farm. Consequently the project would construct some staff houses for the technical personnel and also for some permanent unskilled laborers. It is also planned that a fence be built all around the farm and on both sides of the road that transverses it. To accomplish this the cost is expected to be about K Shs 3.0 million. This is also intended to cover land clearing, ploughing and other pre-operating expenses has been budgeted. An amount of K Shs 500,000 has been included to cover clearing and forwarding costs for all the equipment from Mombasa to the project site. The cost of establishing a nursery for growing ornamental plants and cut flowers under an aeroponic growth system has been estimated separately at an equivalent of K Shs 4.73 million.

3.6 SUMMARY OF INITIAL CAPITAL INVESTMENT

The initial capital investments for the project are summarized in Table 5E and 5D in Appendix 1.

3.7 PROJECT FINANCING

It is proposed that the project would be financed with an owner's equity of K Sh 20 million and a long term loan of K Sh 94,379,593. This includes a working capital totaling K Sh 14,593,984. The detailed financing plan is expected to be as follows.

EQUITY:

	(K Sh 000)	Percentage
Kitangila Limited		
Genevieve Limited	14,800	74
Mr. Francis Mburu	200	1
Mr. John Williams	200	1
Mrs. Wairimu Mungai	200	1
Mr. Mungai Njuguna	200	1
Mrs. Janet Williams	200	1
Mr. David Haris	200	1
New Ag, Inc.	4,000	20
	20,000	100

LOANS:

	(Dollars)	(K Shs)
U.S. Aid		
Bureau of Private Enterprise	3,000,000	31,650,000
U.S. Bank	4,762,167	50,240,862
Continental Credit Finance Corporation	1,183,766	12,488,731
	8,945,933	94,379,593

It is expected that the U.S. Bank will make the entire loan of the capital required. Export-Import Bank will guarantee 85% of the cost of the equipment being shipped from the United States. However, the money will be furnished by Bank of America in Los Angeles, California. This loan will be furnished at an interest rate of 14% for a period of 10 years.

It is also expected that U.S. AID through it's Bureau of Private Enterprise, will lend up to $3,000,000.00 U.S. dollars to the project. However they have to approve

the project. New Ag will submit the data and work with the bureau for approval.

In regard to the equity contribution Genevieve Ltd., the largest shareholder is owned equally by Mr. Francis Mburu and Mr. John Williams. Mr. Mburu is the Managing Director of Kitangila Ltd. and Community Irrigation Systems, Ltd. He also has several other companies which are involved in real property development and hotels. Mr. John Williams is a Chartered Accountant by profession and a business partner with Mr. Mburu. The other shareholders are related to the two principals in one way or another. Sponsors are willing to increase their capital contributions in case of capital cost overruns.

New Ag, Inc., the managers and implementers of the project, will also be 20% equity holders. This will insure that the management will be sincere and successful.

4. CROP PRODUCTION

Ten crops have been selected for inclusion into a ten year cropping farm plan. These are French Beans, Asparagus (White), Asparagus (Green), Melons, Strawberries, Avocados. The choice of these crops and their levels of production were based upon the preferences of the owners and management, their suitability for production under irrigation, and their relative profitability and marketability. The relative profitabiity of these crops in terms of their gross margins (profit) is calculated and reported in Appendix 2, Tables 14-22. For each crop, details about yields, inputs, input-output prices, etc. are given in these tables.

The major assumptions underlying these calculations were:

(1) The farm will be run by well qualified management. Optimal input levels including irrigation water will be applied to achieve at least the estimated yields.

(2) There will be access to export markets, secured by New Ag, Inc., the agency that will provide the management expertise to run the farm (see Section 5). Nonetheless, it was recognized that the export market is risky and therefore the yields and the product prices used are lower than those which would be realized in practice.

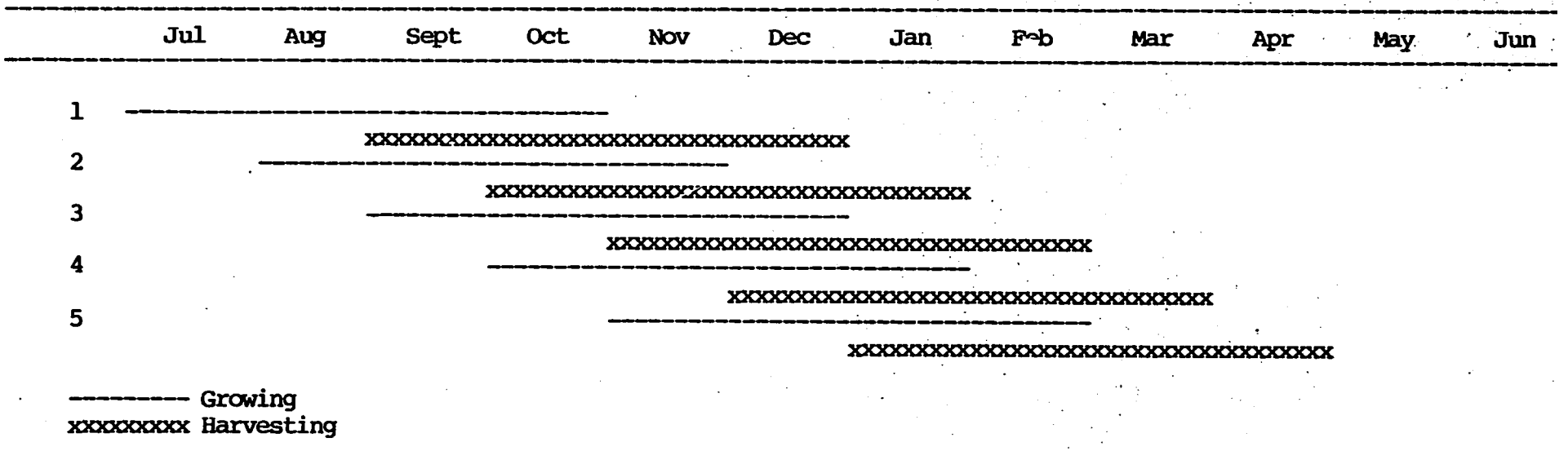
(3) The inflationary trend will affect both input costs and product prices equally. Accordingly constant (1981) prices are used over the ten-year planning horizon.

4.1 CROPPING PATTERN

The annual cropping pattern (Figure 2), can be broadly divided into two seasons according to the dictates of the export market requirements: October-April season for the export crops, and May-September season for the Middle East market. The vegetative state of the perennial crops - Strawberries, Asparagus and Avocados occupies both seasons.

The export season is designed to coincide with the Northern Hemisphere winter months, when the European market has to depend upon imports of horticultural products. Most of the export crops release land as they are harvested which can be planted to local market crops starting in December. The planting of the local market

Fig. 2A. Growing & Harvesting Schedule - French Beans



Production Schedule - French Beans

Month	Hectares	Tonnes Monthly	Tonnes Weekly	Tonnes Daily
Sept	10	74	18	2.5
Oct	20	148	35	4.9
Nov	30	222	52	7.4
Dec	40	296	69	9.9
Jan	40	296	69	9.9
Feb	30	222	52	7.4
Mar	20	148	35	4.9
Apr	10	74	18	2.5

Fig. 2B. Growing & Harvesting Schedule - Asparagus (white) 70 Hectares and (green) 70 Hectares

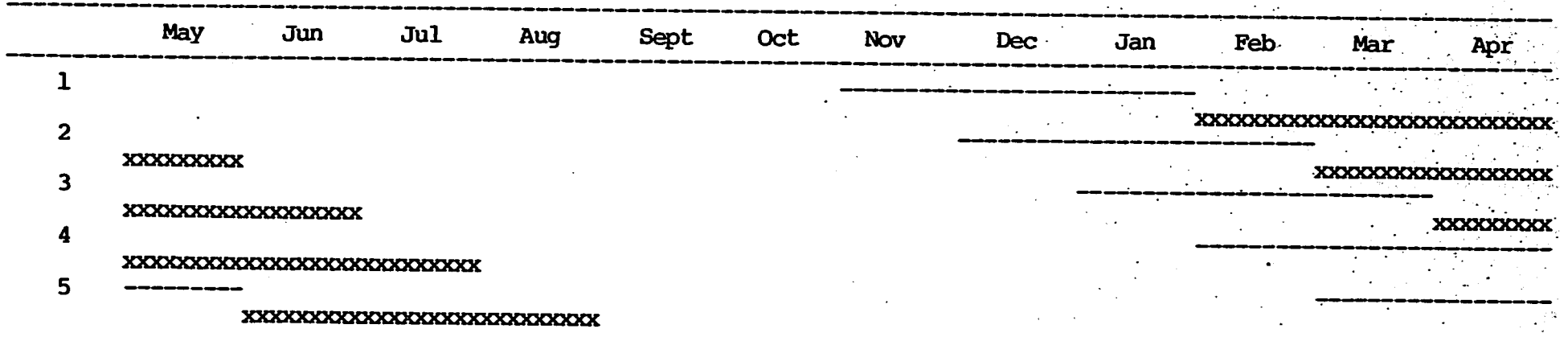
Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
					xxxxxxxxx			xxxxxxxxxxxxxxxxxxxxxxxxxxx			

--------- Growing
xxxxxxxxx Harvesting

Production Schedule - Asparagus (white & green)

Month	Hectares	Tonnes Monthly	Tonnes Weekly	Tonnes Daily
Asparagus White				
Dec	17.5	152	34.3	4.9
Mar	17.5	152	34.3	4.9
Apr	17.5	152	34.3	4.9
May	17.5	152	34.3	4.9
Asparagus Green				
Dec	17.5	172	39	5.55
Mar	17.5	172	39	5.55
Apr	17.5	172	39	5.55
May	17.5	172	39	5.55

Fig. 2C. Growing & Harvesting Schedule - Melon (Charentais) 150 Hectares

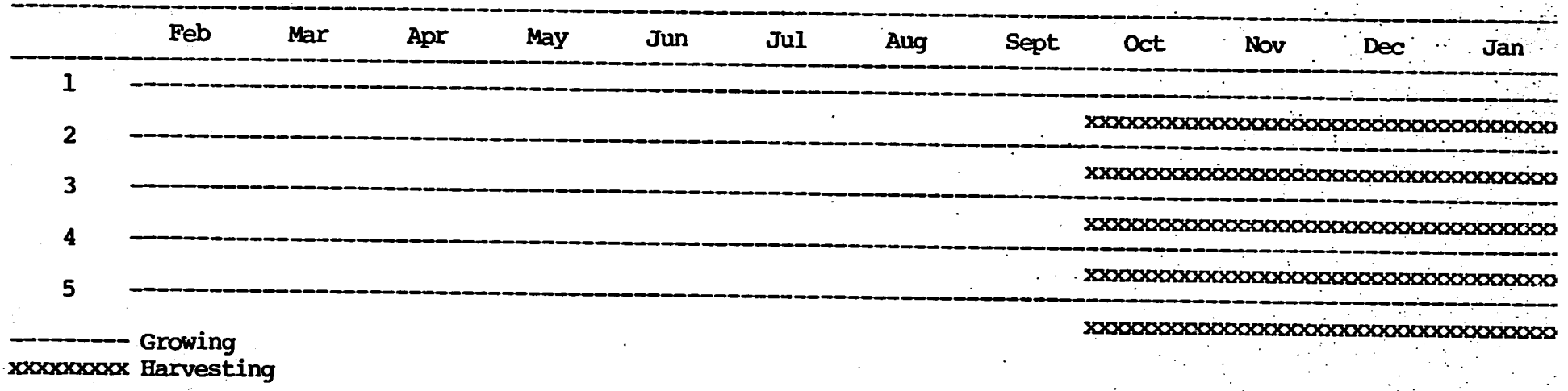


--------- Growing
xxxxxxxxx Harvesting

Production Schedule - Melon (Charentias)

Month	Hectares	Tonnes Monthly	Tonnes Weekly	Tonnes Daily
Feb	30	435	108.5	15.5
Mar	60	870	217.0	31.0
Apr	90	1305	326.0	46.6
May	90	1305	326.0	46.6
Jun	60	870	217.0	31.0
Jul	30	435	108.5	15.5

Fig. 2D. Growing & Harvesting Schedule - Strawberries 60 Hectares



Production Schedule - Strawberries

Month	Hectares	Tonnes Monthly	Tonnes Weekly	Tonnes Daily
Oct	15	840	189.7	27.1
Nov	15	840	189.7	27.1
Dec	15	840	189.7	27.1
Jan	15	840	189.7	27.1
	60	3360	750.8	108.4

Fig. 2E. Avocado - Production - 25 Hectares
1985 Harvest - 28.1 Tonnes

Production	Monthly	Weekly	Daily
Dec	14.5	3.27	.47
Jan	14.5	3.27	.47

1986 Harvest - 140 Tonnes

Production	Monthly	Weekly	Daily
Dec	70.00	15.8	2.25
Jan	70.00	15.8	2.25

1987 Harvest - 280 Tonnes

Production	Monthly	Weekly	Daily
Dec	140	31.6	4.52
Jan	140	31.6	4.52

crops early in the year means that their harvest can get to the market ahead of the rain-fed harvest from the rest of the country to enjoy the relatively high pre-season commodity prices.

4.2 FRENCH BEANS (Phaseolus Vulgaris)

French Beans will be grown mainly for export. The ideal variety for export is Monel, although other varieties such as Primeur, Long Tom Saxa and Masterpiece are also suitable.

The peak export months are December to end of March. Planting should start in October for the December exports and end in January for the March exports. Thus, there should be staggered planting of several fields between October and January to spread the harvest over the export months.

Picking starts about nine weeks after sowing and continues for about two months. Beans should be harvested green. After the pods are picked, they should be sent to the grading shed immediately to avoid shrivelling. The produce for export should arrive at the airport within 12 hours of harvest and should conform with export regulations.

Fifty hectares of French Beans are included in the farm plan per year. At a gross margin of K Shs 40,489 per hectare, K Shs 2.139 million per year, or a total of K Shs 21.39 million gross profit over the ten year period.

4.3 ASPARAGUS (White) Asparagus officinalis

Asparagus (white) is preferred by the French people. It is a vegetable with a high export market potential in Europe. This vegetable is regarded as the ultimate in vegetables.

Because of their high yield, 8645 kg per hectare the profit potential is enormous. It is projected that each hectare will produce a gross margin of K Sh 68,145. Since the farm plan calls for 70 hectares of Asparagus (White) the gross profit for the 10 years will be approximately K Sh 48.880 million.

The harvest season is during December and January which is the off season in Europe.

4.4 ASPARAGUS (Green) Asparagus officinalis

Asparagus (Green) is preferred by the British

people and part of Europe. This type of asparagus is similar to the white but has a higher yield, 9880 kg per hectare.

This vegetable is a perennial plant that is harvested in December and January. The farm plan calls for a planting of 70 hectares.

Because of its good yield, asparagus can produce a gross margin per hectare of K Sh 67,267 and a 10 year gross profit of approximately K Sh 48.68 million.

The export price of Asparagus used in this study is the lowest price experienced during the last five years.

4.5 CHARENTAIS MELON (Cucumis melo)

Charentais Melon is an annual plant with short stem and tendrils; leaves are hairy, and male and female flowers grow on the same plant. It bears large fruits, which are eaten raw as a snack or dessert. The main varieties for which there is a good European market is the Charentais.

It takes about 10-14 weeks from sowing to maturity. The fruits turn yellow and soften when ripe. They should be harvested before fully mature and ripened at room temperature.

The export season is from mid-November to end of April. Planting or sowing should therefore be started in August and continued until January.

Melons will take the lion's share of the hectareage as its export potential by New Ag, Inc. is particularly good. During the first two years of farm development, 130 hectares of the crop are planned. A total gross profit of K Shs 157.530 million is expected to be generated over the ten year plan period. This will make melons the most important crop on the farm.

4.6 STRAWBERRIES (Rosaceae Fragaria Spp.)

Strawberries are perennial, low-growing fruiting plants. They bear reddish fruits which are eaten as dessert or made into jam, and in Europe, may be frozen for later use.

There are a number of varieties of the crop. The common varieties include the Cambridge and Tenira. Both of these varieties are mid-season, heavy croppers and disease resistant. A new area should be planted every 2 or 3 years with disease free plants.

The peak export months are October to end of January. Thus, plants should be grown such that harvesting of the crop occurs during these months. As a field can be harvested for two months, at least two fields should be planted to ensure harvest during the 4 peak export months. Care must be exercised during picking since the berries bruise easily. Only good quality, clean fruits should be packed and should be sold immediately to avoid quality deterioration.

Sixty hectares of land should be under strawberries each year yielding a gross profit of K Shs 51.496 million per year or a total gross profit of K Shs 514.960 million for the 10 year period.

4.7 AVOCADOS (Persea americana)

Avocados will be grown for the export market in Europe. In Europe Avocados command very high prices. It is a fruit that is used in salads, appetizers and as additions to sandwiches. The Europeans have developed a good liking for this and are willing to pay good prices for it.

The fruit is harvested in early spring thru late fall, depending on the variety. The trees belong to the laurel family.

Avocado trees will not bear fruit until the third year. However, at this time the yield will be low. A high yield will not start until the fifth and sixth year.

The varieties most liked in Europe are the Fuertes and the Haas. Both varieties will be grown on the farm. The farm plan calls for 22.5 hectares of avocados.

The gross margin expected from avocados is K Sh 84,072 per hectare per year in the first 10 years. From all 22.5 hectares the gross profit will be K Sh 11.717 million for the first 10 years.

5. NURSERY

A Nursery Aeroponic Growth System provides for the growth and development of detached plant material under highly controlled conditions. Basically, it is an air/water culture in which the nutrients are supplied in a water mist directly to a bare root system. Thus, oxygen and water, so often the limiting growth factor in conventional soil and other media systems, are adequately supplied. The system is composed of modular units controlled electronically, so as to ensure the pre-determined needs of a particular growing plant species. The performance of the system has been tested and applied successfully in Israel, U.S.A. and Mexico, with growing and rooting several varieties of plants such as: Vegetables (tomatoes, pepper, cucumber, lettuce, etc.), ornamental plants (carnation, croton, chrysanthemum, geranium, euonymus, ficus, philodendron, dracaena, diffenbachia, etc.) and citrus trees - woody or other cuttings (olive, avocado, grape, apple, pear, peach, etc.).

From an agricultural point of view, the system produces higher yields than the conventional growing methods. It is also quite economical in the use of fertilizers and water because of the re-use of recycled nutrient solution. This allows the operation of the system in regions where water quality is poor and/or supply scarce. Installations may be operated on a continuous basis (with the exception of down time for cleaning or changing plants) without regarding seasonal type of crop, order of cropping, etc. Furthermore, the system permits space saving because of the high plant population density which can be carried at one time and for very short (3-4 weeks) time intervals.

New Ag, Inc., an agricultural company will establish a Nursery Aeroponic Growth System in Kenya as part of the farm system of Kitangila Limited. The company plans to set up an ornamental growth unit at Athi River, property of Kitangila Limited, at a total cost of K Shs. 16,522,618 (or U.S.A. $1,566,125) in capital investment in facilities (mainly greenhouses, nursery, shadehouses, irrigation systems, aeroculture growth system and motherplants), and operating expenses (mainly management, technical expertise, layout, nutrients and potting material).

New Ag, Inc. through its associates has been running an experimental aeroponic growth system for agricultural production the last three years.

5.1 MANAGEMENT AND ORGANIZATION

Although the aeroponic growth system enables maximum control on plant and root system, a thorough understanding of several parameters is required in order to adopt it successfully to various plant species. Selection of suitable species, planting distances, suitability of nutrient solutions, misting intervals, specific treatments etc., have to be monitored carefully at all times in order to produce high quality product for the competitive European market. Optimal combination of the conditions can be achieved only if other factors are accomplished as well. It is important to note that the aeroponic growth unit serves mainly as a growth medium but does not act as a substitute for required environmental conditions outdoors such as light, temperature, humidity, wind, diseases and pests. The inter-relationships between the units, the plants and the environmental conditions play a major role in the development process of the plant. For many plant species special knowledge is required in the selection of size, rate of woodening, pruning stage, storage survival, etc. Thus a successful operation of the system requires a high level of managerial skill, coupled with extensive knowledge and experience in plant growth and propagation. Such managerial capability is not as yet available locally. Accordingly, a foreign expert will be recruited to provide the requisite managerial input for the unit and will be assisted by a Kenyan counterpart.

5.2 DESCRIPTION OF PRODUCTION FACILITIES

The establishment of the ornamental growth unit involves the construction of greenhouses, a shading house, installation of irrigation, and aeroculture growth, water, electronic and power systems.

Three greenhouses will be constructed. Two will be 1000 square meter rigid greenhouses with a rigid transparent roof. The other greenhouse, also 1000 square meters in size, will be constructed of fiberglass and equipment with high tunnels and a polyethylene cover. The shading house for nurseries and houseplants will be 7000 square meters in size. There will be another 1000 square meters available of open space for some of the plants which do not require the greenhouses. The greenhouses and the shading house will be furnished with growing and propagation tables. Drip and upper-spray irrigation systems will be fitted in the above mentioned houses, together with sprayers and electronic controllers. A 10 cubic meter plastic water tank with a metal base will be installed at the site. A complete refrigeration chamber and elaborate packing facilities will also be provided. The whole unit will cover an area of about one hectare (2.5 acres) or 10,000 square meters of intensive agriculture.

5.3 CAPITAL COST ESTIMATES

The total cost of the above facilities including the acquisition of motherplants is estimated at K Shs. 16,522,618 (U.S.A. $1,566,125). The breakdown of this cost is provided in Table 5B. The estimates for the major facilities and motherplants are based upon the costs of comparable installations in U.S.A. which are assumed to be basically the same in Kenya. The cost estimates include import duties, sales tax and an overall contingency of 10%.

5.4 SUPPLY OF RAW MATERIALS

The major raw material will be the high quality and disease free motherplants of the following ornamental plant species imported from U.S.A. Four varieties of Draceana, two varieties of Ficus, two varieties of Philodendron, two varieties of pears and chrysanthemums (three varieties). Other raw materials such as plant pots, potting peat, fertilizer, insecticides and other chemicals will be purchased locally whenever possible (choclates and some micronutrients may need to be imported).

5.5 THE PRODUCTION PROCESS

The pre-requisites to the production process are the presence of air, water, nutrients, light and temperature in sufficient quantity and state for plant requirements. The distinguishing feature of the aeroponic growth system in growing plants lies in the ability to control and direct these environmental factors precisely for the optimal growth and development of plants.

The system for the production process consists of modular growth benches, in which plant roots are situated. It contains an internal fogging unit producing a fine water and/or nutrient solution fog to the roots. This unit is placed in a container (gutter) along the bottom of the growth chamber. It operates by compressed air and runs through special fogging equipment. The grower pre-selects the amount of internal fog required and an electronic control unit regulates its operation automatically. The container holds about two liters of water or nutrient solution per square meter of the growing bench. A heating system is located in the chamber and is controlled by an electronic thermo-regulatory unit. An external mist system is located about the bench, which is also controlled and regulated by the electronic control unit. The growing bed which supports the plants or propagating material is made

of expanded polystyrene. The nutrient solution consists of a half-strength Hoagland modified to specific needs of the plant.

5.6 PRODUCTS

Ornamental plants will be grown in aeroponic units as stock plants for production of cuttings, flowers, or to enhance the development of young plants. Table 2 summarizes the expected yields per annum.

Table 2. EXPECTED YIELD OF ORNAMENTAL PLANTS

Product	Yield Number of Units	Expected prices K Shs High	Low	High	Low
Unpropagated cuttings	450000	3.16	2.11	1422000	949500
Propagated cuttings	150000	5.28	3.17	792000	475500
6" pot plant	150000	15.83	10.55	2374500	1582500
6" flower pots (chrysanthemum)	60000	15.83	10.55	949800	633000
6" flower pots (photus)	45000	21.10	15.83	949500	712350
Total Gross Sales				6487800	4352850

5.7 THE MARKET: PRESENT

New Ag, Inc. currently supplies its European customers with ornamental plants and flowers produced from its other operations (20 aeroponic growth systems units). However, considerable potential in market expansion still exists especially during the winter months. Kenya's ideal climatic conditions throughout the year and the existence of a dependable air and sea transportation system for horticultural produce to the European market provide an excellent location for the needed expanded production. The company anticipates no problems in marketing products produced in Kenya.

CUT FLOWER PRODUCTION

T. ROSES (Long Stem Roses)

Two acres requires 80,000 rose plants. Each plant will produce 15-30 rose stems per year. On an average each plant will produce 23 rose stems. The total production per year is 1,840,000 stems of which 90% or 1,656,000 will be of export quality. The flower will be packed in bunches, 16 bunches to the box and each bunch contains 20 long stem

roses. Each box weighs approximately 122 1/2 kilos. Each long stem will sell for an average of 3.4815 K Shs per stem. If one acre will produce 1,656,000 stems per year, the total revenue per acre of T. Roses will be 5,765,364 K Shs.

FLORIBUNDA ROSES (Small Roses)

Two acres can accommodate 80,000 plants. However, each plant will produce 45-90 small roses per year. At this rate 80,000 plants will produce an average of 5,440,000 small rose stems per year. If 90% of the roses are of export quality then there are 4,896,000 stems to sell. If these small roses sell for an average of 1.48 K Shs per stem, the total revenue for small roses will be 7,231,392 K Shs per year.

T. ROSE PRODUCTION SCHEDULE - EXPORT
Average Price 3.4815 K Shs per Single Stem

Prod./Plant	15 Year 1	23 Year 2	26 Year 3	28 Year 4	30 Year 5
Nov.		368,000	416,000	448,000	480,000
Dec.		368,000	416,000	448,000	480,000
Jan.		368,000	416,000	448,000	480,000
Feb.	240,000	368,000	416,000	448,000	480,000
Mar.	240,000	368,000	416,000	448,000	480,000
Total/Yr.	480,000	1,840,000	2,080,000	2,240,000	2,400,000
90% Export	432,000	1,656,000	1,872,000	2,016,000	2,160,000
Total Revenue	1504008	5765364	6517368	7018704	7520040

FLORIBUNDA ROSES SINGLE STEM - EXPORT
Single Stem Average Price 1.21325 K Shs

Prod./Plant	50 Year 1	68 Year 2	75 Year 3	80 Year 4	85 Year 5
Nov.		1088000	1200000	1280000	1360000
Dec.		1088000	1200000	1280000	1360000
Jan.		1088000	1200000	1280000	1360000
Feb.	800000	1088000	1200000	1280000	1360000
Mar.	800000	1088000	1200000	1280000	1360000
Total/Yr.	1600000	5440000	6000000	6400000	6800000
90% Export	1440000	4896000	5400000	5760000	6120000
Total Revenue	1747080	5940072	6551550	6988320	7425090
Total Rose Revenue	3251080	11705436	13068918	14007024	15789130

ROSES - MARKET RESEARCH

The season of imported flowers is usually restricted to the traditional winter months in the U.K. Import duties are at 17% of the C&F price for firm purchase or in case of commission sales, gross sales. Imports outside this period of November through May are subject to 24% duty, but more importantly usually compete with a depressed oversupply of English flowers.

Israel is by far the largest exporter of roses, complementing the Channel Island of Guernsey all-year-round production (which is very light during the winter period).

Spain is just beginning to make a small impact on the market. South Africa supplies only a very small amount.

An analysis found in Appendix 3 was made on the price of roses per stem for the 1979/80, 1980/81, 1981/82 seasons and has been increasing at a steady but low rate. The long stem rose average prices for 1979/80 was 20.53 pence or 3,283 K Shs. In 1980/81 season the average price was 21.07 pence or 3.370 K Shs and the 1981/82 season showed an average price of 21.43 pence or 3.428 K Shs. The currency conversion rate was 15.9938 K Shs at the time of this study. The rate of price increase between 1979/80 and 1980/81 season shows a 2.6% increase and between 1981/82 a 1.7% increase.

The total rose stem sales in the United Kingdom of Great Britain is:

1979/80 - 13,200,000 stems
1980/81 - 15,500,000 stems
1981/82 - 16,300,000 stems
1982/83 - 17,100,000 stems

In the Floribunda roses, (the small roses) the study indicates that the price increase during these three seasons is much greater. From 1979/80 to 1980/81 season the increase was 10.4% and between 1980/81 and 1981/82 season the increase rate was 4%. The prices during these three seasons were 6.47 pence or 1.035 K Shs; 7.14 pence or 1.142 K Shs; 7.43 or 1.188 K Shs respectively.

Although the season extends to May for all cut flowers, the home production of roses can be very heavy by the beginning of April.

The flower industry in the U.K. has two very big peaks of demand. The first one is February 14th, St. Valentines Day. During this time the price of Red Roses, long-stemmed can go as high as 60-70 pence per single stem. The next peak is for Mothering Sunday Week, which is usually the third week in March. During the last three years the prices recorded are as follows.

1980 - 50-60 pence - 8.018-9.601 K Shs.
1981 - 60-75 pence - 9.601-12.027 K Shs.
1982 - 60-80 pence - 9.601-12.766 K Shs.

The popular rose varieties now being sold in the U.K. are:

LONG STEM

Ilona - Red
Bridal - Pale Pink
Sonia - Salmon Pink
Cocktail - Deep Yellow
Gabriella - Red
Mercedes - Orange
Jaguar - Red
Golden Times - Yellow

FLORIBUNDA ROSES (Small)

Carol - Pink
Diana - Yellow
Nordia - Red
Garnet - Red
Orange Belinda - Orange

CARNATIONS

Carnations will be grown at Kitangila for shipment to the U.K., France, Belgium. The main variety that will be grown will be Spray Carnations. There is a big market for this variety in the U.K. and throughout Europe.

One acre will hold 200,000 plants and that number of plants will produce 1,214,574 long stem flowers. We assume that 90% will be of export quality or 1,093,117. We expect to plant two acres in Carnations which will produce 2,186,234 stems. According to the market research carnations are demanding an average of 1.551 K Shs per stem in the U.K. Based on this price, when full production is reached, the revenue for the sales of carnation will be 3,390,517 K Shs.

Carnations will be packed in attractive boxes containing 24 bunches with 25 stems in each bunch. Each box will weigh about 16 kilos. The boxed flowers will be transported daily on board commercial airlines to the destinations in Europe. It is estimated that the cost of packaging, handling and transportation to the export market will be 10% of the total sales. Air freight rates are controlled by the Kenyan government. The rates to London, Paris and Brussels are 690.39 K Shs per tonne. The import duty in Europe from November through May is 17% of the firm price for firm purchase (this is the C&F price).

CARNATIONS - MARKET RESEARCH

There is no serious production of carnation during the period of November through May in the U.K.,

France or Belgium. A detailed study was conducted on the price of carnation in the U.K. market on November of 1979 thru Dec. of 1988. The average price per stem during 1979-1980 season , as shown in the study in Appendix 3, was 9.43 pence which is equal to 1.5086 K Shs. For 1980-1981 season the price per stem was 9.57 pence and in 1981-1982 was 9.65 pence. The price per stem for the two seasons convert in K Shs to 1.5308 and 1.5435 respectively. The flower market in all of Europe is similar and we have assumed the same prices.

The European market will buy many varieties of carnations. The colors that at present are coming into the market are as follows:

Red	30%
Light Pink	25%
Dark Pink	10%
White	25%
Sprays	10%

	100%

The number of stems that have been sold in the U.K. during the last four seasons are:

1979-1980	1980-1981	1981-1982	1982-1983
22 million	28 million	35.5 million	41.7 million

The main exporters to the U.K. are Colombia and Italy. However, at present very light supply is coming from Spain, Greece and Kenya. The largest and best quality comes from Colombia. In collecting data for the study all buyers assured us that there is still a shortage for high quality carnations.

CARNATIONS - PROJECTED ANNUAL SALES
Based on Planting Two Acres and 90% Export Quality

Prod./Plant	6	8	10	12	14
	Year 1	Year 2	Year 3	Year 4	Year 5
Jan.	308,570	411,430	514,290	617,140	720,000
Feb.	308,570	411,430	514,290	617,140	720,000
Mar.	308,570	411,430	514,290	617,140	720,000
Apr.	308,570	411,430	514,290	617,140	720,000
May	308,570	411,439	514,290	617,140	720,000
Nov.	308,570	411,439	514,290	617,140	720,000
Dec.	308,570	411,439	514,290	617,140	720,000
Total Stems	2,159,990	2,880,010	3,600,030	4,319,980	5,040,000
Price/ Stem/K Shs	1.5350	1.5350	1.5508	1.5667	1.5825

Total
Revenue 3.315.584 4,280,815 5,582,927 6,768,113 7,975,800

5.8 MARKETING

There is a ready market throughout the European Common Market Countries. Fyffes-Monro Flowers, based in Covent Market in London are the leading cut flower and pot plant wholesalers in the U.K. They have access to all the major markets and a history dating back into the nineteenth century. The Fyffes-Monro group have given us a letter of intent that confirms that they have agreed to market all the flowers that we produce in Kenya. A copy of the letter is provided in Appendix 2.

5.9 THE MARKET: FUTURE

The company plans on establishing the Nursery aeroponics systems for the production of ornamental materials not only for the export market but also for the local market. The local market will be developed alongside the development of the system. Furthermore, research will be undertaken for the growing and propagation of locally available varieties of vegetables, ornamental plants, citrus trees and perhaps even more importantly, cash crops such as tea, coffee and pyrethrum for the local agricultural sector. In the process, local personnel with expertise in the aeroponic growth systems will be trained both locally and abroad. Substantial future developments of the system would be achieved with minimal additional investment once the propsoed ornamental growth unit is established. Such a unit would have considerable capacity for expanded production and use not only because of the high plant densities which can be carried and turned out within short time intervals (e.g. 3,000 square meters of citrus material in three weeks), but also because of its long operational life span (about 20 years). Due to these potentialities, the establishment of the aeroponics system could revolutionize future agricultural production in the face of the ever increasing scarcity of conventional resources of land, water and fertilizer. Kenya would not be left behind in this new and exciting venture into agricultural production.

5.10. IMPACT ANALYSIS OF THE NURSERY PROJECT

The project will also introduce a completely new technology of vegetative propagation known as aeroponic growth system in Kenya. This is one of the latest systems which has been applied with a lot of success in Israel, America and Europe. Kenya would be among the first countries in the developing world where the system would be applied. The technology would be introduced in the country

by the company New Ag, Inc. which helped and developed the system in the United States of America.

The Government of the Republic of Kenya would further benefit from the project through corporate taxation accruing from the project to the Treasury. There will also be other revenues paid to Government in the form of import duties and sales tax on importation of plant and equipment. The project is further attractive in that it would provide employment to about 50 people. These would include a nursery manager, marketing specialist and an agricultural engineer responsible for the technical aspects of the nursery. All the other people would be Kenyans, employed as laborers. The three foreign experts would be replaced in time as Kenyans acquire the requisite training to enable them to take over.

6. MANAGEMENT AND LABOR

The proposed ten year farm development plan, being highly intensive and dependent upon irrigation, will require a group of well qualified personnel to perform management functions, and a considerable number of farm workers to provide the labor input (Appendix 2, Table 20).

6.1 MANAGEMENT

Kitangila Limited, the proprietor of Kitangila Farm, has an agreement with New Ag, Inc. to provide the management for the farm (and the marketing of farm produce). Under the terms of the agreement, the New Ag, Inc. will provide the following expatriate personnel: the Farm Manager, Irrigation Engineer, Entomologist, Agronomist, and Agricultural Economist (Marketing).

The services of the Farm Manager, Irrigation Engineer and Agricultural Economist will be engaged over the whole plan period of ten years. On the other hand, the services of the expatriate Entomologist and Agronomist will be dispensed with from the end of year three of the farm plan, when the farm is fully operational. If desired thereafter the services of any of the last two experts would be engaged locally on consultancy basis. In addition to the above five experts, a qualified Assistant Farm Manager will be recruited locally.

New Ag, Inc. is based in the United States of America but their operations are world wide. They have a wealth of knowledge and experience in the production and marketing of horticultural crops (vegetables, fruits and ornamental plants) under irrigation systems. They have also established export markets all over Western Europe and have marketing branches in Britain, France, Germany, Switzerland and in the Scandinavian countries. They are opening up new export markets in Saudi Arabia, Bahrain and other Middle East countries. Currently, these firms are finding it increasingly difficult to meet the demands of their established customers in Europe from their other productions, hence the proposed participation in the production of horticultural products on Kitangila Farm.

6.2 LABOR

The proposed cropping pattern would require an average of 762 farm workers per year. Out of this, 747 would be the actual field workers and 15 would be skilled and semi-skilled workers such as the foreman, clerk, bookkeeper, artisan, workshop personnel and drivers.

Since many horticultural products are highly sensitive to the timing of various field operations (for instance a day's delay in the harvesting of brinjals would lower the quality of the beans considerably), it is recommended that at least 75 percent of the required field workers should be hired on permanent basis while the other 25 percent can be recruited on a casual basis. This would ensure adequate supply of labor as and when most needed for timely field operations. Casual laborers would be hired from the Athi River township. The proposed wage rate of K Shs 22 per day is sufficiently competitive to lure the needed labor. (Appendix 2, Table 21).

The proposed cropping pattern (Figure 2) as well as the nature of irrigation production would keep permanently hired workers well employed throughout the year. This would minimize or eliminate work-trough periods during which hired and paid for labor could remain idle or under-employed. On the other hand, the practice of hiring some labor on casual basis would mean that no more than necessary labor is hired permanently, and that additional labor demands during work peak periods such as harvesting would be met.

7. MARKETING

The proposed production of horticultural products on Kitangila Farm is largely geared towards the export market. On the average, about 180 percent of the annual gross sales (Table 15) would be generated from the export market and the remaining 20 percent from the local (mainly Nairobi) market. In addition to the management of the farm, New Ag, Inc. will market the farm produce as mentioned earlier (Section 6.1).

7.1 THE EXPORT MARKET

New Ag, Inc. will air freight Kitangila Farm products to its established markets in Western Europe. Over the years, sea freight transport would be explored especially for the relatively long-shelf-life products such as melons and onions.

The production pattern (Figure 2) for the export crops (esp. French Beans, Asparagus, Melons and strawberries) is planned in such a way that harvests coincide with the Northern Hemisphere winter months (November-April). A market research by New Ag, Inc. shown as indicated, that the firm would be able to market a minimum of the following types and quantities of products during this period:

Table 3. Minimum Export Potential, Kitangila Farm Project

CROP	TONNES PER MONTH	PERIOD	TOTAL TONNES	PROPOSED PRODUC-TION
French Beans	100	Dec - March	400	370
Asparagus (Green)	100	Dec - March	800	692
Asparagus (White)	200	Dec - April	1,000	605
Melons	1,000	Mid Nov - April	5,500	2,175
Strawberries	200	Oct - Mid Jan	5,000	3,360
Onions	200	March - June	800	494
Avocados	50	Dec - Jan	100	16

There is immence potential to market considerably larger quantities. The export marketing of projected output would therefore present no major foreseeable problems.

The link between Kitangila Farm and New Ag, Inc. in the production and export marketing of produce is extremely vital. It greatly diminishes the risk of inaccessibility to export markets that Kitangila or any other local producer would face without such connection.

For the overseas markets, all vegetable crops will be picked early in the morning when it is cool. This will minimize any exposure to heat and thereby decrease any deterioration of the vegetable crops. To further insure this, the vegetable crops as soon as picked, will be transported to the packing plant and placed in the refrigerated chilling room at 42 degrees F for at least an hour. This is done to lower the temperature of the vegetables and fruits and slow down the normal breakdown of vegetables and fruits after separation from the mother plant. This procedure will assure a fresh and crisp product to the destination.

From the chilling room the produce will be put through a chilled water wash, then sorted and graded. Thereafter, each crop will be packed and placed in appropriately designed packages with market appeal and placed in refrigerated containers. The containers will be placed in the chill room until time for delivery to the airport to be placed on the flight to London and/or Paris.

The shipment will be made to Fyffes Group Limited, whose registered offices are in London. Fyffes Group also has offices with distribution and sales outlets in France and Belgium. In addition Fyffes has associates in Holland and Germany with good coverage within these two countries.

As soon as the vegetable and fruit shipments are received by Fyffes the entire shipment is placed in a cold room at about 42 degrees F. From the cold room they are distributed to the different wholesale fruit and vegetable outlets. The outlets will then sell within 48 hours whatever vegetable or strawberries is received. Any fruit received will leave the wholesale outlets within 4 days. During the display period in the outlet markets the vegetables and fruits will be placed in the cold room during the off hours.

7.1.1 FYFFES GROUP

Fyffes Group is a wholly owned subsidiary of

United Brands, New York is Britain's foremost importer of fresh fruit and vegetables. Founded in 1901 as Elders and Fyffe Limited. The Group are nationally famous as the first company in the UK to import and market bananas. In recent years the company has extended its product line to include the full range of fresh fruit, vegetables and flowers and is actively involved in related areas such as wholesaling, haulage, and horticultural sundries. The Group's distribution system covers the country in France and Belgium

7.1.2 CENTRAL PROCUREMENT

Fyffes aims to provide it's customers in all parts of the country with a full range of produce. The key to this operation is the Group Central Procurement Office which is located in the New Covent Garden Market. Large quantities of domestic and imported fruit and vegetables are obtained for the Group's distribution system as well as for outside customers and this Department controls direct sales to the large retail chains. Fyffes are established panelists for all the major marketing boards and similar national organizations.

7.1.3 MARKETS & CENTERS

Fyffes offers suppliers and customers a unique combination of complimentary channels of distribution - 18 outlets in the leading wholesale markets and 32 distribution centers. The distribution centers cover all the major urban areas from where telephone salesmen offer daily deliveries of a full range of fruit and vegetables. The company maintains stands at all the principal wholesale markets in the country where customers are able to choose for themselves from a comprehensive selection of produce.

7.1.4 PUBLIC RELATIONS

Fyffes Group Public Relations office maintains a regular program of activities ensuring that the company products and services are projected to both the trade and general public. All the modern methods of communication are employed including recipe demonstrations through a leading home economist, audio visual, information to schools, advertising and point of purchase material.

7.1.5 EUROPE

Fyffes is a European-oriented Company. Even before Britain's membership of the EEC the Group were looking across the Channel to find ways of improving its

service to the customer. La Compagnie des Bananes, part of the Fyffes organization for many years, is responsible for the marketing of green bananas throughout France whilst links have been established with the French Distributor Omer-Decugis and Spiers N.V. of Belgium. Both associate companies are integrated with Fyffes management and the three together represent a powerful force in Europe. Fyffes Omer-Decugis operates through 14 market outlets and runs a fleet of 60 lorries and also has warehousing and packing facilities in Rungis Market, Paris. Fyffes-Spiers has eight centers of distribution and are auctioneers in the Antwerp fruit auction. Fyffes has an association with the largest Western European fruit and vegetable organization, the Scipio Group, West Germany. Operating under the name of Fyffes-Hameico this arrangement increases the collective strength of both groups in world-wide producing areas and in the European market place.

7.1.6 FLOWERS

Fyffes-Monro Flowers, based on the new Covent Garden Market, are the leading cut flower and pot plant wholesale company in the UK, with access to all the major markets and a history dating back into the nineteenth century. Within the Fyffes Group there are a further eight flower marketing points spread across the country and they include many familiar trade names, notably Cowlings in Leeds, Jacksons of Birmingham, Leatherlands in the North East, Monros in Manchester and Renaudons in the Potteries.

7.2 MIDDLE EAST MARKET

New Ag has contacts throughout the Middle East to expand the Market for Kitangila Ltd. Farm products. During the heat of the summer Saudi Arabia, Bahrain, Kuwait, Qatar, Oman and the United Arab Emirates are in great need of the crops that will be grown by the farm.

8. FINANCIAL PROSPECTS OF THE PROJECT

Based on the assumptions made regarding operating expenses, buying and selling prices of various anputs and products, depreciation rates on fixed assets and interest rate on long term loans and overdraft facility, the projected profit and loss accounts for the project are shown in Appendix 1, Table 8.

8.1 INCOME STATEMENTS

In summary the farm's operating results would develop as shown in the following abbreviated income statements.

Table 4. Annual Abreviated Income Statement, Kitangila Farm Project (K Shs 000)

YEAR	SALES	GROSS OPERATING PROFIT	PROFIT AFTER TAX	DIVIDENDS DECLARED
1	107,480	83,231	32,889	-
2	121,212	95,965	39,893	-
3	123,960	98,315	41,186	3,000
4	126,415	100,407	42,885	3,000
5	129,819	103,386	45,150	3,000
6	131,068	104,603	46,533	4,000
7	131,068	104,603	47,347	4,000
8	131,068	104,603	48,274	4,000
9	131,068	104,603	49,332	4,000
10	131,068	104,603	50,537	4,000

The farm is expected to realize profit after tax of K Shs 32.8 million right from the first year of operation rising steadily to K Shs 42.8 million in year 4, K Shs 48.27 in year 8 to over K Shs 50,537 million by year 10. Due to a forecast favorable cash flow position the

project will be able to declare dividends from year 3 of K Shs 3.0 million rising to K Shs 4.0 million from year 6 onwards. This is a return of 15% and 20% respectively on equity contribution.

8.2 LIQUIDITY

The farm's forecast cash flows are calculated in Appendix 1, Table 10 by applying working capital projections and assumptions made in Appendix 1, Table 9.

Thereafter, it will realize cummulative surplus funds of over K Shs 66.7 million in year 1 rising steadily to over K Shs 256.2 million in year 5 and to K Shs 410.6 million by year 10. Overall, the project's forecast liquidity position is expected to be excellent.

8.3 BALANCE SHEETS

Appendix 1, Table 11 depicts the farm's forecast Balance Sheets from which can be calculated various financial ratios. It can be seen that the resultant trends in ratios such as current assets: Current liabilities, debt service ability, return on equity and asset coverage are more than acceptable.

8.4 FINANCIAL RATE OF RETURN

The project is expected to attain an overall internal financial rate of return of 51.21% based on the assumptions made regarding sales, taxes, rates of depreciation and interest. This rate is higher than the opportunity cost of capital presently standing at 14%. The necessary calculations appear in Appendix 1, Table 12.

From the foregoing, it is evident that forecast financial position of the project is sound in terms of profitability, loan servicing and in provision of the necessary security for the required loans.

The financial rate of return is calculated on the profit after tax to which is added the financial costs and depreciation. By doing this the internal rate of return can be calculated and compared to the return by interest without being effected by the cost of interest.

9. INVESTMENT EVALUATION

9.1 FOREIGN EXCHANGE EARNINGS

In considering the project as a whole it is apparent that when analyzed if economic terms, the project is attractive. Like all viable agricultural projects oriented towards the export market, the farm is expected to earn the country the much needed foreign exchange. It is assumed that 100% of the total produce on the farm would be exported, which amounts to an average of K Shs 100.4 million equivalent in foreign currencies per annum. The initial outlay amounting to an equivalent of K Shs 31.4 million in foreign currencies is quite minimal when compared to the annual foreign exchange earnings of the project.

9.2 FINANCIAL ANALYSIS

As explained in Chapter 8, the financial analysis of the project shows that it is profitable, will have a sound liquidity base, be able to service the required loans and generate attractive returns both to the shareholders in the form of dividends paid and to the term lenders in terms of interest paid on loans. The project is expected to have an internal financial return of 51.21% which is higher than the going interest rate of 14%. This shows that it is rational to invest the available funds in the project rather than deposit the same in a bank to earn interest over the project period of 10 years.

9.3 CROP PRODUCTION AND MARKETING

The Chapter on crop production showed in detail the technical feasibility of the proposed production under irrigation. The Management Company has been involved in setting up similar projects in several countries world wide with considerable success. It can therefore be expected that Kitangila Limited would be able to achieve similar success. With regard to marketing the crops especially overseas, the Management Company which has good contacts in Europe is confident of selling them without much problems. Off-season demand presently exceeds supply of the proposed products in Europe.

9.4 EMPLOYMENT

Being dependent on irrigation, the project will be highly intensive and would consequently employ a large number of farm workers. The project is expected to provide employment for 762 farm workers annually. About 75% of

these would be permanently employed while the remaining would be recruited on casual basis. With unemployment being one of the major problems facing the country at present, the project's contribution would be obviously positive towards employment creation.

9.5 INFRASTRUCTURE

The project company has already acquired the farm measuring 627 hectares out of which 405 hectares have been surveyed and confirmed suitable for crop production under intensive irrigation. The farm is well served with the necessary infrastructure including accessibility by road, telephone, close proximity to the railway station at Athi River and electricity. The Athi River which will provide irrigation water forms part of the boundry of the farm. The project company is willing to give the title deed to the farm as collateral for the required loans.

9.6 SENSITIVITY ANALYSIS

The major factors likely to affect adversely the viability of the project would be an increase in capital costs and a fall in prices of the farm products, especially for those which are exported. However, due to the generous estimates of capital costs made and the contingencies provided for, the final costs of the project are expected to stay within the budget. With regard to the selling prices, a sensitivity test has been carried out assuming a 10 percent fall in all the prices for the farm products. As shown in Appendix 1, Table 13, the Internal Financial Rate of Return falls from 51.21% to 45.21% as a result, which is still satisfactory. It can be expected that the project would still remain viable with a 10% fall in its expected revenue.

9.7 CONCLUSION

From the foregoing evaluation of the project, it is evident that the project is technically well conceived, financially viable and economically attractive. The project should meet with Government approval and support. Kitangila Limited is confident that this project would prove interesting to any Agricultural Bank in search of a sound investment opportunity.

APPENDIX 1

CAPITAL INVESTMENTS AND FINANCIAL ANALYSIS

Table 5. List of Materials - Irrigation Equipment

QUANTITY	ITEM DESCRIPTION
4,440,000 ft	EBG3000 Bi-Wall 15 12" x 60" (1110 reels)
400,000	DBK04 E-2 Emitters
1,987,680 ft	ELD81642 16 mm Oval Hose (1212-500m rolls)
60,000 ft	EHR810 Rypol Hose (60 rolls)
2,100	FCC96 Bi-Wall Coupler
11,000	FCR1096 10 mm x Bi-Wall Coupler
11,000	FDV9600 Drain Valve
1,800	FCC16 16 mm Coupler
400	FJQ16 16 mm Figure 8
3,200	FJQ16 16 mm Figure 8
3,700	FTC10 10 mm Wedge Plug Tee
11,000	FTC10 10 mm Wedge Plug Tee
3,900	FCR1610 16 x 10 mm Coupler
5	FMP16 Hole Punch
5	FMD1532 Drill Bit
5	FMJ1532 Drill Jig
1	ABY8020 Cascade Blowdown Filter
1	ABY8030 Cascade Blowdown Filter
2	ABY8040 Cascade Blowdown Filter
1	AAK8020 Hook Up Kit
1	AAK8030 Hook Up Kit
2	AAK8040 Hook Up Kit
5	AYP1600-04 Replacement Socks
1	ACY 4879-03 Sand Media Filter - Solar Coarse Pour Bed
1	ACY4879-04 Sand Media Filter - Solar Coarse Pour Bed
2	ACY4879-05 Sand Media Filter - Solar Coarse Pour Bed

QUANTITY	ITEM DESCRIPTION
1	AKY4803 Hook Up Kit
1	AKY4804 Hook Up Kit
2	AKY4805 Hook Up Kit
115	ASP2353-08 Crushed Granite
115	ASP2353-11 Crushed Granite
4	ATM0280 Fertilizer Tanks
10	GCT030 Tensiometers
10	GCT060 Tensiometers
2	GMP2072 Tensiometers Kit
1	GBF160 Flow Meter (Class 100 6" PVC LPS/Liters)
2	GBF200 Flow Meter (Class 100 8" PVC LPS/Liters)
1	GPE01400 Flow Meter (Class 100 10" PVC Liters)
4	GPM0030 Pressure Gauge
4	GPP04 Air Chuck
410	GPV01 Schrader Valves
2	ZCP9524-02 Free Chlorine Test Kit
5	VBG0252 1" Gate Valve
150	VGB0322 1¼" Gate Valve
310	VBG0402 1½" Gate Valve
345	VBG0502 2" Gate Valve
75	VVA025 Air/Vaccum Relief Valves
260	VVA040 Air/Vaccum Relief Valves
12	VVA100 Air/Vaccum Relief Valves
555 ft	1" PVC Pipe Class 200 (30-18.5 ft length)
28,009 ft	1¼" PVC Pipe Class 125 (1514-18.5 ft length)
37,481 ft	1½" PVC Pipe Class 125 (2026-18.5 ft length)
51,615 ft	2" PVC Pipe Class 125 (2790-18.5 ft length)
22,829 ft	2½" PVC Pipe Class 125 (1234-18.5 ft length)

QUANTITY	ITEM DESCRIPTION
20,165 ft	3" PVC Pipe Class 125 (1090-18.5 ft length)
46,916 ft	4" PVC Pipe Class 100 (2536-18.5 ft length)
11,211 ft	6" PVC Pipe Class 100 (606-18.5 ft length)
14,726 ft	8" PVC Pipe Class 100 (796-18.5 ft length)
7,622 ft	8" PVC Pipe Class 160 (412-18.5 ft lengths Rubber)
4,551 ft	10" PVC Pipe Class 100 (246-18.5 ft length)
50	1¼" PVC Tee
125	1½" PVC Tee
350	2" PVC Tee
40	2½" PVC Tee
40	3" PVC Tee
480	4" PVC Tee
35	6" PVC Tee
22	8" PVC Tee
8	8" x 4" PVC Tee
6	10" x 6" PVC Tee-Head Solvent Weld -125 lbs.
75	1¼" PVC 90° Elbows
225	1½" PVC 90° Elbows
1025	2" PVC 90° Elbows
40	2½" PVC 90° Elbows
70	3" PVC 90° Elbows
110	4" PVC 90° Elbows
10	6" PVC 90° Elbows
10	8" PVC 90° Elbows
3	10" PVC 90° Elbow-Head 125 lb. Solvent Weld
5	1" PVC 45° Elbows
125	1¼" PVC 45° Elbows
300	1½" PVC 45° Elbows

QUANTITY	ITEM DESCRIPTION
75	2" PVC 45° Elbows
4	6" PVC 45° Elbows
16	8" PVC 45° Elbows
6	10" PVC 45° Elbows
25	1¼" PVC Coupler
25	1½" PVC Coupler
25	2" PVC Coupler
10	2½" PVC Coupler
10	3" PVC Coupler
10	4" PVC Coupler
10	6" PVC Coupler
12	8" PVC Coupler
4	10" PVC Coupler (Head-125 lb. Solvent Weld)
150	1" PVC Male Adapters
200	1¼" PVC Male Adapters
950	1½" PVC Male Adapters
1175	2" PVC Male Adapters
10	4" PVC Male Adapters
50	1¼ x 1" PVC Reducer Bushings
100	1½ x 1¼" PVC Reducer Bushings
125	1½ x 1" PVC Reducer Bushings
570	2" x 1½" PVC Reducer Bushings
40	2 x 1¼" PVC Reducer Bushings
15	2 x 1" PVC Reducer Bushings
80	2½ x 2" PVC Reducer Bushings
30	3 x 2½" PVC Reducer Bushings
80	3 x 2" PVC Reducer Bushings
70	4 x 3" PVC Reducer Bushings
10	4 x 2½" PVC Reducer Bushings
575	4" x 2" PVC Reducer Bushings
35	6" x 4" PVC Reducer Bushings
10	6" x 3" PVC Reducer Bushings
10	8" x 6" PVC Reducer Bushings

QUANTITY	ITEM DESCRIPTION
20	8" x 4" PVC Reducer Bushings
5	10" x 8" PVC Reducer Coupler (Head - 125 Solvent Weld)
138	2" Hydrorain 103 Pressure Regulating Valve
130	2" Hydrorain 200 Hydraulic Valves
65	¼" Hydraulic Tubing Tee ¼ NPT x ¼ Tube x ¼ Tube
320 ft	¼" Hydraulic Control Tubing
105,000 ft	8 ga Direct Burial Wire (42-2500 ft reels)
440,000 ft	14 ga Direct Burial Wire (88-5000 ft reels)
125,000 ft	16 ga Direct Burial Wire (25-5000 ft reels)
450	Spears DS100 Dri-splice Wire Connectors
18	Spears DS300 Dri-splice Sealant
360	Quarts PVC Solvent Cement 717
420	Quarts PVC Cleaner Primer
250	Rolls Teflow Tape
3	8" Schedule 80 PVC Flanges
1	10" Schedule 80 PVC Flanges
2	Waterman 4" Manifold with 4 Av 150 2 Air/Vaccum Valves
5	1" Gate Valves - Red and White
2	Pump Unit consisting of JA6 Lister Diesel engines and Paco 5015 Split Case Pumps
2	Pump Units consisting of HRS6 Lister Diesel Engines and Paco 5015 Split Case Pumps
4	8" Suction Pipe - 15 ft long with foot valve and strainer
1	12 volt DC Priming Pump
1	4 Kw Lima Generator - Belt drive from engine
2	8" 81G-02 Cla-Val Non-Slam Check Valves

QUANTITY	ITEM DESCRIPTION
2	10" 81G-02 Cla-Val Non-Slam Check Valves
4	2" 50A-01 Cla-Val Pressure Relief Valves
4	Wallace & Tiernan V-100 A&C Chlorinator - Auto Switch Over for 150 lb. Cylinders
1	6" Flange x 10" Flange Epoxy Coated Concentric w/bolts & gaskets - Ames
4	6" Flange x 8" Flange Epoxy Coated Concentric w/bolts & gaskets - Ames
4	200 psi Pressure Gauges
4	Transformer Boxes 115 volt x 28 volt
2	Control Panels - 8 Switches
2	Control Panels - 4 Switchs
24	Quarts gasket lube 787 weld-on

Total materials FOB El Cajon, California		18,806,936
Estimated ocean freight to Mombasa, Kenya	1,902,925	
Estimated inland freight to USA port	129,027	
Documentation	15,825	
Total CIF Mombasa, Kenya		2,047,777
Total Materials and Shipping Costs - K Shs		20,854,713

Table 5A. KITANGILA FARM PROJECT (K Sh)
LIST OF AGRO EQUIPMENT

	U.S. $	K Sh
2 Ford Tractors Model 5610 62 H.P. P.T.O. with diesel engine, power steering, 16 speed dual transmission, 540 RPM P.T.O. rear hydraulic system, dual pumps, super comfort seat, front and rear tires; dual remote hydraulic valves; front wheel drive; full cab with air conditioning. Shipping Wt. 5902 lbs.	66040	696722
1 Ford Tractor Model (FA315M), with diesel engine, power steering, with 16x8 dual power transmission with synchromesh shift super comfort seat, power adjustable rear wheels, dual remote hydraulic control valve, front and rear wheel weights, linkage stabilizers, 16.9 x 30R1 rear tires. Front wheel drive, full cab with air conditioning. Shipping Wt. 6145 lbs.	44721	471807
1 Ford Model 222-207 8 foot hitch mounted tandem disc with 20" blades, 9" blade spacing. Shipping Wt. 907 lbs.	2205	23263
1 Ford Model 219-211 9 foot 10 inch wheel type offset disc harrow with twenty-six 24" blades, 9 1/4" blade spacing. Shipping Wt. 3305 lbs.	5670	59819
Ford Model 460-51 (8) row crop cultivator, 38" row spacing, folding tool bar type, 248" long, with 41 shanks, 9 guage wheels. Shipping Wt. 2744 lbs.	5942	62688
Ford Model 352-54 Pull-type planter, 8 row, 36" to 38" row spacing, double disc opener, open center press wheel. Shipping Wt. 3288 lbs.	8160	86088
Ford Model 108-3 3 shank tool bar type sub-soiler, 56" tool bar type carrier, 20" shanks. Shipping Wt. 585 lbs.	1230	12977

Table 5A. KITANGILA FARM PROJECT (K Sh)
LIST OF AGRO EQUIPMENT (Page 2)

	U.S. $	K Sh
Ford 133-64 12 foot chisel plow, hitch mounted, with spring loaded shanks. Shipping Wt. 2641 lbs.	4440	46842
Ezee Flow Spreader Model 12F-9002 incl. Tires.	2605	27482
Hardi TR500 Gal. Sprayer incl. 28' Boom, Tips & Screens, Tires. (single axle)	4280	45154
Holland Mulch Plant and Plastic Layer Model 900 complete with 3 pockets, rubber packers and 7.60 x 15 tires. Approx. Wt. 600 lbs.	1706	17998
Mulch Film Model 90.	1153	12164
Holland 901 Kit for Planting Pots (Includes 2 trays with brackets and 1 fiberglass seat with bracket)	99	1045
Holland 923 extra pocket complete with arms and bolts (measures 2 3/4" wide near point).	94	992
Holland 914 Water Valve for applying water immediately after set is made.	93	981
Holland 909 Plug Mix Attachment for use in setting a mixture of seed, fertilizer and soil (or Jiffy Mix). The Soil Mix Attachment keeps soil agitated and meters out up to 1/2 cup of mix automatically in pockets. The pockets pierce the mulch and deposit the soil mix in the ground.	485	5117
Holland 911 Round Pocket Inserts for Jiffy-7's (eliminate tipping).	12	127
Holland 916 three point Hitch for single rows.	78	823
Holland 917 Clamp Assembly for mounting units on tool bar.	85	896

Table 5A. KITANGILA FARM PROJECT (K Sh)
LIST OF AGRO EQUIPMENT (Page 3)

	U.S. $	K Sh
2 Sturdy Stakeside Trailers 8' x 20' bed. Weight 10,000 lb. GVWR complete including 1 only detailed blueprint drawing with dimensions & material specifications; 2 sets Axles with hubs (no brakes); 8 ea. Wheels & Tires 16.5 Wheels/10 ply tires; 2 sets Tandem springs & fitting hardware; 2 sets Frame materials: tube, angle, 12 ga, siderails with stake pocket holes; 2 ea. Couplers 2-5/16"; 2 ea. Step Necks (coupler mounts); 2 ea. Jack Mounts, heavy duty; 2 ea. Heavy Duty Caster Wheel & Jacks; 2 sets Electrical--Lights & Wiring; 2 sets Stakeside materials: Posts, pockets, latches, slats.	4092	43171
1 Caterpillar Tractor D8L complete with all standard equipment. Engine - Caterpillar Model 3408; diesel engine; 333 H.P. @ 1900 RPM; Turbo-charged; direct injection type; with 35 AMP alternator. Transmission - Planetary type; power shift with torque converter; 3 speeds forward; 3 speeds reverse. Hydraulic Control Unit - 4 - Valves for #8S Bulldozer; tilt control; ripper and ripper shank pitch adjustment; semi "U" type. Under Carriage - 8 bottom rollers; 2-top rollers; sealed and lubricated tracts; 22" standard Grouser shoes. Bulldozer Blade - Model #8S semi "U" Bulldozer, with hydraulic tilt cylinder, complete with push arms; braces; cutting edges and end bits. (Unmounted) Ripper - Single shank ripper; with hydraulic tip (pitch) adjustment control and hydraulic pin puller. (Unmounted) R.O.P.S. Canopy - (Roll over protective structure) S.A.E. approved (Unmounted) Cab and air conditioning.	337913	3564982
Duty Custom Clearing	48377	510377
CIF Mombasa	49812	525516
Total Agro Equipment including freight and custom clearing	589292	6217031

Table 5B. KITANGILA FARM PROJECT (K Sh)
CAPITAL COST ESTIMATES - NURSERY

1.	Materials and Construction of rigid transparent roof greenhouses. Ventilation and heating set for two 1000m greenhouses	844000	
2.	Materials and Construction of 1000 sq. meters greenhouse. High tunnels (fibreglass and polyethylene)	44310	
3.	Materials and Construction of 7000 sq. meters greenhouse including shading net	274300	
4.	Installation of above units	137150	
5.	Complete refrigeration chamber	1286045	
	Import duty plus sales tax (40%)	514840	
6.	Ten cubic meters plastic tank for water	23421	
	Sub Total		3124066
7.	Irrigation System		
	- Drip system tupper spray and electronics controllers	738500	
	- Growing and propagating tables	84400	
	- 20cm complete aeroculture growth system	211000	
	- Sprayers tools and gardening equipment	105500	
	- Pots and subster for mother plants	527500	
	- Mother Plants	2695314	
	- Paddling facilities	94950	
	Import duty and sales tax	891475	
	Sub Total		5348639
	Transport & Ins. to Mombasa	639857	
8.	Electricity & Water connection, soil preparation & pre-operating expenses	633000	
9.	Packing Shed including transport	5275000	
10.	Contingencies 10 %	1502056	
	Sub Total		8049913
	Grand Total		16522618

Table 5C. KITANGILA FARM PROJECT (K Sh)
EQUIP. TO BE SHIPPED FROM THE U.S.

Agro Equipment	6217031
Irrigation Equipment	20854712
Nursery Equipment	16522619
Other Capital Costs	
1 Refrigerator Trailer	633000
1 Truck Tractor	738500
1 Packing Shed Equip.	5275000
	50240862

Table 5D. KITANGILA FARM PROJECT (K Sh)
COMPLETE LIST OF OTHER CAPITAL COSTS

Description	Unit Cost $	Tot Cost $	Tot Cost K Shs
Dam	1000000	1000000	10550000
Fences	95000	95000	1002250
Clearing, Forwarding Transportation, etc.	94800	94800	1000140
Construction			
1 Packing Shed	100000	100000	1055000
2 Store	19000	38000	400900
1 Refrig. Trailer*	60000	60000	633000
1 Truck Tractor*	70000	70000	738500
1 4 Ton Lorry	42650	42650	449957
20 Staff Houses	1500	30000	316500
1 Packing Shed Equipment*	1500000	1500000	15825000
5 Managers Housing	80000	400000	4220000
	3062950	3430450	36191247

*To be shipped from the U.S. as part of the loan

Table 5E. KITANGILA FARM PROJECT (K Sh)
SUMMARY OF TOTAL FUNDS REQUIRED

Capital Costs	U.S $	K Sh
Land Costs	2000000	21100000
Irrigation Equipment	1976750	20854712
Agro Equipment	589292	6217031
Nursery Bldgs. & Equipment	1566125	16522619
Other Capital	3430450	36191247
Working Capital	1383316	14593984
Sub Total	10945933	115479593
Less Equity Capital	2000000	21100000
Total Funds Required	8945933	94,379,593

Table 6. KITANGILA FARM PROJECT (K Sh 000)
LOAN AMORTIZATION AND INTEREST SCHEDULE

Yearly Payment 20,345.50 K Sh

Year	Interest 14%	Principle	Balance
1	13213	---	94380
2	13213	---	94380
3	13213	7132	87248
4	12215	8131	79117
5	11076	9269	69848
6	9779	10567	59281
7	8299	12046	47235
8	6613	13733	33502
9	4690	15655	17847
10	2499	17847	---

Table 7. KITANGILA FARM PROJECT (K Sh 000)
DEPRECIATION SCHEDULE

DEPRECIATION RATE	IRRIGATION EQUIPMENT 9 Yrs.	EQUIPMENT (OTHER) 5 Yrs.	NURSERY GREENHOUSES 10 Yrs.	BUILDINGS & DAM 20 Yrs.	TOTAL
Initial Costs	22373	31942	1430	24041	79786
Depreciation (Yr. 1)	2486	6388	143	1202	10219
Balance	19887	25554	1287	22839	69567
Depreciation (Yr. 2)	2486	6388	143	1202	10219
Balance	17401	19166	1144	21637	59348
Depreciation (Yr. 3)	2486	6388	143	1202	10219
Balance	14915	12778	1001	20435	49129
Depreciation (Yr. 4)	2486	6388	143	1202	10219
Balance	12429	6390	858	19233	38910
Depreciation (Yr. 5)	2486	6388	143	1202	10219
Balance	9943	2	715	18031	28691
Replacement (Yr. 6)		31942			
Depreciation	2486	6388	143	1202	10219
Balance	7457	25556	572	16829	50414
Depreciation (Yr. 7)	2486	6388	143	1202	10219
Balance	4971	19168	429	15627	40195
Depreciation (Yr. 8)	2486	6388	143	1202	10219
Balance	2485	12780	286	14425	29976
Replacement (Yr. 9)	22373				
Depreciation	2486	6388	143	1202	10219
Balance	22372	6392	143	13223	42130
Depreciation (Yr. 10)	2486	6388	143	1202	10219
Balance	19886	4	0	12021	31911

Table 8. KITANGILA FARM PROJECT (K Sh 000)
PROJECTED PROFIT & LOSS STATEMENT (10 YEARS)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
SALES										
Farm	98737	98737	98820	99152	99566	100815	100815	100815	100815	100815
Nursery	8743	22475	25140	27263	30253	30253	30253	30253	30253	30253
Total Sales	107480	121212	123960	126415	129819	131068	131068	131068	131068	131068
OPERATING COSTS										
Farm	20004	19759	19695	19709	19735	19767	19767	19767	19767	19767
Nursery	4245	5488	5950	6299	6698	6698	6698	6698	6698	6698
Tot. Operating	24249	25247	25645	26008	26433	26465	26465	26465	26465	26465
Gross Profit	83231	95965	98315	100407	103386	104603	104603	104603	104603	104603
FINANCING COSTS										
Loan Interest	13213	13213	13213	12215	11076	9779	8299	6613	4690	2499
Depreciation	10219	10219	10219	10219	10219	10219	10219	10219	10219	10219
Total	23432	23432	23432	22434	21295	19998	18518	16832	14909	12718
Total Costs	47681	48679	49077	48442	47728	46463	44983	43297	41374	39183
Profit Before Tax	59799	72533	74883	77973	82091	84605	86085	87771	89694	91885
Corp. Tax (45%)	26910	32640	33697	35088	36941	38072	38738	39497	40362	41348
Profit After Tax	32889	39893	41186	42885	45150	46533	47347	48274	49332	50537
Dividends Declared	—	—	3000	3000	3000	4000	4000	4000	4000	4000
Retained Earnings	32889	39893	38186	39885	42150	42533	43347	44274	45332	46537
Accum. Earnings	32889	72782	110968	150853	193003	235536	278883	323157	368489	415026

Table 9. KITANGILA FARM PROJECT (K Sh 000)
WORKING CAPITAL PROJECTIONS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
INVENTORY											
1 Month Supply of Chemicals, Fertilizers, Etc. Assumed at Half The Operating Cost		1083	1083	1083	1083	1083	1083	1083	1083	1083	1083
ADD											
Accounts Receivables: 2 Mo. Collection Period On Sales		21070	21070	21070	21070	21070	21070	21070	21070	21070	21070
Total		22153	22153	22153	22153	22153	22153	22153	22153	22153	22153
LESS											
Accounts Payable: 1 Mo. Production Costs		4332	4332	4332	4332	4332	4332	4332	4332	4332	4332
Working Capital	14594	17821	17821	17821	17821	17821	17821	17821	17821	17821	17821
Additional Working Capital		3227	3227	3227	3227	3227	3227	3227	3227	3227	3227

Table 10. KITANGILA FARM PROJECT (K Sh 000)
PROJECTED ANNUAL CASH FLOW STATEMENT

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CASH INFLOWS											
Equity Capital	21100	---	---	---	---	---	---	---	---	---	---
Cash From Loan	94380	---	---	---	---	---	---	---	---	---	---
Profit Before Tax	---	59799	72533	74883	77973	82091	84605	86085	87771	89694	91885
Depreciation	---	10219	10219	10219	10219	10219	10219	10219	10219	10219	10219
Accounts Payable	---	4332	---	---	---	---	---	---	---	---	---
Total Inflows	115480	74350	82752	85102	88192	92310	94824	96304	97990	99913	102104
CASH OUTFLOWS											
Capital Costs	100886	---	---	---	---	---	31942	---	---	22373	---
Loan Repayment	---	---	---	7132	8131	9269	10567	12046	13733	15655	17847
Taxes Paid	---	---	26910	32640	33697	35088	36941	38072	38738	39497	40362
Dividends	---	---	---	---	3000	3000	3000	4000	4000	4000	4000
Inventory	---	1083	---	---	---	---	---	---	---	---	---
Account Receivable	---	21070	---	---	---	---	---	---	---	---	---
Total Outflows	100886	22153	26910	39772	44828	47357	82450	54118	56471	81525	62209
Cash Balance	14594	52197	55842	45330	43364	44953	12374	42186	41519	18388	39895
Cumulative Cash	14594	66791	122633	167963	211327	256280	268654	310840	352359	370747	410642

Table 11. KITANGILA FARM PROJECT (K Sh 000)
PROJECTED ANNUAL BALANCE SHEET

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CURRENT ASSETS										
Cash	66791	122633	167963	211327	256280	268654	310840	352359	370747	410642
Account Receivable	21070	21070	21070	21070	21070	21070	21070	21070	21070	21070
Inventory	1083	1083	1083	1083	1083	1083	1083	1083	1083	1083
T. Current Assets	88944	144786	190116	233480	278433	290807	332993	374512	392900	432795
FIXED ASSETS-NET										
Depreciable Assets	69567	59348	49129	38910	28691	50414	40195	29976	42130	31911
Land	21100	21100	21100	21100	21100	21100	21100	21100	21100	21100
T. Fixed Assets	90667	80448	70229	60010	49791	71514	61295	51076	63230	53011
T. Assets	179611	225234	260345	293490	328224	362321	394288	425588	456130	485806
CURR. LIABILITIES										
Accounts Payable	4332	4332	4332	4332	4332	4332	4332	4332	4332	4332
Corp. Tax	26910	32640	33697	35088	36941	38072	38738	39497	40362	41348
Dividends	—	—	3000	3000	3000	4000	4000	4000	4000	4000
T. C. Liabilities	31242	36972	41029	42420	44273	46404	47070	47829	48694	49680
L. T. LIABILITY										
Loan	94380	94380	87248	79117	69848	59281	47235	33502	17847	—
SHAREHOLDER EQUITY										
Stock Equity	21100	21100	21100	21100	21100	21100	21100	21100	21100	21100
Retained Earnings	32889	72782	110968	150853	193003	235536	278883	323157	368489	415026
T. Liabilities	179611	225234	260345	293490	328224	362321	394288	425588	456130	485806

Table 12. KITANGILA FARM PROJECT (K Sh 000)
INTERNAL FINANCIAL RATE OF RETURN CALCULATIONS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Profit After Tax		32889	39893	41186	42885	45150	46533	47347	48274	49332	50537
Depreciation		10219	10219	10219	10219	10219	10219	10219	10219	10219	10219
Interest on Loans		13213	13213	13213	12215	11076	9779	8299	6613	4690	2499
Total Inflows		56321	63325	64618	65319	66445	66531	65865	65106	64241	63255
Investments	115480	---	---	---	---	---	31942	---	---	22373	---
Net Cash Flow	-115480	56321	63325	64618	65319	66445	34589	65865	65106	41868	63255

.51209
.196934 = 51.21% Internal Rate of Return

Table 13. KITANGILA FARM PROJECT (K Sh 000)
SENSITIVITY ANALYSIS ASSUMING A 10% FALL IN PRICES

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sales		96732	109091	111564	113774	116837	117961	117961	117961	117961	117961
Less Operating Cost		24249	25247	25645	26008	26433	26465	26465	26465	26465	26465
Gross Operating Profit		72483	83844	85919	87766	90404	91496	91496	91496	91496	91496
Less Financing Cost		23432	23432	23432	22434	21295	19998	18518	16832	14909	12718
Profit Before Tax		49051	60412	62487	65332	69109	71498	72978	74664	76587	78778
Less Tax 45%		22073	27185	28119	29399	31099	32174	32840	33599	34464	35450
Profit After Tax		26978	33227	34368	35933	38010	39324	40138	41065	42123	43328
Add Back Financing Cost		23432	23432	23432	22434	21295	19998	18518	16832	14909	12718
Total Inflows		50410	56659	57800	58367	59305	59322	58656	57897	57032	56046
Investments	115480	---	---	---	---	---	31942	---	---	22373	---
Net Cash Flow	-115480	50410	56659	57800	58367	59305	27380	58656	57897	34659	56046

.45212
.885555 = 45.21% Internal Rate of Return

APPENDIX 2

CROP PRODUCTION, INPUT-OUTPUT DATA, AND RELATIVE CROP PROFITABILITY

Fyffes Group Limited
Registered London No. 70123

Registered Office
15 Stratton Street Piccadilly London W1A 2LL

Telegrams: FYFFESS LONDON TELEX Cables: FYFFESS LONDON W.1
Telex: 25392 Telephone: 01-499 3411

NEW AG,
888, N. Sepulveda Blvd.
Suite 614,
El Segundo,
California 90245,
U.S.A.

22nd March, 1983

For the attention of Mr. J. Carbonniere

Dear Sirs,

Following our recent discussions, we are writing to confirm that we have agreed to provide a comprehensive marketing service for the horticultural produce which you wish to export into European countries. As we have already informed you, we have over 70 selling points for fruit and vegetables and cut flowers belonging to our companies in France, Belgium and the U.K. and, additionally, we are able to distribute through associates having outlets throughout Germany, Holland and Austria.

As you know, there is a vast market for fruit and vegetables of all kinds, including cut flowers in the European Common Market; our own Group's turnover, apart from bananas, in Britain, France and Belgium is of the order of $400 million and we are confident of our ability to give you a satisfactory service.

We undertake to provide a market and distribution service for any quantities of quality produce which you expect to have available.

We look forward to the pleasure of co-operating with you in this enterprise and assure you of our careful attention.

Yours faithfully,

FYFFES GROUP LTD.

A.C.PENNY.

Table 14. KITANGILA FARM PROJECT
LAND USE PER YEAR

Item	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Nursery (Aeroponics)	ha	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
French Beans	ha	50	50	50	50	50	50	50	50	50	50
Asparagus (green)	ha	70	70	70	70	70	70	70	70	70	70
Asparagus (white)	ha	70	70	70	70	70	70	70	70	70	70
Melons (Charentais)	ha	130	130	130	130	130	130	130	130	130	130
Strawberries	ha	60	60	60	60	60	60	60	60	60	60
Avocados	ha	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	2.5
Total	ha	405	405	405	405	405	405	405	405	405	405

Land use plan is based upon 405 hectares available for cropping per annum. For French Beans and Melons, all the ha would be available for a second crop. Thus:

HECTARES AVAILABLE FOR SECOND CROP

Crop	Year 1-2	Year 3-10
French Beans	50	50
Melons	130	130

Table 15. KITANGILA FARM PROJECT (K Sh 000)
ANNUAL SALES AND GROSS PROFIT, FARM VEGETABLES AND FRUITS

Item	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
SALES										
French Beans	3767	3767	3767	3767	3767	3767	3767	3767	3767	3767
Asparagus (green)	7151	7151	7151	7151	7151	7151	7151	7151	7151	7151
Asparagus (white)	6578	6578	6578	6578	6578	6578	6578	6578	6578	6578
Melons (Charentais)	20358	20358	20358	20358	20358	20358	20358	20358	20358	20358
Strawberries	60883	60883	60883	60883	60883	60883	60883	60883	60883	60883
Avocados	---	---	83	415	829	2078	2078	2078	2078	2078
Total	98737	98737	98820	99152	99566	100815	100815	100815	100815	100815
OPERATING COSTS										
French Beans	1628	1628	1628	1628	1628	1628	1628	1628	1628	1628
Asparagus (green)	2283	2283	2283	2283	2283	2283	2283	2283	2283	2283
Asparagus (white)	1690	1690	1690	1690	1690	1690	1690	1690	1690	1690
Melons	4605	4605	4605	4605	4605	4605	4605	4605	4605	4605
Strawberries	9387	9387	9387	9387	9387	9387	9387	9387	9387	9387
Avocados	411	166	102	116	142	174	174	174	174	174
Sub Total	20004	19759	19695	19709	19735	19767	19767	19767	19767	19767
Interest @ 14% of 50% of Sub-Total	1400	1383	1379	1380	1381	1384	1384	1384	1384	1384
Total Operating Costs	21404	21142	21074	21089	21116	21151	21151	21151	21151	21151
Gross Profit	77333	77595	77746	78063	78450	79664	79664	79664	79664	79664

Table 15A. KITANGILA AEROPONICS & HORTICULTURAL PROJECT(NURSERY)
PROJECTED SALES & OPERATING COSTS (K Sh 000)

	Year 1	Year 2	Year 3	Year 4	Year 5
SALES					
Unpropagated Cuttings	474.75	1424.25	1424.25	1424.25	1424.25
Propagated Cuttings	237.38	791.25	791.25	791.25	791.25
6" Pots	791.25	2373.75	2373.75	2373.75	2373.75
6" Chrysanthemums	316.50	949.50	949.50	949.50	949.50
6" Photus	356.59	949.50	949.50	949.50	949.50
Roses (Cut)	3251.08	11705.44	13068.92	14007.02	15789.13
Carnations (Cut)	3315.58	4280.82	5582.93	6768.11	7975.80
Total	8743.13	22474.51	25140.10	27263.38	30253.18
OPERATING COSTS					
Wages for Labor	534.89	640.39	745.89	851.39	956.89
Salaries & other Benefits for Management	1411.59	1517.09	1622.59	1728.09	1833.59
Water	63.30	63.30	63.30	63.30	63.30
Fertilizer	63.30	63.30	63.30	63.30	63.30
Insecticides & Chemicals	63.30	63.30	63.30	63.30	63.30
Electricity	31.65	31.65	31.65	31.65	31.65
Insurance	63.30	63.30	63.30	63.30	63.30
Pots & Peat Replacements	949.50	949.50	949.50	949.50	949.50
Others (10%)	318.08	339.18	360.28	381.38	402.48
Transport, Handling & Packing	745.89	1756.58	1986.57	2103.67	2270.36
Sub Total	4244.79	5487.58	5949.67	6298.88	6697.67
Interest @ 14% of 50% of Sub Total	297.14	384.13	416.48	440.92	468.84
Total Operating Costs	4541.93	5871.71	6366.15	6739.80	7166.50
Gross Profit	4201.20	16602.80	18773.95	20523.58	23086.68

*Years 6-10 on Sales and Operating Costs are the same as Year 5.

Table 15B. KITANGILA AEROPONICS & HORTICULTURAL PROJECT
LIST OF ASSUMPTIONS

1. The selling prices are as follows (farm gate):

	Year 1	Year 2 ++
Unpropagated cuttings	$0.20	$0.30
Propagated cuttings	0.30	0.50
6" pot plants	1.00	1.50
6" Chrysanthemums	1.00	1.50
6" Photus	1.50	2.00

The expected yields per annum are:

	No. Units
Unpropagated cuttings	450,000
Propagated cuttings	150,000
6" pot plants	150,000
6" Chrysanthemums	60,000
6" Photus	45,000

2. General:

All financial projections are based upon constant prices.

3. Market:

It is assumed that the market for all the products produced is infinite. All that is produced is therefore sold.

4. Production Capacity:

The ornamental growth unit is assumed to operate at 60% utilization capacity.

5. Depreciation:

Greenhouses and shadehouse are estimated to depreciate in 10 years, while the irrigation equipment would be depleted in 9 years. Depreciation is computed by the straight line method.

6. Exchange Rate:

It is assumed that 1 U.S. $ - 10.55, the rate prevailing on 26th March 1982.

7. Market Research in the U.K. - the exchange rate of U.S. Dollars to Pounds Sterling is $1.516 U.S. dollars.

8. Export Quality is assumed to be 90% of actual production for all sales.

9. Price increase of Carnations is 1% per year on projection of sales.

Table 16. KITANGILA FARM PROJECT (K Sh)
GROSS MARGIN PER HECTARE OF VEGETABLE PRODUCTION

Item	Unit	French Beans	Asparagus (Green)	Asparagus (White)	Melons	Strawberries
GROSS OUTPUT						
Yield	kg	7400	9880	8645	14500	56000
Price	K Sh/kg	10.18	10.34	10.87	10.8	18.12
Gross Income	K Sh	75332	102159	93971	156600	1014720
VARIABLE COSTS						
Ploughing (h)	K Sh	500	500	500	500	500
Harrowing	K Sh	360	360	360	360	360
Seed (a)	K Sh	1800	1404	1404	1500	17313
Fertilizers: (b)						
CAN	K Sh	351	——	——	1170	——
SS	K Sh				680	
TSP	K Sh	1660	2988	2988	——	2988
Urea	K Sh	——	690	690	——	——
Insecticides (c)	K Sh	70	70	70	185	70
Fungicides (d)	K Sh	401	220	220	962	220
Wages (e,f,g)	K Sh	14243	8523	8523	5253	13902
Spraying (i)	K Sh	344	344	344	——	——
Transport:						
on Farm (j)	K Sh	258	387	387	258	258
Marketing	K Sh	6027	8172	518	12528	81178
Air Freight (k,l)	K Sh	4928	6579	5760	9656	37287
Repairs & Maintenance (m) of Irrigation System	K Sh	872	872	872	872	872
Irrigation Fuel (n)	K Sh	750	1500	1500	1500	1500
Sub Total		32564	32609	24136	35424	156448
Interest 14% of 50% of the variable Costs		2279	2283	1690	2480	10951
Total Variable Costs		34843	34892	25826	37904	167399
Gross Margin		40489	67267	68145	118696	847321

Table 17. KITANGILA FARM PROJECT (K Sh)
TECHNICAL DATA FOR GROSS MARGIN CALCULATIONS OF VEGETABLE CROPS IN TABLE 16

Item	Unit	French Beans	Asparagus (Green)	Asparagus (White)	Melons	Strawberries
Yield	kg/ha	7400	9880	8645	14500	56000
Price	K Sh/kg	10.18	10.34	10.87	10.8	18.12
(a) Seed or Seedling(s)	Kg/ha	60	18	18	6	60000
Seed Price	K Sh/kg	30	78	78	250	.28855
(b) Fertilizers:						
-SS	kg/ha	---	---	---	400	---
SS Price	kg/ha	---	---	---	1.7	---
-CAN	kg/ha	150	---	---	500	---
CAN Price	K Sh/kg	2.34	---	---	2.34	---
-TSP	kg/ha	500	900	900	---	900
TSP Price	K Sh/kg	3.32	3.32	3.32	---	3.32
-Urea	kg/ha	---	300	300	---	---
Urea Price	K Sh/kg	---	2.3	2.3	---	---
(c) Insecticides:						
-Folidol, 50%						
EC	litr/ha	1.25	1.25	1.25	---	1.25
Sprays	No.	2	2	2	---	2
Folidol Price	K Sh/lit	28	8	28	---	28
-Gusathion 20%						
EC	litr/ha	---	---	---	2.5	---
Sprays	No.	---	---	---	1	---
Gusa. Price	K Sh/lit	---	---	---	74	---
(d) Fungicides:						
-Bayleton						
W.P. 25%	kg/ha	.25	---	---	---	---
Applications	No.	6	---	---	---	---
Bayleton Price	K Sh/kg	267	---	---	---	---
-Ridomil						
W.P. 25%	kg/ha	---	---	---	1	---
Applications	No.	---	---	---	2	---
Rido. Price	K Sh/kg	---	---	---	205.7	---

Table 17. KITANGILA FARM PROJECT (K Sh)
TECHNICAL DATA FOR GROSS MARGIN CALCULATIONS OF VEGETABLE CROPS IN TABLE 16

Table 17. Continued

Item	Unit	French Beans	Asparagus (Green)	Asparagus (White)	Melons	Strawberries
- Dithane						
W.P. 80%	kg/ha	---	2	2	2	2
Applications	No.	---	2	2	5	2
Dit. Price	K Sh/kg	---	55.00	55.00	55.00	55.00
(e) Labor Requirements:						
- Nursery	MH	---	40	40	---	40
- Transplanting	MH	---	720	720	---	720
- Planting	MH	82	---	---	82	---
- Fertilizing	MH	65	75	75	65	75
- Spraying	MH	---	---	---	280	400
- Weeding	MH	440	640	640	400	640
- Harvesting	MH	3464	496	496	420	1190
- Transport from field	MH	456	456	456	456	456
- Pick/Clean/Pack	MH	362	362	362	17	6120
- Irrigation	MH	160	160	160	160	160
(f) Total Lab Require.	MH	5179	3099	3099	1910	5055
(g) Wage Rate	K Sh/MH	2.75	2.75	2.75	2.75	2.75
(h) Field Preparation:						
- Plowing	No.	2	2	2	2	2
Cost Per Plow	K Sh	250	250	250	250	250
- Harrowing	No.	2	2	2	2	2
Cost Per Harrow	K Sh	180	180	180	180	180
(i) Machine Spraying	No.	8	4	4	---	---
Cost Per Spray	K Sh	43	6	86	---	---
(j) On-Farm Transport:						
Tractor-Trailer	hr	6	9	9	6	6
Cost	K Sh/hr	43	43	43	43	43

Table 17. KITANGILA FARM PROJECT (K Sh)
TECHNICAL DATA FOR GROSS MARGIN CALCULATIONS OF VEGETABLE CROPS IN TABLE 16

Table 17. Continued

Item	Unit	French Beans	Asparagus (Green)	Asparagus (White)	Melons	Strawberries
(k) Transport to Nairobi Airport, 22 km x 2:						
- Load Per Journey	MT	10	10	10	10	10
- Journeys	No.	.67	.89	.78	1.31	5.04
- Cost @ Shs 4/km	K Sh/ha	118	157	137	231	887
(l) Air Freight Cost:						
- Tonnes Exported	No.	7.4	9.88	8.65	14.5	56
- Cost Per Tonne	K Sh	650	650	650	650	650
(m) Repairs & Maint. of Irrigation System	K Sh/ha	872	872	872	872	872
(n) Cost of Irrigation Fuel	K Sh/ha	750	1500	1500	1500	1500

Table 18. KITANGILA FARM PROJECT (K Sh)
ANNUAL GROSS MARGIN PER HECTARE OF AVOCADOS PER YEAR

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Yield	kg/ha	----	----	1125	5610	11200	28068	28068	28068	28068	28068
Price	K Sh/kg	----	----	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
GROSS INCOME		----	----	3701	18457	36848	92344	92344	92344	92344	92344
VARIABLE COSTS											
Tractor/Plow/Harrow (a)		860	----	----	----	----	----	----	----	----	----
Seedling (b)		10930	1093	----	----	----	----	----	----	----	----
Fertilizer (c):											
-CAN		164	328	491	655	819	983	983	983	983	983
Hired Labor (d)		4180	3850	1870	2200	2860	3630	3630	3630	3630	3630
Irrigation Fuel (e)		2128	2128	2128	2128	2128	2128	2128	2126	2128	2128
Transport (f)		----	----	54	162	495	990	990	990	990	990
Sub Total		18262	7399	4543	5145	6302	7731	7731	7731	7731	7731
Interest @ 14% of 50% of Sub Total		1278	518	318	360	441	541	541	541	541	541
TOTAL VARIABLE COSTS		19540	7917	4861	5505	6743	8272	8272	8272	8272	8272
GROSS MARGIN		-19540	-7917	-1160	12952	30105	84072	84072	84072	84072	84072

Table 19. KITANGILA FARM PROJECT (K Sh)
ANNUAL QUANTITIES OF INPUTS AND OUTPUTS PER HECTARE OF AVOCADOS

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Yield	Kg	----	----	1125	5610	11200	28068	28068	28068	28068	28068
Price	K Sh	----	----	3.29	3.29	3.29	3.29	3.29	3.29	3.29	3.29
GROSS INCOME		----	----	3701	18457	36848	92344	92344	92344	92344	92344
VARIABLE COSTS											
Tractor/Plow/ Harrowing (a)	No.	2	----	----	----	----	----	----	----	----	----
Seedling (b)	No.	272	20	----	----	----	----	----	----	----	----
Fertilizers (c):											
- CAN	kg	70	140	210	280	350	420	420	420	420	420
Hired Labor (d) MD		190	175	85	100	130	165	165	165	165	165
Irrigation Fuel (e)	ltr	400	400	400	400	400	400	400	400	400	400
Transport to Nairobi Airport by 10 Tonne Lorry:											
-No. Journeys	No.	----	----	6	28	57	142	142	142	142	142
-km/Journey	km	----	----	44	44	44	44	44	44	44	44
-Cost/km	K Sh	----	----	4	4	4	4	4	4	4	4
Total Ground Transport Cost				1003	4998	9979	24992	24992	24992	24992	24992

1. Average Farmgate Price of Avocados in Europe: 3.29/kg
2. Tractor Ploughing/Harrowing: 860/1 K Sh/ha
3. Seedlings: 147.38 K Sh/Seedling
4. Fertilizers: - CAN: 2.34 K Sh/kg
5. Hired Labor: 22K Sh/MD
6. Irrigation Fuel (Diesel): 5.32 K Sh/ltr

Table 20. KITANGILA FARM PROJECT
ANNUAL MANAGEMENT AND LABOR REQUIREMENTS

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Labor Requirements (a)											
French Beans	MD	32369	32369	32369	32369	32369	32369	32369	32369	32369	323
Asparagus (Green)	MD	27116	27116	27116	27116	27116	27116	27116	27116	27116	27116
Asparagus (White)	MD	27116	27116	27116	27116	27116	27116	27116	27116	27116	27116
Melons	MD	45563	45563	45563	45563	45563	45563	45563	45563	45563	45563
Strawberries	MD	74633	74633	74633	74633	74633	74633	74633	74633	74633	74633
Avocados	MD	4180	3850	1870	2200	2860	3630	3630	3630	3630	3630
Total Labor Req.	MD	210977	210647	208667	208997	209657	210427	210427	210427	210427	210427
Total Field Workers (b)	No.	771	771	731	727	730	757	733	738	766	740
Regulars (c)	No.	578	578	578	578	578	578	578	578	578	578
Casuals (d)	No.	193	193	153	149	152	179	155	160	188	162
Farm Manager (e)	No.	1	1	1	1	1	1	1	1	1	1
Asst. Farm Manager (f)	No.	1	1	1	1	1	1	1	1	1	1
Irrigation Eng. (g)	No.	1	1	1	1	1	1	1	1	1	1
Entomologist (h)	No.	1	1	1	1	1	1	1	1	1	1
Agronomist (i)	No.	1	1	1	—	—	—	—	—	—	—
Marketing Expert (j)	No.	1	1	1	—	—	—	—	—	—	—
Farm Foreman	No.	1	1	1	1	1	1	1	1	1	1
Farm Clerk	No.	1	1	1	1	1	1	1	1	1	1
Bookkeeper	No.	1	1	1	1	1	1	1	1	1	1
Farm Artisan	No.	1	1	1	1	1	1	1	1	1	1
Workshop Manager	No.	1	1	1	1	1	1	1	1	1	1
Workshop Technicians	No.	2	2	2	2	2	2	2	2	2	2
Tractor Driver	No.	2	2	2	2	2	2	2	2	2	2
Caterpillar Driver	No.	1	1	1	—	—	—	—	—	—	—
Pick-up Driver	No.	1	1	1	1	1	1	1	1	1	1
Range Rover Driver	No.	1	1	1	1	1	1	1	1	1	1
Lorry Driver	No.	1	1	1	1	1	1	1	1	1	1
General Driver	No.	1	1	1	1	1	1	1	1	1	1
Total Employment (k)	No.	791	791	751	744	747	774	750	755	783	757
Local (l)	No.	786	786	746	742	745	772	748	753	781	755
Foreign (m)	No.	5	5	5	2	2	2	2	2	2	2

*Footnotes to Table 20

(a) Annual Man-Days (MD) Labor Requirements by each crop are obtained by multiplying crop hectares (Table 14) by the Man-Hour (MH) labor requirement per hectare (Table 17) and dividing the product by 8, i.e., 1 MD = 8 MH.

(b) The total number of field workers per annum is obtained by dividing the annual total labor requirement in MD by 225 MD, i.e., 225 MD = 1 Man-Year of work, calculated as follows:

Public Holidays ----------	10 days in year
Sundays ----------	52 at 1 day/week
Sick Leave ----------	12 at 1 day/month
Off Days ----------	6 at 1/2 day/month
Annual Leave ----------	30 days in year
Total	110 Days

: 365 days in a year less 110 days equals 255 working days.

(c) Regular or permanent field workers are taken at 75% of the first year's total field workers required.

(d) Casual or temporary field workers are the difference between total field workers and regular field workers (e, g, h, i, j). New Ag, Inc. will provide a well qualified Farm Manager, Irrigation Engineer, Entomologist, Agronomist and an Agricultural Economist (Marketing Expert). The first two are expected to provide services for the whole planning horizon of 10 years, while the services of the last three experts are expected to terminate by the end of year three of the farm project.

(e) An Assistant Farm Manager, locally recruited, should have at least 3 years of operational experience, and preferably with a diploma in Farm Management and Bachelor of Science in Agriculture.

(k) Total Employment is the sum of field workers and salaried employees.

(l) Local employment is the difference between the Total Employment and the number of foreign experts employed.

(m) Foreign employment consists of the Farm Manager, Irrigation Engineer, Entomologist, Agronomist and the Agricultural Economist.

Table 21. KITANGILA FARM PROJECT
ANNUAL WAGES AND SALARY EXPENSES (K Sh 000)

	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Wages (a)											
Field Workers	K Sh	6106	6106	5790	5758	5782	5995	5805	5845	6067	5861
Salaries (b)											
Farm Managers (c)	K Sh	630	630	630	630	630	630	630	630	630	630
Asst. Farm Manager	K Sh	50	50	50	50	50	50	50	50	50	50
Irrigation Engineer	K Sh	420	420	420	420	420	420	420	420	420	420
Entomologist	K Sh	420	420	420							
Agronomist	K Sh	420	420	420							
Marketing Expert	K Sh	420	420	420	420	420	420	420	420	420	420
Farm Foreman	K Sh	18	18	18	18	18	18	18	18	18	18
Farm Clerk	K Sh	15	15	15	15	15	15	15	15	15	15
Bookkeeper	K Sh	15	15	15	15	15	15	15	15	15	15
Farm Artisan	K Sh	15	15	15	15	15	15	15	15	15	15
Workshop Manager	K Sh	18	18	18	18	18	18	18	18	18	18
Asst. Workshop Manager	K Sh	15	15	15	15	15	15	15	15	15	15
Workshop Technicians	K Sh	24	24	24	24	24	24	24	24	24	24
Tractor Driver	K Sh	24	24	24	24	24	24	24	24	24	24
Caterpillar Driver	K Sh	12	12	12	12	12	12	12	12	12	12
Pick-up Driver	K Sh	12	12	12	12	12	12	12	12	12	12
Range Rover Driver	K Sh	12	12	12	12	12	12	12	12	12	12
Lorry Driver	K Sh	12	12	12	12	12	12	12	12	12	12
General Driver	K Sh	12	12	12	12	12	12	12	12	12	12
Sub Total		8670	8670	8354	7482	7506	7719	7529	7569	7791	7585
10% Benefits		867	867	835	748	751	772	753	757	779	759
Total Wages & Salaries		9537	9537	9189	8230	8257	8491	8282	8326	8570	8344

*Footnotes to Table 21

(a) Wages:

Kitangila Farm is prepared to pay a high wage rate of K Shs 660 per month, or K Shs 22 per man-day or K Shs 2.75 per man-hour of field labor in order to attract and maintain dedicated workers. This wage rate is 187 percent above the minimum consolidated agricultural wage of K Shs 7.66 per man-day for the unskilled farm workers (see Ministry of Agriculture, "Yields, Costs-Prices, 1981", April 1981, p. 119).

(b) Salaries:

As for wages, the farm will pay competitive salaries as follows:

WORKER	BASIC ANNUAL SALARY (K Shs)
	(1 US $ = 10.55)
Farm Manager at USA $60,000 p.a.	630,000
Irrigation Engineer at USA $40,000 p.a.	420,000
Entomologist at USA $40,000 p.a.	420,000
Agronomist at USA $40,000 p.a.	420,000
Agricultural Economist (Marketing Expert) at USA $40,000	420,000
Assistant Farm Manager	50,000
Foreman	18,000
Farm Clerk	15,000
Bookkeeper	15,000
Farm Artisan	15,000
Workshop Manager	18,000
Ass't. Workshop Manager	15,000
Workshop Technician	12,000
Tractor Driver	12,000
Catepiller Driver	12,000
Pickup Driver	12,000
Range Rover Driver	12,000
Lorry Driver	12,000
General Driver	12,000

(c) Constant Wages and Salaries are used over the planning horizon because it is assumed that Wages and Salaries, like other input costs, will be rising equally with product prices due to inflation.

APPENDIX 3

MARKET RESEARCH PRICES ON CROP COMMODITIES

APPENDIX 3

SUMMARY OF VEGETABLE PRICES

ITEM	PERIOD	PRICE	COUNTRY	VARIETY
Asparagus	Sept. - Feb.	$ 1.63/lb.	England	Green
Asparagus	March - May	.97/lb.	England	Green
Asparagus	Dec. - Peak	2.26/lb.	England	Green
Asparagus	Nov. - March	1.02/lb.	France	White
Asparagus	Dec. - Peak	1.22/lb.	France	White
Tomatoes	March - May	.81/lb.	England	
Tomatoes	Nov. - April	.34/lb.	France	
French Beans	Dec. - May	.95/lb.	France	
French Beans	April - Peak	1.38/lb.	England	
French Beans	Feb. - July	1.13/lb.	England	
Strawberries	Nov. - April	1.94/lb.	England	
Strawberries	Dec. - Peak	3.88/lb.	England	
Strawberries	Nov. - April	1.70/lb.	France	
Strawberries	Dec. - Peak	2.37/lb.	France	
Melons	Oct. - March	1.02/lb.	France	(Orange pulp,
Melons	Peak	1.35/lb.	France	light green skin, Charentais)
Avocados	Year Round	.68/lb.	France	
Avocados	Year Round	.71/lb.	England	
Cucumbers	Oct. - April	.20/lb.	France	
Cucumbers	Oct. - April	.24/lb.	England	
Lettuce	Oct. - April	.15 each	England	
Lemons	Sept. - Oct.	.31/lb.	France	
Lemons	Sept. - Oct.	.27/lb.	England	
Bell Peppers	Oct. - May	.27/lb.	France	
Bell Peppers	Jan. - Peak	.65/lb.	England	

AVOCADOS - ENGLAND

Prices in Pence per 4 Kg Tray

MONTH	1982	1981	1980	ORIGIN
January	40 300-350	25 600	30 360-50	Israel U.S.A. Canary
February	450-500	500-550 600-700 550-650	360-50	Israel U.S.A. Canary
March	300-400	450 550 500-550 500	500-55	Israel U.S.A. Cape Canary
April	300-350	350 450	400-450	Cape Canary
May	300-350	350-400	350-420	Cape
June	450-500	360-450	300-400	
July	450-500	350-450	300-400	
August	500	485 600 450-500	375-480	Cape U.S.A. Kenya
September		400-450	450-600	Cape
October		450 480-540	450-650	Cape Israel
November		380 350 380	400-600	U.S.A. Canary Israel
December		380-400 360-400	450-650	Israel Canary

AVOCADOS - FRANCE

Prices in Francs per 4 Kg Tray

MONTH	1980	1981	1982	ORIGIN
January	32-36	35-38	39-42	Israel U.S.A.
February	32-36	35-38	39-42	Israel U.S.A.
March	35-39	38-41	42-45	Israel U.S.A.
April	35-39	38-41	42-45	South Africa Israel
May	36-40	39-42	43-46	South Africa Israel
June	32-36	35-38	39-42	South Africa
July	32-36	35-38	39-42	South Africa
August	32-36	35-38	39-42	South Africa Ivory Coast
September	32-36	35-38	39-42	South Africa Martinique
October	35-39	38-41	42-45	Israel
November	33-37	36-39	40-43	Israel
December	36-40	39-42	43-46	Israel

STRAWBERRIES - ENGLAND

Prices in Pence per Kg

MONTH	1982	1981	1980	ORIGIN
January	280-320	360-400		Israel
	200-280			Kenya
February	240-353	225-265		Israel
	240			Spain
	160			Kenya
March	220-250	250-260		Israel
	170-220			Spain
April	200-220	160-198		Israel
	171-210	132-198		Spain
		120-150		Italy
May	267-309	221-353 (Eng. I)		
		121-133		France
		86-140 (Others)		
June		176-265 (Eng. I)		
	143-265	176-206		Belgium
		132-154		France
		88-143		Italy & Spain
July	110-165	66-110 (Eng. I)		
		40-66 (Eng. II)		
August		154-198 (Eng. I		
	176-264	220-350		Belgium, Etc.
September		137-176 (Eng. I)	176-441 (Eng. I)	
		157-189		France
			176-265 (Eng. III)	
October		176-221	154-176	Eng. I
		132-198	121-154	Eng. III
November		200-240		Italy
		132-176	132-154	Eng. III
December		400-480	353-441	Israel
		240-320		Kenya

STRAWBERRIES - FRANCE

Prices in Francs per Kg

MONTH	1980	1981	1982	ORIGIN
January	25-30	30-35	33-36	Israel
February	22-25	25-30	33-36	Israel Spain
March	26-29	26-32	33-36	Israel Spain
April	28-30	26-32	32-35	Israel Spain
May				
June				
July	French Strawberry Production			
August				
September				
October				
November		28-32	25-30	Israel U.S.A.
December		30-35	30-32	Israel U.S.A.

MELONS - ENGLAND

Prices in Pence per 10 Kg

MONTH	1982	1981	1980	ORIGIN
January	500-550 G 650 Y	400-500 G	600-800 G 600-700 W	Spain Colombia Cape
February	1000-1200 G 1200 W	550-600 G 500 W	700 G 600-700 W	Spain Cape
March	900-1050 800 Y	900-1000 650-700 700	850W 900-1000G 600-620 W	Chile Brazil Cape Colombia
April	600-800 450	650-700 800-900	400-600 G 550 W	Chile Cape
May	600 650-700 Y	750 700 Y	800-700 W 700 G	Chile Spain Colombia
June	500-550 Y	650-500 Y	500 Y	Spain
July	600 400-450 Y	240-280 Y	250-350 Y	Cyprus Spain
August	300-380 Y	260-280 Y	280-360 Y 400	Spain Greece
September		200-300 Y	200-300 Y	Spain
October		360-400 Y 300-360 G	280-400 Y 260-320 G	Spain
November		240-330 G	300-350 G	Spain
December		500-600 Y 400-550 G	500-550 G	Spain

G = Green W = White Y = Yellow

FRENCH BEANS - ENGLAND

Prices in Pence per Kg

MONTH	1982	1981	1980	ORIGIN
January	73-132	88-128		Kenya
	56-60			Senegal
February	85-90			Egypt
	128-132	103-148		Kenya
	100-121	110-147		Senegal
March	176-198	160-221		Kenya
	110-130			Senegal
April	165-184	147-184		Kenya
May	66-88	110-121		Egypt
	143-154	143-165		Kenya
	100-130	110-143		Others
June		88-110		Egypt
	110-147	132-154		Kenya
	88-132			England I
	88-122	99-154		Others
July	110-143	66-221		England I
	110-120	110-147		Kenya
August	44-66	66-88		England I
	99-132	88-132		Kenya
September		33-44	33-44	England I
		74-129	110-220	Kenya
October		44-47		England I
		88-121	77-110	Kenya
November		83-132	110-121	Kenya
		55-88		Egypt
December		77-120	120-129	Kenya
		110-121	60-80	Egypt
			42-66	Spain

Previous Page Blank

ASPARAGUS - ENGLAND

Prices in Pence per Kg

MONTH	1982	1981	1980	ORIGIN
January				
February		180-250		
March	130-140	120-130	120	
April	120-130	60-100	100-120	
May	100-150	70-120	100-150	
June	80-130	80-180	60-90	
July	100-150		240	
August				
September		200	200	
October		180	180-240	
November		150	160-180	
December		280	300	

CUCUMBERS - FRANCE

Prices in Francs per 8 Kg Tray

MONTH	1980	1981	1982	ORIGIN
January	34-38	32-36	30-35	
February	40-42	30-35	30-35	
March	30-32	28-32	28-32	
April	26-30	28-32	28-32	
May	24-26	20-25	28-32	
June	20-22	18-20	20-25	
July				
August		Local French Production Period		
September				
October	24-26	30-32		
November	20-22	22-25		
December	24-26	28-32		

CUCUMBERS - ENGLAND

Prices in Pence per 8 Kg Tray

MONTH	1982	1981	1980	ORIGIN
January	320	340	350	
February	320	320	380	
March	300	300	300	
April	300	300	250	
May	300	180	220	
June	220	130	180	
July	120	160	180	
August	120	180	250	
September		180	200	
October		280	220	
November		180	180	
December		260	220	

LETTUCE - ENGLAND

Prices in Pence

MONTH	1982		1981		1980		ORIGIN
January	80-140	12	100-200		100-150		England
	240-280	24	340-440	24	300-340	24	Dutch
February	100-140	12	150-180 R		80-120 R		England
	280-300	24	360-400	24	180-260	24	Dutch
March	80-120	12	100-150 R		80-140 R		England
	240-260	24	240-280	24	200-220	24	Dutch
April	100-140		120-160 R		80-100 R		England
	260-280	24	320-360	24	200-220	24	Dutch
May	100-150		120-150 R		80-100 R		England
					180-220 C		"
			260	24	160-200	24	Dutch
June	100-150 R		100-130 R		60-100 R	12	England
	120-130 C		180-200 C		80-120 C		"
July	120-140 R		80-100 R		60-100 R		England
	120-140 C		140-150 C		90-100 C		"
August	80-140 R		80-100 R		80-100 R		England
	120 C		140-150 C		100 C		"
September			80-100 R		60-100 R		England
			140 C		120 C		"
October			120-140 R		120-180 R		England
			150 C		120 C		"
			300	24			Dutch
November			120-140		140-180 R		England
					150-160 C		"
			260-300	24			Dutch
December			120-140		100-180		England
			320	24	300-360	24	Dutch

12 or 24 = Heads per case

LEMONS - ENGLAND

Prices in Pence per 15 Kg

MONTH	1982	1981	1980	ORIGIN
January	450-500	400-500	550-600	Italy
	300-480	350-550	350-550	Cyprus
	500-550			Greece
		450-680	400-600	Cape
February	400-450	370-400	450	Italy
	160-180		160-180	Spain
	380-520			Jaffa
	300-350	300-440	300-460	Cyprus
		450-680		Cape
March	300-350	450-475	400-450	Italy
	140-150		180-200	Spain
	380-520	570-600		Jaffa
	250-300			Cyprus
		600-650	500-560	Cape
April	380	400-550	450-480	Italy
	320-350	400-550	180-230	Spain
	450-500	450-550	400-600	Cape
		500-520		Jaffa
May	350-400	400-480	450-480	Italy
	330-380	400-480	180-230	Spain
	450-550	400-560	400-600	Cape
		460-480		Jaffa
June		400-500	400-500	Italy
	360-450	450-520	160-220	Spain
	500-600	400-550	400-600	Cape
July			450-500	Italy
	260-350	500-600	550-600	Spain
	500-600	450-700	500-650	Cape
August		550-650	700	Italy
	380	500-750	250-300	Spain
	500-600		700-850	Cape
September		850-1050	750-850	Cape
			450-680	Italy
		750-850		Jaffa
		950-1050		Chile
			260-300	Spain

LEMONS - ENGLAND

Prices in Pence per 15 Kg

MONTH	1982	1981	1980	ORIGIN
October		900-1000		Italy
		800-1100	600-750	Cape
		700-750	550-600	Cyprus
			500-600	Spain
November		500-550	650-700	Italy
		550-700	500-700	Cape
		300-400	400-540	Cyprus
December		450-500	420-500	Italy
		500-700	450-650	Cape
		450		Jaffa
			380-520	Cyprus

BELL PEPPERS - ENGLAND

Prices in Pence per 5 Kg Packages

MONTH	1982	1981	1980	ORIGIN
January	450			Israel
	400	500-650	30/lb.	Canary
February	350-390	40/lb.	480-500	Canary
	340-350			Cuba
	250			Spain
		45/lb.		Kenya
			420-520	Ethiopia
March	600		60/lb.	Dutch
	350-400	40-50/lb.	45/lb.	Canary
April	550	50/lb.	55/lb.	Dutch
	450	30/lb.	45/lb.	Canary
May	650	50/lb.	500	Dutch
	250-300	25/lb.	200-250	Canary
June	650	35/lb.	70/lb.	Dutch
	350	18/lb.		Spain
			40/lb.	Canary
July	450	38-45/lb.	25-30/lb.	Dutch
	30/lb.			England
August	360	300	25/lb.	Dutch
	25-28/lb.	25/lb.	20/lb.	England
September		30/lb.	270-450	Dutch
		25/lb.	25/lb.	England
October		33-35/lb.	28/lb.	Dutch
		25-30/lb.	25/lb.	England
			28/lb.	France
November		33/lb.	25/lb.	Israel
		45/lb.	25/lb.	Dutch
			20-25/lb.	England
		28/lb.	20-25/lb.	Canary
December		35/lb.	20/lb.	Israel
		45/lb.	40/lb.	Dutch
		30/lb.	25/lb.	Canary

TOMATOES - ENGLAND

Prices in Pence per 5 Kg

MONTH	1982	1981	1980	ORIGIN
January	300	300	400	
February	350	300	400	
March	600	500	600	
April	550	700	600	
May	500	450	450	
June	320	320	320	
July	200	220	280	
August	280	260	260	
September		200	200	
October		220	200	
November		300	300	
December		280	350	

TOMATOES - FRANCE

Prices in Francs per Kg

MONTH	1980	1981	1982	ORIGIN	
January	3-5	3-4	3-4	Holland, Belgium,	Spain Israel
February	3-5	3-4	3-4.5	"	"
March	5-6	4-6	5-7	"	"
April	5-6	6-8	5-6	"	"
May					
June					
July		Local French Production Period			
August					
September					
October					
November		3-4	3-5	"	"
December		3-5	4-6	"	"

CAULIFLOWERS - ENGLAND

Prices in Pence per Dozen Heads

MONTH	1982	1981	1980
January	200-540	250-360	250-300
February	200-300	210-300	250-400
March	200-345	250-390	300-360
April	250-420	150-285	150-400
May	300-500	260-450	200-350
June	350-550	270-500	280-480
July	250-400	200-400	200-350
August	130-170	100-240	140-220
September	250-335	200-300	150-260
October	200-260	170-240	120-220
November		200-300	200-450
December		280-500	180-400

PRICE RANGE VARIES ACCORDING TO SIZE AND QUALITY.

KITANGILA AEROPONICS & HORTICULTURAL PROJECT (NURSERY)
UNITED KINGDOM MARKET RESEARCH - CARNATIONS
PER STEM STERLING - PENCE

	1979-80		1980-81		1981-82	
	Low	High	Low	High	Low	High
Nov.	7	10	7	11	7	11
Dec.	7	12	7	12	7	12
Jan.	7	12	8	12	6	11
Feb.	8	12	8	12	8	13
Mar.	8	12	8	13	8	13
Apr.	8	12	8	11	8	12
May	6	11	7	10	7	12
Ave. Low & High	7	12	8	12	7	12
Ave. Total		9.43		9.57		9.65
Ave. U.S. Cents		14.30		14.51		14.63

ROSES - PENCE

	1979-80				1980-81				1981-82			
	T. Roses Long Stem		Floribunda Sm. Roses		T. Roses Long Stem		Floribunda Sm. Roses		T. Roses Long Stem		Floribunda Sm. Roses	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Nov.	15	25	5	10	15	25	5	10	15	25	6	12
Dec.	20	30	5	10	20	30	5	10	5	25	4	10
Jan.	20	30	5	10	20	30	5	10	20	35	5	10
Feb.	20	30	5	10	20	30	5	12	20	40	6	12
Mar.	15	25	4	8	20	25	5	10	20	30	5	10
Apr.	10	20	3	7	10	20	4	8	10	25	4	8
May	10	17	3	6	10	20	3	8	10	20	4	8
Ave. Low & High	16	25	4	9	16	26	5	10	14	29	5	10
Ave. Total		20.50		6.50		21.07		7.14		21.43		7.43
Ave. U.S. Cents		31.12		9.81		31.94		10.82		32.49		11.26

APPENDIX 4

WATER REQUIREMENTS

DAM DATA AND SPECIFICATIONS

KITANGILA FARM PROJECT
WATER REQUIREMENTS
DAM DATA AND SPECIFICATIONS

1. CURRENT SITUATION

1.1 Climate of the Region

Kenya lies astride the equator and its climate is dominated by the monsoonal systems of the Indian Ocean. It lies within the intertropical convergence zone (ITCZ) but the high mountains and great lakes modify the classical ITCZ pattern significantly. There are two main divisions in the annual pattern of circulation, June to September or early October and December to March. The intervening periods are best considered as transitional.

The southeast monsoon dominates btween June and September, bringing a subsiding air mass that inhibits rainfall and causing dull weather and low temperatures. From December to March, the dry northeast monsoon is dominant. In the transitional times of March-June, the season of the "long" and heaviest rains, and October to November, the "short" rains, winds are from the east bringing moist maritime air from the Indian Ocean.

Table 22 shows that the average annual potential evaporation (EO) is in the order of 1882 mm. It is evident that except in April, the evaporation demand for most of the year exceeds the mean monthly rainfall. This implies that most and especially horticultural crops cannot be grown successfully under the natural rainfall conditions. Supplementary irrigation is necessary in the greater part of the year.

The consumptive use listed in Table 22 is based on the data by Woodhead in Table 1 in the feasibility report. We feel however, we should design the irrigation system on peak consumptive use of 5 mm per day. January and February for Athi show 4.5 mm/day.

The reasons for using design peak consumptive use of 5 mm/day are:

1. There is less rainfall and probably less effective rainfall.

2. The river flow is more variable and there is greater demand for the water of the Athi and Stony Athi.

There are two main sources of irrigation water to the farm: the Athi River which forms the southwestern, western and northwestern boundary of the farm and the Stony Athi River which forms the northern, ortheastern and

Cu and Water Requirements

Table 22

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Ave.
Temperature														
Max (Mean)	26.8	28.0	27.4	24.6	24.1	23.1	22.3	22.7	25.3	26.2	23.6	25.1		25 9
Min (Mean)	13.1	13.4	14.4	14.3	14.2	12.6	11.5	11.8	12.2	13.7	14.4	13.8		13.3
Mean	20.0	20.7	20.9	19.5	19.2	17.9	16.9	17.3	18.8	20.0	19.0	19.5		19.1
Rainfall														
Nairobi	48	48	115	195	137	42	16	21	24	52	114	77	889	
Athi	28	37	90	153	72	23	6	8	10	35	85	49	596	
Consumptive Use														
Eo(Potentail)	207	188	188	151	132	113	94	113	169	188	151	188	1882	
ET mm/month	138	125	125	101	88	75	63	75	113	125	101	125	1254	
ET mm/day	4.5	4.5	4.0	3.4	2.8	2.5	2.0	2.4	3.8	4.0	3.4	4.0	344	
ET in/month	5.4	4.9	4.9	4.0	3.5	3.0	2.5	3.0	4.5	4.9	4.0	4.9	49.5	
Eff Rain	0	0	3.5	6.0	2.8	0	0	0	0	0	3.3	0		
*A F for1000	452	410	117	0	58	56	207	250	370	410	58	410	2798	
Ave. Flow 70-71-72	447.5	195.5	629.0	8663.0	17534.1	2413.7	686.6	558.4	429.5	568.7	2035.2	543.5		
Min.Flow 68-81	343.1	180.5	141.5	191.4	946.5	203.3	299.2	242.8	203.7	186.6	311.5	214.3		
Ave. 68-75-	685.5	423.8	547.3	8183.5	11238.8	2824.9	664.7	545.2	463.3	687.1	2099.5	1653.5		

*A F = Acre Feet 1 AF = 1234.0121 cubic meters

eastern boundary. Both of these rivers are seasonal. Conservation of water from these rivers during the rainy seasons by use of dams is necessary for irrigation during the dry season. Currently, the Kenya Meat Commission (KMC) has two dams in the farm. One is located on the Stony Athi River and the other in the middle of the farm.

1.2 WATER REQUIREMENT

Table 23 gives the flow for the Athi River for measurements available. A dash in the year and month means data was taken but not complete. A blank means no data available or it was not taken.

Since water requirements are high in December, January and February and the flows of the river are low and there are other pumping rights in the river, we feel we should provide for 2026 acre feet (AF) or 2.5 million cubic meters of storage. January, February, October and December all require more than 400 AF during the month. If not much pumping was possible from the river all we need would come from storage. With less storage, chances of crop failure increase.

$$\frac{2026 \text{ AF} \times 43560}{35.315} = 2{,}500{,}018.5 \text{ M}$$

1.3 OTHER WATER USERS

In addition to the KMC mentioned above, there are four other users of the water resources available to the farm. These are Maingi Farm, sharing the Athi River boundary, and Mutisya Farm, Lukenya Ranch and Ndeti Family Farm, sharing the Stony-Athi River boundary from the north to the east.

1.4 WATER PERMITS

The previous farm owner had two permits for drawing water from the Athi River for irrigation purposes. The first permit, permit no. 14304 of January 1977, allowed for 210,000 gallons of water per day to irrigate an area of 90 acres of fodder crops. The second permit, permit no. 10710 of 1980 allowed for 86,000 gallons of water per day to irrigate 40 acres of fodder crops.

A water permit remains valid for a period of five years according to information received from the Ministry of Water Development. Accordingly, the first permit expired in 1982, while the second permit will expire in 1985.

AIHI RIVER FLOW
Acre Feet

Table 23

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOVE.	DEC.
68			902.7	17199.4	11520.4	1516.9	611.9	382.9	236.5	186.6	4988.4	7856.5
69	491.5	418.1	470.2	361.2	946.5	303.3	299.2	242.8	203.7	205.9	341.5	214.3
70	403.2	198.2	1477.3	23236.9	10145.8	2094.5	538.0	338.6	255.9	286.2	377.1	220.9
71	455.4	180.5	141.5	2560.9	40971.8	6776.7	636.1	525.0	314.9	247.2	3375.5	483.8
72	483.8	207.9	268.3	191.4	1484.8	4469.1	885.8	811.6	717.9	1172.8	2353.0	925.9
73	1935.9	1114.33	377.0	5551.3	2364.1	1424.2	521.3	590.3	642.8	1296.7	1101.5	219.4
74	343.1	-	194.2	-	-	3189.9	1160.4	-		1414.3		-
75	-	-	-	-	-	-	-	925.3	871.1	-	-	-
76	-	-										
77			-	-	-	-	12216.4	10710.9	7239.8	6432.5	9206.9	1008.7
78	-	6327.4	21825.4	-	-	-	-	-	-	-	-	-
79	19420.5	47624.8	15 254.1	13156.2	31686.4	39199.9	68641.2					
80		-	-	-	-	-	-	-				
81			-	-	-	-						
Min.	343.1	180.5	141.5	191.4	946.5	303.3	299.2	242.8	203.7	186.6	341.5	214.3
Average 68-75	685.5	423.8	547.3	8183.5	11238.9	2824.9	664.7	545.2	463.3	687.1	2089.5	1653.5
Average All	3299.8	8010.2	4545.6	8893.9	14160.0	7371.8	9498.1	1815.9	1310.3	1405.3	3106.3	1561.4

However, both permits can be transferred to the new farm owner by application and subject to proof of farm ownership (production of land title deed or a letter from whoever is holding the title deed) and payment of a K Shs 50 fee per permit application to the Water Board of the Ministry of Water Development.

1.5 WATER QUALITY

The water quality for samples 1 and 2 taken from both rivers appear to be good, based on the laboratory analysis, with the exception of samples 3 and 4 taken from the effluent from the slaughter house. This is not being used for irrigation purposes under this plan.

2. FUTURE SITUATION

2.1 Current Water Availability Versus Future Needs

The existing water permits, if transferred to the new farm ownership, would provide a total water amount of 296,000 gallons per day. This amount would be adequate to irrigate merely 59 acres per day at an equivalent rainfall of 7.87" (200 mm) per acre per month for many horticultural crop requirements.

The farm project calls for the irrigation of about 1,000 acres of horticultural and floricultural crops. This acreage would therefore require a total of about 2.5 million cubic meters of water storage.

2.2 WATER QUALITY

Samples of the water quality (Table 24) from the Athi River #1, Stony Athi #2, KMC Dam #3 and small dam (pond) #4 are shown in Table 24. Water from samples 1 and 2 can be used on almost all soils and crops. Water from sample 3 can also be used on most crops. However, care must be taken to keep soil open to prevent salt accumulation. Sample #4 is the effluent from the KMC plant and should not be used for irrigation.

2.3 DAM CONSTRUCTION

Enquires from the Water Apportionment Board have revealed that the Board would have no objection, and would in fact encourage the construction of dams on the above mentioned rivers or on the farm itself. This means that a water storing structure must be built that will store the necessary water during the overflow season. The required application has been made to Water Apportionment Board and the approval to construct the water storing facilities has

MINISTRY OF AGRICULTURE

Table 24

National Agricultural Laboratories,
P.O. Box 14733,
NAIROBI

Ref....WAT/II/IV/66 ..... 1st February, 19 82

Sample Sent By...Mr. J.Williams.....
Address ...P.O. Box 60158,.....
...NAIROBI.....
.....

Ref: Four water samples Ex. Athi River.

Ref	1	2	3	4		
Lab.No. /82	295	296	297	298		
pH	7.1	7.9	8.8	8.1		
Conductivity micro mhos/cm	400	400	1200	4500		
Sodium m e/litre	2.00	2.00	10.43	43.00		
Potassium m e/litre	0.23	0.21	0.41	0.92		
Calcium " "	1.10	1.16	1.06	0.82		
Magnesium " "	0.52	0.26	0.44	0.40		
Carbonates " "	NIL	NIL	1.52	1.48		
Bicarbonates " "	3.00	3.02	6.30	26.60		
Chlorides " "	0.80	0.90	4.10	16.40		
Sulphate " "	0.05	0.002	0.28	0.29		
Nitrates " "						
Fluorides " "						
Sodium Adsorption Ratio	2.22	2.35	14.3	66.1		

been granted.

2.4 WATER STORAGE OPTIONS

The nature of the operations envisioned by Kitangila Limited require the storage of a large quantity of water to ensure year round operating.

Two possible water storage solutions have been identified. One solution is based on on-site storage in earth - bank reservoirs and the other solution entails the construction of a mass concrete weir on the Stony Athi, which forms one boundry of the farm.

The on-site earth - bank reservoir will impound a total of 2.5 million cubic meters of water, to a depth of 6.0 meters, and will cover an area of some 50 hectares. The total embankment length is approximately 3.5 km and involves the excavation of 1.4 million cubic meters of soil. The arrangement of the storage reservoirs is shown in Drawing W.S.0705:2/0102.

The mass concrete weir solution on the Stony Athi will also impound 2.5 million cubic meters of water. The maximum height of the weir will be 12.0 meters, with a crest length of 380 meters. The surface area covered at full supply level is 57 hectares. The total volume of concrete required will be approximately 15,000 cubic meters. The general proposals for the concrete weir are shown in Drawing W.S.0705:2/0101 and W.S.0705:2/6003.

Both the Athi and Stony Athi Rivers are seasonal. Of the two rivers the Stony Athi River is more or less unexploited.

The Consultants are therefore directing their efforts to obtaining water from the Stony Athi River.

From the studies completed to date it can be stated that the concrete weir solution is a positive option. Surveys and investigations have established the constraints on the site of the concrete weir, and hydraulic analysis has shown that the required impoundment can be achieved, without the build-up of the head waters causing problems to the main trunk road. The final selection of the preferred storage solution will be mainly determined by the hydrological constraints.

During the periods of low flow the storage system would have a significant effect on down-stream flows and flood regulation. During years of normal and high rain fall the comparatively small impoundment would have little effect on flood flows.

2.5 THE USE OF THE STORED WATER

The primary use of the stored water would be to provide water for irrigation of the intensive horticultural production which is planned. Market research has established that Kenya can sell French Beans, Asparagus, Charentais Melons and Strawberries on the European Market at competitive prices. Initial production is targeted to produce a revenue of K Shs. 80 million, or approximately U.S. $6 million per annum.

Secondly the stored water will be for the drinking water supply to the company's housing estate.

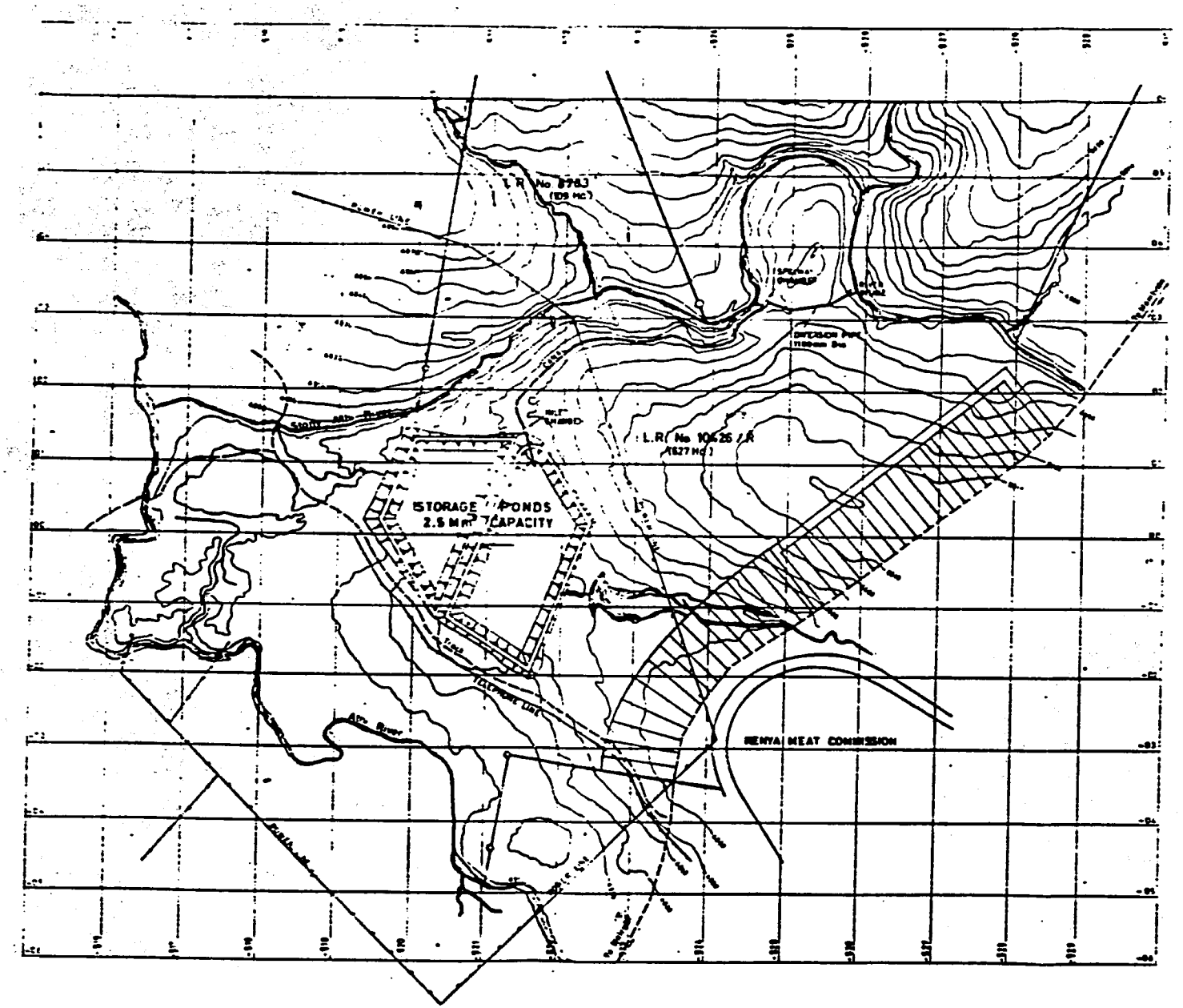
In the future, the water could also support a productive fishing industry.

The whole operation will create extensive employment and some seven hundred people will require housing.

2.6 CONCLUSION

The environmental, economic and engineering impact which the project will have on the area will be most beneficial. It will make use of the flash flows in a seasonal river; it will allow for a highly productive development to take place which will be an important source of external revenue for Kenya, it will create an additional employment. In the future, the stored water will increase the production of much needed protein from a fishing farm industry.

This is an imaginative and soundly based project which will contribute substantially to Kenya's economic growth.



BEST AVAILABLE COPY

No	Description of Revision

Client
KITANGILA LIMITED
P.O. Box 468
MAIROBI

East African Engineering Consultants
P.O. Box

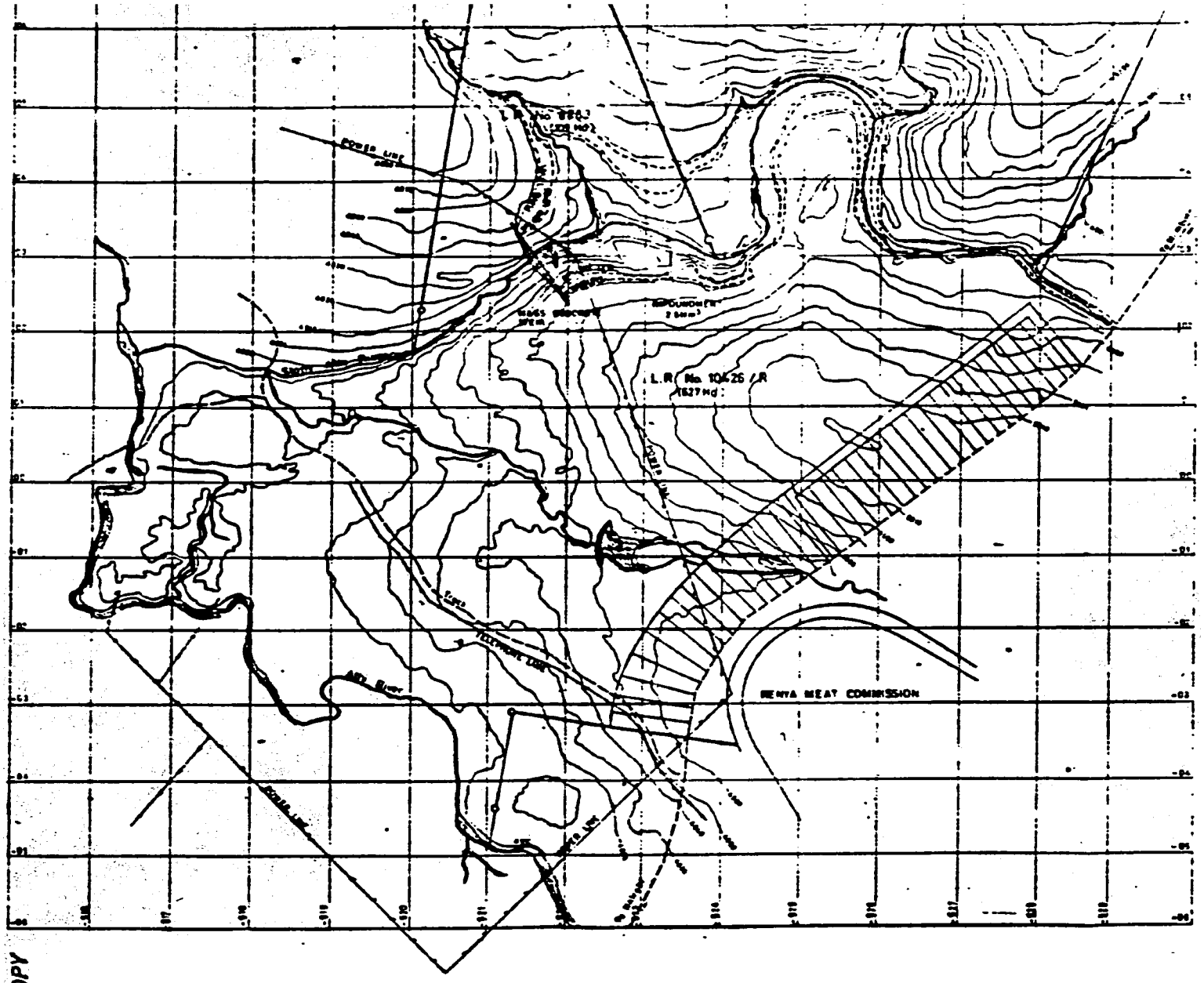
Date JUNE 1983	Designed R.D.B.
Scale 1:10,000	Checked

Project
KITANGILA FARM
IRRIGATION PROJECT

Title
FARM MAP
LOCATION OF WORKS
ON SITE STORAGE PONDS

PRELIMINARY DESIGN

Drawing No



KITANGILA LIMITED
P.O. Box 46...
NAIROBI

East Africa Engineering Consultants

Date: JUNE 1983	Drawn: B.M.B.	Checked:
Scale: 1:10,000	Drawing No: 6-4	

Project:
KITANGILA FARM IRRIGATION PROJECT

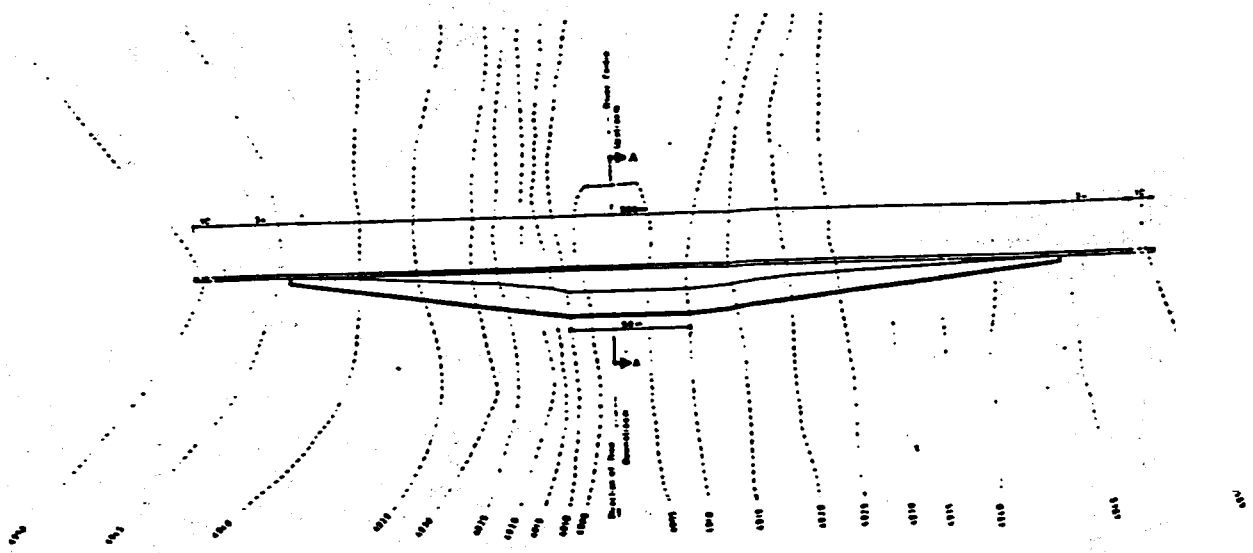
Title:
FARM MAP
LOCATION OF WORKS
WEIR ON STONY ATHI RIVER

PRELIMINARY DESIGN

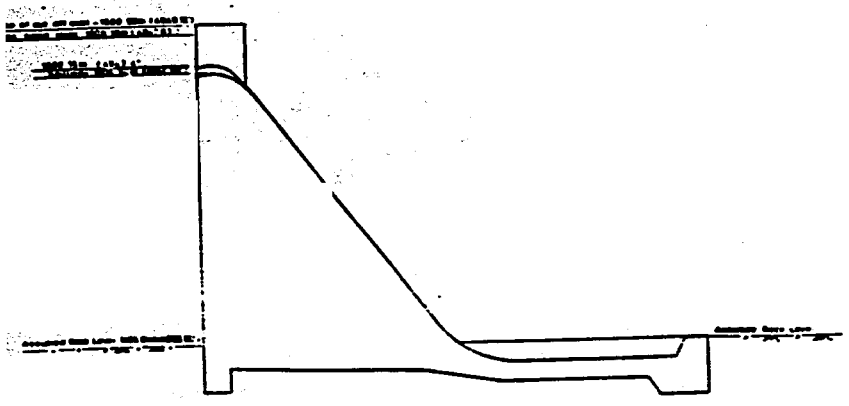
Drawing No: WS.0705.2/0101

BEST AVAILABLE COPY

BEST AVAILABLE COPY



PLAN



SECTION A-A

No.	Description of Revision	Date

Client: KITANGILA LIMITED, P.O. Box 4EE, NAIROBI

East African Engineering Consultants

Date: JUNE 1981 | Designed

Scale: 1:1000 1:100 | Checked · Approved

Project: KITANGILA FARM IRRIGATION PROJECT

STONY ATHI MASS CONCRETE WEIR SITE LAYOUT AND GENERAL ARRANGEMENT

PRELIMINARY DESIGN

Drawing No. WS 0705.2/6003

Revision

APPENDIX 5

OIL SAMPLE ANALYSIS

AVAILABLE NUTRIENTS FOR L R Nos 10426/R

DATE 11th May 1982

PROFILE NO.	1A	1A	2A	2A	$3A_1$	$3A_1$	$3A_2$	$3A_2$	$4A_1$	$4A_1$
LAB NO.	1	2	3	4	5	6	7	8	9	10
DEPTH (CM)	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
HYDROLIC CONDUCTIVITY	--	--	--	--	--	--	--	--	--	--
BULK DENSITY	--	--	--	--	--	--	--	--	--	--
% SAND	29.355	26.89	31.07	15.51	25.53	19.66	32.27	48.70	39.59	8.21
% SILT	25.21	34.26	20.18	17.29	42.39	26.08	30.41	20.94	40.12	21.96
% CLAY	55.42	38.85	48.75	67.20	32.08	54.34	37.32	30.36	23.29	68.56
TEXTURE CLASS	C	C	C	C	SIC	C	SICL	SICL	CL	C
E.C. (mmhos/cm)	0.006	3.072	0.704	0.768	0.020	0.049	0.819	0.627	0.934	1.280
pH H_2O	7.6	8.3	7.0	7.5	8.0	8.2	7.4	7.6	7.2	8.9
pH $CaCl_2$	6.6	7.5	6.1	6.6	7.3	7.9	6.8	6.9	6.6	6.9
%C	1.00	0.73	1.57	1.03	1.22	0.61	1.34	0.80	2.10	1.22
%N	0.13	0.08	0.18	0.11	0.11	0.06	0.13	0.14	0.17	0.11
P - ppm	5.08	5.00	5.00	1.92	15.80	8.08	5.00	1.92	10.42	5.00

AVAILABLE NUTRIENTS FOR L R Nos 10425/R (Cont.)

DATE 11th May 1982

Ca me/100g	26.0	43.0	16.4	28.5	24.0	40.0	29.0	28.0	33.0	35.0
Mg me/100g	2.0	2.0	29.2	18.0	4.0	6.0	10.0	9.0	11.0	7.0
Na me/100g	4.6	9.85	2.20	5.60	9.41	22.00	0.88	0.70	1.80	5.82
K me/100g	1.0	0.90	2.83	3.50	1.60	1.90	2.78	1.20	3.65	1.65

AVAILABLE NUTRIENTS FOR L.R Nos 10426/R

DATE 11th May 1982

PROFILE NO.	$4A_2$	$4A_2$	$5A_1$	$5A_1$	$5A_2$	$5A_2$	6A	6A	7A	7A
LAB NO.	11	12	13	14	15	16	17	18	19	20
DEPTH (CM)	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
HYDROLIC CONDUCTIVITY	--	--	--	--	--	--	--	--	--	--
BULK DENSITY	--	--	--	--	--	--	--	--	--	--
% SAND	9.05	25.52	23.31	19.45	9.94	9.72	21.07	20.34	24.00	29.87
% SILT	30.98	58.24	27.93	37.69	33.43	31.94	23.84	44.43	30.21	21.04
% CLAY	59.78	17.81	48.19	43.72	58.23	56.12	35.75	45.77	49.18	50.12
TEXTURE CLASS	C	SiL	SiCL	SiC	C	C	SiCL	SC	SiC	C
E.C. (mmhos/cm)	1.856	0.019	0.019	0.960	0.022	1.472	1.056	1.280	0.064	4.992
pH H_2O	8.0	8.5	7.0	7.4	7.2	8.1	7.7	8.0	7.7	8.6
pH $CaCl_2$	7.1	7.3	6.7	6.7	6.4	7.4	7.1	7.5	7.1	8.2
%C	1.34	0.27	0.92	1.19	1.80	1.07	2.56	1.42	1.99	0.77
%N	0.10	0.08	0.14	0.08	0.24	0.13	0.29	0.19	0.20	0.10
P - ppm	7.25	2.92	8.33	7.17	1.92	3.92	3.92	3.00	5.00	4.35

AVAILABLE NUTRIENTS FOR L R Nos 10426/R (Cont.)

DATE 11th May 1982

Ca me/100g	31.0	22.0	25.0	27.0	30.3	31.0	44.1	54.0	29.0	37.0
Mg me/100g	9.0	11.0	9.0	8.0	17.8	7.0	3.0	1.0	8.0	18.0
Na me/100g	6.5	9.50	1.50	2.13	6.00	14.00	0.95	1.22	0.95	15.00
K me/100g	1.90	0.80	2.00	1.30	1.90	0.33	5.20	3.30	3.40	3.60