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INVESTIGATIONS INTO PROPOSALS OF
INTERNATIONAL AGRICULTURAL INDUSTRIES FOR
HORTICULTURAL DEVELOPMENT IN KENYA

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ABBREVIATIONS

CDC	-	Commonwealth Development Corporation
DEG	-	Deutsche Gesellschaft für Wirtschaftliche Zusammenarbeit MbH
DCK	-	Dansk Chrysanthemum Kultur
IAI	-	International Agricultural Industries Ltd SA
HCDA	-	Horticultural Crops Development Authority
NSA	-	Nuclear Stock Association
DCKN	-	DCK Nurseries
20m	-	Twenty million
20 m	-	Twenty metres
kg	-	Kilogramme
cm	-	Centimetre
tonne	-	1,000 kilos and 2,205 lb
ton	-	1,016 kilos and 2,240 lb

CONVERSION RATES

1 DM = K Shs3.03

SUMMARYS.1 Introduction (Part 1)

(1) The Dansk Chrysanthemum Kultur (DCK) group of companies is engaged in Kenya in the production and propagation of chrysanthemum cuttings, carnation cuttings and flowers and asparagus fern (plumosus), in West Germany in the marketing of finished products (flowers and plumosus) and in Great Britain in the marketing of unfinished products (chrysanthemum cuttings). The companies are being consolidated into a new company entitled International Agricultural Industries SA (IAI) which is now seeking funds to finance an expansion programme in Kenya for the period 1975/1980.

(2) In response to a request from DCK, Deutsche Gesellschaft für Wirtschaftliche Zusammenarbeit MbH (DEG) mounted a mission in November/December 1975 in co-operation with the Commonwealth Development Corporation (CDC) to investigate and report on the past operations and performance of the companies to be contained within the IAI group and the re-organisation and consolidation of that group as a basis for the proposed development programme.

(3) CDC provided a Horticulturalist for the mission and this section of the report is essentially on the technical operations.

S.2 Brief History of DCK's Production Units (Part 2)

(1) The DCK group started operations in Denmark in the 1950s, transferred in 1959/1960 to the Riviera, Southern Europe, then to Sardinia where chrysanthemum and carnation cuttings, plumosus and a range of flowers and other foliage plants were produced. As a result of labour difficulties and competition from other better-placed growers, Kenya was investigated as a future production area and operations started in Kenya in 1970.

(2) The structure of the group, before and after reconstruction, is given as Figures 1 and 2, pages 6 and 7 of the report. IAI is registered in Luxembourg and operates from Cranleigh, United Kingdom, with a subsidiary, IAI (Kenya) in Nairobi. The production centres in Kenya are Sulmac Ltd at Lake Naivasha for carnations, Updown Ltd near Nairobi for carnations, roses and alstromerias, Masongaleni Estate for chrysanthemum cuttings (redi-rooters) and plumosus; near Masongaleni are Manoni Plantations Ltd, Kibwezi for tomatoes and DWA Plantation Ltd, Kibwezi for sisal. The sales and distribution centres in Europe are Evergreen Flora GmbH Frankfurt (Evergreen) for finished products and DCK Nurseries Ltd for unfinished products.

S.3 Notes on Areas Proposed for Development (Part 3)

(1) Of the three areas chosen for trials with carnations, Naivasha, Updown and Upland, Naivasha proved to have the advantage over the other two as to topography, water supplies and soils.

(2) Masongaleni, near Kibwezi, was found to be suitable for chrysanthemums and plumosus as to climate and soil, provided these crops were grown under diffused shading. Water supplies are likely to be at risk in any further development and preparations have been made for the construction of two dams and ten weirs on the Kibwezi River, a proposal which seems to be more economical than another possibility of extracting water from the Athi River.

(3) Manoni and DWA Plantation have water rights which are adequate for present use. However, if tomato production is to expand as planned in the development programme, then the situation as to water supplies for irrigation and processing requires further investigation. Furthermore, the Chai Irrigation Scheme, on which smallholders irrigate about 100 acres, appears to be uncontrolled and is a cause of considerable loss of water.

(4) The legal positions of estates owned by the group are summarised in Part 3. Present land usage is summarised in the table below -

Land Owned in Kenya and Present Usage

Estate	Area (ha)	Cultivated (ha)	Usage
Sulmac, Naivasha	4,470	100	Carnations
Updown, Redhill	130	5	Carnations, roses and alstromeria
Masongaleni	9,200	70	Plumosus and chrysanthemums
DWA Plantation, Kibwezi	10,800	3,280	Sisal
Manoni, Kibwezi	880	22	Tomatoes
Athi	394	Nil	For water rights
Kinancop (leased)	±40	Nil	Formerly carnation trials
Total	25,914	3,477	

Embakasi Airport - Shipping office and cold store

Wilson Airport - IAI Kenya office

S.4 Organisation of Sulmac Estate at Naivasha and Updown Estate and Crop Operations (Part 4)

(1) At Sulmac Estate a nett area of 43.8 hectares had been planted to carnations. The estate is organised in six main departments - Production Control, Propagation, Growing, Irrigation and Disease, Grading and Shipping and Maintenance. Cost control is undertaken at the Nairobi office of IAI (Kenya). Managerial staff include five expatriates and there is a work force of between 2,500 and 3,500 according to the season.

(2) Nuclear material is obtained from Yoder Brothers Inc, USA (Yoders), and is used for propagation purposes for three years. It may not be necessary to import nuclear cuttings yearly when in full production and there could be a saving in the cost of planting material (see paragraphs 3.04 and 9.08(2), Part 4). Cuttings from the nuclear beds ("A" cuttings) are used to plant up further multiplication beds for cuttings ("B" cuttings) which are used to plant up the production beds.

(3) Production beds have an average life of 12 months and each planting contains a mixture of colours from varieties of standards (single flower per stem) and sprays (more than one flower to a stem). The

(iii)

production cycle is arranged so that flowering occurs over the period September to May. A mean yield of 238 stems/m² has been estimated.

(4) The flowers are graded in accordance with strict specifications and, after packing in customer boxes, are immediately placed in cold storage until shipped.

(5) All estate operations, both in the field and in the grading/packing shed, are carefully checked by the Production Control Department which is also responsible for carrying out the trials (of which there are 21,000 m²) required by the Technical Director.

(6) Tables have been prepared for the basic inputs in carnations both for labour and materials. For a planted area of 1,000 m² (0.1 ha) basic annual labour input is given at 2,110 man-days costing K Shs13,423 and the cost of materials is K Shs27,814. It has been suggested that economies could be possible in certain operations such as bed preparation, planting and spraying and in some materials, particularly fertilisers.

(7) At Updown operations are on a smaller scale covering only five hectares as follows - carnations (3.3 ha), roses (1.4 ha) and alstromeria (0.3 ha). Yields of carnations are lower, 156 blooms/m², but grades are better than at Naivasha because the blooms are rubber-banded. As the number of beds is limited and it is desirable to utilise the available space continuously, alternative crops to carnations are being sought; the most likely appears to be alstromeria which has not yet passed the trials stage. Roses were planted after an encouraging marketing study and this season, 1975/1976, is the first in which the market has been seriously tested. Of the three kinds grown, the Babies are fetching the best price but it has yet to be shown that the yield is satisfactory.

S.5 Organisation of Masongaleni Estate and Crop Operations (Part 5)

(1) At Masongaleni Estate a nett area of 6.6 ha has been planted to redi-rooters (chrysanthemums) and 33.6 ha to plumosus. The estate is organised into departments in a similar way to Sulmac and employs 15 expatriates to be reduced to 12 on 1.4.1976. At both Sulmac and Masongaleni the policy is to train Kenyans for management posts. The total work force is about 2,500.

(2) Chrysanthemums are propagated in a similar way to carnations; nuclear material is obtained from Yoders which is propagated for support beds. Nuclear beds are used for cutting production for at least 32 weeks. The stock beds are kept in production for a period of about 22 weeks. No crop rotation appears to be necessary and one bench can, therefore, take two production plantings per annum, ie 85% bench utilisation.

(3) About 160 varieties are propagated and cuttings are required all the year round. Production has to be planned on the basis of orders from DCK Nurseries (DCKN) and in order to ensure continuity of supplies with the minimum number of unsold cuttings, a weekly planting programme is determined with the help of a computer which is fed with additional data as to variety, production factor, cold store time, flush factor etc. At the moment only 60% bench utilisation is achieved and it was hoped to improve to 67%. This seems to be disappointing for such sophisticated programming. The planting programme had been determined up to week 10 of 1976 which assumed that the requirements for cuttings has been forecast up to week 45 of 1976.

(4) Cuttings are graded as to diameter of stem, then bundled and eventually packed in customer boxes of 1,000 cuttings. They must be stored in the cold store for at least 10 days, as a pests and disease control measure and can be kept in store for up to four or, in some varieties, six weeks. By this means a buffer stock is maintained for planting stock beds and for sale.

(5) Plumosus is a perennial crop and it is harvested throughout the year although there are seasonal variations in the market requirements. The crop can be controlled to some extent by varying the frequency of harvesting and of pinching. The grading system is strict; after grading, the bundled fern is packed in bulk for Europe where it is repacked for customers.

(6) As at Sulmac, all estate operations are carefully monitored by the Production Control Department which is also responsible for trials under the control of the Technical Director. Although this Department is providing a very useful service, as supervision becomes more reliable it should be possible to dispense with some of its activities in quality control.

(7) Tables have been prepared for the basic inputs in redi-rooters and plumosus. On a planted area of 1,000 m², for redi-rooters the direct labour requirements over 22 weeks are 1,399 man-days costing K Shs10,934. For plumosus the annual direct labour requirements are 1,663 man-days costing K Shs10,723 and for materials K Shs14,934. Observations have been made on certain items and savings might be possible in the cost of planting material, fertilisers and lighting. The annual requirement for materials is K Shs49,927. Rationalisation is required in the use of chemicals.

S.6 Tomato Production at Manoni (Part 6)

(1) Manoni Estate, originally planted to sugarcane, had reverted to bush when DCK acquired it. Tomatoes were chosen as a development crop because climatic conditions were considered to be favourable for the maximum number of crops per annum. Tahal Consulting Engineers of Israel (Tahal) were engaged to operate a pilot scheme. During 1975 sowings were made at the rate of 1 ha weekly and by November about 20 ha had been planted.

(2) The first season's trials gave indications as to sowing, manuring, plant density, irrigation requirements, varieties and yields. Certain varieties appeared capable of producing 12 tonnes fresh fruit per hectare (30 tonnes/acre) over the period April to October. An indication was obtained of the basic inputs required for labour and material.

(3) A three-year rotation is planned and trials have been started with suitable annual crops. A bare fallow is an alternative.

(4) Preliminary results have been encouraging but another two years of trials are required before a decision should be reached as to going into commercial production on a scale large enough to supply a puree factory, the smaller version of which has a capacity of 2,000 tonnes paste or 12,000 tonnes of fresh fruit.

S.7 Sisal Production at Kibwezi (Part 7)

(1) DWA Plantation has shown a poor performance in sisal production since before 1964. Nett profits were made only in 1965, 1972 and 1973 due to poor growing conditions and low market prices.

(2) A study of the costs of production has been made difficult in that the estimates have been based on a notional area of 3,000 acres whereas 6,388 acres will be harvested in 1975/1976. It appears that the output for harvesters has been overestimated.

(3) Replanting had been neglected for 21 years and there has been heavy encroachment of bush. Under normal circumstances the area would have ceased to exist as a sisal estate.

S.8 Proposals for Development (Part 8)

(1) The development proposals for the period 1975/1980 are summarised as follows -

	Sulmac, Naivasha	Masongaleni		Manoni	DWA Plantation
	Carnations	Chrysanthemums	Plumosus	Tomatoes	Sisal
<u>Area in Production</u>					
Present	315,000 m ²	66,408 m ²	336,982 m ²	67 acres	7,848
Proposed	630,000 m ²	96,138 m ²	403,390 m ²	462 acres	7,367
<u>Yield of Marketable Produce</u>					
Present	75m blooms	80m cuttings	2.2m bundles	2,000 tonnes*	900 tons fibre
Proposed	145m blooms	120m cuttings	2.6m bundles	13,860 tonnes	2,120 tons
Development cost K Shs22.5m		26.0m		8.7m (under revision)	3.0m

* Estimated

A further K Shs1.5m has been estimated for development costs in Europe.

(2) At Sulmac, because carnations have to be grown on a rotation, the nett area developed including 21,000 m² for experiments will be 1,659,000 m² or including roads and pathways a gross area of 2,552,300 m² (255 ha) of which a gross area of 1,550,700 m² (155 ha) have to be developed under the development programme.

(3) Although it is to the interest of Evergreen that its through-put reaches a maximum as soon as possible, the proposal to double production within one season is considered inadvisable because -

- (a) planting will have to be rushed in June and July 1976 and may suffer;
- (b) old fields will have to be replanted because land development will not follow at the same pace;

- (c) the slack period, June/July, should be used for important soil conservation works;
- (d) a sudden increase in production will place a burden on the air freight carriers with which they may be unable to cope (see also paragraph 2 of Part 9).

The mission considers that it would be more satisfactory to halt the planting programme for this season at 500,000 m² which will have been planted by mid-March 1976 and understands that such a modification to the development programme is now under consideration by IAI's management.

(4) Comments are made on the cost of various operations and equipment which in some cases require justification. Of these the item for vacuum cooling equipment is the most costly at DM 248,000. The phasing of expenditure on plant and equipment does not always appear to coincide with the proposed development programme.

(5) No expansion is proposed for Updown Estate. It is, however, proposed to base an outgrowers' scheme on Updown but no costs to Updown have been assumed. 15 growers have been selected to plant a total area of 750 m² of carnations, they are advised by the company's own extension officers and the crop is bought at a pre-arranged price. The estimated nett return to a grower, for part-time work, was K Shs1,640 per annum. It was proposed to double the number of growers yearly to a total of 240 by the end of 1980 but the mission was informed that it is now proposed to bring the total of growers up to 200 by the end of 1976. The mission considers that the timing is hasty and further proof is required of the growers capabilities and enthusiasm. The proposal must have Government's full support and the mission understands that the Ministry of Agriculture would like to send an Agricultural Officer to Updown for training with a view to Government providing an extension service. The yields assumed for growers, which are high compared with those obtained at Updown, must be proved feasible. It might be difficult to find 200 growers in the immediate vicinity of Updown and a survey should be made of potential growers both at Updown and at Naivasha as returns to growers might be better in the latter area.

(6) The future of Updown as a production centre for carnations is doubtful as they do not perform as well as at Naivasha. Its future hinges more on the performance of roses, on which a decision should be possible by the end of this season, and of alstromerias and other minor crops which are still in the investigational stage and could be under the control of the Technical Director.

(7) At Masongaleni the expansion programme for chrysanthemums (redi-rooters) has been phased over two years but the full yield of saleable cuttings is not expected to be realised until 1980 by which time it is expected to reduce the number of undersize cuttings which have to be rejected. The programme for plumosus will follow upon the redi-rooters and full production is scheduled for 1980.

(8) The development programme includes the expenditure of K Shs10.9m for capital items (see paragraph 8.07 at Part 8). Of this K Shs2.7m is required to provide storage facilities for one year's supply of water; this estimate should be reviewed when the site has been fully surveyed. Comments have been made on certain other items of expenditure.

With the proviso that more accurate estimates are required for certain items, the proposed development appears to be sensible. However, the mission is of the opinion that more efficient utilisation of benches should be possible; this could reduce the gross area required for development from 16 ha to 13 ha with a proportionate saving in sprinkler equipment, net houses and drainage.

(9) There was also a proposal for fencing Masongaleni as a game sanctuary but this has now been dropped; it is still hoped to employ the unused portion of the estate as a game reserve.

(10) Trials at Manoni with tomatoes have been encouraging but the results are insufficient to justify immediate expansion to a commercial planting.

(11) It is debatable whether this is the appropriate time to embark upon an entirely new project. It might be better to discontinue all work on tomatoes until IAI's other operations have been consolidated. On the danger of the land being occupied by squatters if it is left undeveloped, Government's influence should be sought in this matter and this would more likely be forthcoming if there were a possibility that at some stage of the proposed development there would be a place for smallholding development with tomatoes as the main cash crop. In the meantime assistance might be sought from international funds for the tomato investigations to be resumed; such aid is more likely to materialise if an application is made through Governmental channels. Suggestions are made in this report as to investigations which are still required. A model project could be proposed in greater detail than already put in DCK's development programme.

(12) DWA Plantation expects to increase its production by new plantings in 1974/1975 and from 1976 to 1978. No estimate has been made for the rehabilitation of old plantings which will still have to contribute a large proportion of the crop.

(13) The estimates show continuing losses up to and including 1980 and the mission considers that the development programme should be put into abeyance and a new one drafted with the objectives of -

- (a) reducing acreage to be harvested;
- (b) operating one decorticator;
- (c) reducing overhead costs, particularly in management;
- (d) improving efficiency of field workers, particularly harvesters.

If it is not possible to show a viable project, the sisal operations should be closed down altogether. Labour made redundant could be given an opportunity to participate in the proposed redi-rooster and plumosus expansion

(14) The project development costs for the period 1970-1975 have been reviewed. Much of these costs were incurred in commercial development and an attempt has been made to identify those costs which might justifiably be incurred in a pilot project. On this basis the total cost of DM 25.2m could be reduced to DM 9.3m.

S.9 Markets (Part 9)

(1) The main market for carnation flowers is in West Germany from mid-October to mid-May and prices and demand appear to be holding well in spite of the recent recession in general trade. The plumosus market is also mainly in West Germany and is for the year round. Although good grades were being achieved this season, the average price has not been as good as estimated. Redi-rooter sales are effected mainly in England but markets are being developed on the Continent. The general conclusion is that -

- (a) redi-rooters offer the best long-term market;
- (b) carnations are giving good returns on a market that is still expanding;
- (c) plumosus sales have probably reached their peak but, as some European growers are giving up production, there is an opportunity for IAI to take an increasing albeit modest share of the market.

(2) As to tomatoes there is a good potential market for tomato paste in Kenya. However, before the manufactured product could be priced, further study is required of local costs of production and processing.

(3) As to sisal, the market for agricultural twine will be crucial to its future. The short and medium term price prospects appear to be bleak.

S.10 Tariffs

For the next two years the EEC member states will operate a surveillance scheme with the object of monitoring imports of finished products. During that period there will be no duty on imports from Kenya but if importations are seen to be competing with local production they may be restricted or prohibited over given periods (see paragraph 3 of Part 9)

S.11 Marketing Organisations

(1) DCK Nurseries (DCKN)

Sales and production forecasts are correlated through a computer. Field representatives are employed in Britain and on the Continent. In Britain a comprehensive programme of operations is worked out for growers as much as a year in advance and deliveries of cuttings coincide with this programme. There is good liaison between DCKN and the production centre in Kenya.

(2) Evergreen Flora GmbH (Evergreen)

The sales organisation is very efficient and is well directed to obtaining the best prices for the produce it handles. It does not operate at full capacity at the moment and is trying to reduce overheads by handling limited quantities of horticultural produce from the United States.

S.10 Advisory Services and Research (Part 10)

(1) The Technical and Research Department is responsible for all trials and for production control. It is under the direction of a Technical Director and a Technician who are stationed at Updown.

(2) Some of the agronomic problems encountered by the Department are discussed in Part 10, particularly pests and disease control and fertiliser use. More recently the Department has become aware of the need to reduce costs in production, an important object for research.

(3) Production control continues after the crop has left the production centre, during transport by road and air and on arrival in Europe. This enables management to pinpoint potential trouble points and to deal with complaints should they arise.

(4) Technical manuals are being prepared as a basis for a series of lectures and demonstrations in a training programme for managers and supervisors.

(5) Good liaison is maintained with the National Agricultural Laboratory as to pests and disease control. This liaison could be extended to include the Horticultural Research Station, particularly in the context of field trials.

(6) IAI obtains its nucleus planting material from Yoders which has a financial interest in the group. It is recommended that management reconsider the value of membership of the Nuclear Stock Association of the United Kingdom.

INVESTIGATIONS INTO PROPOSALS OF INTERNATIONAL AGRICULTURAL
INDUSTRIES FOR HORTICULTURAL DEVELOPMENT IN KENYA

PART 1 - INTRODUCTION

1 Objectives

1.01 The Dansk Chrysanthemum Kultur (DCK) group embraces a group of companies in Kenya and Europe engaged in Kenya in the production and propagation of chrysanthemum cuttings, carnation cuttings and flowers and asparagus fern (plumosus), in West Germany in the marketing of finished products (flowers and fern) and in Great Britain in the marketing of unfinished products (chrysanthemum cuttings). The group is associated with an American horticultural company, Yoder Brothers Inc, which supplies clonal material of chrysanthemum and carnation varieties and holds a proportion of the group's capital.

1.02 DCK has now embarked or is embarking on an expansion programme in Kenya for the period 1975/1980 with the object of increasing its output of carnation flowers at Naivasha, of chrysanthemum cuttings and asparagus fern at Masongaleni and on a smaller scale of roses at Updown Farm. Plans are also in hand to start up a new production line in tomatoes and to expand sisal production on estates near Masongaleni. It is proposed to create a game sanctuary in the Masongaleni area.

1.03 The companies are being consolidated into a new company entitled International Agricultural Industries SA (IAI).

1.04 Earlier in 1975 DCK approached the West German Overseas Development Agency, Deutsche Gesellschaft für Wirtschaftliche Zusammenarbeit MbH (DEG), for a loan to finance the proposed development programme.

2 Mission

2.01 DEG mounted a mission in November/December 1975, in co-operation with the Commonwealth Development Corporation (CDC), to investigate and to report on the past operations and performance of the companies to be contained within the IAI group and the re-organisation and consolidation of that group as a basis for expansion and on the proposals for future development.

2.02 Mission members were Mr H.G.Hansmann, Financial Analyst, DEG and Mr L.J.Foster, Horticulturalist, CDC. The mission visited the operation in Kenya over the period 22nd November to 9th December 1975, and the operations in West Germany and in England at various other times.

2.03 Joint discussions were also held with local representatives of Edesa (a Corporation for Development for Equatorial and Southern Africa) (Andreas Count Doenhoff) and International Finance Corporation of the World Bank (IFC) (Mr G.M.Dixon), as they too have been approached by IAI as potential investors.

2.04 The duties and terms of reference for the Horticulturalist required him to report on -

(1) Horticultural Aspects

The production of carnations at Naivasha and chrysanthemums and asparagus fern at Masongaleni in respect of -

- (a) cultural requirements and suitability of soil and climatic conditions for the crops to be grown in the project;
- (b) general cultural methods with special reference to disease and pest control;
- (c) proposals for phased field development;
- (d) requirements for rotations and land use proposals for areas not included in the rotation;
- (e) alternative crops/fallow in the rotation;
- (f) water resources and adequacy for field, domestic and processing requirements;
- (g) relative merits of proposed irrigation systems;
- (h) sources of disease-free propagating material of carnations and chrysanthemums;
- (i) participation by outgrowers in the Naivasha area to promote the export of cut flowers as joint programme with FAO, Horticultural Crops Development Authority (HCDA) and the Ministry of Agriculture.

(2) Staff and Labour

Adequacy of current staff and labour in terms of -

- (a) various expertise and technical requirements;
- (b) numbers of staff and labour by categories;
- (c) training;
- (d) staff and labour requirements for the phased development plans and likely availability;
- (e) competency of general management.

(3) Marketing Aspects

- (a) technical aspects of produce collection, packing, storage and shipment;
- (b) air freight problems and alternative methods of shipment;
- (c) technical aspects of marketing alternative crops.

(4) New Production Lines

- (a) for the production of tomatoes at Masongaleni, particularly in respect of -

(i) progress of pilot scheme 1974/1975 under supervision of Israeli consultant to investigate the potential of the project with special reference to varieties, methods of planting, fertiliser usage, pest and disease control, irrigation requirements, labour utilisation, operative costs and alternative crops production;

(ii) processing requirements, if any;

(b) for the production of sisal, noting -

(i) area planted, its present condition and general cultural requirements;

(ii) market assumptions showing total incremental production annually over the life of the project and marketing organisation.

(5) Financial Aspects

(a) basic current unit costs of production;

(b) assumptions made for basic unit costs in the feasibility study and forward planning now being proposed by sponsors;

(c) agricultural inputs proposed with feasibility study;

(d) adequacy of the past development costs from the agricultural point of view.

2.05 Section I of the report is essentially a report on the technical operations and has been prepared by the Horticulturalist.

2.06 The mission wishes to express its appreciation of the assistance given by the management of DCK (East Africa) Ltd, Sulmac and Masongaleni Estates and DWA Plantation Ltd and, in particular, to Messrs P. Evenhuis and G.A. Jones who arranged for the mission to be fully informed and provided facilities for travel and accommodation.

PART 2 - BRIEF HISTORY OF DCK'S PRODUCTION UNITS

1 Activities in Europe

1.01 The DCK group started operations in the 1950s in Denmark where the company specialised in the production of chrysanthemum cuttings. In 1959/1960, DCK transferred its operations to the Riviera, Southern Europe, for about a year and then to Sardinia using rented greenhouses. Local growers were contracted to produce chrysanthemum cuttings under DCK management. Rooting stations were set up in Germany, the United Kingdom and Denmark but they were closed in 1964/1965, rooting thereafter being exclusively a Sardinian operation.

1.02 Up to 1964/1965 no carnations or Asparagus plumosus (hereinafter called plumosus) were grown. In 1964 a Swedish Horticulturalist, Mr L.Edstrom, was engaged in Sardinia as Technical Director to start trials with carnations and plumosus and to advise outgrowers on carnation growing.

1.03 By 1970 the Sardinian project was producing 85m-90m chrysanthemum cuttings, most of which were rooted and about 30m carnation cuttings. Plumosus occupied a glasshouse range of 10,000 m². Poinsettia were also tried for cutting production and problems in shipping were worked out. At peak annual production, three million cuttings were produced but output was reduced to two million because of lack of glasshouse space. A few other flowers, such as Gerberas, were also grown.

1.04 Chrysanthemum production methods were reviewed in the late 1960s and various improvements and savings were effected, notably in innovating a system for grading unrooted cuttings.

1.05 In May 1967, because of labour difficulties in Sardinia and of competition from other better-placed growers, the Technical Director was asked to investigate Kenya as a future production area of horticultural produce for shipment to Europe. He reported favourably on the technical possibilities and found that the airport at Nairobi provided good facilities both as to IATA and charter flights.

2 Activities in Kenya

2.01 Subsequent developments were as follows -

(1) 1969

Kenya Government invited DCK to start a horticultural project. DCK (East Africa) was incorporated in November and for a short time one acre of coffee land near Thika was rented for growing carnations.

(2) 1970

DCK acquired a ^{majority} shareholding in Sulmac, a company with land along Lake Naivasha, an area considered to be more suitable for carnations. Chrysanthemum propagation was started at the same time at Masongaleni, M I. Poinsettias, plumosus and Gerberas were also brought in from Sardinia.

(3) 1971

The main commercial area of Masongaleni, M II, ten miles from M I was opened. Updown Farm was acquired in June and planted to carnations

(4) 1972

Two more fields, each of 63,000 m², were planted at M II, Masongaleni. Sulmac was purchased outright.

(5) 1973/1974

Fourth field was planted at Masongaleni. First planting of roses from Denmark was made at Updown.

2.02 Carnations were also tried for one year on rented land on the Kinancop at Upland, in an area similar to that in which Colombian carnations are grown, Colombia being one of DCK's competitors in the export of carnation flowers. The best quality of flowers was produced on the Kinancop but protection would probably be required against rain. The final decision to develop Naivasha for carnations resulted from a compromise between the climatic and environmental requirements for quality and quantity. Furthermore, at Updown the topography was unsuitable for large-scale development.

2.03 The roses were planted at Updown after a marketing study in Germany indicated that it was a crop worth developing. It is the main cut flower marketed in Europe after carnations. More plantings of roses were made in 1974/1975 and 1975/1976 is the first selling season for commercial quantities.

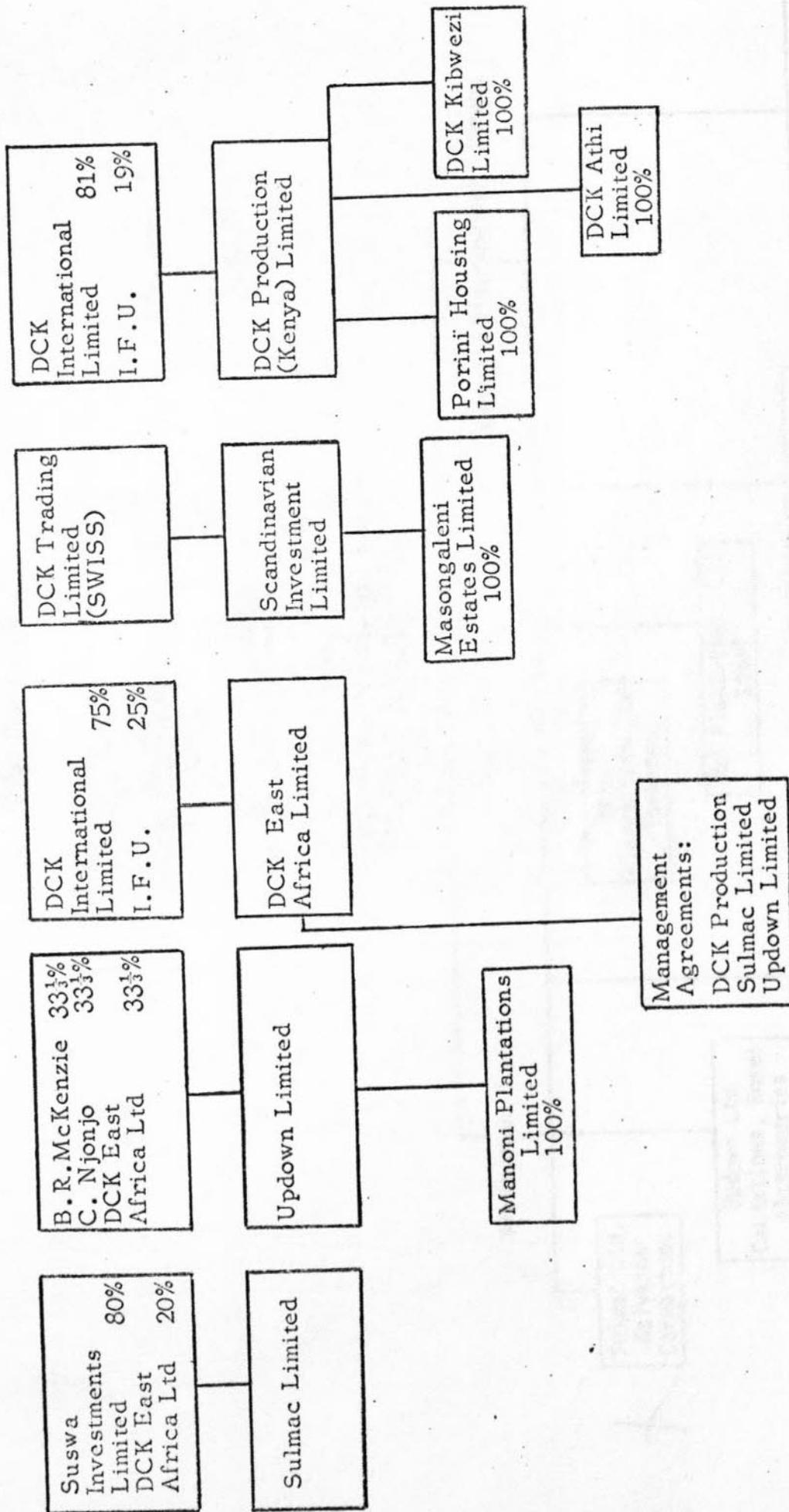
2.04 In order to safeguard water supplies to Masongaleni, two former sisal estates were acquired: Manoni Plantations Ltd and DWA Plantation Ltd. The former no longer grows sisal but is now the centre for tomato trials. The latter still operates as a sisal plantation.

3 Structure of IAI Group

The companies of the IAI group before and after re-structuring are shown at Figures 1 and 2 respectively. The restructuring had not been completed at the time of writing this report.

INTERNATIONAL AGRICULTURAL INDUSTRIES LTD

BEFORE RECONSTRUCTION



INTERNATIONAL AGRICULTURAL INDUSTRIES LTD (IAI)

AFTER RECONSTRUCTION

Shareholders -
 IAI (Luxembourg) Ltd 55%
 Suswa Investments Ltd 35%
 IFU (Denmark) 10%
100%
 Office at Cranleigh, UK

IAI (Kenya) Ltd
 DCK Production (Kenya) Ltd,
 Nairobi Office and Shipping

Production, Kenya

Sulmac Ltd,
 Naivasha
 Carnations

Updown Ltd
 Carnations, Roses
 Alstromerias

Masongaleni Estate
 Redi-rooters
 and plumosus

Manoni
 Plantations Ltd
 Tomatoes

DWA Plantation Ltd
 Sisal

Sales and Distribution, Europe

Evergreen Flora GmbH
 Frankfurt
 Finished products
 Flowers, Plumosus

DCK Nurseries Ltd
 Bishops Stortford, UK
 Cuttings

plans
expanding

PART 3 - NOTES ON AREAS PROPOSED FOR DEVELOPMENT

1 Naivasha

1.01 Location

The position of Sulmac Estate is shown at Maps 1 and 2. It is at a latitude of 1°05' and is on the southern lacustrine plain of Lake Naivasha at an altitude of 6,200 ft (1,900 m). The property covers about 10,855 acres (4,393 ha) but only about 375 acres (152 ha) are suitable for development for irrigated horticulture where the topography is level to gently sloping with a slight fall to the lake. Natural vegetation is scrub and, near the lake, wet grassland.

1.02 Climatic Factors - Rainfall

There are no long-term rainfall records for Sulmac but meteorological records significant for estimating irrigation requirements have been maintained by neighbouring estates and, at Naivasha town, over a period of 14 years or more. Rainfall at Kongoni and Longonot Estates averages 27.6 in (700 mm) annually. It has been suggested that rainfall at Sulmac is lower, 21.8 in (600 mm), but rainfall has been below normal everywhere in Kenya in recent years. There is a bimodal rainfall pattern, i.e. with a long rainfall season from March to May, and a short season from November to December. For carnations low rainfall gives rise to fewer disease problems or flower damage and is, therefore, an advantage.

1.03 Wind

The mission was told that wind has not been a problem. Winds of considerable strength and turbulence are known to occur in the vicinity of the lake, particularly of the whirlwind type. Carnations are grown in compact beds and are supported and, being fairly dwarf growing, will not be very susceptible to wind. However, whirlwind gusts can be very damaging and it would be advisable to plant field boundaries to wind-breaks such as pepper trees and Hakea which grow well under local conditions.

1.04 Soils

The soil of the horticultural area consists mainly of a sandy volcanic ash which has weathered to a dark brown to grey sandy loam. The profile is very uniform and is underlain by pumice at a depth ranging from 1 m upwards. The soil is friable, free draining and contains little colloidal matter to retain moisture or nutrients. Nutrient level is low and carnations under irrigation would require frequent and high levels of fertiliser. The soil has a low bulk density which, combined with its limited cohesion, makes it highly susceptible to erosion by rain and by wind. This was apparent after a recent rain storm when severe gullying had evidently occurred. Storm drainage canals are being constructed on the contour between fields and it is essential that they are protected; the most effective way would be to grass down all waterways and main service roads. Some stone facing may be required but precautions would be necessary to ensure that such works are not undermined. Some field drains have been necessary in low-lying areas and management is aware of the dangers of salinity that might arise from poor drainage.

Showing Location of Sulmac and Masongaleni

Scale 1:1,000,000



1.05 Water for Irrigation

The lake is the source of water and its quality is fully acceptable for irrigation. The level of the lake has fluctuated considerably in recent years, but Sulmac Estate appears to be well placed and is in a position to move its pumping station if necessary. Water requirements at full production have been estimated at 1.5m gallons per day. There is a permit for 2m gallons per day. Power for pumping is obtained from the main electricity power line and there is reserve diesel-driven equipment for an emergency.

2 Updown

2.01 Updown Farm is situated at Redhill, Limuru, 18 miles north-west of Nairobi at an altitude of about 6,000 ft and covers about 220 acres (89 ha). The soil is a dark red friable clay of volcanic origin. The topography is very undulating and it is impossible to demarcate fields at one level; terracing is necessary for horticultural crops which occupy about 20 acres (8 ha). The farm is used mostly for grazing, pasture being of good quality. Meteorological records were not available, but rainfall is higher than for Naivasha, about 47 in (1,200 mm). Water is obtained from a dam on the river and a permit exists for the withdrawal of 220,000 gallons per day.

2.02 Better quality carnations are said to be produced at Updown than at Naivasha. This is surprising as there is little difference in the altitude and soil conditions are more difficult for a crop like carnations which dislike waterlogging. The other horticultural crops are roses and Alstromeria on a smaller scale.

3 Upland

About 100 acres of land in the Kinancop, at an altitude of 7,000 ft (2,500 m) where temperatures are more akin to those in which the Colombian carnations are grown, was taken on a lease. Rainfall is about the same as for Updown. Carnations were grown here for one season but, although quality was good, yields were poor.

4 Choice of Area for Carnations

4.01 The DCK study has considered the following factors -

Factor	Requirement	Actual at Estates		
		Sulmac	Updown	Upland
Altitude - metres	2,000-2,600	2,000	2,000	2,500
<u>Mean temperature - °C</u>				
day, standards	19-23)	26	22	20
day, sprays	21-23)			
night, standards	7-11)	8	11	8
night, sprays	9-11)			
standards, average	13-17)	17	16.5	17
sprays, average	15-17)			

Day length is 12 hours throughout the year, an advantage for cutting production in that the maximum number of shoots is produced.

4.02 Naivasha has the advantage over the other two sites as to topography, water supplies and soils. It is not at the best altitude, temperature being slightly on the high side, but not so high as to give weak stemmed flowers and "grassy" growth. Rainfall is low, an advantage because the flowers can be produced in the open without protection. For carnation culture, Naivasha is the best compromise out of the three available sites.

5 Masongaleni

5.01 Location

Masongaleni Plantation is near Kibwezi on the Nairobi to Mombasa road at an altitude of about 2,800 ft (860 m); its location is shown at Maps 1 and 3. It covers about 23,014 acres (9,314 ha) of which 260 acres (105 ha) are under intensive cultivation. A further 900 acres have been cleared for camp buildings, residences, air strips, etc and the balance is Acacia/baobab savanna and thicket. The topography is of rounded ridges, generally gently sloping to valleys with occasional small hills and broken by numerous dry water courses.

5.02 Rainfall

Rainfall averages 24 in (612 mm) per annum (48-year mean). There is a bimodal pattern, March-April and November-December. The area has a reputation for unreliable rainfall and long dry spells can occur.

5.03 Temperature

Daily average temperature is around 26°C. The hottest period is February/March (maximum noon shade temperature being 36°C and the minimum 21°C) and the coldest is from late June to end of August when the daily maximum temperature is 28°C with a minimum of 18°C and a mean of 23°C.

5.04 Soils

Soils are derived from basement complex gneisses with some schists and intrusives. The areas selected for horticultural development are dark greyish-brown compact sandy loams of variable depth (30 cm-75 cm) overlying dark brown loose coarse sand or plastic clay up to 190 cm deep. Near the water courses, secondary deposits of calcareous sandstone or alluvial silts are encountered. Massive laterite may occur at depth in areas away from the valley floors. Under irrigation there is a possibility of groundwater and salinity building up and some areas may require drainage. Fields 1, 3 and 4 already have pipe drains at a depth of 1.20 m to 1.50 m.

5.05 Water for Irrigation

The first area to be developed for irrigated crops was near the Masongaleni River but the river flow is unreliable and the water is highly alkaline. A pilot planting of plumosus and chrysanthemums was made under a net house of 50,000 m² but, because of the limited river and groundwater resources which were also of variable quality, further development was at a site 10 miles away near the Kibwezi River which is permanent and gives water of better quality (see Appendix 1 for water analyses). The peak water demand at full development is estimated at 22,000 m³ per day or nine cusecs. Existing water rights amount to 12.5 cusecs but this is above the average

Showing Location of Masongaleni Complex

Scale 1:250,000



base flow of the river. It follows that any future development by Masongaleni will be at considerable risk during normal and below average years. Manoni and DWA Plantation Estates were acquired ostensibly to prevent any further abstraction upstream. Experts from Tahal, Consulting Engineers of Tel Aviv, and Kenya Government water officials have submitted reports on the situation and two main alternatives have been suggested - either the construction of two dams and ten weirs on the Kibwezi River at an estimated cost of K Shs2.7m, or to dam the Athi River. The latter would involve more capital expenditure and recurrent pumping costs would be heavier, a pipe line 5.2 km long and booster pump being required, compared with 2.3 km from the Kibwezi River. Preparations have already started on the Kibwezi River proposal.

5.06 Suitability of Masongaleni for Horticulture

(1) The main crops under consideration were plumosus and chrysanthemums for cuttings. Requirements at this latitude were considered to be as follows -

	Optimum		Masongaleni
	Plumosus	Chrysanthemums	
Altitude - metres	500-1,000	800-1,300	860
Mean night temperature °C	17-20	15-18	17.5

(2) Masongaleni was deemed suitable for these two crops as to climate and soil provided they were grown under diffused shading, saran net being used. In the case of plumosus, shade improved foliage colour. Shade is not so important for chrysanthemums but, as this crop has a high water requirement, it does help to prevent water losses and wilting.

6 Manoni and DWA Plantation, Kibwezi

6.01 Manoni, which adjoins Masongaleni, was at one time a sisal and sugarcane estate but is now in secondary bush. The estate covers 2,242 acres (907 ha). There is a spring rising from basaltic lava at the western end of the estate and two dams, one needing repair. The estate has a right to 5.5 cusecs of flood flow from the Kibwezi River and to the full flow of the Manoni Spring, totalling six cusecs. It is intended to develop a plantation for irrigated tomatoes at Manoni and trials started in 1975.

6.02 DWA Plantation, Kibwezi, covers 27,140 acres (10,983 ha) of which 8,325 acres (3,370 ha) are planted to sisal most of which is now in bush and the crop is obtained from sucker growth. Mean annual rainfall (58 years) is 25.2 in (640 mm), about the same as for Masongaleni. The estate has a permit to extract water from the Kibwezi River and is taken through the Chai dam which has recently been repaired. The dam also supplies the Chai Irrigation Scheme, which is a co-operative group of Wakamba, farming about 100 acres and for which there is a permit to extract 1 cusec of water. The scheme appears to be uncontrolled and is a source of considerable loss of water.

7 Legal Positions of Estates

7.01 Naivasha

(1) LR No 404/6 and 404/11 (held under one title)

Area - 20 acres, less road reserve 1.1 acres and 4,830 acres, less 3.4 acres road reserve respectively.

Term - 999 years from the 1st August 1906.

Annual rent - K Shs10 and K Shs642 respectively (both revisable).

The property is presently registered in the name of Sulmac Co Ltd subject to two caveats in favour of the East Africa Power and Lighting Co Ltd claiming grants of easement and subject to a charge in favour of Grindlays Bank International (Kenya) Ltd and Grindlays International Finance (Kenya) Ltd securing K Shs21,000,000.

(2) LR No 7471

Area - 6,345 acres.

Term - 99 years from the 1st January 1906.

Annual rent - K Shs793/13.

The property is presently registered in the name of Sulmac Co Ltd subject to -

(a) caveat in favour of the East Africa Power and Lighting Co Ltd;

(b) charge in favour of Grindlays Bank International (Kenya) Ltd and Grindlays International Finance (Kenya) Ltd securing K Shs21,000,000.

The company has negotiated the purchase of about 2,000 acres of Longonot Farm on the eastern boundary and this should have been completed in February 1976.

7.02 Updown

(1) LR No 8704

Area - 57 acres, less road reserve 5.5 acres - nett area 51.5 acres.

Term - 955 years from the 1st September 1954.

Annual rent - K Shs50 (revisable).

The property is presently registered in the name of Updown Limited free from further encumbrances.

(2) LR No 2950/2

Area - 113 acres
Freehold

Annual rent - K Shs199 (revisable)

The property is presently registered in the name of Updown Limited subject to a mortgage in favour of Grindlays Bank International (Kenya) Limited securing K Shs1,766,541.

(3) LR No 4868

Area - 112 acres
Freehold

The property is presently registered in the name of Updown Limited subject to a mortgage in favour of Grindlays Bank International (Kenya) Limited securing K Shs1,766,541.

7.03 Masongaleni

(1) LR No 5903

Area - 20,000 acres
Term - 999 years from the 1st January 1927
Annual rent - K Shs3,600 (revisable)

The property is presently registered in the name of DCK (East Africa) Limited subject to the following -

- (a) grant of easement in favour of Manoni Sugar Co Ltd;
- (b) grant of easement in favour of DWA Plantation Ltd;
- (c) caveat by Grindlays Bank International (Kenya) Ltd claiming a chargee's interest and forbidding dealings absolutely.

(2) LR No 2949

Area - 2,219 acres
Term - 999 years from the 1st November 1937
Annual rent - K Shs333 (revisable)

The property is presently registered in the name of DCK (East Africa) Limited subject to -

- (a) grant of easement in favour of Manoni Sugar Co Ltd;
- (b) grant of easement in favour of DWA Plantation Ltd;
- (c) caveat by Grindlays Bank International (Kenya) Ltd claiming a chargee's interest and forbidding dealings absolutely.

(3) LR No 7442

Area - 795 acres
Term - 999 years from the 1st November 1937
Annual rent - K Shs159 (revisable)

(3) Once only operation. One man prepares 25 m² per day plus three additional men per 1,000 m² for finishing off beds.

$$\frac{1,000}{25} = 40 \text{ plus } 3 = \underline{43}$$

(4) 25 m² per man-day for planting cuttings (25 x 50 per m² = 1,250 cuttings).

$$\frac{1,000}{25} = 40 \text{ plus } 3 \text{ man-days for marking out } 1,000 \text{ m}^2 = \underline{43 \text{ man-days}}$$

(5) 1 man-day per 1,000 m² for hand spraying from tractor.

$$\text{For 12 weeks} = \underline{12 \text{ man-days}}$$

(6) One man takes 1,200 cuttings per day. Assumed production at 50,800 cuttings from 1,000 m² or 1.016 per plant.

$$\frac{50,800}{1,200} = \underline{42 \text{ man-days}}$$

(7) Maintenance: weeding, watering etc. 1 man per 280 m² per day, based on 9 weeks (55 working days) after cuttings have rooted (see (8) below).

$$\frac{55 \times 1,000}{280} = \underline{196 \text{ man-days}}$$

(8) One man waters 350 m² of netting per day. Cuttings take 3 to 4 weeks to root and 20 waterings have been assumed -

$$\frac{1,000}{350} \times 20 = \underline{57 \text{ man-days}}$$

(9) One man supervises 6,000 m². For 12 weeks (72 working days), requirement is -

$$\frac{72 \times 1,000}{6,000} = \underline{12 \text{ man-days}}$$

The figure of 14 shown in this schedule assumes that the supervisor also works some overtime

(10) One man uproots 25 m² per day plus three men to clear 1,000 m² beds -

$$\frac{1,000}{25} = \underline{40 + 3} = \underline{43 \text{ man-days}}$$

(11) Weeding, watering, etc. 1 man maintains 240 m². Daily operation for 14 weeks (84 working days) -

$$\frac{84 \times 1,000}{240} = \underline{350 \text{ man-days}}$$

This task can be improved to 280 m²

(12) Disbudding, watering, harvesting, etc. 1 man maintains 175 m². Daily operation for 24½ weeks (150 working days) -

$$\frac{150 \times 1,000}{175} = \underline{855 \text{ man-days}}$$

This task can be improved to 200 m²

(13) Spraying as for (5). This assumes 1 man per 1,000 m² -

$$\underline{39 \text{ man-days}}$$

(14) Assumes a yield of 244 flowers/m² allowing for 6 to be discarded ie, mean yield of 238/m². 1 man-day to grade and put in cold store 750 flowers -

$$\frac{244 \times 1,000}{750} = \underline{325 \text{ man-days}}$$

(15) 1 man supervises 6,000 m² in the field. Period of 39 weeks (234 working days) -

$$\frac{234 \times 1,000}{6,000} = \underline{39 \text{ man-days}}$$

Supervisor in grading shed and cold store - 14 man-days (estimated) - Total 53 man-days

Table 3

Direct Inputs : Carnations - Materials (per annum)

		Cost K Shs
<u>Materials for 1,000 m²</u>		
<u>Propagation</u>		
Planting material	(1)	238
Labels	(2)	71
Basic fertilisers	(3)	2,150
Liquid fertilisers	(4)	1,500
Chemicals	(5)	1,062
Packing materials	(6)	254
Watering materials	(7)	343
Protective clothing	(8)	11
Tools	(9)	6
Total	(10)	5,635
<u>Production</u>		
Liquid fertilisers	(11)	8,113
Chemicals, stock	(12)	2,550
Chemicals, flowering	(12)	2,550
Packing materials	(13)	10,665
Watering materials	(7)	561
Protective clothing	(8)	215
Tools	(9)	75
Total	(10)	22,179
Grand total		27,814

Notes to Table 3

(1) Cost of cuttings estimated at K Shs150,000 for 37.8m cuttings to provide planting material for 630,000 m² including 30,000 nucleus cuttings imported at a cost of K Shs16,000 fob (US \$65 per 1,000), say K Shs20,000 landed Naivasha -

$$\text{K Shs } \frac{150,000}{630,000} \times 1,000 = 238$$

(2) Labels for beds estimated requirement: K Shs45,000 per annum for 630,000 m² -

$$\frac{45,000}{630,000} \times 1,000 = 71$$

The property is presently registered in the name of DCK (East Africa) Limited subject to a caveat lodged on behalf of Grindlays Bank International (Kenya) Limited claiming a chargee's interest and forbidding dealings absolutely.

7.04 Manoni

LR No 3685

Area - 2,242 acres

Term - 999 years from the 1st August 1913

Annual rent - K Shs404 (revisable)

The property is presently registered in the name of Manoni Plantations Limited subject to -

- (a) grant of easement in favour of DWA Plantation Ltd;
- (b) grant of easement in favour of Bullows & Roy Ltd.

7.05 DWA Plantation, Kibwezi

(1) LR No 11070

Area - 20,179 acres, less road reserve 145 acres -
nett area 20,034 acres

Term - 947 years and three months from the
1st January 1962

Annual rent - K Shs3,876 (revisable)

The property is presently registered in the name of DWA Plantation Ltd subject to -

- (a) equitable charge in favour of Barclays Bank DCO for an unspecified sum but stamped with K Shs200;
- (b) caveat by the East Africa Power and Lighting Co Ltd claiming a grant of easement.

(2) LR No 11515

Area - 5,935 acres

Term - 86 years and 10 months from 1st August 1964

Annual rent - K Shs1,187 (revisable)

The property is presently registered in the name of DWA Plantation Ltd subject to an equitable charge in favour of Barclays Bank DCO for an unspecified sum but stamped with K Shs200.

(3) LR No 917/4/1

Area - 1,000 acres
Freehold

The property is presently registered in the name of DWA Plantation Ltd subject to an equitable charge in favour of Barclays Bank DCO for an unspecified sum but stamped with K Shs200.

7.06 Other Land - Not Used

Athi (Near Athi River 15 miles outside Nairobi)

(1) LR No 8529

Area - 11,487 acres, less riparian reserve
98 acres - nett area 11,389 acres

Term - 948 years and four months from the
1st August 1957

Annual rent - K Shs1,538 (revisable)

The property is presently registered in the name of Rohet Sisal Ltd subject to -

- (a) charge in favour of Guardian Assurance Co Ltd;
- (b) caveat by East Africa Power and Lighting Co Ltd claiming a grant of easement;
- (c) caveat by DCK Production Co Ltd claiming a purchaser's interest and forbidding dealings absolutely.

A portion comprising 1,117 acres, less riparian reserve 28 acres, LR No 8529/1, has been transferred to Drumvale Farmers Co-operative Society Limited and a portion comprising 4,026.6 hectares, less 15.1 hectares riparian reserve, LR No 8529/4, has been transferred to Lukenya Ranching and Farming Co-operative Society Limited.

(3) LR No 10501

Area - 8,225 acres

Term - 949 years from the 1st November 1959

Annual rent - K Shs1,925 (revisable)

The property is presently registered in the name of Rohet Sisal Limited subject to -

- (a) three caveats by the East Africa Power and Lighting Co Ltd claiming grants of easement;
- (b) caveat by DCK Production Co Ltd claiming a purchaser's interest and forbidding dealings absolutely.

A portion of the property comprising 3,019.5 hectares, LR No 10501/2, has been transferred to Lukenya Ranching and Farming Co-operative Society Limited.

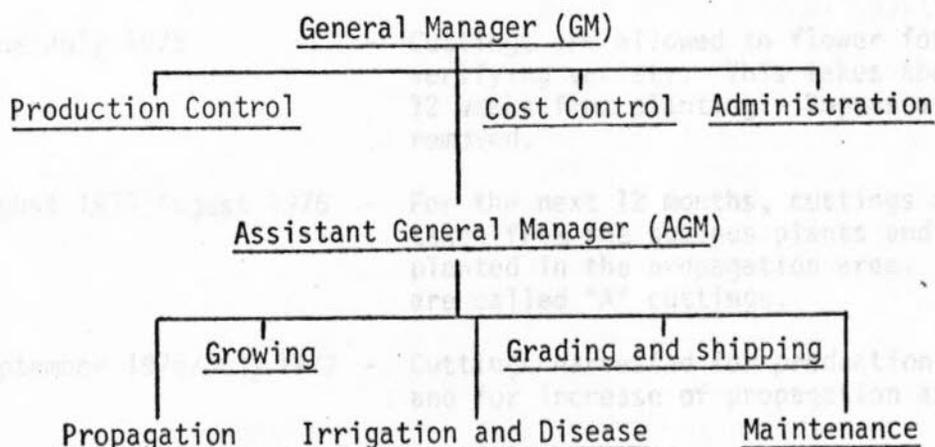
PART 4 - ORGANISATION OF SULMAC ESTATE AT NAIVASHA AND UPDOWN ESTATE
AND CROP OPERATIONS

1 Organisation of Sulmac Estate

1.01 There is one crop, carnations, and estate operations are directed to the propagation, growing, harvesting, grading, packing and despatch of that crop from a producing area of 315,000 m² which is rapidly being increased to 630,000 m² as outlined in Part 8. Planted area as at 1st December 1975 was as below; a map of the estate is given in Part 8.

	m ²
Rooting area (newly imported material) part Field 1	6,400
Propagation, Field 17	63,000
New plantings, Field 3	25,100
Production, Field 5	7,900
Production, Field 0 and 1 (in parts) 4, 7, 8 and 16	315,000
Experiments, Field 0	21,000
Total	438,400
Total hectares	43.84

1.02 The diagram below shows the various departments under the control of the General Manager, Mr M.C.Tremlett.



Each department is under the control of a Departmental Manager. The GM and Managers of Production Control, Propagation, Growing and Grading and Shipping, five in all, are expatriates. The AGM is a Kenyan of Greek origin and is also in charge of Irrigation and Disease and Maintenance. A local Kenyan is responsible for Administration. Cost control is undertaken by an expatriate accountant at the Nairobi office of DCK.

2 Administration

The GM, through the Administration Manager, has direct administration of personnel, security, medical orderly (small dispensary), clerks

and ancillary workers such as house servants and gardeners (for senior staff).

3 Propagation Department

3.01 The Propagation Department is in two sections. The first section contains 10 headmen and about 180 workers, organised in ten teams. They operate in a propagation field of 63,000 m² which is the standard size for all fields at Sulmac and, in conjunction with the Technical Department, in a small rooting area of 6,400 m² for nucleus stock. These two areas produce all the cuttings required as planting material in the production areas and surplus cuttings for sale. Workers of this section plant up beds required for propagation after treating the beds with Brassicol (quintozene) to prevent damping off, maintain all propagation areas, take cuttings and transport them to the cold store and apply rooting hormone powder. Beds are watered both by hand and by spray line. These workers are not responsible for subsequent pest and disease control which is undertaken by the Irrigation and Disease Department.

3.02 The rooting area (6,400 m²) receives the nuclear material of cuttings from Yoder Brothers, USA. A typical sequence of events is as follows -

- February/March 1975 - 200 nucleus unrooted cuttings per variety planted at 24 plants/m². Cuttings take four to six weeks to root. There are about six standard varieties (producing a single large flower per stem) and eight spray varieties (producing several smaller flowers per stem) in commercial production but many more are on trial.
- June/July 1975 - Cuttings are allowed to flower for verifying variety. This takes about 12 weeks from planting. Rogues are removed.
- August 1975/August 1976 - For the next 12 months, cuttings are taken from the nucleus plants and are planted in the propagation area. They are called "A" cuttings.
- September 1976/July 1977 - Cuttings harvested for production area and for increase of propagation area.
- October 1977/May 1978 - Flower production.

3.03 The propagation area of 63,000 m² is planted up with cuttings from the nuclear planting ("A" cuttings) and from cuttings from those plantings, ie the first increase block generation or "B" cuttings. A typical sequence of events is as follows -

- August 1975/August 1976 - "A" cuttings planted at 48 plants/m². Cuttings from these planted as "B" cuttings.

Area covered by block - 100 x 1 x 30 x 7 = 21,000 m²

For field layout, see map at Part II

September 1976/July 1977 - Cuttings taken for planting in production area or stored until required. Cuttings can be kept in cold store for about three months.

October 1977/May 1978 - Flower production.

Cuttings are produced at the rate of one per plant per week.

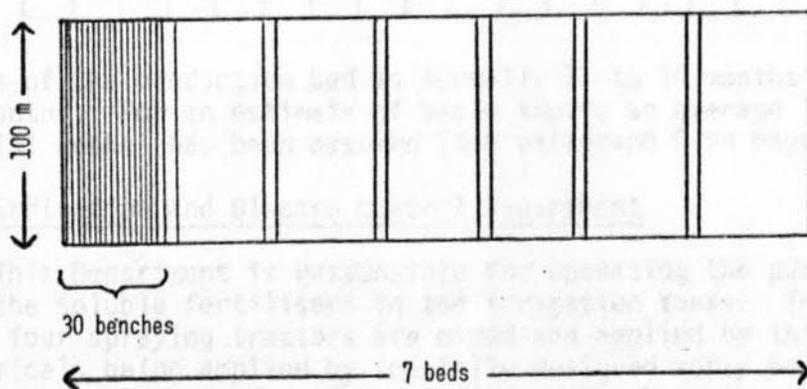
3.04 Nuclear material is, therefore, discarded just over three years after it has been obtained and propagation beds last rather less. It is the intention to import nuclear material yearly and three nuclear sets of any one variety could exist in the nurseries at any one time. This may not be necessary when in full production and nuclear material could possibly be imported every other year, with a proportionate saving in the cost of planting material.

3.05 The second section consists of a further two supervisors, three headmen and 80 workers, organised as three teams, who are responsible for planting up the production area. Their duties include bed preparation and watering up to establishment, ie for the first four to six weeks. The number of workers in this section will have to be augmented as the planted area increases; when they are not planting, these three teams work for the Growing Department.

3.06 Although the small nucleus beds have a life of nearly three years, a production bed is kept on the average for about 12 months. Each planting will have a mixture of colours from varieties of standards (single flower per stem) and sprays (more than one flower to a stem). This mixture will vary with the time of year when each bed is to come into production. Sprays are required for the spring trade and will then be in a greater proportion. On an average the ratio of standards:sprays is 60:40. Each field is of 63,000 m² nett (6.3 ha) covering a gross area of about 9.7 ha including service roads and pathways.

3.07 There are three blocks of 21,000 m² and each block is divided into seven beds. Each bed is divided into 30 benches of 100 m x 1 m in size. The density of planting in the production beds has been 50 per m² (1.05m plants per block) but planting will now be at 60 per m², requiring 1.26m plants per block, so as to give a stand of 50 plants per m² when rooted, assuming a success rate of 85%; this will avoid additional expenditure in replanting in order to achieve a full stand.

Block Layout - not to scale



Area covered by block - $100 \times 1 \times 30 \times 7 = 21,000 \text{ m}^2$

For field layout, see map at Part 8.

4 Growing Department

4.01 The Growing Department at Naivasha is large with two Assistant Managers and one supervisor to each of the five fields, ie five senior supervisors, 15 block supervisors, 43 headmen supervising a total of about 1,500 workers during the productive season. The number of workers will approximately double as the number of fields in production is increased to ten, as outlined in Part 8. The Department is responsible for the maintenance of all fields in production, ie fixing supports, watering, disbudding, harvesting of flowers, cleaning beds and discarding old beds.

4.02 One gang of workers is responsible for the same beds throughout their life. Beds are watered by hand, so as to avoid wetting the plants thereby reducing the incidence of leaf and stem diseases and flower damage, but an occasional soaking is given by sprinkler. A trickle system, installed experimentally in one block, is promising but has still to be evaluated; it delivers 10 mm per day over a 10-hour period through percolation tubes buried in the beds.

4.03 Standards are disbudded to give a single flower on a long straight stem. In sprays the terminal bud is removed.

4.04 The maturity (flowering) of production beds can be delayed and, therefore, timed as required by taking cuttings from them. This is usually not done after six months (24 weeks) from planting. Flowering is allowed over the period September to April or May. Potential flower production is about 250 stems per m² or five stems per plant, although lower figures have been quoted in the estimates; this is a good yield by European standards.

Production Cycle

J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
Plant																
	Growing															
								Flowering								

The life of the production bed is normally 11 to 14 months with a maximum of 17 months. For an estimate of basic inputs an average life of 11½ months (51 weeks) has been assumed (see paragraph 9 on page 25).

5 Irrigation and Disease Control Department

This Department is responsible for operating the pumps and for mixing the soluble fertilisers in the irrigation tanks. The chemicals for the four spraying tractors are mixed and applied by this Department, the chemicals being applied by specially designed spray booms which spray both upper and lower sides of the foliage. The Department employs a small number of relatively skilled employees. Fungicides are always

applied after rain and up to three sprayings a week may be necessary in rainy weather. The basic inputs at paragraph 9 on page 25 have allowed for an average of one spraying per week.

6 Grading and Shipping Department

6.01 The standard and spray flowers are taken to the grading tables, of which there is one for each block, 15 in all. Each table has its own supervisor. There are about 280 graders and supporting staff, including packers.

6.02 The grading specifications are shown at Table 1 on page 24. The lower grades of standards have recently been packed in smaller boxes, thus saving freight space. All stems have to be of such a strength that, when held horizontally at the tip, they do not bend more than 20 cm. The cut stage refers to the stage of development of the flower bud at the time of cutting; stage 1 is a bud just showing colour and stage 10 is a fully open flower. These stages have been photographed and prints are fixed to each grading table.

6.03 After grading and packing, the flowers are immediately placed in cold storage at 1-30C where they stay for at least 24 hours until shipped. They are transported in refrigerated lorries at the same temperature to a cold store at Embakasi airport, and are transported by air also at the same temperature.

7 Maintenance Department

The workshop contains three artisans and other staff who are responsible for the maintenance of the tractors, other vehicles and pipe equipment.

8 Production Control

8.01 The Production Control Department is a seventh department and comes directly under GM. It has two main functions: product control and experimental.

8.02 The departmental head has 55 checkers who check in detail the operations of all the other departments and reports back to GM and to the Technical Director. The checkers record data from random sample or, in the case of pest and disease control, by systematic examination of -

Virus and aphid populations

Disbudding

Rubber-banding of flowers

Harvesting buckets - level and cleanliness of water

Packing in boxes - number of bundles and mix

Storage - temperature in lorries and in cold store

Grading - flower development when cut (10 stages are identifiable), flowers per bundle, quality (broken, split, dirt, scorch etc)

Irrigation - time, discharge rate, soil moisture

Fertiliser - conductivity of water in tank and in field

Spray programme and state of equipment

If an error has been detected, this is immediately notified to the department concerned.

8.03 Product control is essential in such a large organisation and has helped Sulmac to maintain a reputation for consistent standards. Furthermore, in the rare case of complaint, it is possible to work back and trace the fault, sometimes to an individual team of workers.

8.04 There are 21,000 m² of experimental plantings under the direction of the Technical Director for whom this Department employs a supervisor, five headmen and about 120 workers. These plantings include new varieties for trial, growing techniques and so on. The work of the Technical Department is described in more detail at Part 10, Advisory Services and Research.

9 Basic Inputs for Carnations at Naivasha

9.01 Basis for Calculations

Tables 2 and 3 on pages 26 and 28 give the basic inputs for labour and materials for carnations at Naivasha for a planted area of 1,000 m² (0.1 ha). Basic annual labour input is shown as 2,110 man-days costing K Shs13,423 and the cost of materials is K Shs27,814. These figures have been based on actual costs, 1974/1975, for an area of 315,000 m² which included one field of carnations under propagation and four production fields. The average life of a production bed has been taken as 51 weeks, (see paragraph 4.04 on page 22). At full production there will be a greater proportion of production fields to which these figures apply. The notes to the schedules are self-explanatory and the paragraphs below are the mission's comments on the assumptions. These tables do not include land preparation, ie bush clearing, ploughing, harrowing, levelling, draining (where necessary), placement of irrigation supply line or preparation of roads which are development costs.

9.02 Labour Rates

All rates are based on the minimum of K Shs5.75. This appears to be unrealistic as some labourers have worked with Sulmac for several years and will be earning a higher rate. However, the efficiency of workers should also improve with experience and no changes have been made in the rate.

9.03 Bed Preparation

This figure (43 man-days) is high compared with the preparation of identical beds at Masongaleni which cost only 34 man-days. There is room for a 20% saving in costs.

9.04 Planting

2,000 cuttings can be planted per day, not 1,250 assumed, and estimates could be reduced by more than 35%.

9.05 Spraying

One man can spray 7,500 m². The figure given assumes that 7½ men are employed in the spraying gang. Although this is too generous and could be reduced to about five men, including tractor driver, only one spraying per week has been estimated.

Table 2
Basic Inputs : Carnations - Labour (per annum)

<u>Direct Labour per 1,000 m²</u> (1)	Man-days	Cost K Shs (2)
<u>Propagation</u>		
Bed preparation (3)	43	247
Planting (4)	43	247
Spraying (5)	12	69
Taking cuttings (6)	42	242
Immature costs (7)	196	1,127
Watering nets (8)	57	328
Supervision (9)	14	350
External cleaning	3	17
Total	410	2,627
<u>Production</u>		
Clearing and discarding (10)	43	247
Immature costs (11)	350	2,013
Mature costs (12)	855	4,916
Spraying (13)	39	224
Grading (14)	325	1,869
Supervision (15)	53	1,325
External cleaning	35	202
Total	1,700	10,796
Grand total	2,110	13,423

Notes to Table 2

(1) Based on actual costs for an area of 315,000 m². In this table the average life of a carnation bed is assumed to be 51 weeks as follows -

Establishment and propagation	- 12 weeks
Production immature	- 14 weeks
Production mature	- 25 weeks
Total	<u>51 weeks</u>

(2) Basic rates assumed at K Shs5.75 per day, ie K Shs150 per month of 26 days for labour and K Shs25.0 per day, ie K Shs650 per month for supervision.

(3) Requirements for top dressing 1,000 m² nett of beds -

Item	Kg	K Shs/kg	Cost K Shs
Agricultural lime	200	0.15	30
Mag max (magnesian limestone)	200	0.32	64
Double superphosphate	200	2.94	588
NPK, 15:15:6:4	200	2.50	500
Iron sulphate	20	1.35	27
Zinc sulphate	5	8.10	40
Total			1,396

This is applied to the gross area before the beds are made up. 1 m² nett = 1.54 m² gross. Therefore total quantity required =

$$\frac{1,396}{65} \times 100 \text{ kg} = 2,147.7 \text{ kg}$$

say 2,150.0 kg

(12) This is equivalent to 14 tonnes/ha which is a very high rate.

(4) Crop requirement for liquid fertilisers has been estimated as follows -

Item	Kg	K Shs/kg	Cost K Shs
Calcium nitrate	150	1.63	245
Diammonium phosphate	45	3.70	166
Potassium sulphate	53	2.19	116
Epsom salts	45	1.84	83
ASN	75	2.06	155
Manganese sulphate	1.5	3.00	5
Iron chelate	3	20.50	61
Solubor	3	7.75	23
Total			854

This is applied to the beds. For the propagation period half this amount is required, costing K Shs427 for 3½ applications -

$$427 = 1,494.5 \text{ say } 1,500$$

(5) Weekly spraying has been assumed at an average cost of K Shs88.5 per week per 1,000 m² -

$$\text{Total cost for 12 weeks} = 12 \times 88.5 = 1,062$$

Compared with production costs, this appears to be high.

(6) Packing materials and storage estimated at 0.5 cents per cutting for transporting in the field and storing in cold store -

$$50,800 \text{ cuttings per } 1,000 \text{ m}^2 = \frac{50,800 \times 0.5}{100} = 254$$

(7) Estimated as proportionate cost of supplying hosepipes.

- (8) Protective clothing for staff spraying chemicals. Estimated at K Shs7,000 per annum -

$$\frac{7,000}{630,000} \times 1,000 = \underline{11}$$

Basis for estimate for production not given but appears high on a pro rata basis.

- (9) Tools, rakes, knives, etc. Basis of estimate is K Shs500 per month for 315,000 m². Propagation period is three months. Therefore -

$$\frac{3 \times 500 \times 1,000}{315,000} = \underline{4.76}$$

Estimate of 6 is on the high side. Basis for estimate for production not given but appears high on a pro rata basis.

- (10) This table does not include food for workers calculated on a basis of K Shs0.25 per day per worker -

$$\frac{410 \times 25}{100} = 102, \text{ say } \underline{100}$$

This item has been included in indirect costs in the financial schedules.

- (11) Liquid fertilisers for production, full quantity applied. Average application -

$$9.5 \times 854 = \underline{8,113}$$

- (12) Production is divided into two periods -

- (a) immature, ie before flowering, based on average cost of K Shs75 per week for 1,000 m², ie -

$$\text{for 14 weeks cost} = 75 \times 14 = \text{K Shs } \underline{1,050}$$

- (b) mature period, ie during flowering at average cost of K Shs60 per week, ie -

$$\text{for 25 weeks cost} = 60 \times 25 = \text{K Shs } \underline{1,500}$$

$$\text{Total K Shs } \underline{2,550}$$

- (13) Packing materials work out at 4.5 cents per stem yield of 237 stems packed per m² or 237,000 per 1,000 m² -

$$\frac{237,000 \times 4.5}{100} = \underline{10,665}$$

This is inconsistent with the estimated yield of 238 stems/m²

9.06 Taking Cuttings

Cuttings are taken over the growing period (part propagation, part immature production) which can extend over six months. One round of taking cuttings, therefore, appears to be an underestimate.

9.07 Grading and Packing

Item 14 of Table 2 is based on a yield of 244 flowers per m² of which six are graded out as rejected or are damaged in handling. Although the financial estimates are based on 238 stems/m², packing materials allow for only 237 stems/m².

9.08 Planting Material

- (1) Table 3 shows an estimated cost of K Shs238 for 60,000 cuttings to plant 1,000 m² based on a total cost of K Shs150,000 for 37.8m cuttings

to plant 630,000 m². This includes the cost of imported cuttings, say K Shs20,000 landed Naivasha, leaving a balance of K Shs120,000 to pay for propagation beds. Based on Tables 2 and 3, direct propagation costs per 1,000 m² per hectare for 12 months are likely to be as follows -

	Man-days	K Shs
<u>Labour</u>		
Bed preparation	43	247
Planting	43	247
Spraying	51	266
Taking cuttings	780	4,485
Immature costs	546	3,140
Watering nets	57	328
Supervision	56	1,400
External cleaning	13	74
Total	1,589	10,187
<u>Material</u>		
Planting material		238
Labels		71
Fertilisers		11,763
Chemicals		3,612
Other materials		1,161
Total		16,845
Grand total		27,032
Say		27,000

K Shs120,000 would therefore allow for not more than 4,500 m² of propagation beds. If each plant produced one cutting per week over 50 weeks and the plant population is 48 per m², then 4,500 m² will produce only 4,500 x 50 x 48 = 10.8m cuttings. It is presumed that the balance of 27m cuttings will be obtained from the early stages of the propagation beds. This would be possible if only one round of cuttings is taken from just over 70% of the beds.

(2) It is understood that, in the past, once-grown planting material had been obtained from Sardinia. It is now proposed to import nucleus cuttings direct from Yoders, see paragraph 9.06 in Part 5. This means that material can be used for a longer propagation period that hitherto at Naivasha before it is discarded and it may be necessary to import fresh material every other year instead of yearly. This would represent an annual saving of about K Shs10,000.

9.09 Fertilisers

(1) The basic fertilisers are applied as a top dressing before the beds are made up. As the beds occupy only 0.65 of the gross area, this means that more than 1.5 times the amount of fertiliser required for the beds has to be applied. It might be more economical if a way could be found of applying this fertiliser when the beds are made. The rates of application for basic and liquid fertilisers are very high. At Part 10, proposals are given for trials aimed at determining what reductions can safely be made overall or at certain stages in the development cycle.

(2) The cost of fertiliser varies considerably between estates, even allowing for cost of freight. Table 4 below illustrates this point. Savings could be effected by buying in bulk for all estates and by reducing the variety of fertilisers; for example, no less than five carriers of nitrogen are employed.

Table 4
Cost of Fertilisers (K Shs)

Material	Masongaleni	Naivasha	Nairobi 3.12.75
Calcium nitrate, kg	1.65	1.63	1.26
ASN, kg	1.10	2.06	1.73
Potassium sulphate, kg	1.87	2.19	1.70
Potassium nitrate, kg	2.85	-	2.85
Double superphosphate, kg	0.85	2.94	2.50
Dolomitic limestone, kg	0.29	0.32	0.31
Solubor, kg	13.00	7.75	5.50
Iron chelate, kg	20.00	20.50	29.10
Nitric acid, litres	7.10	-	7.50
Phosphoric acid, kg	11.50	-	9.90
Epsom salts, kg	1.82	1.84	1.84
Copper sulphate, kg	11.00	-	8.00
Zinc sulphate, kg	9.25	8.10	8.50
Ammonium molybdate, kg	75.00	-	56.00
Iron sulphate, kg	1.10	1.35	1.35

10 Organisation of Updown Estate

10.01 The estate is managed by Mr H.J.Serger-Hansen who is officially employed at Co-ordinator of Freight and Production at IAI's Nairobi office. He also assists in planning Sulmac's planting programme.

10.02 Updown contains 50,000 m² (5.0 ha nett) of beds as follows -

Carnations	33,000 m ²
Roses	14,000 m ²
Alstromeria	3,000 m ²
Total	<u>50,000 m²</u>

10.03 The carnations are grown much as described in the preceding paragraphs for Naivasha. Yields are lower, about 156 blooms per m²; grades are better than at Naivasha because the blooms are rubber-banded. The number of beds is limited and it is desirable to utilise the available space continuously; thus alternative crops to carnations are being sought.

10.04 Roses were planted after a marketing study had indicated that it was a crop worth developing; the rose is the main cut flower marketed in Europe after carnations. Experiments started in June 1971 at Masongaleni but were terminated after three years trials in favour of Updown where conditions of soil and climate were found to be more favourable. This season, 1975/1976, is the first in which the market has been seriously tested. Three varieties each of three kinds have been planted and production has been estimated as follows -

Kind	Variety	Number of blooms November/May	%age
Grandiflora (12%)	Baccara	131,400	5.8
	Sonia	128,900	5.6
	Dr Verhage	13,750	0.6
Sweetheart (14%)	Nordia	66,900	3.1
	Montrea	137,000	6.3
	Belinda	100,600	4.6
Babies (74%)	Red Garnette	1,379,800	62.2
	Jingles	213,900	9.6
	Evergold	52,050	2.2
Total		2,224,300	100

10.05 Climatic conditions are not ideal for roses at Updown as the night temperatures fall too low. The crop is, therefore, protected and grown in houses of plastic sheeting which has to be renewed yearly. Weekly inspections are made for pests and diseases. Mildew is a problem, particularly with the most important variety, Red Garnette; Nimrod appears to be the best chemical for its control. Black spot occurs from the second year onwards and spider mite and aphids can be troublesome. The standard of budding does not yet appear to be very high, only 56% take being achieved. Watering can be controlled to get the main flush of blooms at Christmas.

10.06 Preliminary marketing trials had suggested that the "Babies" would fetch the best prices and for this reason over 74% of the planting was in this kind. The table below confirms that the Babies performed best during the first month this season; the best grade of Red Garnette was classified as a Sweetheart.

Kind	Aalsmeer Return, K Shs		Frankfurt
	Budget	Actual	Actual, 1.12.75
Grandiflora	1.70	1.50	2.21
Sweetheart	1.12	1.00	1.12
Babies	0.70	0.75	1.39

The yield of blooms has been disappointing, about a quarter of that expected for the period, and the crop will have to be assessed carefully at the end of this season.

10.07 Hybrid Alstromerias are being tried in an area formerly planted to carnations. The main crop is obtained in Europe from March to June and, although sales could be made from Kenya throughout the year, it is intended to restrict sales to the period mid-November to mid-March. The crop is being grown under licence and no increase may be made to the planted area without paying half the royalty rate of 32.50 Dutch guilders per m². No crop has yet been obtained; a yield of 400,000 stems per acre is considered possible and crops could be produced over two to four years.

10.08 Freesias and liatris are also under trial in small plantings.

2.02 Security

The Security Department employed a large force of askaris, which will be reduced, and operates a communications system throughout the estate. The mission was informed that such a force was necessary for the protection of property and in the movement of cash. The uncultivated parts of the estate are operated as a game reserve for which the District must employ game wardens; it is suggested later in this report that the protection of game should be a self-financing operation.

2.03 Accounts

This Department is responsible for the payment of wages and for stores.

2.04 Public Health

The Medical Officer operates a small hospital, mainly for out-patients and patients in transit to the District Hospital. The Department is also responsible for camp cleanliness and the operation of the kindergarten and nursery. 33.9% of the cost of this Department is charged to general overheads, 13.6% to red-roofers and 52.5% to plumbers.

PART 5 - ORGANISATION OF MASONGALENI ESTATE AND CROP OPERATIONS

1 Organisation

1.01 There are two crops at Masongaleni, chrysanthemums for cuttings (redi-rooters) and plumosus. For redi-rooters an area of 66,408 m² (6.6 ha) is cropped and for plumosus 336,982 m² (33.6 ha).

1.02 The organisation under the General Manager, Mr G.M.O.Stein, is shown at Table 5 on page 36. The main departments are Planning, Growing, Redi-rooter Production, Plumosus Production, Production Control and Workshop. Supporting administrative departments are Personnel, Security, Accounts and Public Health. Each is under the management of an expatriate except for Personnel which is headed by a Kenyan.

1.03 The policy is to train Kenyans for management posts; thus a Kenyan, now in charge of plumosus harvesting, is Assistant Production Manager and can expect to take over the Plumosus Production Department. The expatriate staff will have been reduced from 15 to 12 with effect from 1.4.76, including a teacher and part-time worker, to supervise about 2,500 local employees.

2 Administration

2.01 Personnel

This Department is responsible for registration of labour, housing, industrial relations and welfare.

2.02 Security

The Security Department employed a large force of askaris, which will be reduced, and operates a communications system throughout the estate. The mission was informed that such a force was necessary for the protection of property and in the movement of cash. The uncultivated parts of the estate are operated as a game reserve for which the Department employs game wardens; it is suggested later in this report that the protection of game should be a self-financing operation.

2.03 Accounts

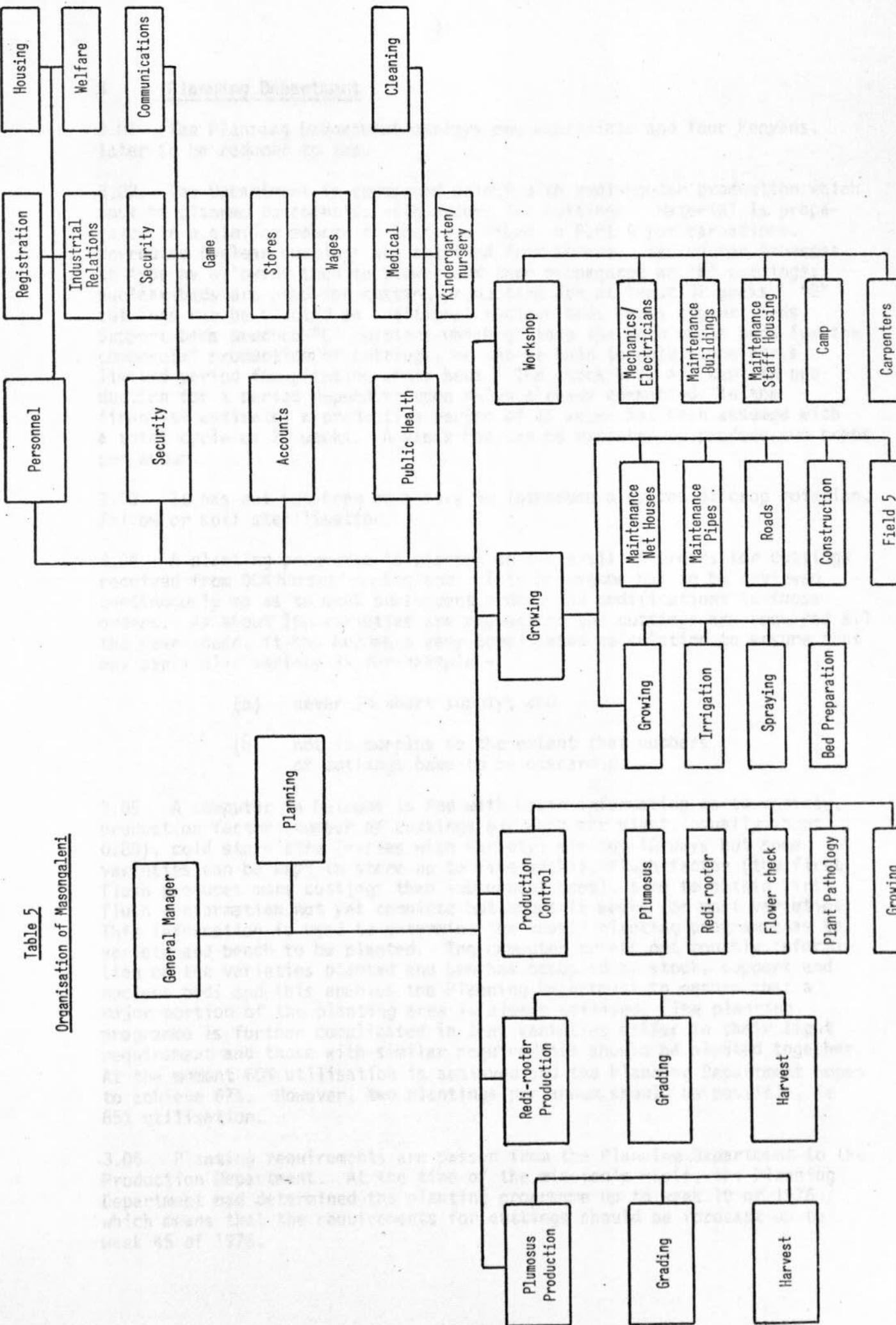
This Department is responsible for the payment of wages and for stores.

2.04 Public Health

The Medical Officer operates a small hospital, mainly for out-patients and patients in transit to the District Hospital. The Department is also responsible for camp cleanliness and the operation of the kindergarten and nursery. 33.9% of the cost of this Department is charged to general overheads, 13.6% to redi-rooters and 52.5% to plumosus.

Table 5

Organisation of Masongaleni



3 Planning Department

3.01 The Planning Department employs one expatriate and four Kenyans, later to be reduced to two.

3.02 The Department is concerned mainly with redi-rooter production which must be planned to coincide with orders for cuttings. Material is propagated in a similar manner to that described in Part 4 for carnations. Un-rooted nuclear cuttings are obtained from Yoders, tested for trueness to type by allowing them to flower and then propagated as "B" cuttings; nuclear beds are used for cutting production for at least 32 weeks. "B" cuttings can be planted as additional nucleus beds or as support beds. Support beds produce "C" cuttings which go into the main stock beds for the commercial production of cuttings, or can be held in cold store for a limited period for planting stock beds. The stock beds are kept in production for a period depending upon sales already committed; in the financial estimates a productive period of 15 weeks has been assumed with a total cycle of 22 weeks. A stock bed can be expected to produce two crops per annum.

3.03 It has not yet been necessary to introduce a system of crop rotation, fallow or soil sterilisation.

3.04 A planting programme is planned on the basis of orders for cuttings received from DCK Nurseries, England. This programme has to be reviewed continuously so as to meet subsequent orders and modifications to those orders. As about 160 varieties are propagated and cuttings are required all the year round, it has become a very complicated calculation to ensure that any particular variety is for example -

- (a) never in short supply; and
- (b) not in surplus to the extent that numbers of cuttings have to be discarded.

3.05 A computer in Nairobi is fed with basic information as to variety, production factor (number of cuttings per week per plant: usually about 0.80), cold store time (varies with variety: minimum 10 days but some varieties can be kept in store up to five weeks), flush factor (the first flush produces more cuttings than subsequent ones), time to obtain first flush (information not yet complete but about 15 weeks for most varieties). This information is used to determine the weekly planting programme as to variety and bench to be planted. The computer prints out monthly information on the varieties planted and benches occupied by stock, support and nucleus beds and this enables the Planning Department to ensure that a major portion of the planting area is always utilised. The planting programme is further complicated in that varieties differ in their light requirement and those with similar requirements should be planted together. At the moment 60% utilisation is achieved and the Planning Department hopes to achieve 67%. However, two plantings per annum should be possible, ie 85% utilisation.

3.06 Planting requirements are passed from the Planning Department to the Production Department. At the time of the mission's visit, the Planning Department had determined the planting programme up to week 10 of 1976 which means that the requirements for cuttings should be forecast up to week 45 of 1976.

4 Growing Department

4.01 The Growing Department is responsible in redi-rooters for the preparation of the beds, incorporation of fertiliser in the beds, covering them with nets after the cuttings have been planted, maintaining the beds up to rooting, watering them thereafter, pest and disease control and discarding of plants at the end of production.

4.02 In plumosus the Growing Department is also responsible for bed preparation, for irrigation and for pest and disease control, but this occurs only for new developments as the crop is perennial.

4.03 The Department erects and maintains the net houses in which both crops are grown, maintains pipes and roads and is responsible for the new development in Field 5. The maintenance of 100,000 m² of net houses in Field 1 was estimated to cost K Shs350,000.

4.04 Redi-rooters are watered at the rate of 65-85 mm (3 in) two to three times per week, whereas plumosus receives 45-55 mm (2 in) once weekly. The spray lines deliver 500 m³ per hectare per hour and most of the irrigation is done at night. Low angle nozzles are used for redi-rooters and high angle nozzles for plumosus. Fertiliser is added to the irrigation water except during the last hour when only nitric acid is added.

5 Redi-rooter Production

5.01 The Redi-rooter Production Department is responsible for the planting, harvesting, grading and packing of cuttings, for weeding the beds and for light control.

5.02 The planting programme is determined by the planning control system described at paragraph 3 on page 37. Planting benches are prepared by the Growing Department. The cuttings are planted at a density of 70 per m² by the Production Department which submits a weekly return of plantings to the Planning Department. Cuttings are covered by nets during the rooting period, six days; they are irrigated by spray lines, one to every six benches. The net house is divided into blocks of 78 benches, each of 100 m², and there are six blocks in Field 2 and one in Field 1. This number is being increased at Field 5 under the development programme.

5.03 The harvesting section of the Department employs 26 supervisors and about 150 workers. There are 14 small groups of seven to nine workers, two groups to each block, engaged on harvesting cuttings, cleaning beds, tying up nets, pinching newly planted material and weeding. The remaining workers are engaged in transporting the cuttings to the packing shed and cold store. The harvesting of cuttings usually commences at the sixth week from planting and can continue to the 22nd week. Cuttings are harvested throughout the year. Most varieties are harvested weekly but some have to be harvested twice a week. A harvester is required to pick five boxes of 120/150 cuttings per box, ie 600 to 750 cuttings in one hour. Each cutting should have not less than two fully developed leaves, but the length and thickness (diameter) of the stem will depend upon the variety. Cuttings are always taken after 11 am; if taken earlier, the sucrose content is insufficient in certain varieties for them to last in cold store. Cuttings from young stock must be taken later in the day than those from old stock.

	4	6,138
Total		255,987

5.04 The grading section employs about 160 workers including 25 supervisors and clerks. Cuttings are taken by the harvesters to small field sheds where a tractor collects the field boxes and takes them to the cold store within half an hour of harvesting. They are cooled for about 24 hours and then graded. One variety is graded at a time at a given table to which is affixed five full-size photographic plates illustrating the range of diameters permitted for that variety. Great importance is attached to the diameter of the cutting as it is considered to influence the growth of the plant. The grader discards immature cuttings (the length of the leafless part of the stem must be greater than a third of the total length), leggy stems and damaged stems. Discards are counted and recorded; they usually amount to about 5% to 7%. The graded cuttings are then bundled in tens and placed in trays of 250 cuttings, except for large grades which take 200 cuttings. The grades are clearly marked and the bundles placed in boxes of 1,000 cuttings which are registered as to quantity, grade, variety and date. These data are the source of the production figures for chrysanthemum cuttings. The registered boxes are placed in cold store for not less than ten days. This treatment is required by the Ministry of Agriculture in Britain (the main market for cuttings) to control certain pests and diseases, notably Spodoptera. They are usually not in cold store for more than four weeks although some varieties can be kept up to six weeks. This is a useful device for maintaining a buffer stock for planting stock beds and for sale.

5.05 The packing section receives its orders from the computer about three days before the boxes have to be made up. In the rare event of stock not being available, this gives time to arrange for another variety or a smaller grade to be substituted. The small grades of cuttings usually go to special markets, eg Finland, or are sent to contractors in the United Kingdom for rooting in bulk before selling to nurserymen. Cuttings are treated with rooting hormone powder and then packed in boxes of 1,000 which are addressed direct to the nurseryman using labels printed out by the computer.

5.06 The light control section employs three supervisors and seven workers, six on night shift and four on day shift. Intermittent lighting at night is essential to prevent flower bud initiation. Cuttings must not be sent out with incipient flower buds. The present regime is on a 20-minute cycle throughout the night of five minutes illumination and 15 minutes darkness. The replacement of bulbs, which is done during the day, is a costly item.

6 Plumosus Production

6.01 The Plumosus Production Department is responsible for the maintenance and handling of the crop in the field, harvesting, grading and packing. There are five plantings as follows -

Field	Area (m ²)	Remarks
M I -	23,632	Original planting
M II 1	78,336	} Balance of these fields contains redi-rooters
2	44,988	
3	93,888	
4	96,138	
Total	336,982	

There is a supervisor in charge of each field and 18 block supervisors. The total work force is 1,215 persons.

6.02 Plumosus is grown from seed sown between April and August and seedlings take 9/12 months to come into bearing. Four to five-year old plants have shown no decline in yield. However, there have been difficulties in re-establishing plumosus in former plumosus nursery beds in Field 1 and, should replanting eventually be necessary, it would probably have to be done in a new area.

6.03 The maintenance and handling gangs inspect each bed daily. The area one gang can cover varies with the time of the year according to the growth rate. Fronds are untwisted and are pinched at a height of 50 cm-55 cm (20 in). The frequency of pinching can be varied and this will change the proportion of pinched to unpinched fronds.

6.04 There are nine groups of harvesters and harvesting is done throughout the year. In the harvesting gangs, each worker must harvest not less than 30 bundles, each of 50 stems, and receives a bonus for higher rates. The frequency of harvesting varies according to the time of the year, usually two to three weeks but fronds can stay in the field for six to seven weeks. Thus the harvesting frequency will also determine the proportion of pinched to unpinched fronds which might vary from 20% to 45%. At the time of the mission's visit, a large stock was being built up for the Christmas trade. When the demand is heavy, some immature fronds can be harvested; maturity can be hastened by three days with a dithane spray. Average yield is six to eight stems per m².

6.05 In the grading section there are nine groups of graders, 63 in all, each group under a supervisor. The fronds are placed in water immediately after harvesting and are never left out of water longer than necessary because of the danger of needle drop. Fronds are graded by length and straightness of stem and the number of laterals. There are eight grades, the first six being exported. The grading system is strict and not so easy to learn as for the other crops. On the occasion of its visit, the mission noted a 30% discard rate; this is unusual and the reason is being investigated. A new system of grading is on trial for three months and all new graders have to spend 7-14 days in a training group. Details of the grading system are given at Appendix 2.

6.06 After grading, the plumosus is washed in an acid solution, rewashed and placed in the cold store for about 24 hours. The bundles are packed in bulk for Frankfurt where they are repacked for customers; the number of bundles per box varies from 30 to 100 according to the grade.

7 Production Control

7.01 Production Control Department

This Department employs a staff of about 125 and functions similarly to that described in Part 4 for carnations. Its object is to provide a monitoring service for the control of quality at all stages of production and for the detection and control of pests and diseases and to provide field and recording services for research and development. Although under the administration of GM, Masongaleni, the Manager of this Department reports direct to the Technical Director to whom a weekly report is submitted.

7.02 Quality Control

(1) Irrigation Rate and Frequency

The rate and frequency are determined from meteorological records and evaporation data and the Growing Department is advised. That Department's operations are checked and the water-table and soil moisture are also recorded.

(2) Fertiliser Programme

Recommendations are received from the Technical Director for the basis of which the Production Control Department takes soil samples for analysis in Sweden. Stock solutions and the irrigation tanks are checked by conductivity measurements.

(3) Harvesting Standards

16 workers check in the afternoons samples of redi-rooter cuttings for size, labelling etc. This operation and checks on grading are regarded as useful safeguards for checking on customers' claims, which have been much reduced.

(4) Grading Operations

10%-15% of the plumosus production is inspected and reports made on errors in grading, mixing of grades, discards, etc.

(5) Packing Operations

There are five inspectors in the cold store to check on damage, labelling of boxes as to variety, grade, quantity, etc.

(6) Shipment

The cold store temperature is checked three times daily. For chrysanthemums (redi-rooters) the temperature should be 0.50C-1.50C and for plumosus 40C-60C. The temperature is also checked in the packing boxes and before loading in the refrigerated vans which transport the produce to Nairobi.

(7) Flower Check

Cuttings from the first pinching from all plantings of nucleus, support and stock beds are taken and planted at a density of 5,000 per m². They are allowed to flower, which takes ten weeks, to check on variety and on mutants which occur frequently. A report is made to the Planning Department if any mixing of varieties has occurred.

7.03 Pest and Disease Control

The same 16 workers (see 7.02(3), harvesting standards above) inspect each bed weekly in the mornings for pests and diseases mainly spider mite, aphids, caterpillars and Helminthosporium. Samples are taken for identification of any unrecognised disorder. Helminthosporium is controlled with Dithane, caterpillars with Lannate and spider mite with Kelthane. Tractors, fitted with spray booms, are used and the condition of the sprayers and tanks is inspected weekly to prevent scorching of foliage. After every spraying there is an inspection to check on its correct application

7.04 Research and Development

Under the direction of the Technical Director a programme of experiments is carried out for redi-rooters and plumosus. These are described in detail at Part 10 and cover fertiliser and light requirements, harvesting and keeping quality in store.

7.05 Reduction in Cost of Production Department

While the Kenyan labour force is inexperienced, the Production Control Department is providing a very useful monitoring service and can indicate where improvements can be undertaken. However, as supervision becomes more reliable, it should be possible to dispense with some of its activities in quality control. In fact, some operations such as checking the height of pinching plumosus should not be necessary. It is doubtful whether daily sampling of the Masongaleni River serves a useful purpose now that more than one year's records are available.

8 Workshop

The workshop is responsible for mechanical and electrical maintenance and the maintenance of all buildings and housing but not the net houses which come under the Growing Department.

9 Basic Inputs for Redi-rooters at Masongaleni

9.01 Basis for Calculations

Tables 6 and 7, on pages 43 and 45 respectively, give the basic inputs for labour and materials for chrysanthemums at Masongaleni for a planted area of 1,000 m² (0.1 ha). The direct labour requirements for stock beds over a period of 22 weeks (say six months) is shown to be 1,399 man-days costing K Shs10,934. Although two crops might be obtained from a given area in a year, only 1.2 crops per annum are obtained; therefore, annual direct labour cost is K Shs10,934 x 1.2 = K Shs13,121. The cost of materials for one year is K Shs49,927 based on actual costs; 1974/1975, for an area of 66,408 m² which included nucleus, support and stock beds. The notes to the schedules are self-explanatory and the paragraphs below are the mission's comments on the assumptions. As in the case of carnations (see paragraph 9 in Part 4 on page 25), these tables do not include land development costs which are given at Part 8.

9.02 Labour Rates

See comments at paragraph 9.02 in Part 4 on page 25. Some increase over the basic minimum of K Shs5.75 per day should be expected.

9.03 Planting

1,250 cuttings are planted per man-day. If the task can be increased to 2,000 for carnations, the same should be possible for chrysanthemums.

9.04 Spraying

One spraying every other day appears to be too generous and could probably be reduced at certain times of the year. This is a matter which the Technical Department could investigate.

Table 6

Basic Inputs: Chrysanthemums - Direct Labour for 1,000 m² (one crop) (1)

		Man-days	Cost K Shs
<u>Growing</u>	(2)		
Bed preparation	(3)	34	196
Irrigation by day	(4)	8	46
Irrigation by night	(4)	14	80
External cleaning		4	23
Fertiliser mixing	(5)	6	35
Support work		2	12
Spraying	(6)	74	425
Special group	(7)	24	138
Supervisors	(8)	14	350
Total		180	1,305
<u>Production (2)</u>			
Planting & harvesting	(9)	599	3,444
Grading		350	2,013
Packing	(10)	110	633
Cold storage		50	288
Light control	(11)	50	288
Supervisors	(8)	60	2,963
Total		1,219	9,629
Grand total		1,399	10,934

Notes to Table 6

(1) Based on actual costs for 66,408 m², one crop. Two crops per annum would be feasible, ie 2 x 22 weeks + 8 weeks fallow. Yield at 1,500 cuttings per m² would be 3m cuttings, but there is only 60% bed utilisation and yield is 1,807 cuttings per m². Annual cost is 1,807 ÷ 1,500 = 1.2 times cost of one crop, ie K Shs1.2 x 10,934.

(2) Life of bed is reckoned at 22 weeks (154 days). The operations growing and production are divided between two departments. Production of cuttings starts at the sixth week. Rate for labour K Shs5.75.

(3) One man prepares 30 m² per day, including application of basic fertiliser.

$$\frac{1,000}{30} = 33.3, \text{ say } \underline{34 \text{ man-days}}$$

(4) Irrigation by spray lines, two to three times per week.

$$22 \text{ weeks} \times 2.5 \text{ times at } 1 \text{ man-day to } 2,500 \text{ m}^2$$

$$\frac{22 \times 2.5}{2,500} \times 1,000 = \underline{22 \text{ man-days}}$$

Above calculation includes a more intensive watering of cuttings during rooting period, ie for first month.

(5) Fertiliser added to irrigation water.

(6) Spraying for pest and disease control - 1 man-day for 1,000 m² of hand spraying from tractor. For 148 days, after rooting nets have been removed, at one spraying every other day - 74 man-days.

(7) Special group is engaged in pipe maintenance and drainage.

(8) One man supervises 11,000 m² of growing beds. For 22 weeks (154 days) the requirement is -

$$\frac{154 \times 1,000}{11,000} = \underline{14}$$

The figure for supervision of production beds is composite, averaging one man to 2,500 m² of production beds, and includes some supervisors paid at a rate exceeding K Shs25 per day. For 150 days, not including bed preparation, the requirement is -

$$\frac{150 \times 1,000}{2,500} = \underline{60 \text{ man-days}}$$

(9) Planting density = 70 plants/m² 1,250 cuttings per man-day -

$$\frac{70 \times 1,000}{1,250} = 56 \text{ man-days per } 1,000 \text{ m}^2 + 3 \text{ man-days for marking out} = \underline{59 \text{ man-days}}$$

Rate of harvest, 625 to 700 cuttings per hour or 5,000 per man-day. Harvest twice a week over 16 weeks -

Labels	$\frac{2 \times 16 \times 1,000 \times 70}{5,000} = 448$	1,171
Poles		121
Support and binding netting	Transport	33
Fertilisers	Total	540 man-days
Chemicals	Grand total 59 + 540 =	599 man-days
Electrical help		

(10) Grading, packing and cold storage staff based on previous year's performance.

(11) 10 workers per 30,000 m², three on night-shift, four on day-shift changing bulbs and four resting, 150 days -

$$\frac{10 \times 150 \times 1,000}{30,000} = \underline{50 \text{ man-days}}$$

Packing units		6,046
Tools		161
Protective clothing		91
Running costs, tractor		274
Miscellaneous		212
Total		69,824
Grand total		70,423

Notes to Table 7

(1) Cost in the above schedule has been based on the estimate for 1975 for 66,000 m².

(2) Replacement of sprinklers, hoses, spray machine, etc.

(3) Incidental tools, eg spade, rake, etc.

Table 7
Basic Inputs : Chrysanthemums - Direct Materials for 1,000 m² (1)

		Cost K Shs (per annum)
<u>Growing</u>		
Irrigation material	(2)	61
Spraying material		124
Tools	(3)	18
Protective clothing	(4)	161
Running costs, tractor	(5)	503
Miscellaneous		9
Total		876
<u>Production</u>		
Plants	(6)	273
Sterilisation	(7)	152
Labels	(8)	1,171
Poles	(9)	121
Support and shadow nets	(10)	758
Fertilisers	(11)	22,086
Chemicals	(12)	6,340
Electrical bulbs	(13)	3,396
Production boxes	(14)	2,720
Maintenance, grading tables	(15)	61
Forwarding boxes	(16)	7,200
Packing materials	(17)	4,046
Tools	(3)	151
Protective clothing	(4)	91
Running costs, tractor		273
Miscellaneous		212
Total		49,051
Grand total		49,927

Notes to Table 7

- (1) Cost in the above schedule has been based on the estimate for 1975 for 66,408 m².
- (2) Replacement of sprinklers, hosepipes, spray nozzles, etc.
- (3) Incidental tools, eg spade, rake, etc.

(4) Protective clothing, growing - for spraying gang, protective clothing, production - for cold store, etc.

(5) For spraying and carrying cuttings.

(6) Planting material - 70 cuttings planted per m². Requirement for 1,000 m² = 70,000 cuttings, basis for cost not given. 75,000 cuttings @ US \$42 fob per 1,000 cuttings will cost about K Shs27,000 landed Masongaleni.

(7) Basis for cost not given. Temik has been included in cost of chemicals.

(8) Labels, tags and tape for taking cuttings -

$$\text{K Shs}77,800 \div 66.408 = \underline{\text{K Shs}1,171}$$

(9) Poles, crosspoles

$$\text{K Shs}8,000 \div 66.408 = \underline{\text{K Shs}121}$$

(10) Support nets - 2 rolls per months @ K Shs1,000 = K Shs24,000

Shadow nets for rooting cuttings = 52 nets per annum

1 roll, size 282 x 6 m gives 20 nets of 50 x 1.5 m plus piece for repairing old nets.

$$\text{Price per roll} = \text{K Shs}10,152$$

$$\text{Cost of 52 nets} = \frac{10,152 \times 52}{20} = \underline{26,395}$$

$$\text{Total } \underline{50,395}$$

$$50,395 \div 66.408 = \underline{\text{K Shs}758}$$

(11) (a) Fertilisers as top-dressing -

Item	Quantity (kg)	Price/kg	Cost (K Shs)
Magmax (Mag limestone)	39,090	0.29	11,336
NPK	24,340	0.90	21,906
Iron sulphate	2,335	1.10	2,568
Zinc sulphate	720	9.25	6,660
Copper sulphate	360	11.00	3,960
Manganese sulphate	252	7.30	1,840
Solubor	195	13.00	2,535
Ammonium molybdate	36	75.00	2,700
Total			53,505

(b) Fertilisers applied in irrigation water -

Item	Quantity (kg)	Price/kg	Cost (K Shs)
Phosphoric acid	8,232	11.50	94,668
Calcium nitrate	398,850	1.65	658,103
ASN	215,020	1.10	236,522
Potassium nitrate	16,440	2.85	46,854
Potassium sulphate	66,574	1.87	124,493
Epsom salts	52,370	1.82	95,313
Copper sulphate	406	11.00	4,466
Zinc sulphate	184	9.25	1,702
Ammonium molybdate	184	75.00	13,800
Iron chelate	6,640	20.00	132,800
Borax	996	4.50	4,482
			1,413,203
Total			1,466,708

K Shs1,466,708 ÷ 66.408 = 22,086

Note Double superphosphate has been deleted from the top-dressing mixture.

(12) The following chemicals have been assumed for redi-rooters (chrysanthemums) -

Item	Quantity (kg)	Price/kg	Cost (K Shs)
Alar (daminozide)	234	285.00	66,690
Antracol (propineb)	819	20.00	16,380
Benlate (benomyl)	199	130.00	25,870
Brassicol (quintozene)	650	16.50	10,725
Captan	650	21.80	14,170
Copper oxychloride	602	24.68	14,857
Dithane M45	325	17.40	5,655
Kelthane	541	29.06	15,722
Folimat (omethoate)	60	88.00	5,280
Lannate	82	145.00	11,890
Lindane (methomyl)	325	36.00	11,700
Temik (aldicarb)	4,004	37.45	149,950
Thiodan	650	39.00	25,350
Spreader/sticker	375	15.00	5,625
Total c/f			379,864

Item	Quantity (kg)	Price/kg	Cost (K Shs)
Total b/f			379,864
Methylated spirit	416	10.00	4,160
Hormone, rosa	520	20.00	10,400
Hormone, white	884	30.00	26,520
Total			420,944
Say			421,000

$$421,000 \div 66.408 = \text{K Shs}6,340$$

- (13) Replacements, electrical bulbs, estimated @ 24,750 bulbs.

$$225,500 \div 66.408 = \text{K Shs}3,396$$

- (14) Transport boxes and containers estimated @ K Shs 62,900

Small production boxes, size 305 x 203 x 102 mm 117,700

Total K Shs180,600

$$180,600 \div 66.408 = \text{K Shs}2,720$$

- (15) Replacement of photographs showing cutting grades, etc.

- (16) Estimated nett sales 68,900,000 cuttings from 106,830,000. Forwarding boxes contain 1,000 cuttings each.

$$\text{Requirement is } \frac{68,900,000}{1,000} + 3\% = 70,967 \text{ or}$$

35,130 winter boxes + styropor (for insulation) @ 8.00 K Shs 281,040

35,837 summer boxes @ 5.50 197,104

Total 478,144

$$\div 66.408 \quad \underline{7,200}$$

- (17) Tying materials, plastic sheets, labels, staples, rubber bands.

Total cost estimated at K Shs268,700

$$\div 66.408 = \text{K Shs } \underline{4,046}$$

9.05 Harvesting

At paragraph 5.03 on page 38, a harvesting rate of five boxes of 120/150 cuttings per box (ie 600 to 750 cuttings) per hour is given. The actual rate is between 625 and 700 per hour or 5,000 per day. Note 9 to Table 2 assumes that cutting can be harvested twice weekly but this is true only for certain varieties and the figure for harvesting costs could be reduced. The estimates for redi-rooters show an average yield of 1,807 cuttings per m² which is based on 1,500 cuttings per planting and 1.2 crops per annum ($1.2 \times 1,500 = 1,807$). This shows a low occupancy rate and should be improved.

9.06 Planting Material

The basis for the cost was not given to the mission. However, it is understood that, as for carnations (see Part 4, paragraph 9.08 on page 30) once-grown planting material had been obtained from Sardinia and that it is now proposed to import nucleus material direct from Yoders, USA. To this end, IAI has contracted with Yoders to supply IAI with unrooted chrysanthemum cuttings in quantities and varieties to be specified by IAI on at least six months' notice, provided they are classified as available varieties, at a cost of US \$0.02 (two cents) per cutting, this price to be raised yearly with effect from 1st January 1977, according to their current price list. For patented varieties the price will be increased to cover royalty charges. The estimates show a cost of US \$42.00 per 1,000 cuttings free on Air Florida. As for carnations, it may not be necessary to import fresh planting material, except for new varieties for trial, and some savings could be effected in the cost of planting material.

9.07 Fertilisers

This is the most costly item, and trials are necessary with lower rates and simpler formulations, an important criterion being that the keeping quality of the cuttings must not be impaired. Of the fertilisers used in the irrigation water, iron chelate is an expensive item and consideration should be given to using a cheaper alternative; iron deficiency may be induced if the soil pH is too high, whereas boron toxicity can occur if the pH is below 5.5. Fertiliser should be purchased in bulk for all estates.

9.08 Lighting

The cost of replacing bulbs only is shown in Table 7, note (13) on page 48. Electricity costs are allocated in overheads; the basis for allocation is given at Table 9, note (2) on page 52, in the plumosus costs. If a different lighting regime is found to be feasible, savings in this item should be expected.

9.09 Chemicals

A large variety of fungicides and insecticides are employed. It should be possible to reduce this number so that bulk purchases may be made at more favourable prices, and a small number of alternatives could be kept in stock for emergencies. There are already many chemicals in stock which have been used for experimental purposes. Those which are not required for emergencies should be sold. For experimental purposes it is often possible to obtain free samples.

10 Basic Inputs for Plumosus at Masongaleni10.01 Basis for Calculations

Tables 8 and 9 on pages 50 and 52 respectively, give the basic inputs for labour and materials for plumosus for a planted area of 1,000 m². The annual input is shown as 1,663 man-days costing K Shs10,723, and for materials the cost is K Shs14,934. The figures have been based on actual production costs at Masongaleni I and Masongaleni II over a period of 12 months. Comments on labour rates, spraying, fertilisers and chemicals made for redi-rooters apply equally to plumosus.

10.02 Harvesting and Grading

Labour costs appear to be overestimated. A harvester should be able to harvest more than 30 bundles, each of 50 stems (1,500 stems) in one day. Graders bundle 45 stems per bundle.

11 Other Crops

11.01 Roses, originally on trial at Masongaleni I, are still being grown there on a small scale. It is suggested that this crop now be abandoned.

11.02 The estimate for chemicals includes small items for roses, lawns and vegetables, hedges, citrus, grapes and staff gardens. However, if these and other costs for the above items are scrutinised with a view to effecting economies, the savings will not be significant.

Table 8

Basic Inputs : Plumosus - Direct Labour for 1,000 m² per annum (1)

	Man-days	Cost (2)
<u>Growing</u>		
Bed preparation	34	196
Day irrigation	8	46
Night irrigation	14	81
Crop maintenance	17	101
External cleaning	4	23
Fertiliser mixing	6	35
Support work	2	11
Spraying	74	426
Special group	24	138
Supervisors (3)	15	375
Total (6)	198	1,432

Table 8 (contd)

Basic Inputs : Plumosus - Direct Labour for 1,000 m² per annum (1)

	Man-days	Cost (2)
<u>Harvest</u>		
Harvesting (4)	555	3,191
Transport	30	173
Pinching	150	863
Crop maintenance	85	489
Supervision (3)	25	625
Total	845	5,341
<u>Grading</u>		
Grading (5)	520	2,990
Washing	20	115
Cold storage	25	144
Transport	35	201
Supervision (3)	20	500
Total	620	3,950
Grand total	1,663	10,723

Notes to Table 8

- (1) Based on cost for a production area of 336,982 m², ie 23,062 m² @ M I and 313,920 m² @ M II.
 (2) Minimum rate for labour K Shs5.75 per day.
 (3) Supervisors @ K Shs25 per day.
 (4) Harvesting -

Yield of 8,000 bundles per 1,000 m² @ 14/15 bundles per man-day $\frac{8,000}{14/15} = 555$ man-days

- (5) Standard task for grading is 2.5 bundles per man per hour or 15.5 bundles per man-day

$$8,000 \div 15.5 = 520 \text{ man-days}$$

- (6) In the year of establishment, which occurs once, costs would be approximately as follows -

	Man-days	Cost
<u>Nursery and Bed Costs for 1,000 m²</u>		
<u>Labour</u>		
As for growing - Table 8	198	1,432
<u>Materials</u>		
Seed	-	50
As for growing - Table 9	-	289
Fertilisers	-	7,849
Chemicals	-	2,619
Total	198	12,239

Table 9

Basic Inputs : Plumosus - Direct Materials for 1,000 m² per annum (1)

		Cost K Shs
<u>Growing</u>		
Irrigation material	(2)	61
Spraying material		124
Tools	(10)	18
Protective clothing	(3)	161
Running costs, tractor	(4)	503
Miscellaneous		9
Total		876
<u>Harvest</u>		
Fertilisers	(5)	7,849
Chemicals	(6)	2,619
Maintenance, grading tables	(7)	282
Forwarding boxes	(8)	1,747
Packing materials	(9)	470
Tools	(10)	273
Protective clothing	(3)	424
Running costs, tractor	(4)	303
Miscellaneous		30
Internal transport		61
Total		14,058
Grand total		14,934

Notes to Table 9

(1) Same basis as for labour.

(2) For maintenance of hosepipes, spray nozzles, etc. This item does not include cost of pumping water to the mixing tanks or from the tanks to the spray lines which are included in the overheads. At Masongaleni, the total cost for the operations of the generators was K Shsl.93m, which was divided as to -

0.35 for pump

1.55 for electricity

0.03 for cold stores

Total 1.93m

The electricity costs were sub-divided as to 10% for plumosus, 70% for chrysanthemums (redi-rooters) and 20% for overheads (housing, office, etc).

- (3) Supervisors at rate of K Shs25. Composite figure.
- (4) Details not given.
- (5) Fertiliser based on the following usage for 336,982 m² -

Item	Quantity (kg)	Cost/kg	Cost K Shs	Remarks
Nitric acid	25,116	7.10	178,324	(a)
Phosphoric acid	30,006	11.50	345,069	(c)
Calcium nitrate	637,028	1.65	1,051,096	(b)
ASN	354,780	1.10	390,258	(c)
Potassium nitrate	26,556	2.85	75,685	(b)
Potassium sulphate	107,134	1.87	200,341	(c)
Epsom salts	80,900	1.82	147,238	(c)
Copper sulphate	614	11.00	6,754	(c)
Zinc sulphate	288	9.25	2,664	(c)
Ammonium molybdate	288	75.00	21,600	(c)
Iron chelate	10,892	20.00	217,840	(b) (c)
Borax	1,637	4.50	7,367	(c)
Total cost			2,644,236	
Say			2,645,000	

- (a) Used for washing foliage after irrigating with stock solutions.
- (b) Used in Stock Solution I.
- (c) Used in Stock Solution II.

$$\text{Cost per 1,000 m}^2 = \frac{2,645,000}{336,982} \times 1,000 = \text{K Shs}7,849$$

- (6) Based on usage of following chemicals -

Item	Quantity (kg)	Cost/kg	Cost K Shs
Aldrin	4.5	27.00	122
Antracol (propineb)	160	18.40	2,944
DDT	7,282	17.40	126,712
Dithane M45	21,726	18.28	397,151
Kelthane	1,750	29.06	50,855
Total c/f			577,784

Item	Quantity (kg)	Cost/kg	Cost K Shs
Total b/f			577,784
Lannate	1,201	145.00	174,145
Phosvel	865	45.00	38,925
Polyram combi	1,450	18.25	26,462
Spreader/sticker	4,320	15.00	64,800
Total			882,116
Say			882,500

$$\text{K Shs} \frac{882,500}{336,982} \times 1,000 = \underline{2,619}$$

(7) Based on the cost of two prints which are mounted on the grading tables to illustrate the current grades. These are renewed every three months.

(8) Based on the following production -

Grade	Bundles	Bundles per box	Number of boxes
White	115,640	40	2,891
Blue	396,067	55	7,201
Yellow	521,500	85	6,136
Green	164,000	120	1,367
Red/blue	153,260	32	4,789
Red	462,560	38	12,173
Brown	447,800	58	7,721
Grey	51,830	60	864
Contingency			2,158
Total			45,300

$$\text{Cost at K Shs} 13 = 588,900 \div 336,982 = \underline{1,747}$$

(9) Packing materials include rubber bands, old newspapers (@ K Shs2.50 per kg), labels, rubber stamps, sisal string, tape and 5.3% contingencies, totalling K Shs158,400.

$$\frac{158,400 \times 1,000}{336,982} = \text{K Shs} 470$$

(10) These include pruning knives and sharpening stones for the field and for graders, buckets, sundry hand tools.

PART 6 - TOMATO PRODUCTION AT MANONI

1 Trials at Manoni

1.01 Manoni Estate had reverted to bush when DCK acquired it. Tomatoes were chosen as a likely crop for a development programme because climatic conditions, particularly rainfall and temperature, were considered to be favourable to growth for the maximum period of the year without running into pest and disease problems or physiological disorders.

1.02 Some plantings were made in 1974 and the main trials started in 1975 when the Israeli company, Tahal Consulting Engineers Ltd of Tel Aviv (Tahal), were appointed on a contract basis to operate a pilot scheme with a view to investigating the potential of tomato production. Land was prepared in March and the first sowing for a 10-acre planting was made on 15th April. The first planting in the field was over the period 15th-21st May; by November about 50 acres of tomatoes had been planted in the field.

1.03 Sowings were made at the rate of about 2.5 acres (1 ha) weekly up to 21st September with a range of varieties.

2 Results of the First Season's Trials

2.01 Sowing

Nursery-sown seedlings were transplanted bare-root in the field, took five months to reach harvesting stage compared with four months for seedlings sown direct in the field, and yields were frequently lower. Although direct seeding in the field requires 1 kg of seed per acre compared with $\frac{1}{4}$ kg for nursery sowings, the cost of the extra seed was found to be less than the cost of a nursery and transplanting. In future tomatoes will be direct-sown at the rate of 100 seeds per metre run.

2.02 Manuring

(1) Soil samples were sent to Israel for physical and chemical analyses on which the fertiliser rates were based. The soil was described as a sandy loam, pH 7.2-7.6 with the following data -

Depth cm	Physical			Chemical			Conductivity mmhos
	Clay	Silt	Sand	P, ppm	NO ₃	K	
Top soil	24-32	6-11	55-66	10-14	8-27	1.3	0.4-0.8
60	39-48	3- 8	49-58	4-10	5- 8	1.5	0.2-0.4
90	40-50	3- 6	43-57	4- 8	4- 8	0.6-1.0	0.2-0.3

Calcium and magnesium were also analysed with mean figures of 5.90 ppm and 4.65 ppm respectively.

(2) A general basic dressing of 200 kg superphosphate and 75 kg urea per acre is applied at sowing, and this is followed by a further 65 kg urea as a top dressing just before flowering. The response to

fertiliser has been indeterminate; there has been some response in observation plots to potash and phosphate with respect to yield and keeping quality. Formal trials are required to determine fertiliser levels and to compare the effects of various fertilisers, such as calcium ammonium nitrate versus urea.

2.03 Plant Density

No difference has been recorded in yields for spacings of 8, 10 and 12 plants per metre run. A standard spacing of 8 per metre has been adopted, the plants being in double rows of 2 x 4 plants.

2.04 Irrigation

The crops have survived with remarkably low rates of water in an area where rainfall has been negligible. Before sowing, the ground was watered at the rate of 450 m³ per acre, ie for 15 hours at about 7.5 mm per hour using sprinkler lines. Thereafter, up to germination, a similar rate was applied every two days. Up to the first flowering, ie in four to five weeks, there were on the average a further six irrigations, ie every 5/6 days, but it had been possible to go 12 days without irrigation. For transplanted seedlings there were three irrigations every two days, ie for six days and then a similar regime for direct sown seedlings up to flowering. After flowering had started, the frequency was reduced to once every 14 days and the rate was 280 m³ per acre, ie for 10 hours at about 7.5 mm per hour.

2.05 Varieties and Yields

Over 20 varieties have been planted. Harvesting commenced when the crop was 30% ripe and continued every 10 days over three pickings. Direct sown plants were, therefore, in the ground for five months. However, it was found that the crop could be extended to a second flush over a period of one month if irrigation was resumed after harvest; generally the additional yield was small and may not be worth the further costs of irrigation etc involved. The following are some examples of yields at random -

Variety	Yield - tonnes/acre		
	First Crop	Second Crop	
VF 145	30.1	3.6	Direct sown
VF 270	24.2	3.0	Direct sown
VF 198	32.9	3.6	Direct sown
Cal-J	37.9	8.1	Direct sown
Chico 3	35.1	10.2	Direct sown
VF 134	30.1	9.9	Direct sown
Roma VF	41.3	2.0	Harvesting not complete. Transplanted
VF 134	31.2	10.6	Transplanted
VF 44	36.7	2.8	Transplanted
Cal-J	36.6	1.6	Transplanted
H 1350	20.5	4.2	Transplanted
Ventura	23.1	1.0	Transplanted
VF 145/B7879	26.5	-	Transplanted and irrigation not resumed
VF 270	19.0	-	Transplanted and irrigation not resumed
VF 198	24.4	-	Transplanted and irrigation not resumed

The Verticillium and Fusarium resistant strain of Roma and the new Californian selection Cal-J had shown the best results to date. On the above evidence, selected varieties should be capable of producing 30 tonnes fresh fruit per acre on a field scale, over the period April to October. Solids content had not yet been assessed.

2.06 Pests and Diseases

Alternaria leaf spot was not much in evidence and it had been controlled by fortnightly sprayings by tractor and always after irrigation using maneb or polyram (Combi). Caterpillars were controlled when seen and, on the average, five sprayings of Thiodan or Lindane (BHC) were made to each planting. Lannate had also been used to control Heliothis, but is more expensive. There had been little rain during the period the trials had been running and the disease situation had been kept well under control. Trials have now run into the rainy season and this will help to determine the period over which the crop can be grown. In anticipation of the rains, plants in some plots had been staked so as to keep the fruit and foliage off the ground. A few plants were uprooted at random and nematode infestations were seen.

3 Other Crops

3.01 It could not be expected to grow tomatoes in succession without the use of expensive chemicals because of the pest and disease hazard, the most important being the root-knot nematode. Thus, a three-year rotation is planned.

3.02 Suitable annual crops are being sought for the rotation. These include cereals, mainly wheat, and a range of vegetables, including onions. Those for which yields were available were sweet corn (6 tonnes/acre: poor stand, could possibly reach 8-10 tonnes/acre), sunflower (800 kg/acre) and melons (9-12 tonnes/acre). Groundnuts and peppers have not been included as they are carriers of nematodes. If satisfactory yields can be obtained, sweet corn and wheat are likely to be the most suitable crops.

3.03 An alternative to an irrigated crop resistant to nematodes is a bare fallow which could be enforced at low cost because of the low rainfall at Manoni.

4 Basic Inputs for Tomatoes at Manoni

4.01 In their report of October 1975, Tahal gave a rough estimate of direct costs at K Shs2,760 per acre. As a result of the experience from this year's trials, these costs have now been revised and are summarised at Table 10 on page 58. The life of the crop should be taken as five months.

4.02 Table 10 shows that the total direct costs now amount to K Shs4,991 per acre or K Shs166 per tonne, assuming a yield of 30 tonnes per acre compared with the original (October, 1975) estimate of K Shs142 per tonne for 30 tonnes per acre. The crop had not yet experienced a rainy season and at least a full year's trials will be required to give an indication as to the length of the growing season and the mean yield to be expected. Tahal's management fees and other overheads will greatly increase the cost of production but, in this section of the report, comments will be confined to the cost of direct inputs. Tahal's expert at Manoni has been careful to keep direct costs to a minimum. Fertiliser rates are high but only two

Table 10

Basic Inputs : Tomatoes per acre

1	<u>Labour</u>	Man-days	Cost K Shs (1)
	Sowing (2)	1	5.75
	Manuring (3)	8	46.00
	Thinning (4)	9	51.75
	Irrigating (5)	17	97.75
	Handling stems (6)	4	23.00
	Weeding	22	126.50
	Harvesting (7)	120	690.00
	Carrying from field	15	86.25
	Weighing	10	57.50
	Loading to lorry	10	57.50
	Pest control (8)	3	17.25
	Total	219	1,259.25
	Say		1,260.00
2	<u>Tractors, etc</u>		
2(a)	<u>Land Preparation</u>		
	Clearing bush (9)		200.00
	Ripping		70.00
	Ploughing and harrowing		50.00
	Roads		30.00
	Total		350.00
2(b)	<u>Cultivation and Harvesting</u>		
	Bed preparation		90.00
	Levelling		45.00
	Marking		22.00
	Manuring (3)		105.00
	Spraying		210.00
	Transport from field		620.00
	Total		1,092.00
3	<u>Materials</u>		
	Fertilisers (3)		1,020.00
	Chemicals (8)		594.00
	Seeds (2)		250.00
	Water (5)		425.00
	Total		2,289.00
	Grand total		4,991.00

Notes to Table 10

- (1) Cost does not include supervision of labour.
- (2) Direct sowing in the field at a rate of 1 kg seed/acre. Cost is K Shs250/kg.
- (3) One round at sowing, a second 4/5 weeks later at first flowering. Estimated cost of fertilisers -

Superphosphate	K Shs3,000 per tonne - 200 kg	= K Shs 600
Urea	K Shs3,000 per tonne - 140 kg	= K Shs 420
		Total K Shs1,020

- (4) Thin to eight plants per metre run.
- (5) This allows for about 17 irrigations as follows -

1	before sowing
3	over germination period
6	up to first flowering
7	flowering to harvest
Total	17

The cost of water is a charge for fuel used for pumping.

- (6) The stems are pushed back into the rows.
- (7) Three rounds of harvesting.
- (8) 15 rounds, say 5 for pests and 10 for disease, at 0.2 man-days per acre = 3 man-days and tractor K Shs14 per acre. Cost of chemicals -

Polyram (combi)	K Shs15 per kg - 9 kg	= K Shs135
Thiodan	K Shs18 per litre - 18 l	= K Shs324
Copperax	K Shs15 per kg - 9 kg	= K Shs135
		Total K Shs594

- (9) The original figure was K Shs227 as for sisal, see Part 7.

kinds have been used generally; experiments may show a significant response to other fertilisers, particularly potash, and they may have to be introduced. Similarly, the use of chemicals and of water has been most economical and, if the regimes employed this year remain valid for subsequent years, tomatoes should prove an economic crop. In fact the economical use of fertilisers and chemicals might be an example to other operations at Masongaleni. Seed rates for direct sowing have been high but will, no doubt, be reduced as local experience is gained.

PART 7 - SISAL PRODUCTION AT KIBWEZI

1 Past Performance

1.01 DWA Plantation, Kibwezi (DWA) has grown sisal in recent years on a planted area of about 7,000 acres. Yields have been as follows -

Year	Yield (tons fibre)
1964	1,855
1965	1,662
1966	1,891
1967	1,596
1968	1,768
1969	2,135
1970	2,338
1971	2,111
1972	1,082
1973	1,714
Mean	1,815
Tons per acre	0.24

This performance is poor compared with most plantations in East Africa which achieve about 0.4 tons fibre per acre. Furthermore, fibre content was less than 3% on average, whereas on better plantations, it normally exceeds 4%. The low yields are evidently a reflection of the poor growing conditions, rainfall being an important factor. Although the 58-year mean is 25.2 in, annual rainfall can be very erratic with long dry periods; thus, for example, rainfall for 1974 was 22.7 in and for 1975 was only 10.2 in, of which 6.6 in fell in December.

1.02 Sisal is a crop which suffers from cyclic fluctuations in the market price and plantations frequently have to face years of nett losses. Over the period shown above, due to a combination of poor yields and low prices, DWA made nett profits only in 1965, 1972 and 1973.

1.03 A plantation is usually replanted every 10/11 years but DWA had adopted a policy of replanting on a 15-year cycle. Due to poor returns, replanting had lagged behind even this extended cycle. The company instituted the first replanting programme for seven years when prices reached a high level in 1972/1973 with the intention to plant 1,500 acres as soon as possible, to be followed by an annual planting programme of 500-700 acres.

2 Present Position

2.01 In the event, just under 1,000 acres were planted in September/October 1974, and 1,460 acres of old plantings were excised. Table 11 below shows the total area now planted to sisal to be 7,374 acres. Over 4,637 acres are more than 10 years old and some areas are 27 years old. Areas 20-22, 31-34 and 74, totalling 1,751 acres, were planted during the period 1956/1967 and the remainder of 986 acres is the new planting not yet in bearing. It was expected to have planted a further 300 acres by the end of 1975.

Table 11

List of Areas Planted

Area Number	Situation	Areas Planted	When Planted	Spacing
1	Railway to Gasciogne's camp	409	1949	12' x 3'
2	Area 1 to old area 19	539	1949	12' x 3'
3	Double row	111	1950	13' x 3' x 2' 9"
4	Research to area 21	183	1949	12' x 3'
5	Back of office	41	1949	12' x 3'
6	Front of office, small area near factory and the vegetable shamba	140	1949/50	12' x 3'
7	Long strip outer edge	441	1950/51	12' x 3'
8	Between Chai road and A14	58	1949	12' x 3'
9	Back of Kazi road to Mutinda	134	1950	12' x 3'
10	Chai side of Gatti's house	143	1950	13' x 2' 6"
11	Masongaleni and Rly far corner	45	1950	13' x 2' 6"
12	Siding	121	1950	13' x 2' 6"
13	Kibwezi to A.B. deS	240	1950	13' x 2' 6"
14	New Musia to Manoni road	406	1950	13' x 2' 6"
15	Pereira's house to Masongaleni rd	327	1953	9' x 3'
16	Black's triangle	115	1953	9' x 3'
17	Masongaleni road/Bennett's	346	1954/55	9' x 3'
18	West of Bennett's house	38	1955	6' x 6'
19N	Between Black's road and siding	178	1955	9' x 2' 9"
20	North of area 1 and east of former area 19	258	1956	9' x 2' 9"
21	Old	165	?	-
22	Old	88	?	-
31	Chai north	320	1964	13' x 3' x 2' 9"
32	Chai	477	1965	13' x 3' x 2' 9"
33	Manoni rd between A6 & former 28	23	1965)	14' x 3' x 2' 9"
		203	1966)	13' x 3' x 2' 9"
31	Between original 31 and boundary	13	1966	13' x 3' x 2' 9"
34	Chai area	204	1967	13' x 3' x 2' 9"
74	Chai area	986	1974	13' x 3' x 2' 9"
Mpira 1		503	1951/52	13' x 2' 6"
Mpira 2		119	1952/53	13' x 3' x 2' 9"
Total		7,374		

2.02 All the old plantings have poled and, because of the lack of maintenance, there has been heavy encroachment of acacia thorn bush and boabab trees; the crop is consequently difficult to harvest and the leaves are cut entirely from sucker growth. No fertiliser has been applied. Under normal circumstances this area would have ceased to exist as a sisal estate.

2.03 The more recent plantings of 1,751 acres have also been poorly maintained and are rapidly reaching a similar condition. Maintenance costs have been included in the estimates for 3,000 acres for 1975/1976 which are presumably intended to cover these plantings. There was no sign that this money has been expended or, if it has, then it is clearly inadequate.

2.04 The most recent plantings of 986 acres in the Chai area were planted from secondary bush and are being adequately maintained, except that the numerous baobab trees were not removed on account of the cost. Furthermore, these plantings were made with suckers from the old plantations, not from bulbils which would have required a nursery period of 12-18 months; growth is likely to be somewhat irregular. Hybrid material was not planted although there are nurseries at Kibwezi of both 11648 and 1300. The mission was told that 1300 has proved more satisfactory under DWA conditions; 11648, although drought-resistant, poled after five years of cutting at Kibwezi.

3 Costs of Production

3.01 Table 12 on page 63, details the basic inputs for field costs and summarises the processing costs and overheads. The basic field cost from Year 3 onwards is K Shs96 per acre assuming that the first cut can be taken that year; this does not include field development costs.

3.02 The basic input for cutting is given as 5.91 man-days per acre and harvesters are paid an average rate of K Shs8.00. At this rate, a harvester must cut 150 bundles per day, the average weight of which was stated to be 40 lb at DWA. Thus the total yield per acre is -

$$5.91 \times 150 \times 40 \text{ lb} = 35,460 \text{ lb leaf per acre}$$

2,240 lb of leaf yields an average weight of 60 lb fibre

$$\text{Thus yield of fibre} = \frac{35,460}{2,240} \times 60 = 932 \text{ lb or } 0.4 \text{ tons per acre}$$

The estimates state that a yield of 0.3 tons of fibre per acre is obtained from a notional area of 3,000 acres. Therefore, the figure for man-days appears to be high for the estimated crop. Alternatively, the harvesters achieve lower rates in a man-day, in which case the cost of cutting has been overestimated. Moreover, the mission was told that the total planted area was cut each season. For the 1975/1976 season this would be 6,388 acres, not 3,000 acres, and it appears that cutting is costing much more than it should for the crop harvested.

3.03 Row and inter-row maintenance is adequate for the first two years when bromacil (Hyvar) is used as a herbicide. Thereafter the three inter-row weedings and one row cultivation should be adequate, but appears to have been neglected in the mature plantings.

Table 12
Basic Inputs : Sisal per acre

<u>Planting</u>		Cost K Shs	
Land clearing	(1)		227.00
Ploughing and cultivating			102.00
Marking	(2)		27.00
Planting and supplying	(3)		101.00
<u>Add overheads -</u>			457.00
Management staff			30.00
General charges			230.00
Total			260.00 717.00
<u>Maintenance per annum, Years 1 and 2</u>			
Weed control	(4)		90.00
After Year 2 Weed control	(4)		36.00
<u>Harvesting</u>	Man-days		Cost K Shs
Cutting leaves	5.91 (5)		47.28
Transport and loading	1.48		8.51
Leaf transport to factory	0.43		3.55
Total	7.82		59.34
Say			60.00
Total field cost Year 3 subsequently			96.00
	Man-days	Rate	Cost K Shs
<u>Processing</u>			
Decortication	4.28	6.05	25.89
Drying	0.41	5.75	2.36
Brushing	0.61	6.05	3.69
Boxing	0.89	6.05	5.38
Baling	0.53	6.05	3.21
Tow sorting	0.49	6.05	2.96
Engine attendant	0.23	7.24	1.67
Transport and loading bales	0.13	6.05	0.79
Vehicle repair	0.55	8.25	4.54
Machinery repair	0.17	10.77	1.83
Factory maintenance	0.27	6.05	1.63
Total	8.56		53.95
Say			54.00

Table 12 (contd)
Basic Inputs : Sisal per acre

	Cost K Shs
<u>Overheads</u>	
Maintenance - nursery	48.32
- vehicle	73.65
- agricultural equipment	17.87
Road maintenance	1.38
Capital expenditure	72.41
Staff salaries and supervision	71.79
Total	313.88
Say	314.00
Total production costs per acre -	
Maintenance and harvesting	96.00
Processing	54.00
Overheads	314.00
Total	464.00

Depreciation on planting and marketing costs are not included.

Notes to Table 12

(1) Land clearing costs -

K Shs per acre

Tractor fuel	64.14
Labour - 4.2 man-days @ K Shs8.25	34.65
- 22.3 man-days @ K Shs5.75	128.23
Total	227.02
Say	227.00

(2) Marking -

4.69 man-days @ K Shs5.75	26.97
Say	27.00

Spacing is in double rows of 3' x 2' 9" at 13' apart or a plant population of 1,980 per acre.

(3) Planting has been done from suckers transported from old fields. 2,000 suckers per acre planted.

Fuel for transport	21.40
Labour for uprooting and planting -	
2.3 man-days @ K Shs8.25	19.98
10.4 man-days @ K Shs5.75	59.80
Total	100.18
Say	101.00

(4) Weed control, per annum -

	<u>Cost K Shs</u>
First two years -	
3 weedings (harrow or gyrotiller)	26.00
1 spraying with herbicide	10.00
Herbicide	54.00
	<hr/>
Total	90.00
	<hr/>
Subsequent years -	
3 weedings	26.00
Row cultivation	10.00
	<hr/>
Total	36.00
	<hr/>

No fertiliser costs have been shown

(5) Cutting costs are as follows -

<u>Bundles per day cut</u>	<u>Rate K Shs</u>
125	6.60
150	8.00
175	9.50
200	11.10
225	12.60
250	14.20
275	16.80
300	17.90

Standard task is 125 bundles per day. An average task of 150 bundles @ K Shs 8.00 has been assumed in this calculation. Bundles are of 25 leaves, average weight 40 lb.

3.04 Table 12 does not show an item for fertiliser. The mission was told that nitrogen is normally applied as a basic dressing at planting and then annually up to cutting stage, the dressing split - half to each rainy season. Phosphate is applied only at planting time; no potash is required. Purple leaf roll is rare and the application of trace elements is not considered to be necessary.

3.05 As to processing, the UG grade, which is air-dried, is produced instead of 3L, which is machine dried and is a better colour, because the price differential does not make the higher grade attractive. For sisal decortication the estate has a permit to extract five cusecs of water from the Kibwezi River, ie 30% of normal flow, of which 80% must be returned to the River.

PART 8 - PROPOSALS FOR DEVELOPMENT

1 Proposals for Carnations, Sulmac Estate, Naivasha

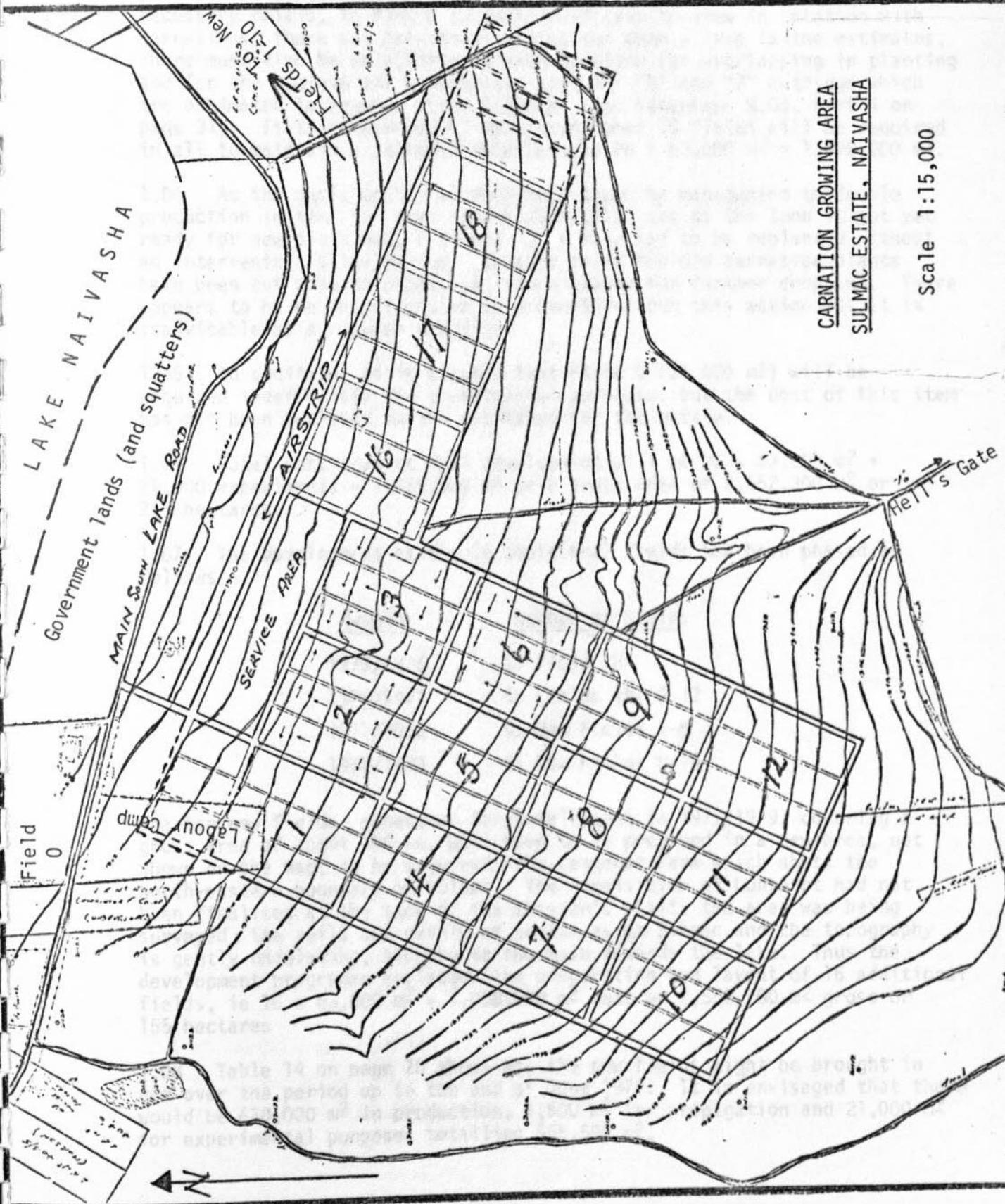
1.01 Production of carnations in 1974/1975 was from an area of five fields covering 315,000 m² nett. The layout of a field into blocks, beds and benches has been described at paragraph 3.07, Part 4 on page 21. The yield was estimated at 75m saleable blooms or 238 blooms per m². Latest information indicates that these yields are being exceeded.

1.02 The development proposal is to double the area in production at Naivasha over the period November 1975 to July 1976 to 630,000 m² nett or ten fields as shown in the diagram at page 67 and at Table 13 below. Total annual production of saleable blooms was estimated at 145m which represents a reduced yield of 230 blooms per m² because it is expected that, in the face of competition from other exporters particularly Israel and Colombia, it may be necessary to raise still further the grading standards.

Table 13
Planting Programme 1975/1976, Sulmac

Year	Month	Production area '000 m ²			Propagation '000 m ²		Total	Production '000 Number of flowers
		Immature	Mature	Total	Month	Cumulative		
1975	Jul	315	-	315	21	21	336	-
	Aug	315	-	315	21	42	357	-
	Sep	252	63	315	21	63	378	1,719
	Oct	189	126	315	21	84	399	6,860
	Nov	126	189	315	21	105	420	10,625
	Dec	-	315	315	42	147	462	15,115
1976	Jan	-	315	315	42	189	504	12,455
	Feb	-	315	315	42	231	546	9,560
	Mar	-	315	315	42	273	588	9,310
	Apr	-	315	315	42	315	630	6,190
	May	-	157	157	-	315	472	3,030
	Jun	-	-	-	126	441	441	-
	(Jul)	To following season			189	630	630	-
Total							74,864	

1.03 Part of the field layout is shown at Map 4 on page 68. The existing fields are numbers 0, 1-8, 16 and 17. Field 18 is scheduled for preparation early this season (1975/1976) and Field 19 next season. Because of disease problems, it is not desirable to replant without an intervening resting period. The alternative is soil sterilisation with chemicals, which is expensive and not necessarily effective or reliable.



CARNATION GROWING AREA
SULMAC ESTATE, NAIVASHA

Scale 1:15,000

Thus, it is planned to allow for a year's bare fallow, although it may be possible at a later date, when the Technical Department has undertaken the necessary trials, to find a suitable cash crop to grow in rotation with carnations; there has been no provision for such a crop in the estimates. There must also be an additional area to allow for overlapping in planting and for the nucleus and propagation beds for "A" and "B" cuttings which are estimated to require about 4,500 m² (see paragraph 9.08, Part 4 on page 31). It is considered by management that 26 fields will be required in all to maintain a suitable rotation, ie 26 x 63,000 m² = 1,638,000 m².

1.04 As the decision has already been taken by management to double production in time for next season, 1976/1977, and as the land is not yet ready for new plantings, Fields 2 to 6 have had to be replanted without an intervening fallow period. In some cases the old carnation plants have been cut back to produce a ratoon growth for further cropping. There appears to be no deterioration in production from this action but it is inadvisable as a regular practice.

1.05 In addition, it is assumed that Field 0 (21,000 m²) will be required indefinitely for experimental purposes, but the cost of this item has not been included in the estimates for the estate.

1.06 Total nett area at full development will be 26 x 63,000 m² + 21,000 experiments = 1,659,000 m² or a gross area of 2,552,300 m² or 255 hectares.

1.07 The development of the 16 additional fields has been phased as follows -

<u>Season</u>	<u>Number of Fields</u>
1975/1976	1: Field 18
1976/1977	5: Fields 19, 9-12
1977/1978	5: New Fields 1-5
1978/1979	5: New Fields 6-10

The ten new fields scheduled for development in 1977/1979, covering a gross area of about 100 ha, will have to be prepared in a new area, not shown on the map, to be acquired from Longonot Farm which abuts the north-eastern boundary of Sulmac. The acquisition of Longonot had not been finalised at the time of the mission's visit; the area was being surveyed; the soils are mainly of pumice as at Sulmac and the topography is gently undulating, sloping in the main towards the lake. Thus the development programme envisaged the preparation and layout of 16 additional fields, ie 16 x 63,000 m² = 1,008,000 m² nett or 1,550,700 m² gross or 155 hectares

1.08 Table 14 on page 70 shows how the new fields might be brought in use over the period up to the end of June 1979. It is envisaged that there would be 630,000 m² in production, 4,500 m² for propagation and 21,000 m² for experimental purposes totalling 655,500 m².

Table 14
Planting Programme, Sulmac Estate, Naivasha

Field Number	As at 1.12.75 1/	1975/1976 2/	Proposed 1976/1977 3/	1977/1978	1978/1979
0	Experiments 21,000 Production 6,400	Experiments 21,000 Rest	Experiments 21,000 Rest	Experiments 21,000 Rest	Experiments 21,000 Rest
1	Rooting 6,400 Production 56,600	Propagation 6,400 Production 35,600	Production 6,400	Rest	Propagation 4,500 Production 58,500
2	Resting	New plantings 126,000	Production 313,100	Rest	Rest
3	New plantings 25,100				
4	Production 63,000				
5	Production 7,900	Production 63,000	Replant	Production 126,000	Rest
6	Resting	Planting 63,000			
7	} Production 126,000	To replant 21,000	} Production 252,000	} Rest	} Production 252,000
8		} To be prepared			
9					
10	} Not yet prepared	Rest 63,000	} Production 126,000	} Rest	
11		} Not yet prepared			Propagation 63,000
12	} Not yet prepared		To be prepared	} Production 4,500	} Production 4,500
16		} Not yet prepared			
17	} Not yet prepared		To be prepared	} Production 4,500	} Production 4,500
18		} Not yet prepared			
19	} Not yet prepared		To be prepared	} Production 4,500	} Production 4,500
New 1		} Not yet prepared			
2	} Not yet prepared		To be prepared	} Production 58,500	} Remainder rest
3		} Not yet prepared			
4	} Not yet prepared		To be prepared	} Production 58,500	} Remainder rest
5		} Not yet prepared			
6	} Not yet prepared		To be prepared	} Production 58,500	} Remainder rest
7		} Not yet prepared			
8	} Not yet prepared		To be prepared	} Production 58,500	} Remainder rest
9		} Not yet prepared			
10	} Not yet prepared		To be prepared	} Production 58,500	} Remainder rest
		demarcated			
Total m ²	438,400	462,000	655,500	655,500	655,500

Notes

1/ See paragraph 1.01 of Part 4.

2/ To 30th June 1976, ie 441,000 m² as at Table 13 + 21,000 m² of experiments.

3/ 630,000 m² of production + 21,000 m² of experiments and 4,500 m² propagation.

2 Comments on the Development Proposals for Sulmac Estate

2.01 It is in the interest of the operation of Evergreen in Germany that the maximum throughput is handled at Frankfurt as soon as possible; this is discussed at Part 9, Marketing. For this reason there has been pressure applied to Sulmac to compress its development programme into one season. Sulmac had agreed to do this by stepping up the planting rate from one block of 21,000 m² per fortnight during November to April to one and then three a week in June and July on the grounds that labour would not be fully employed in June and July. Table 15 on page 72 shows that the manpower requirement is normally low in that period. Nevertheless, the mission considers this plan inadvisable for the following reasons -

- (a) planting will be rushed in June and July and will suffer from poor supervision;
- (b) land development will not be sufficiently advanced and, as for the earlier plantings of the 1975/1976 season, old fields will have to be replanted without a fallow period thereby incurring the risk of disease and total loss of crop as chemical control cannot be used once the crop has been planted;
- (c) the slack period in June and July should be used to employ surplus labour on soil conservation works and for the planting of windbreaks, as mentioned in Part 3 (paragraph 1.03). The cost of this has not been estimated;
- (d) a doubling of crop in one season will place a sudden strain on air freight carriers and time should be given for them to find additional southbound loads.

2.02 It would, therefore, be more satisfactory in the opinion of the mission, to halt the planting programme immediately and it should certainly not exceed 500,000 m² which will have been planted by mid-March 1976. This has been discussed with the management of IAI and the mission understands that a modification to the planting programme is now under consideration.

2.03 The mission further understands that returns from carnations are at the moment well exceeding estimates and management might wish to consider the advantage of consolidating at 500,000 m² for a season or so. The financial advantages and disadvantages of full development are discussed in the later sections of this report.

2.04 If development is to continue to 630,000 m², then the cost of capital expenditure for the 16 fields for land preparation, water piping and irrigation equipment, tractors, vehicles, ancillary equipment, housing, cold store and other buildings has been estimated as follows -

<u>Year</u>	<u>Cost (K Shs '000)</u>
1975/1976	6,000
1976/1977	9,000
1977/1978	5,000
1978/1979	2,300
1979/1980	200
Total	22,500 or K£1.1m

Table 15
Man Power Requirement 1976/1977

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Immature Workers	2,250	2,250	1,125	1,125	1,125	450	-	-	-	-	-	-
Mature Workers	-	-	1,575	1,575	1,575	2,520	3,150	3,150	3,150	3,150	3,150	-
Propogation	378	137	137	183	369	514	782	989	1,537	1,669	1,669	2,300
Grading and Packing	-	-	60	320	490	500	670	710	550	430	325	-
Departments	350	350	350	350	350	350	350	350	350	350	350	350
Supervisors	40	40	40	40	40	40	40	40	40	40	40	40
Headmen	60	60	60	75	75	75	75	75	75	75	75	75
Total	3,078	2,837	3,347	3,668	4,024	4,449	5,067	5,314	5,702	5,714	5,609	2,765

Comments on individual items are as follows -

(1) Soil Levelling

K Shs199,980 (DM 66,000) for 63,000 m² nett (97,000 m² gross or 9.7 ha) works out to K Shs20,616 per ha (equivalent to K£412 per acre) and appears to be high for this operation, even if it includes bush clearing, ploughing and harrowing and further details should be available.

(2) Tractors

Same tractors cost DM 29,500 (K Shs89,000) in 1975/1976 and DM 30,000 in 1976/1977; yet no inflation factor has been included for other items. The requirement for 18 tractors in 1975/1977 needs justification if they are all required to service an additional area of 315,000 m² nett. Only three tractors are required at Masongaleni for an additional area of 96,138 m² nett. Running time of 200 hours per month (page 18 of the estimates) is unlikely to be achieved and is, therefore, overestimated.

(3) Support Nets

Support nets are shown for one field in 1975/1976 (@ DM 82,000), five fields in 1976/1977 (@ DM 105,000 per field) five fields in 1977/1978 (@ DM 52,800) and for five fields in 1978/1979 (@ DM 32,000). Costs should be phased with development and appear to be out of proportion to cost for one field.

(4) Main Pipes for Irrigation

Piping for one field costs DM 99,000 in 1975/1976, yet the cost for five fields in 1976/1977 and for 10 fields in 1977/1978 is DM 33,000 per field.

(5) Excavator

Cost is K Shs148,470 at Sulmac for a JCB excavator compared with K Shs300,000 at Masongaleni for an unspecified excavator. If a different excavator is required at Masongaleni, this should be justified as the conditions and requirements are likely to be similar. The advantages of standardising equipment from the viewpoint of servicing and spares should also be considered.

(6) Vacuum Cooling Equipment

The total cost is estimated at DM 248,000. The efficacy of vacuum cooling has not yet been proved. The additional costs should be fully justified and the mission understands that the intention is to put in a small plant for trials before vacuum cooling is adopted as a standard treatment. This item should, therefore, be held in abeyance until trials have been undertaken. If, because of the shortage of capacity, additional cooling equipment must be installed immediately, then the Technical Director should be requested to show why additional cold storage space, as installed hitherto, should not be installed at lower cost.

There are other discrepancies which suggest that the phasing of expenditure on plant and equipment does not coincide with the proposed development programme given at paragraph 1.07 on page 69.

3 Development at Updown

3.01 Carnations

No expansion is planned for carnation production at Updown. It will remain at about 5m flowers from 33,000 m². The yield is much lower, about 156 stems per m², than from Naivasha and it is questionable whether this operation should continue.

3.02 Roses and Alstromerias

These two crops have yet to be proved. As to roses, it should be possible to arrive at a decision by the end of the season as to whether the Babies, which are yielding very good prices, are a viable proposition. Cost of production, including the annual replacement of the plastic sheeting, is high. As to Alstromerias, marketing trials will be undertaken in the 1976/1977 season.

4 Outgrowers in the Updown Area

4.01 In consultation with the Horticultural Crops Development Authority (HCDA), FAO and the Ministry of Agriculture, DCK had proposed an outgrowers' scheme for carnation production to be operated from Updown. Selected smallholders on their own property in the Updown area would each be issued with planting material, fertiliser and chemicals at cost plus a small servicing charge. DCK would operate an advisory service with its own extension officers and would also operate collecting centres for the outgrowers' flowers which would be transported to DCK's own packing centres for grading, packing, cold storage and transport to Europe as for DCK's own produce.

4.02 A programme had been planned for growers to plant 50 m² each with 2,500 rooted cuttings up to 1977 after which 100 m² would be allowed per grower. A yield of 200 standard flowers per m² had been postulated.

Year	Growers	Area, m ²	Yield, flowers
1975/1976	15	750	150,000
1976/1977	30	1,500	300,000
1977/1978	60	6,000	1,200,000
1978/1979	120	12,000	2,400,000
1979/1980	240	24,000	5,000,000

In July 1975, the yield had been revised to 240 flowers per m², ie 12,000 flowers per grower, based on the estate production at Naivasha. On this basis the return to the grower was estimated as follows -

	K Shs
<u>Expenditure</u>	
2,500 rooted cuttings at K Shs0.5	1,250
Fertiliser	450
Chemicals	175
Other materials	85
	1,960
<u>Revenue</u>	
12,000 flowers at K Shs0.3	3,600
<u>return to grower</u>	1,640
DCK would benefit as follows -	
<u>Expenditure</u>	
Air freight, K Shs0.15/stem	1,800
Packing material, K Shs0.05/stem	600
Grading, K Shs0.01/stem	120
Payment for flowers	3,600
	6,120
<u>Revenue</u>	
12,000 flowers @ K Shs0.54/stem	6,480
<u>return to DCK</u>	360
	(0.03/stem)

4.03 15 outgrowers had been selected by December 1975. Most had some previous association with Updown usually through a member of the family being employed by the company. The mission visited two growers and was impressed by the high standard of culture. There could be significant losses because of rain damage; one grower had been prevented from harvesting his crop because of rain, there was a high percentage of flowers at a stage too advanced for cutting and they would normally have to be rejected.

4.04 The mission was informed that, based on the limited experience with these growers, Updown now proposes to select more growers to bring the total up to 200 by the end of 1976, a much more rapid expansion than originally envisaged.

4.05 The proposal for carnation outgrowers had been well received by HCDA and the Ministry of Agriculture, as Government still wishes to further its policy for horticultural development. In recent discussions with Government, Manager Updown had proposed the establishment of a Flower Board composed of representatives of HCDA, the Ministry of Agriculture and DCK, the functions of which would be to -

- (a) plan flower production on a long-term basis in conformity with Government policy;
- (b) plan production for current season in co-operation with DCK (IAI);
- (c) select outgrowers;
- (d) establish and supervise packing centres;
- (e) make loans to growers;
- (f) make payments to growers;
- (g) assume responsibility for air-freight;
- (h) adopt a uniform marketing policy.

DCK have made it clear that they would expect to assume responsibility for the flowers from the time they arrived at the packing centre as they have all the facilities for grading, packing, storage, transport overseas, distribution and marketing intelligence. HCDA would inspect produce at the grading centre.

4.06 The proposal for an outgrowers scheme is interesting, but the immediate expansion to 200 outgrowers suggests an unjustified urgency, unless the plan has been devised as a rescue operation for Updown. The proposal must undoubtedly have Government's full support. Ministry of Agriculture officials at Thika informed the mission that they are interested but have had no experience in flower production. They would like to send an agricultural officer (there are suitable horticultural graduates) to Updown for training with a view to the Ministry providing an extension service to growers. The possibility of the Ministry providing free extension services, perhaps by seconding one of its officers to DCK until such time as a Flower Board or some other appropriate organisation has been established, should be pursued by management.

4.07 The yield appears to be optimistic. The estate yields at Updown are about 156 standard flowers per m² and there is no evidence at this stage for assuming that outgrowers will do better. At 156 flowers per grower, his return from 50 m² would be reduced from K Shs1,640 to K Shs380. Furthermore, air freight costs have been underestimated and are K Shs0.17 per stem.

4.08 It might also be difficult to find 200 growers in the immediate vicinity of Updown: the population in the area is becoming urbanised. In the long-term there might be a better chance for the scheme if a smaller number of growers were encouraged to grow larger areas or if the scheme was transferred to Naivasha. There should be no further expansion until the scheme has been fully worked out with Kenya Government.

5 Future for Updown

From the horticultural viewpoint carnations do not perform as well as at Naivasha and there seems to be no case for continuing with their culture at Updown. The smallholding scheme is one which should be encouraged but no more rapidly than originally envisaged, ie over a period

of five years, and not until the full co-operation of the Government has been obtained. The future of Updown as a horticultural production centre, hinges on the performance of roses and alstromeria. In the case of roses, it should be possible to reach a decision on the viability of this crop by the end of the 1975/1976 season when roses could either be expanded or closed down. In the latter event, this would mean the closure of Updown as a horticultural production centre since the alstromeria and other minor crops are still in the investigational stage and could be controlled by the Technical Director who lives on the estate.

6 Proposals for Redi-rooters and Plumosus at Masongaleni Estate

6.01 It is proposed to increase the sales of redi-rooter cuttings from 80m in 1975/1976 to 100m in 1977/1978 and 120m in 1979/1980. This means a gross production of 120m cuttings in 1975/1976 rising to 173m in 1977/1978 after which it is expected to make more efficient use of cuttings by planning control and by reducing the number of undersize cuttings. The area of 66,408 m² in Fields 1 and 2 will have to be increased and it is proposed to develop a new Field 5 of 96,138 m² nett in two stages to 1977/1978, ie the transfer of 66,408 m² from Fields 1 and 2 plus the additional area of 29,730 m². Nucleus cuttings from Yoders take up a very small area and will be grown in isolation at M I.

6.02 It is further proposed to increase the shipment of plumosus from 2.2m bundles to 2.6m which means the gross production of 2.7m bundles in 1975/1977 will rise to 3.3m in 1979/1980. This expansion will be effected by planting the vacated areas in Fields 1 and 2, at present occupied by redi-rooters, and will increase the area to plumosus from 336,982 m² in 1975/1977 to 403,390 m² by 1979/1980. It will be noted that this proposal involves a year's delay to the original planting programme so as to give time for the new area in Field 5 to be prepared. The proposed planting programme is given at Table 16 on page 78.

6.03 Table 16 shows a constant yield of 1,807 cuttings per m² for redi-rooters, based on 1.2 crops per annum or a 60% occupancy of beds*. Planning Department is expecting to increase this to 67% occupancy which would give about 1½ crops and increase yield to 2,250 cuttings/m². However, with sophisticated computer control, better utilisation of net-houses should be possible with a maximum utilisation of two crops per annum, ie over a period of 2 x 22 = 44 weeks out of 52. Yield could then be increased to 3,000 cuttings/m².

6.04 The total expansion in Field 5 will be 96,138 m² of beds or 160,000 m² gross of net-house over a period of two years. The gross area of net-houses at Masongaleni will then be as follows -

<u>Field</u>	<u>Gross Area (m²)</u>
M I	50,000
M II, Fields 1-4	720,000
M II, Field 5	160,000
Total	<u>930,000</u>
Or	<u>93 hectares</u>

* See Note (1) on Table 6 at page 43.

Comments on the Development Proposals for Masongaleni Estate

7.01 The development programme includes the construction of two dams and can weirs on the Kibeei River to provide storage facilities for one year's supply of water; the capital requirements for this have been estimated as -

Table 16
Proposed Planting Programme - Masongaleni

	1975/1976	1976/1977	1977/1978	1978/1979	1979/1980
<u>Redi-rooters</u>					
Area m ²	66,408	81,273 <u>1/</u>	96,138	96,138	96,138
Additional area <u>2/</u>	-	14,865 <u>1/</u>	14,865	-	-
Fields	1 & 2	2 & 5	5	5	5
Yield/m ² <u>3/</u>	1,807	1,807 & 1,500 <u>1/</u>	1,807	1,807	1,807
Total yield'000	120,000	133,378	173,721	173,721	173,721
Nett yield	80,000	90,000	100,000	110,000	120,000
<u>Plumosus</u>					
Area m ²	336,982	336,982	363,584	396,788	403,390
Additional area <u>4/</u>	-	-	26,602	33,204	6,602
Fields	← M I, M II, 1-4 →				
Yield bundles/m ²	8.0	8.0	7.9	8.0	8.0
Total bundles	2,713,000	2,713,000	2,914,820	3,198,360	3,258,540
Nett bundles	2,213,800	2,213,800	2,311,000	2,533,000	2,561,000

Notes

- 1/ Additional area planted late and will yield only one crop of 1,500 cuttings per m². Yield calculated on 60% bed utilisation.
- 2/ Total additional area - 29,730 m².
- 3/ Yield 1,807 cuttings per m² from 1.2 plantings. One planting yields 1,500 cuttings. In 1976/1977 planting does not commence until first quarter of 1977.
- 4/ Total additional area - 66,408 m².

7 Comments on the Development Proposals for Masongaleni Estate

7.01 The development programme includes the construction of two dams and ten weirs on the Kibwezi River to provide storage facilities for one year's supply of water; the capital expenditure has been estimated as -

2 dams @ K Shs1,000,000	2,000,000
10 weirs @ K Shs40,000	400,000
Survey and design fees	300,000

It is intended to spread this expenditure over two years, 1975/1976 and 1976/1977. The estimate was made by General Manager, Masongaleni in May 1975 and should, in fact, read K Shs2.5m due to an error in addition. It is recommended that a more accurate estimate be obtained after the site has been surveyed. The areas selected for dams and weirs have already been cleared of bush.

7.02 The capital expenditure for water storage facilities and land preparation, water piping and irrigation equipment, tractors, vehicles and ancillary equipment, housing, net-house, cold store, grading shed, fertilisers and chemicals for Field 5 has been estimated as follows -

	<u>Year</u>	<u>K Shs '000</u>
	1975/1976	5,230
	1976/1977	4,156
	1977/1978	452
	1978/1979	352
	1979/1980	352
	1980/1981	352
	<u>Total</u>	<u>10,893</u>
	Or	<u>K£0.5m</u>

Comments on individual items are as follows -

(1) Soil Levelling

The cost of K Shs400,000 includes work on the water storage facilities and cannot, therefore, be compared with costs at Sulmac, Naivasha.

(2) Tractors

The cost is for three Leyland tractors (not Same tractors) at K Shs40,000, which is half the cost of Same tractors quoted for Sulmac. Equipment should be standardised as requirements for Sulmac and Masongaleni are similar.

(3) Cold Store

K Shs600,000 has been estimated as the cost of an extension to the grading area for pre-cooling and K Shs95,000 for an extension to the

plumosus grading hall. There is no mention of vacuum cooling equipment in the estimates. However, the mission understands that it was intended to put in a small vacuum cooling plant for trial with plumosus. If successful, it would then be used for redi-rooters and a larger plant purchased for plumosus. In such an important item there should be liaison with Sulmac, through the Technical Director, as to the necessity for vacuum cooling, (see paragraph 2.04(6) page 73).

(4) Electricity Generator (K Shs2.35m)

A quotation has been given for deferred payments up to 1980/1981; terms and rate of interest are not known. This arrangement would improve the estate's cash flow but, if DEG/CDC were financing this item, it should be possible to purchase at a lower price on a single payment.

(5) Irrigation Costs

Sprinklers, PVC piping, clamps, stands, valves etc are estimated to cost K Shs575,000 for 16 ha gross or K Shs35,900 per ha (K£898 per acre). Even allowing for recent inflation this appears to be very costly and quotations should be sought from more than one source. Total capital expenditure on irrigation equipment for Field 5 is estimated to cost -

	<u>K Shs</u>	
Sprinklers, etc	575,000	
Maoi piping	270,000	From the Kibwezi pump
Pumps (2)	421,800	
Tanks	85,900	For distributing dosed water
Tanks	20,500	For mixing concentrates
Piping	79,800	
Fuel storage	365,000	At Masongaleni River for pumps
Total	<u>1,818,000</u>	

The General Manager, Masongaleni is an engineer and the estate may be able to undertake much of the installation work without the assistance of an outside contractor.

7.03 With the proviso that more accurate estimates are required for certain items and, on the assumption that the market exists for the increased production, the proposed development for Field 5 appears to be sensible. However, before the full expansion is authorised management should explain why, with the assistance of Masongaleni's Planning Department, a better utilisation of benches could not be effected. If, for example, bench utilisation could be increased from 60% to 75%, the gross area for Field 5 could be reduced from 16 ha to 13 ha with proportionate savings in sprinkler equipment, netting, drainage etc.

8.05 It is, therefore, recommended that, before a commercial planting commences, trials should continue for a further two years on not more than 50 acres.

8 Proposal for Tomatoes at Manoni Estate

8.01 It is proposed to increase production of fresh tomatoes for manufacture into paste from 2,000 tonnes in 1975/1976 to 13,860 tonnes in 1978/1979 on the following planting programme -

	<u>1975/1976</u>	<u>1976/1977</u>	<u>1977/1978</u>	<u>1978/1979</u>
Acres	67	167	333	462
Yield per acre	30 tonnes fresh fruit			
Yield, tonnes	2,000	5,000	10,000	13,860*

* Sufficient to support a factory producing 2,200 tonnes of paste.

Appendix 3 from Investment in Africa makes a case for tomato paste production in Kenya where consumption is already 1,500 tonnes per annum. The above planting programme would, therefore, be logical if there had been previous commercial experience of tomato production in Kenya.

8.02 The only detailed investigations with tomatoes suitable for paste production were undertaken by the Government Horticulturalist over the three years 1954/1956 in areas considered promising at that time, at altitudes from 4,700 ft to 6,700 ft chosen possibly because an area at 6,000 ft had a past history of good tomato yields. Problems were encountered with nematodes, blight, sun-scorch and birds. Conclusions were -

- (a) seed should be sown direct in the field;
- (b) there should be no staking or pruning;
- (c) yield from irrigated crop was in order of 10 to 17 tonnes per acre;
- (d) best sowing period was mid-August to early September and these sowings were harvested in December and January;
- (e) soluble solids content averaged 6%.

8.03 Trials at Manoni during 1975 have confirmed some of these points and the results suggest that Manoni is a better locality for tomatoes than any of those chosen by the Government Horticulturalist. Yields have been good and there has been little trouble with blight and sun scorch; but it should be noted that the earlier trials were done over a period of three years; at Manoni 1975 was exceptionally dry and control of disease was therefore comparatively easy. The absence of sun-scorch at Manoni suggests good water control; improved varieties were also planted.

8.04 The results of one season's planting over 67 acres are insufficient as a pilot project on which to base expansion to a commercial planting sufficient to support a factory producing 2,000 tonnes or more of paste. Such an expansion would require a factory on the estate as there is none nearby; transport costs to existing factories are excessive.

8.05 It is, therefore, recommended that, before a commercial planting commences, trials should continue for a further two years on not more than 50 acres.

8.06 It is, however, debatable whether this is the appropriate time to embark on an entirely new project. It has been reasoned that, lacking development at Manoni, the estate would rapidly be over-run by squatters and water supplies to Masongaleni would be jeopardised.

8.07 The cost of employing an Israeli consultant to undertake investigations is more than can be met from a pilot scheme of 50 acres. This cost could be aggravated next season if processors, on which the project is dependent for its revenue, reduce the price for tomatoes which, the mission understands, is a strong possibility.

8.08 Management appears to be presented with the following alternatives -

- (a) continue with the planting programme as proposed;
- (b) continue with pilot plantings of not more than 50 acres over 12 months for the next two years;
- (c) dispense with the permanent services of Tahal's expert but engage Tahal to pay an advisory visit once or twice a year;
- (d) discontinue all work on tomatoes until IAI's other operations have been consolidated.

Arguments against (a) have already been presented. If alternatives (b) and (c) are adopted, it would be possible to put the expatriate field assistant at DWA Plantation in charge of the planting programme. He has already had some contact with the tomato trials. Alternative (d) is preferred by the mission, on these grounds the clearing of 750 acres was premature. On the understanding that the tomato development proposal has been postponed sine die, it might be possible to elicit an undertaking from Government that it will exert its influence in the prevention of squatting. Government would be more likely to give this undertaking if there was a possibility that at some stage of the proposed development there would be a place for smallholding development with tomatoes as the main cash crop.

8.09 In the meantime it is recommended that assistance be sought from international funds for the tomato investigations to be resumed. Assistance is most likely to be forthcoming if such an application is made through Government channels.

8.10 Investigations should continue on the lines of those outlined for 1975 in Part 6, ie on planting techniques, pest and disease control, irrigation and the selection of suitable varieties. All operations should be carefully costed and direct inputs of labour and materials calculated. Additional items requiring investigation are harvesting methods, labour utilisation versus mechanical operations; varieties should be examined for solids content as the conversion factor of 6.3 assumed in the estimates may prove to be false. It is important to continue to examine the suitability of alternative crops in the rotation, vegetables, cotton, cereals, pigeon peas etc, particularly if smallholders are likely to be involved, the cost of their production and markets for the produce.

8.11 On the processing side it is important to know something of the quality requirements and their assessment for paste production and processing techniques to be employed. Factors such as can supplies,

containers other than cans, water supplies for processing, power supply and waste disposal would have to be investigated thoroughly; some will be key factors in the choice of a site for the factory. The pilot project should be sited on land typical of that on which the commercial plantation will be placed; this in turn will be placed as near as possible to the site chosen for the factory.

8.12 A model project could be proposed in greater detail than that already proposed on the assumptions that -

- (a) a pilot scheme has proved that field production of tomatoes is economically feasible at Manoni;
- (b) water supplies are adequate for irrigation and processing;
- (c) field production commences on a nucleus estate which will iron out any minor agronomic problems outstanding from the pilot scheme and will provide a training ground for smallholders;
- (d) processing to be under the same management as field production;
- (e) the factory will produce tomato puree in the first instance but possibilities of diversification into other crops or forms of processing tomatoes to be considered when development has proceeded satisfactorily;
- (f) the industry will be protected for a given period by duties on competing imported goods;
- (g) smallholders to be introduced at a given stage of development on a limited proportion of the total acreage to be planted to tomatoes (say a maximum of 200 acres out of 500), each smallholding being allocated enough land to grow other crops in rotation or to maintain a fallow, whichever is favoured as a result of investigations;
- (h) smallholders to contract with company to plant tomatoes on dates required and supply the whole crop to the company at a pre-determined price;
- (i) a tenancy agreement is drawn up between the company and the smallholder which would stipulate general rules concerning the use of irrigation equipment, hand tools and hire of equipment for cultivation and spraying and include an agreement to accept advice on routine operations such as fertiliser application and crop protection.

9 Proposal for Sisal at DWA Plantation

9.01 The estimates assume an expansion in production from 900 tons of fibre in 1975/1976 to 2,120 tons in 1979/1980 by increasing the area in production from 3,000 acres in 1975/1976 to 7,067 acres in 1979/1980, the yield per acre remaining constant at 0.3 tons fibre per acre. The

1979/1980 crop would be obtained from 986 acres planted in 1974/1975, 300 acres planted in 1976/1977 and 5,781 acres of old plantings. The development programme shows a further 300 acres for planting in 1977/1978.

9.02 The schedule of sisal production/sales at page 44 of the estimates is misleading since, for the season 1979/1980, it shows a greater area used (ie, cut for production) at 7,067 acres than is planted for production, ie 6,800 acres. Thus Table 17 below is an attempt to show the true picture. It has already been suggested in Part 7 that the "total area used" is purely notional and that, in fact, the whole estate is worked over. Therefore line 6 in the table shows the notional area harvested whereas line 5 shows the mission's estimate of the actual area harvested. It will be seen from line 8 that, to achieve the yields estimated, the yield fibre per acre must increase from 0.14 tons to 0.30 tons per acre. It is difficult to see how old neglected sisal can give a higher yield over the period 1975/1979; it is not likely to exceed its past performance of 0.24 tons fibre per acre.

Table 17
Sisal Production

Acreage	1975/1976	1976/1977	1977/1978	1989/1979	1979/1980	Notes
1 Area planted	7,848	7,374	7,374	7,367	7,367	-
2 New plantings (+)	986	300	300	-	-	-
3 Discarded (-)	1,460	300	307	-	-	-
4 Balance	7,374	7,374	7,367	7,367	7,367	1+2-3
5 Mature	6,388	6,388	5,781	6,767	7,067	-
6 Notional	3,000	4,616	5,567	6,400	7,067	-
<u>Yield</u>						
7 Tons fibre	900	1,385	1,670	1,920	2,120	-
8 Per acre (actual)	0.14	0.21	0.29	0.30	0.30	7:5
9 Per acre (notional)	0.30	0.30	0.30	0.30	0.30	7:6

9.03 The development programme shows capital expenditure of K Shs3.04m over the period 1975/1980 for replanting 600 acres, replacement of field equipment and transport vehicles (by estate railway and by road) and new decorticating machinery on the assumption that by 1979/1980 there will be 7,067 acres in bearing of which just under 1,500 acres will have been recently planted. No estimate has been made for the rehabilitation of the old plantings and none would be justified as it would be very costly to do so. Page 45 of the estimates show continuing losses up to and including 1980. Clearly drastic economies are required.

9.04 The mission, therefore, recommends that the development programme be put into abeyance and a new one drafted with the following objectives -

- (a) harvested acreage to be reduced;
- (b) one decorticator to be operated;

- (c) overhead costs to be reduced;
- (d) efficiency of field workers, particularly harvesters, to be improved.

9.05 Management should examine the financial results of operating 4,000 acres of which 1,600 acres would be the newly-planted acreage. All the old sisal, except 2,400 acres of the least neglected, would be worked over intensively or "slaughter-harvested" and then totally abandoned. The estate would then be consolidated to 3,000 acres which should give 0.37 tons fibre per acre; this figure may be optimistic.

9.06 Yield would then not exceed 1,500 tons fibre per annum which would be adequate for one decorticator operating on two shifts. It may be possible to cannibalise one decorticator to maintain the other, thereby saving in capital expenditure on a new decorticator.

9.07 On a smaller acreage overhead costs would be reduced. The largest single item is staff salaries. Senior staff consists of a General Manager, an Assistant General Manager (i/c administration and technical matters), an Assistant Manager (i/c field and production), an Engineer, a Field Assistant (Kenyan) and a Bookkeeper (local Asian). The first four are British expatriates. The Engineer is assisted by three mechanics, all Asians of whom two are expatriates. Management should be reduced to a General Manager, Engineer, Field Assistant, Bookkeeper and one mechanic.

9.08 Direct labour inputs are 7.82 man-days per acre for harvesting and 8.56 man-days for processing, a total of 16.38 man-days per acre to produce 0.14 tons fibre. This represents 117 man-days per ton. It should be possible to reduce manpower so that productivity is five tons fibre per man employed. Assuming 300 man-days per annum, this represents $300 \div 5 = 60$ man-days per ton fibre. The notional manpower of 16.38 man-days per acre to produce 0.3 tons fibre represents 55 man-days per ton fibre.

9.09 The cut leaf is transported both by rail and by tractor and trailer. Maintenance costs of the railway are high and a study should be made of the comparative costs of transporting leaf from a reduced acreage, part by rail and part by road as at the moment, or wholly by road.

9.10 On a long-term basis it might be advisable to close down the sisal operations altogether and this may in any case be necessary if it is not possible to work out a viable project. Labour made redundant should be given an opportunity to participate in the proposed redi-rooter and plumosus expansion. At a later date it might be possible to bring some into the proposed tomato production project if that should materialise.

10 Project Development Costs - 1970/1975

10.01 When a project is proposed in an area in which there is no local experience of the crop(s) to be grown, then it is usual to initiate a pilot project for a period of about three years in order to gain reasonable control over a local situation. The crops grown by DCK/IAI in Kenya were started on small trial plots for the first year or so but there was a tendency to go into large scale commercial production before some major problems had been solved. An attempt has been made to account for project development costs in the green volume entitled "Notes on Project Development" dated 10.11.75. Over the period 1970/1975 total expenditure of DM 25.2m was incurred; this is summarised at Table 18 on page 86.

Table 18
Project Development Costs 1970-1975
(Estimated Cost DM'000)

Items	Plumosus	Chrysanthemums	Carnations	Roses	Others	Tomatoes	Miscellaneous	Total
Experiments -								
General	773 1/	774 1/	1,336 4/	773 5/	1,197 6/	200	-	5,053
Pests and diseases	1,236 2/	-	-	-	-	-	-	1,236
Commercial production -								
Fertiliser	256 3/	275 3/	-	-	-	-	-	531
Lighting problems	-	136	968 3/	-	-	-	-	136
Transfer of "know-how"	-	3,000	2,250	-	-	-	-	5,250
Marketing overseas	261	-	-	-	-	-	4,327	4,588
Planning and pre-formation	-	-	-	-	-	-	1,600	1,600
Grading	2,390 7/	-	-	-	-	-	-	2,390
Packing and freight costs	1,842	-	663	-	-	-	-	2,505
Transport problems	436	-	-	-	-	-	-	436
Labour efficiency	415	125	-	-	-	-	-	540
Total	7,609	4,310	5,217	773	1,197	200	5,927	25,233 8/

Notes

- 1/ Area of 36,000 m² for plumosus and 2,000 m² for chrysanthemums.
- 2/ Area of 135,000 m².
- 3/ Both for plumosus (on 135,000 m²) and chrysanthemums (on 290,000 m²) these figures represent losses from reduced fertiliser rates. For carnations (on 100,000 m² and 475,000 m²) at Naivasha where expansion into commercial production was too rapid.
- 4/ Small trials at Como Coffee Farm, Updown and Naivasha 1970-1974.
- 5/ Small trials at Masongaleni, Naivasha and Updown.
- 6/ Trials as follows -

Crop	Area m ²	DM'000
Croton	10,000	614
Ficus	1,500	135
Diffenbachia	750	54
Geranium	300	22
Poinsettia	450	32
Adian Turn	150	7
Sprengeri	500	24
Leather Leaf	600	76
Gerbera	2,250	194
Chrysanthemum	200	9
Gladiolus	200	17
Freesia	150	13
Total		1,197

- 7/ Based on large-scale production in 1973 and 1974.
- 8/ This total does not coincide with that shown in the consolidated balance sheet of 1.7.75 where written down value of development costs (not detailed) is stated to be DM 27,550m.

10.02 Costs which might normally be considered those of a pilot project are -

- (a) surveys to select suitable production areas;
- (b) collation of meteorological and river flow data;
- (c) identification of suitable crops to be grown;
- (d) trials to solve agronomic and marketing problems;
- (e) studies of direct costs of labour and materials;
- (f) establishing links with suppliers of materials and formulating policy for kinds and quantities of stores to be stocked;
- (g) establishing links with transport system between Kenya and Europe.

These items are reflected in the development costs; but it has also been admitted that the company bought its experience dearly through mistakes in management and finance and through insufficient control of either.

10.03 The problem now is to determine how much of this expenditure could have been incurred reasonably as pilot project expenses and how much should be charged to commercial operations. There are some clear distinctions as to the size of plantings. An area of 36,000 m² of plumosus experiments could reasonably be accepted as a pilot planting; when that area has increased to 135,000 m², it is a commercial planting of considerable dimension. Similar situations have arisen for the chrysanthemum and carnation plantings, vide note (3) at Table 18 on page 86.

10.04 It has been argued that marketing is an item where production has to be on a commercial scale before a reliable estimate can be made of the grades and prices per grade that can be obtained. However, the marketing costs shown at Table 18 are in connection with the establishment of DCK's own marketing organisations in six countries in Europe; an unnecessary luxury when there are already marketing organisations in those countries which would give a rough guide as to the value of the Kenyan produce.

10.05 It is proposed that the following items be disallowed as development expenditure in that they go beyond the pilot project stage -

(a) Plumosus

pest and disease control was on 135,000 m² and could have been on 36,000 m². Proportional cost would have been DM 330,000. For fertiliser trials and grading proportional costs would be DM 68,000, not DM 256,000 and DM 635,000 not DM 2,390,000 respectively. Proportional costs for packing, etc, transport and labour would be DM 718,000. Thus plumosus costs would be reduced to DM 2,785,000;

(b) Chrysanthemums

if the fertiliser trials had been done on 2,000 m² the proportional cost would have been about DM 2,000. The transfer of "know-how" is inadmissible since the project has already paid for the Technical Director. Cost should be reduced for this item to DM 1,037,000;

(c) Carnations

the largest trial planting was of 18,000 m². Accepting this as a norm for a pilot project, losses in commercial production should not have exceeded DM 174,000 ($968,000 \div 100,000 \times 18,000$); transfer of "know-how" not admitted. Cost should be reduced to DM 2,173,000;

(d) Roses

no comment;

(e) Other Crops

the planting of crotons was more on the scale of a commercial project and half the cost, DM 307,000, should be allowed for a pilot project;

(f) Tomatoes

this expenditure should not have been incurred at this stage, as already explained in preceding parts to this report;

(g) Miscellaneous

it has already been suggested that the marketing costs are inadmissible. The cost for miscellaneous items is, therefore, reduced to DM 1,600,000.

10.06 Development costs that might have been incurred in a pilot project may, therefore, be summarised as follows -

	<u>DM</u>
Plumosus	2,785,000
Chrysanthemums	1,037,000
Carnations	2,173,000
Roses	773,000
Other crops	890,000
Miscellaneous	1,600,000
Total	<u>9,258,000</u>

11 Other Plans for Diversification

11.01 There are plans to diversify into other crops such as roses for perfume and certain types of peppers. It has already been emphasised that the introduction of a new crop should be preceded by an adequate period of trials.

11.02 The IAI development programme mentions the possibility of IAI providing advice on a consultancy basis for similar developments in other territories, particularly the Middle East. It is difficult to visualise staff becoming available for this sort of operation until the present developments have been fully consolidated.

Grade	Price - pfennigs			
	Estimated	%age	Actual	%age
White	12.04	4.8	11.33	3.0
Blue	8.60	17.2	6.00	29.1
Yellow	4.49	24.8	3.25	18.8
Green	2.61	4.9	2.72	2.1
Red super	9.89	6.8	9.30	4.0
Red standard	8.59	17.7	8.36	22.1
Brown	4.74	19.8	3.75	17.1
Grey	2.94	4.0	3.00	3.8
Mean	6.60		5.73	

Prices per grade were lower than estimate and, although good grades were achieved, the average price has been lower than estimated.

1.05 Roses

Rose imports into West Germany increased from 5,562 tonnes to 14,460 tonnes over the period 1969-1974, the main suppliers being Holland (13,018 tonnes), Israel (841 tonnes) and Italy (205 tonnes). Kenya exported three tonnes. The demand for roses is exceeding carnations in real growth terms and it is a higher value product with only one principal exporter. Values have increased about 12½% from 1970 to 1974. The greatest demand is in the winter. Evergreen have found that of the grandifloras, Baccara arrives from Kenya with soft flower buds which open too quickly or discolour to a bluish red. Research in California suggests this might be a result of high temperatures, which must not exceed two hours whilst in transit on the plane. The least problem is with the Babies which are fetching good prices compared with those from Holland (see Part 4). There is the possibility that if value increased, prices would be lower. At the moment, because of the restricted supplies, roses go to selected customers who are willing to pay for quality. However, the yield of blooms is not proving up to expectation. The yield of Babies should be about three times that of Grandiflora.

1.06 Alstromeria

Alstromeria hybrids from Kenya have yet to be tried on the market. On the Dutch auctions at Aalsmeer prices between 50 and 80 pfennigs per stem are quoted. With 300 to 350 stems to a box, leaves are damaged and a more satisfactory pack has to be devised. It is recommended that the foliage is not stripped as the leaves are said to prolong the life of the flowers. Sales may be made only through the agent who limits the quantity available with the object of maintaining the price.

1.07 Tomatoes

Kenya imports about 4,500 tonnes of double concentrate tomato paste per annum and there is a good potential market for tomato paste production as import substitution. Further study would be required of the

local market, costs of production and processing before a price structure for the manufactured product could be formulated. Although the trials indicated possible yields of 30 tonnes/acre in all, the 67 acres produced about 992 tonnes which is only 15 tonnes/acre. Further agronomic trials are undoubtedly necessary.

1.08 Sisal

(1) DWA Plantation produces a fibre shorter than the average for the main producer, Tanzania, and in common with 75% of the Kenyan production achieves very good grade. An increasing amount of sisal from Kenya, particularly from the smallholders, is sold as unwashed hand decorticated sisal (UHDS) and this is giving Kenyan fibre a good name. The sisal from DWA has been of a consistent quality and is sold for harvesting twine; a slight premium has been obtained from sales in Japan. Local agents are fairly optimistic as to the future prospects for sisal in spite of the fact that polypropylene, although not becoming any cheaper, is penetrating traditional sisal markets. On the other hand the World Bank forecasts are gloomy: the traditional outlets, viz ropes, cables and twines, are slowly shrinking in total size as a result of technological changes in transportation, industry and agriculture, thus reducing the overall requirements for cordage. Synthetic ropes and cables will continue to displace sisal ropes; therefore, the market for agricultural twine will be crucial to the future of sisal. As to prices, short and medium-term price prospects are bleak. The new planting cycle, stimulated by the high prices in 1973 and 1974 and in which DWA Plantation participated, will increase availability again when demand will be falling against increased capacity of polypropylene. World Bank forecasted that the substantial fall in the real price of sisal in 1975 would continue through 1978-1979.

(2) As further evidence of the gloomy picture Brazil, traditionally a major exporter of up to 220,000 tons per annum, had exported only 44,000 tons to September 1975 as compared with 112,000 tons for the same period in 1974. 100,000 tons was being purchased from producers at an internal support level because of the fall in price earlier in the year. The estimates assume a price of DM 872.22 (K Shs2,643) per ton and this is probably realistic.

2 Transport and Transporting Facilities

2.01 Cuttings and cut flowers are kept in a refrigerated condition from the time they are packed into boxes until they are placed on board the aircraft at Nairobi. There are cold stores at Masongaleni, Naivasha and Updown and the produce is transported in refrigerated trucks from the production centres to a cold store at Embakasi Airport where there is capacity for storing at least one freighter load (up to 30 tons) of produce at 10°C.

2.02 The cold store facilities at Masongaleni and Sulmac, Naivasha, have to be extended and reference has been made in Part 8 to the possibility of vacuum cooling. The advantage of vacuum cooling is that produce can be dry-packed which makes it more resistant to transport damage, cheaper to transport and easier to handle. It is possible to guarantee a minimum vase life of ten days for carnations and this can earn a premium for the flowers. Colombian carnations, potential competitors, are dry-packed and are meticulously graded.

2.03 Communication between Kenya and the sales offices in Germany and the United Kingdom are by telex and telephone and is good.

2.04 Transport to Europe is by IATA flights or by chartered aircraft, mostly the latter. In the 1974/1975 season, 107 charter flights were operated between the months of October 1974 and May 1975 at an average cost of K£7,000 per flight or K Shs6 per kg. Costs per unit worked out at K Shs1.70 per bundle for plumosus, K Shs20.25 per box of 1,000 cuttings for redi-rooters and K Shs0.14 per stem for carnations and roses.

2.05 At full production total volume is estimated as follows -

Plumosus	854 tonnes
Redi-rooters	337 tonnes
Carnations	3,416 tonnes
Roses	133 tonnes
Total	4,740 tonnes

To transport this quantity one freighter, or the equivalent in scheduled flight capacity, will be required daily except on Fridays; deliveries on Fridays arrive on the market too late for weekend distribution. This volume of traffic would also enable Evergreen to operate at full capacity from mid-October to mid-May. However, to ensure deliveries on this scale, the airlines would have to find a greatly increased amount of southbound traffic. It might be possible to attract some flights from the Middle East and further east which would otherwise be returning to Europe empty. IAI is considering the possibility of setting up its own company to promote southbound traffic to East Africa. In the meantime the mission feels that expansion in carnations, which make up the bulk of the increase in volume arising from the proposed development programme, should be spread over a longer period.

3 Tariffs

3.01 Under the Arusha and Commonwealth agreements cut flowers entered the European Economic Community (EEC) free of customs duty. Both agreements expired on 30th June 1975, since when the EEC Member States began to impose customs duties at varying rates. Kenya made representations for a derogation from those duties on the grounds that -

- (a) cut flowers and foliage originating in Kenya are only imported into the Community during the period 15th October to 15th May. Thus, imports of these products during the period in question does not constitute a threat to European producers;
- (b) Kenya's share of the EEC market is minimal and thus it cannot seriously threaten the activities of national producers of these products;
- (c) given that the cut flowers and foliage industry is important in terms of employment, this is a priority development project;

- (d) the development needs of Kenya and the fact that this country depends (60%) on agricultural products for finance are two factors of importance which should be emphasised;
- (e) the duties imposed make it impossible for this project to be viable in as far as the Kenyan farmer is concerned, taking into account that the EEC market is the only market where Kenya exports this commodity.

3.02 The position has been reviewed by the EEC and it has been decided that under the home convention, with effect from 1st January 1978, all quotas will be abolished unless a strong case has been made by then for specific quotas. France, Germany and Denmark have traditionally controlled imports of roses and carnations by quota. From 1.2.76 each member state will operate a surveillance scheme whereby importers will be obliged to inform their respective Ministries of Agriculture of their importations so that they may be monitored. The scheme will include importations of carnations, cut roses and asparagus fern (plumosus) from Kenya and Colombia. During that period there will be no duty on cut flowers from Kenya and importations may be made throughout the year. However, if importations are seen to be competing with local production, then member states may prohibit or restrict imports over given periods and from named countries and it will obviously be the onus of the importer to behave responsibly during the trial period. However, if a member state wishes to control imports by licence, this action will require the agreement of all members of the EEC.

3.03 VAT of 5% is payable on the imported value of horticultural produce based on cost up to port of entry.

3.04 Chrysanthemum and carnation cuttings dutiable in Germany in 1975 will be allowed duty free in both Germany and the United Kingdom.

4 Marketing Organisations

DCK's horticultural produce was marketed through a central marketing organisation entitled Marketing Department DCK International with its base at Copenhagen, Denmark. It had the following subsidiaries: Scan Cargo, DCK Nurseries (UK) Ltd, DCK Scandinavia A/S, DCK Deutschland, DCK France, DCK Italia SpA, DCK Nederland and DCK Austria. These companies have been wound up, leaving a trail of debts behind them, except for DCK Nurseries. The marketing organisation now consists of the Shipping Office and Embakasi Airport, Nairobi, which is controlled by IAI Kenya's office in Nairobi, DCK Nurseries Ltd for the sales of unfinished products (chrysanthemums and carnations cuttings) throughout Europe and Evergreen Flora GmbH for the sales of finished products (flowers and foliage) throughout Europe.

5 DCK Nurseries Ltd

5.01 DCK Nurseries (DCKN), Manager, Mr H. Pudney, was established about 12 years ago and has operated in the past on sales of chrysanthemum and carnation cuttings exclusively in the United Kingdom. From 1976 DCKN will cover all Europe for these commodities. Its office, originally at Ashted, Surrey, is now at Bishop's Stortford near Stanstead Airport.

5.02 Sales were made on behalf of DCK's operations in Sardinia and subsequently for the past four years in Kenya. Most of DCKN's material is now

obtained from Kenya except for one or two of the older English varieties of chrysanthemums such as derivatives of Princess Anne which are difficult to propagate in Kenya and are still propagated in Sardinia; however, it is intended to phase these out by offering alternative varieties from Kenya.

5.03 Sales and production forecasts are correlated through a computer in Sardinia, but this is due to be sold and a computer terminal will be rented at Hertford. Peak periods for cuttings are June/July for natural season sales of cut flowers, late September for pot plants at Christmas and in France early August for All Saints Day (1st November).

5.04 In Britain DCKN employs three field representatives operating from Littlehampton, Chichester and North England and serving the main markets. On the Continent there is an agent in Copenhagen for Denmark and Sweden and an additional representative has been engaged in Germany for sales in Holland, Germany, Switzerland and France. Some encouraging exploratory work has been done in Finland with small cuttings. It is considered that the potential in the United Kingdom has not yet been fully tapped and sales could be doubled without much difficulty. There is also a small demand for about 5m rooted chrysanthemum cuttings in the United Kingdom and rooting is contracted out to a grower at Titchfield, near Southampton, who is supplied with the smaller grades of cuttings; rooting takes an extra month. The prices for unrooted and rooted cuttings and the terms of sales are given at Appendix 4.

5.05 Salesmen provide a comprehensive and reliable service to growers. For chrysanthemums grown for cut flowers and as pot plants, a programme of operations is worked out for planting date, pinching (if necessary), duration of night lighting and/or day shading, date of flowering and replanting. These operations are shown on a schedule which details the delivery of cuttings each week by varieties in order to fulfil the programme. Salesmen encourage a grower to plan his planting programme a year in advance and, with planning, it is possible to obtain 3½ flower crops per annum.

5.06 Cuttings now arrive at Gatwick instead of Stanstead and deliveries are made throughout the year direct to nurserymen on a weekly basis. As plant cuttings are classified as unfinished material, they are not subject to import tariffs. All delivery points in the United Kingdom are notified to the Ministry of Agriculture Plant Health Inspectorate whose inspectors can visit a nursery at any time to check that phytosanitary control measures have been adequate.

5.07 Cost to DCKN start at the airport of arrival and 15% of the sales price is reckoned to cover all costs.

6 Evergreen Flora GmbH

6.01 Evergreen Flora GmbH (Evergreen) was established at Frankfurt originally as DCK Deutschland about 12 years ago as a sales organisation for DCK's finished products - plumosus and carnations and other foliage and flowers. Evergreen also handles small quantities of chrysanthemums from Sardinia and France and heather leaf fern from Miami, USA. There is a staff of 43 with the Manager (Mr Levine), Assistant Manager (Mr Bergmann), seven salesmen (three permanent and four part-time), accounting staff computer programmer, 16 drivers and other minor employees including two men involved on packing plumosus.

6.02 Evergreen is advised from Nairobi by telex of shipments which are due to arrive by chartered or scheduled flights. Chartered flights generally leave Nairobi at night to arrive at Frankfurt during the following morning.

6.03 Details of quantities, grades of carnations, roses and plumosus are fed into a computer together with stock, if any, left over from previous shipments. Salesmen sell this stock by telephone from 6 am midday, the computer being used to monitor sales of stock and to issue invoices, way-bills and despatch notes. Prices are agreed among salesmen and are reviewed daily. Discounts are allowed for quantity. There are about 800 wholesalers and agents on Evergreen's books of whom about 300 are regular customers. Customers are divided into five areas throughout Western Germany and there is a sixth in Berlin. All sales are to wholesalers who sell on their own stalls or deliver to retailers.

6.04 While sales are progressing, the shipment will have arrived and is unloaded. A 30-ton freighter takes 13 pallets, which hold about 1,400 boxes of flowers, in the cabin and plumosus is stored in the hold. The old airport departure lounge has been converted into a reception centre for the pallets; the former duty-free store has been converted into a cold store for 500 boxes should any produce have to be carried over. These facilities are rented on a fixed contract to 1978 in place of paying a handling charge of six pfennig/kg which would otherwise be levied. The Kenya Government supplies phytosanitary certificates for every consignment. The German health authorities do spot checks at the airport.

6.05 As they are unloaded, boxes are selected at random for inspection by a checker on production control. Reports are sent back to the Technical Director in Kenya. In the consignment seen by the mission, some condensation was evident but not important; this could have been serious if the temperature reached 15°C. Spray carnations were slightly squashed at one end of some boxes; this is a packing problem.

6.06 At midday sales close and drivers of five refrigerated 6-ton lorries, one lorry assigned a circuit in each area, collect the boxes of flowers and plumosus fern assigned to their circuits according to the despatch notes. Most of the produce (90%) is sent by Evergreen's own lorries except to Berlin, where a contractor is employed, or for a few consignments which go by train or by air, eg to Switzerland, or where the wholesaler collects personally. The five distribution circuits each cover up to 1,200 km on the round trip and two drivers are required for each trip; a third rests at home as the round trip takes up to 24 hours. There are seven lorries, two in reserve and all are fitted with sleeping compartments. Deliveries run into the night and drivers are entrusted with the keys to the wholesalers' premises.

6.07 As most of the sales are effected by telephone, it is important that salesmen are well informed as to current prices. The Dutch auction at Aalsmeer is the best indication and one refrigerated lorry load per day is sent there via a contractor for checking grades and prices. Aalsmeer is not favoured as an outlet for all of Evergreen's sales because on large quantities prices would be depressed and, in any case, 90% of the sales would return to Germany.

6.08 A further aid to marketing intelligence is by visits to customers and markets by an Evergreen representative during the six-month sales season for carnations. These visits are also used to maintain contact with the less active buyers and with Italian carnation growers to estimate production since

their production competes with that of IAI's. In the case of plumosus the future for IAI's sales is considered good, as Danish and Dutch production has been noted to be declining; however, there is also the possibility that alternative foliage, such as leaf fern and eucalyptus, may have taken part of the market previously occupied by plumosus. Unemployment in Germany and elsewhere does not appear to have affected flower sales and Evergreen is optimistic that it will not do so since economies tend to be made on capital items. Flower consumption was noted to be high when there was a minor recession in 1967.

6.09 Evergreen undertook a marketing study on roses in 1974 as a preliminary to rose production in Kenya.

6.10 Evergreen is selling small quantities of carnations in the United Kingdom through J & E. Page of Covent Garden (Nine Elms). Although the market is a smaller one (DM 0.82 being spent per head in the United Kingdom compared with DM 0.82 in Germany), it is considered to be worth developing and a small part of certain consignments to Frankfurt are sent on with the chrysanthemum cuttings to London. Evergreen considers that the arrangement with J & E. Page, which is on a commission basis, is wholly unsatisfactory. Prices are poor, sales are not promoted and there are long delays in making payments. On the other hand salesmen had found carnations difficult to move in October/November 1975 because outdoor flowers were still in good supply. The main complaint is with the selling system in Britain compared with that in Germany rather than with the agents.

6.11 Evergreen also acts as a buying agent for IAI in Kenya and has recently ordered rubber bands for carnations and fertiliser.

6.12 The cost of its operations is reckoned by Evergreen at about 17% of the sales price. The company attempts to control cost. Each salesman's telephone is metered; fuel, oil and running time for the lorries are recorded and thermographs can be fitted to refrigerated lorries if necessary. Sales in Germany are on a ten-day credit except where special arrangements have been made.

DCI employed an Entomologist for a brief period when the quarantine requirements for chrysanthemum cuttings into Britain were being worked out. The company relies on its liaison with the National Agricultural Laboratory, particularly with their two plant pathologists. Most pests and diseases are kept well under control, with only one or two exceptions noted below. The main problem now is to find more economical spray regimes by reducing the frequency of spraying, without incurring the danger of a serious outbreak of pests or disease. For example, this is desirable in the case of carnations for Alternaria and rust control, especially at flowering time. It would also be desirable to reduce the large variety of chemicals purchased annually as this would enable more advantageous terms to be obtained by bulk buying.

6.12 Fertilisers

The fertiliser programme has been based on rates used in Sardinia and on advice from foders and research centres in the United States. These rates are not necessarily the best or the most economical for local conditions and it is intended to initiate fertiliser experiments with the object of assessing the effect of lower rates. As in the case of pests and disease control, a wide variety of chemicals is employed, some being very costly. Fertiliser trials should be given high priority, particularly where the most costly items are used. Sulfon in the form of Solobor is one example of

PART 10 - ADVISORY SERVICES AND RESEARCH

1 Organisation of Technical and Research Department

The Technical and Research Department is organised as two sections -

Research

Production Control

The Technical Director, Mr L.Edstrom, started his service with DCK in Sardinia and moved with DCK to Kenya (see Part 2) thereby transferring much of the knowledge gained in the cultivation of carnations, chrysanthemums, plumosus and other horticultural crops. He is based at Updown and is assisted by a Technician, Mr P.O.Hansen, and two Production Control Managers, formerly Technical Managers, one each at Naivasha and Masongaleni. A job description for the Technical Manager, Masongaleni, is given at Appendix 5. At Sulmac Estate, Naivasha, there are 21,000 m² of ungerminated plantings for which there are employed a supervisor, five headmen and about 120 workers; the cost of these workers does not appear to have been included in the Sulmac budget. At Masongaleni the Production Control Manager has a programme of experiments for redi-rooters and plumosus, the cost of which is included in the overheads of the estate.

2 Research - General

The years 1970-1973 were basically a pilot period when the Technical Department was engaged in solving the problems of crop production in the climatic and ecological conditions of Kenya and of logistics and marketing. More recently the Department has become aware of the need to reduce costs in production. Some of the problems encountered are briefly outlined below.

2.01 Pests and Disease Control

DCK employed an Entomologist for a brief period when the quarantine requirements for chrysanthemum cuttings into Britain were being worked out. Now the company relies on its liaison with the National Agricultural Laboratory, particularly with their two plant pathologists. Most pests and disease are kept well under control, with one or two exceptions noted below. The main problem now is to find more economical spray regimes by reducing the frequency of spraying, without incurring the danger of a serious outbreak of pests or disease. For example, this is desirable in the case of carnations for Alternaria and rust control, especially at flowering time. It would also be desirable to reduce the large variety of chemicals purchased annually as this would enable more advantageous terms to be obtained by bulk buying.

2.02 Fertilisers

The fertiliser programme has been based on rates used in Sardinia and on advice from Yoders and research centres in the United States. These rates are not necessarily the best or the most economical for local conditions and it is intended to initiate fertiliser experiments with the object of assessing the effect of lower rates. As in the case of pests and disease control, a wide variety of chemicals is employed, some being very costly. Fertiliser trials should be given high priority, particularly where the most costly items are used. Boron in the form of Solubor is one example of

the use in which the Technical Department has been afraid to cut down in chrysanthemums because a deficiency can induce chlorosis and hard growth which may give rise to petal scorch if cuttings with an unbalanced nutrient status are sent out to growers; in carnations boron deficiency can give rise to bullheads and other deformities in flowers, such as splitting.

2.03 Soils

In order to check on fertiliser requirements and usage, soil samples are sent monthly to Sweden for analysis, three samples being taken from each field. The service is quick and reliable. There is a possibility in the near future of using plant sap instead of soils for analysis and this could result in considerable savings in freight costs, but it is not yet known whether there will be any other savings. There should be no commitment until the efficacy of the system has been proved and until costs have been fully worked out.

2.04 River Water

Water from the Masongaleni and Kibwezi Rivers has been sampled daily. Over the years this has given a good pattern of the mineral content of the water - important as nutrients added to the irrigation water can be varied accordingly. The Masongaleni River contains the most dissolved salts but this does make it unsuitable for irrigation except that plumosus foliage is stained and a weak acid has to be added to the water to clean it at the end of each irrigation period.

2.05 Carnations

During the pilot period, 1970/1974, problems were solved in timing production, quality, packing and transport. Soil erosion problems were encountered. Further investigation is required on the following lines -

- (1) (a) to reduce the cost of disease control in respect of -
 - (i) petal rot caused by Alternaria, Helminthosporium and/or Botrytis. This is worst after rain and systemic sprays are being tried. It is hoped to have petal rot under control within two years;
 - (ii) Alternaria and rust on leaves and stems. This has been controlled completely but savings have to be effected by more timely spraying;
 - (iii) root diseases caused by nematodes, Fusarium and Rhizoctinia. This is a long-term problem to which the only solution at present is a resting fallow. Thus about 50% of the developed land will rest each year from carnations; the alternative, sterilisation by chemicals, could be very costly.
- (b) to increase yield per m² by spacing and time of planting trials, which affect the grade and quantity

produced. This item seems to deserve low priority since earlier trials have probably found satisfactory answers. Rubber banding will improve the yield of higher grades by reducing the number of split flowers, which is at the moment 33%, but the cost involving the employment and housing of an additional 600 workers has yet to be assessed against the value of the higher grade to be achieved;

- (c) to economise in fertiliser rates by withholding fertiliser at appropriate periods in the growth cycle;
- (d) to find the most economic system of irrigation. The Viaflow system, under investigation, is claimed by the makers to show a saving in fertiliser rates, but it is also very costly to instal;
- (e) to determine the most profitable mixture of colours and kinds (standards and sprays). The best variety is not always the best yielder;
- (f) to find the most economical pack. Some work has been done on this and an extra 100 flowers have been squeezed into a box; but there is still unutilised space with the short-stemmed grades;
- (g) worker training to reduce the number of flower stems broken when harvesting and grading;
- (h) vacuum cooling is being considered as a possibility instead of extending the cold store. It would reduce the weight of flowers to be consigned, thereby effecting a saving in air freight costs, and might also reduce the incidence of petal rot (see 2.06(c) below);
- (i) to find a suitable cash crop during the resting period. None has yet been grown. Alstromeria, on trial at Updown, is a possibility but could be grown on a very limited area.

2.06 Plumosus

Immediate objectives are -

- (a) to economise in the use of chemicals by spot checks;
- (b) to improve quality. The green and grey grades should be eliminated and this can be achieved with strong growing plants. The ideal is to leave three stems to a plant, so as not to weaken it, and variable treatments are the harvesting cycle and the frequency of pinching;
- (c) to pack consumer packs in Kenya instead of re-packing in Germany. Vacuum cooling offers a possibility as at the moment the foliage has to be cooled over a

24-hour period whilst standing in water, whereas with vacuum cooling, produce could be consigned the same day as harvesting. A trial is intended at Naivasha with a small vacuum cooler. However, re-packing in Frankfurt employs only two men and it is doubtful if there would be any saving in cost by doing the operation in Kenya. Undoubtedly the advantages and disadvantages of vacuum cooling for carnations and plumosus must be carefully weighed and costed before a decision is made to purchase a small cooler.

2.07 Chrysanthemums

The main problems requiring further investigation are -

(1) Undersize Cuttings which have to be Discarded

These could be sold in Britain if already rooted and a contract has been placed with a nurseryman in Southern England. Alternatively, alar (B9) can be used to reduce internode length but care is needed to ensure that its effect is not carried forward by the cutting, important if it is to be used for cut flowers or when grown during the winter.

(2) Planning the Planting Programme

The computer in Nairobi is indispensable for this purpose and ensures that beds are used to the maximum. However, it requires very careful planning to ensure that varieties with similar light requirements are planted in the same area. The company's computer programmer appears to be competent.

(3) Lighting

At present the light regime is five minutes illumination every 20 minutes (5 minutes on, 15 minutes off) throughout the hours of darkness. This is probably excessive but is done because labour on the lighting equipment is not entirely reliable and the company cannot afford to send cuttings out with incipient flower buds. However, means should be found to reduce the period of intermittent lighting to not more than about seven hours, ie from 9 pm to 4 am. Very sensitive varieties may require a regime of 10 minutes on and 10 minutes off.

(4) Cost of Chemicals for Pests and Disease Control (see paragraph 2.01 on page 98)

This item is expensive and it is difficult to foresee any immediate savings for chrysanthemums. Plant quarantine regulations in the United Kingdom require a 10-day period in the cold store to kill eggs and larvae of Spodoptera. Soil disinfection is not considered necessary except for treatment with Temik at the end of each crop to control mites, aphids and nematodes: the growth of chrysanthemums when grown continuously in the same bed suggests that the microflora population has hitherto been satisfactory. However, methyl bromide is kept in stock for unforeseen emergencies.

2.08 Other Crops

Roses are being tried in commercial quantities this year. The main problem has been the control of mildew. It has also been difficult to get the variety Baccara to the standard required for the highest grade. Trials have started with Alstromeria, partly as an alternative crop to carnations to be planted in place of a resting fallow.

3 Production Control

3.01 The operation of the Production Control Departments at Naivasha and Masongaleni has already been described. Production controls continue through transport to delivery at airports in Germany and Britain where boxes are opened at random and reports submitted. Appendices 6 and 7 are examples of the type of report made on carnations and plumosus. The data for Appendix 6 are prepared at Masongaleni and for Appendix 7(a) and 7(b) on arrival at Frankfurt airport. Appendix 8 gives the quality specifications for carnations.

3.02 The two Production Control Managers report regularly to the Technical Director and to the Estate Managers. Prompt action can be taken on faults detected by the inspectors under their control.

4 Training Programme

4.01 Technical manuals are being prepared for supervisors and managers. When complete they will be used as the basis for a series of lectures and demonstrations. An instruction manual has been completed for redi-rooters and one on carnations is almost ready. They contain sections on -

- (a) general background (botanical and historical notes);
- (b) instructions (technical circulars on operations such as bed preparation, planting, etc); and
- (c) problems (pests and disease and their control).

4.02 The Technical Director, with his experience in Sardinia, is well qualified to train liaison officers to work with the outgrowers. The proposals for outgrowers have been given in Part 8.

5 Advisory Services to DCK/IAI

5.01 The National Agricultural Laboratory provides specialist services for pests and disease control as noted above (see paragraph 2.01 on page 98). Other Government departments have little expertise to offer. The Director of the Horticultural Research Station at Thika is eager for his staff to gain experience in commercial horticulture and would welcome facilities for co-operating in trials. This possibility should be explored as it could lead to Government, in effect, subsidising the services to outgrowers and some of the investigational work undertaken by IAI's Technical Director.

5.02 In the choice and as a source of carnation and chrysanthemum varieties, IAI relies exclusively on Yoders, USA and reference has already been made to agreements with this company which also has a financial interest in IAI.

5.03 IAI is not a member of the Nuclear Stock Association (NSA) of the United Kingdom. NSA, through the Ministry of Agriculture's Experimental Station at Ilford and the Government Glasshouse Crop Research Institute, is promoting trials with new standard and spray carnation clones, some of which are showing less than 10% calyx splitting. It might be worth reconsidering the value of membership of NSA.

6 Cost of Technical Department

The cost of the Technical Department has not been shown in full in the estimates, particularly for Sulmac. All the research activities should be costed in detail and the Department should be required to prepare a budget, the cost of which would be allocated by IAI Kenya's Head Office at Nairobi.

	PH	CA (Ksh)					
Abuja Riv at boundary	7.5x	75.0	50.0	110.0	65.0	45.0	
Kaji Riv at New SX	2.0x	25.0	45.0	107.0	60.0	10.0	
Kaji Riv at Old DR	2.7	300.0	40.0	190.0	60.0	30.0	
Imani Spring (Syrinx)	7.3	170.0	10.0	35.0	45.0	50.0	
Forest Lake (Syrinx)	9.0	80.0	20.0	100.0	40.0	60.0	
Kiambu Spring	6.8	370.0	20.0	170.0	105.0	55.0	
Kilimani at Old Dam	2.0	200.0	20.0	170.0	50.0	20.0	
Kilimani Kat's House	8.4	20.0	20.0	155.5	90.0	65.0	
Kilimani DKA G.S.	5.4	20.0	22.0	180.0	100.0	30.0	
DKA G.S. (Kilimani Riv)	8.0	1,500.0	50.0	500.0	-	-	
First pit at Ajua	6.7	505.0	50.0	-	621.0	10.4	
Sec pit at Ajua (20/72)	6.7	200.0	140.0	300.0	180.0	140.0	
Kilimani Riv at Mill 61	6.2	250.0	25.0	160.0	60.0	75.0	
Masingalen	5.6	30.0	135.0	305.0	175.0	210.0	
Kilimani Riv	7.0	26.0	60.0	245.0	120.0	120.0	

All figures are based on typical values. Higher values of 50% which are not shown in field estimate values of 50% which are probably high.

SUMMARY OF CHEMICAL ANALYSES OF WATER MADE AT MASONGALENI II 25-28/1973

	PH	Ca Co3 (ppm)	Cl (ppm)	Ca + Mg (ppm)	Ca (ppm)	Mg (ppm)	SO ₄ (ppm)	Conduct µMHOS
Athi Riv at boundary	7.5x	75.0	50.0	110.0	65.0	45.0	190.0x	690.0
Athi Riv at New BR	8.0x	85.0	45.0	100.0	60.0	40.0	180.0x	390.0
Athi Riv at Old BR	7.7	105.0	45.0	90.0	60.0	30.0	190.0x	420.0
Umani Spring (Swamp)	7.3	170.0	10.0	95.0	45.0	50.0	15.0	490.0
First Lake (Swamp)	9.0	40.0	20.0	100.0	40.0	60.0	18.0	510.0
Kitui Spring	6.8	270.0	25.0	170.0	105.0	65.0	15.0	580.0
Kibwezi at DWA Dam	7.5	290.0	20.0	170.0	90.0	80.0	10.0	530.0
Kibwezi Kutin Nombe	8.4	30.0	25.0	155.0	90.0	65.0	15.0	620.0
Kibwezi DWA Gate	8.4	20.0	22.0	180.0	100.0	80.0	11.0	690.0
DWA Outlet (Wandole Riv)	8.0	1,500.0	92.0	600.0	-	-	-	2,150.0
First Pit at Athi	8.7	435.0	550.0	-	621.0	10.4	14.5	1,820.0
Sec Pit at Athi (28/2)	6.7	285.0	140.0	290.0	190.0	100.0	175.0x (Turbid Water)	780.0
Kibwezi Spr at Rail St	6.7	260.0	25.0	160.0	85.0	75.0	15.0	590.0
Masongaleni	8.6	35.0	135.0	385.0	175.0	210.0	40.0	1,500.0
Kibwezi at BR	8.3	25.0	60.0	245.0	125.0	120.0	45.0	900.0

Sulphates tested by turbidity method: samples marked "x" were not clear enough to yield reliable values of SO₄ (which are probably high).

PLUMOSUS

QUALITY SPECIFICATIONS

Grade	Stem Length (cm)	Width of Branch (cm)	Width of Branch (cm)	Colour Green	Dirt	Crooked Stems	Pinched	Side Branches Missing	Dry Spots	Number of Side Branches
White	+67.0	+27.0	+30.0	Dark	Nil	Slight	No (yes)	3	Few	NA
Blue	+54.0	NA	+27.5	Dark	Nil	Slight	No (yes)	3	Few	NA
Yellow	+42.0	NA	+20.0	Dark	Nil	Slight	No (yes)	3	Few	NA
Green	+34.0	NA	+15.0	Dark	Nil	Slight	No (yes)	3	Few	NA
Red/Blue	60.0-67.5	+27.0	22.0-26.0	Dark	Nil	Slight	Yes	3	Few	6(5)
Red/Yellow	52.5-60.0	+27.0	20.0-23.0	*Dark	Nil	Slight	Yes	3	Few	6(5)
Red/Green	45.0-52.5	+27.0	18.0-21.0	Dark	Nil	Slight	Yes	3	Few	6(5)
Brown	38.0-45.0	NA	13.0-18.0	Dark	Nil	Slight	Yes	3	Few	5(4)
Grey	30.0-38.0	NA	NA	Dark	Nil	Slight	Yes	3	Few	4

EXPLANATIONS AND DEFINITIONS OF QUALITY1 Stem Length

1.01 White, blue, yellow and green grades to be measured from stem base to tip. These grades are not pinched.

1.02 Red, brown and grey grades to be measured from stem base to pinch. The pinch shall be done just above the top branch and any stubb remaining shall be removed.

2 Width of Branch

To be measured at the widest part of the branch.

3 Depth of Branch

To be measured from tip of branch for white, blue, yellow and green grades and from pinch of red, brown and grey grades to the lowest placed side branch.

4 Colour

No other colour than dark green is accepted.

5 Dirt

Soil and chemical residues.

6 Crooked Stems

Crooked stems have sharp bends or zigzag bends. .

7 Pinched

Tip of branch is removed. If tip is lost on white, blue, yellow and green shades, they are still considered non-pinched if the width at the top is less than -

white	-	10 cm
blue	-	10 cm
yellow	-	7.5 cm
green	-	5 cm

8 Side Branches Missing

One plumosus branch can be missing maximum three side branches, but only two can be missing consecutively.

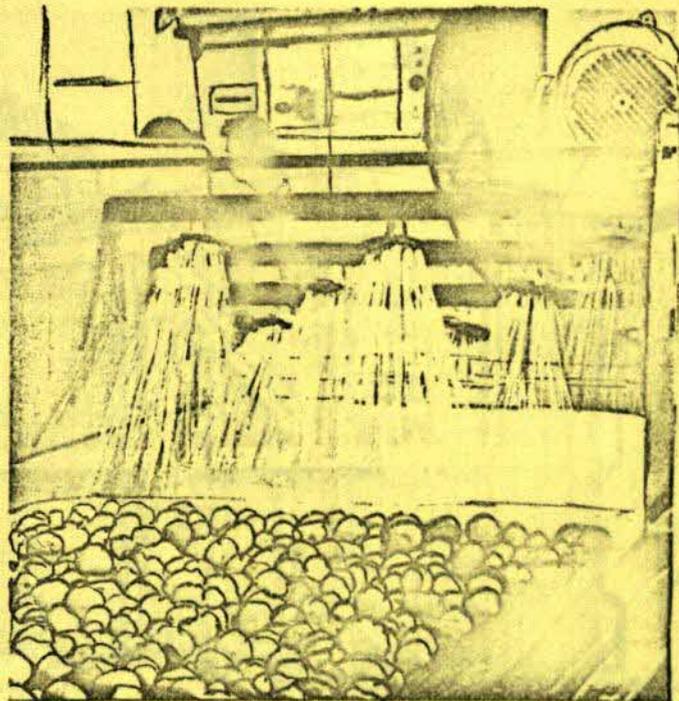
9 Dry Spots

Burnings can only be allowed to a very small degree. They should not be seen unless they are really looked for.

10 Number of Side Branches

Red grades are allowed to have only five side branches, if the width is more than 40 cm. Brown grades are allowed to have only four side branches if the width is more than 40 cm.

TIME RIPE FOR TOMATO PASTE PLANT IN KENYA



■ The time is ripe for the establishment of a tomato paste processing plant in Kenya, says a report of the Food Industries Group of the Joint ECA/UNIDO Industry Division.

Presently, Kenya's consumption of tomato paste is approximately 1500 tons per year, whilst that of the entire East African Community (Kenya, Tanzania and Uganda) is approximately 3,000 tons per year. The report envisages the setting up of a medium size tomato processing plant to cater for this and other markets. For instance, the Arabian peninsula poses as a large and promising market for tomato paste and other food products. The team spent only ten days on the project while in Kenya and, therefore, was not able to obtain sufficient data to produce a feasibility study for the project. However, the study they were able to undertake, relating to all the pertinent factors required for such a project, convinced them that good prospects exist for its establishment.

Although, in Kenya, the small scale cultivation of tomatoes, for the fresh market, is increasing, so far large scale cultivation has not been organized. The report suggests that large scale operations can be arranged in places where

adequate, and suitable, land and irrigation are available, such as in the Kibwege area, south east of Nairobi and, in the Nawasha area, north of Nairobi.

It emphasizes, however, that to ensure a regular supply of tomatoes to the plant and to avoid long distance haulage with its subsequent, almost inevitable, damage to the fruit, the proposed processing plant must be sited in the centre of the growing area.

PROBLEMS TO COMBAT

In instances, the problems faced by a small to medium size conventional tomato paste factory already established in Kenya between the towns of Nakuru and Nawasha, which produces 400 to 500 tons of tomato paste a year.

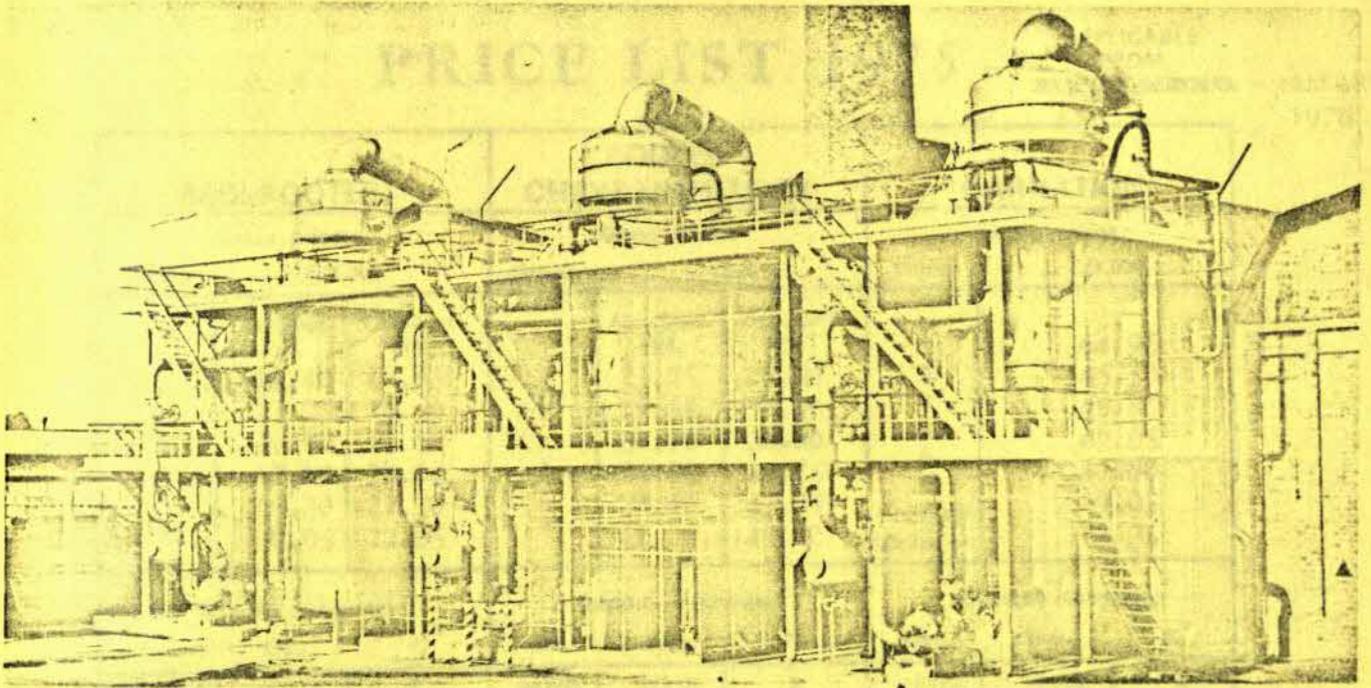
The capacity of this plant is considered to be under-utilized, as its present output appears to be one sixth of its capacity in terms of a 250 day, three shifts (24 hours) operation. The reason for this is the lack of a dependable and sufficient supply of suitably high and uniform quality tomatoes, at an economic price.

The bulk of the factory's input consists of supplies from small growers, but these people also

supply the fresh market, where the price paid is generally higher than that offered by the factory. Obviously then, the fresh market is more attractive to outgrowers and the factory finds its plant under-utilized since it has not got sufficient control over the production and deliveries of the tomatoes it requires for processing.

To obviate these problems, the report suggests that, initially, tomatoes will have to be cultivated on a large scale to produce 18,000 tons of tomatoes, the minimum quantity required for producing 3,000 tons of double strength tomato paste. A conservative estimated yield of 40 tons per hectare, will require 450 hectares and assuming a four year crop rotation, with a variety of crops not susceptible to, or a carrier of, tomato pests and diseases, a total plantation area of 1800 hectares will be needed.

The ECA team was not able to obtain an estimate of the cost of establishing the required tomato plantation, because they were not in possession of local cost figures. It will, no doubt, involve extensive investment in acquiring land, transportation equipment, tractors, farm buildings, staff, fertilizers and other inputs.



▲ Left, washing and sorting the fruit and, above, three Rossi and Catelli continuous evaporators which have a working capacity of over 1,500 tons of fresh tomatoes in 24 hours. Photos Courtesy of Rossi and Catelli and FAO.

The team suggest, however, that a working capital of US\$ 1,000,000 would be required for the factory, with plant and buildings costing US\$ 700,000. They anticipate a selling price of US\$ 900 per ton, at factory, for the domestic and the export markets and that the volume of sales for the domestic market would reach 1500 tons (US\$ 1,350,000 at factory). They opine that sales would be roughly the same for the export market.

RAW MATERIALS

As for raw materials, tomatoes will be obtained from the plantation, it is recommended to be established, and also from out-growers who presently seem to be increasing their output. Tin cans may, initially, be obtained from Metal Box (Kenya) Ltd. Thika, in Kenya, and cartons can be obtained from domestic sources.

The project's infrastructural requirement, power, water, sewerage, transport etc. already exists in the area recommended for implementing the project.

The team estimate that it will take about a year to design and construct the factory and that it

will need 52 people (5 management, 3 administrative, 4 skilled and 40 unskilled) to run it.

PERSONNEL TRAINING

It will be necessary to implement a training programme, geared towards equipping local personnel with the specialized knowledge they will require in the procuring of tomatoes for processing, food technology, hygiene, quality standards and operation of a food processing plant. Such training could be arranged locally, or abroad, depending on the level of achievement required.

Precise personnel requirements for the cultivation of tomatoes in the plantation, cannot be determined until the growing and harvesting methods have been determined. However, the team recommend, labour intensive, rather than capital intensive, methods.

Besides creating employment for 52 people, the project, once it is successfully started, will have an employment creating impact on related enterprises, the cultivation of tomatoes, the production of tin cans and cartons, and

transport. It should contribute to the further development of the container industry, improve the development of the food processing industry and the horticultural production in Kenya. It should also contribute towards rural development by helping to bring about improvements to the infrastructure in the area in which it is located.

If successfully implemented, the project should enable Kenya to export, rather than import, tomato paste. This will reduce her import bill and provide her with much needed foreign exchange.

It must, however, be re-stated that this exercise was not a full pre-investment or feasibility study, of the type needed before a decision can be taken to invest. Its objects are simply to draw attention to an investment opportunity and to supply some basic facts relating to it.

For those whose interests have been aroused and would like to know more about the project, it is suggested that they write to: Mr. W.R. Millager, Senior Industrial Field Adviser, UNDP, P.O.Box 30218, Nairobi, Kenya.

PRICE LIST 1975

APPLICABLE
FROM
15 OCTOBER 1975JANUARY
1976

REDI-ROOTER*			ROOTED CHRYSANTHEMUM			CARNATION		
Gross prices:			Gross prices:			Gross prices:		
Group	£/1,000		Group	£/1,000		Group	£/1,000	
	May-Sept incl.	Oct-April incl.		May-Sept incl.	Oct-April incl.			
1	14.40	16.85	1	25.25	28.30	1	44.95	
2	15.25	18.30	2	27.55	32.20	2	45.50	
3	16.80	19.80	3	31.70	36.00	3	45.85	
4	17.60	20.60	4	34.65	40.75	4	46.65	
5	19.30	21.30	5	38.40	43.35	5	47.80	
6	20.05	22.05	6	41.80	47.40	6	49.05	
						Unrooted Deduction	12.35	
Quantity discounts:			Quantity discounts:			Quantity discounts:		
Min.	Max.	%	Min.	Max.	%	Min.	Max.	%
250,000	499,750	1	20,000	34,750	2	10,000	19,750	4
500,000	999,750	2	35,000	49,750	5	20,000	34,750	5
1,000,000	1,499,750	3	50,000	74,750	8	35,000	49,750	6
1,500,000	1,999,750	4	75,000	99,750	12	50,000	74,750	8
			100,000	199,750	13	75,000	99,750	10
			200,000	299,750	14	100,000	199,750	11
			300,000	399,750	15			
			400,000	and over	16			
The quantity discount is dependent on your total purchase per calendar year contracted in advance. By application to our Sales Office full details are available to you for orders of more than 2,000,000 plants.			The quantity discount is dependent on your total purchase per calendar year contracted in advance.			The quantity discount is dependent on your total purchase per calendar year contracted in advance. By application to our Sales Office full details are available to you for orders of more than 200,000 plants.		
Packing: Packing is charged at 0.80/1,000 plants net-outside the discount system. Cuttings are delivered in boxes containing 1,000 or 500 plants. Minimum per delivery is 1,000 and per variety 250 plants. Minimum contract 50,000 plants per year.			Packing: Packing is charged at 0.80/1,000 plants net-outside the discount system. Cuttings are delivered in boxes containing 500 or 250 plants. Minimum per delivery is 1,000 and per variety 250 plants.			Packing: 0.80 Packing is charged at 0.80/1,000 plants net-outside the discount system. Cuttings are delivered in boxes containing 250 plants. Minimum per delivery is 1,000 and per variety 250 plants.		

DISCOUNTS FOR EARLY ORDER

The following early order discounts are available to you if payment is made within 10 days of delivery.

Ordered up to:

12 weeks before delivery	3%
from 13 to 26 weeks before delivery	7%
27 weeks or more before delivery	12%

YOUR PRICE

- 1) Calculate your total intake and gross price for the calendar year.
- 2) Find the corresponding quantity discount.
- 3) Add this to the appropriate early order and punctual payment discount.
- 4) Subtract the discount total from the gross price.
- 5) Add packing charges.
- 6) Add value added tax — and the answer is YOUR net price.

TERMS OF SALE

1) VALIDITY OF ORDERS

Orders are accepted by the Company's office at Bishop's Stortford only when an acknowledgement of order has been posted to the buyer.

2) PRICES, DISCOUNTS AND PAYMENT

Orders are registered at the prices, discounts, and terms of sale in force at the date of delivery. No further discounts are allowed. Where duties or taxes are levied or increased prior to delivery, the Company reserves the right to increase the charges accordingly. Prices are based on exchange rates current at 1st November 1975. Where substantial changes in these rates occur prior to delivery the Company reserves the right to adjust prices accordingly. Quantity discount is calculated according to the price list current at the date of delivery. Payments must be made to the Company's office within 10 days and must be made in delivery date order. Discounts for early order and punctual payment can only be allowed when payment reaches the Company's office prior to or on the due date. Overdue accounts will be charged interest of 2% per month retrospective to the date of delivery.

3) TRANSPORT

Shipments are made free of charge at the buyer's risk to the nearest main line station or airport and any claims for loss or damage in transit should be made to the transporter. In the event of the transporter not accepting liability for any loss or damage in transit, the buyer shall be deemed to accept full liability. Export orders (including Republic of Ireland, Northern Ireland, and Channel Islands) are Free on Board either aircraft or ship. Cuttings bought from this Company may not be re-exported.

4) COMPLAINTS AND COMPENSATION

Complaints can only be accepted when notified in writing to the Company's office. The buyer must examine cuttings upon arrival and complaints of visible defects must be reported in writing within 24 hours of receipt of cuttings.

5) LIABILITY

Whilst every effort is made to ensure that the stock is of highest quality, true to description and free from pests and disease, cuttings are sold without warranty, express or implied, as to description, quality, productivity or freedom from pests and disease. Where the Company's production is delayed or fails, the Company reserves the right to make part delivery or changes in variety without being liable to compensation. The Company's maximum liability on complaints is limited to the invoice value and the liability will be extinguished by a credit note, cash, or by a new delivery to be effected when the Company's production so allows. The Company's advisory service is available to the buyer free of charge, but without liability to the Company.

6) CANCELLATION AND CHANGES

The Company reserves the right of cancellation if it has found that the buyer has not kept his obligations of payment in connection with earlier deliveries and the Company informs the buyer of this at the latest one week before the date of delivery. The Company reserves the right to charge the buyer 20% of the invoice value of future deliveries already accepted and cancelled due to the buyer's non-payment of previous invoices. All changes at the buyer's request in dates of delivery, quantities or varieties will be regarded as cancellations. The Company reserves the right to compensation on the buyer's cancellation by charging the buyer at one of the following:

- a) Cancellations received 6 weeks or less prior to delivery—full invoice value.
- b) Cancellations received more than 6 weeks prior to delivery—20% of invoice value.

7) VARIETY PROTECTION

All protected varieties for which plant breeders' rights have been granted or have been applied for, indicated by **P** in the variety list, are supplied subject to the following conditions:

- a) Cuttings of protected varieties may only be used for self-flowering cultivation and are to be disposed of in no other way.
- b) Self-propagation shall only be permissible under special licence granted by the owner or his accredited representative.
- c) The finder of mutations from protected varieties has to inform the patent owner or his accredited representatives immediately upon finding all mutations. Commercial evaluation of all such mutations is subject to a special agreement between finder and the owner of the protection rights.
- d) All protected varieties are subject to fee due to the owner of the variety in the U.K. This fee has been included in the gross prices stated in the Company's current price list.
- e) The placing of an order for these protected varieties constitutes an acceptance of these conditions.

8) GENERAL

All notices and other communications shall be deemed to have been received on the day following posting, except in the case of export orders. The placing of an order constitutes an acceptance of these terms. Previous terms of sale are cancelled.

DCK Nurseries Limited. Registered office: 20 Nails Lane, Bishop's Stortford, Hertfordshire.
 Phone: Bishop's Stortford (0279) 55097. Directors: J. Bonde Nielsen (Danish)
 The Hon. B. R. McKenzie, EGH, DSO, DFC (Kenyan)

/two words

JOB DESCRIPTION, TECHNICAL MANAGER, PRODUCTION CONTROLJobs to be Supervised

Field inspections
 Processing inspections
 Shipping inspections
 Laboratory
 Research and development
 Office

1 Narative Descriptions

1.01 The Technical Manager is the Managerial and Administrative Head of the Technical Department on the project.

1.02 Supervised by the Plant Pathologist, he controls daily the insect and disease situation, order and alter treatment to fit present situation, and carried out experiments with new chemicals, methods and techniques.

1.03 Supervised by the Research and Development Manager, he carries out all the experiments connected with cultivation, harvesting, packing, storage and shipping.

1.04 Supervised by the Technical Director, he checks daily all production phases in the field and processing areas, and is responsible that these checks are carried out to give true information for safeguarding an economic production.

2 Responsibilities2.01 Technical

(1) Co-ordination of field insect and disease inspection reports, insect and disease control treatments, irrigation and rainfall reports to determine the need of extra applications (I&D).

(2) Based on reports (a), order and alter routine insect and disease control applications (I&D).

(3) When new insect and disease problems develop, have them diagnosed by the Plant Pathologist (I&D).

(4) To test out old and new chemicals, tools and equipment and methods or any other field or laboratory experiments ordered by the Plant Pathologist (I&D).

(5) To carry out all experiments connected to cultivation, harvesting, packing, storage and shipping, ordered by the Manager for research and development (R&D).

(6) Co-ordination of rainfall, evaporation, soil humidity, water level in the soil and irrigation reports, to prepare irrigation instructions (PC).

(7) Co-ordination of soil and leaf analysis with feeding programmes to determine the need of changes in the programme (PC).

(8) To adjust quality and work standards to fit present situation (PC).

2.02 Field

(1) Daily inspections and registration of pest and diseases and physiological disorders in the field (I&D).

(2) Daily inspections of chemical applications (I&D).

(3) Monthly inspections of equipment for applications of chemicals (I&D).

(4) Inspection of the origin and quality of chemicals and materials purchased for insect and disease control (I&D).

(5) Daily inspections, measurement and registration of results from experiments (I&D and R&D).

(6) Daily collection of environmental data as rainfall, humidity, evaporation, temperature and water flow/level (PC).

(7) Daily inspections and registration of work performance and quality (PC).

(8) Daily inspection of quantity water irrigated, soil humidity and soil water level (PC).

(9) Daily collection of water used for irrigation and spraying (PC).

(10) Daily inspections and registration of temperatures in cold-stores and refrigerated lorries.

(11) Daily inspections and registration of artificial light given to chrysanthemum (PC).

(12) Regular inspections of the functioning of the production facilities (PC).

(13) Regular test flowering of chrysanthemum for control of mixing (PC).

(14) Regular sampling of soil and plants for evaluation of the requirement of nutrients required (PC).

2.03 Laboratory

(1) Regular examination of flower bud initiation in chrysanthemum cuttings (PC).

(2) Examination of pests on chrysanthemum cuttings for shipment with less than 10 days cold storage (I&D).

(3) Preparation of disinfectant liquid and rooting hormones for chrysanthemum (I&D).

(4) Regular evaluation of plumosus needle crop caused by the spider mite population in the fields, in order to determine when to apply extra treatments (I&D).

(5) Determination of electric conductivity of irrigation solutions and water for spray liquids (I&D and PC).

(6) Portioning of chemicals for experiment (I&D).

2.04 Administration

(1) Calculation of field inspect and disease inspection results and preparation of weekly and yearly reports (I&D).

(2) Calculation of production control field inspection results and preparation of daily, weekly and yearly reports (PC).

(3) Preparation of chemical requirement plan, calculating and preparing a monthly and yearly report of chemical consumption (I&D).

(4) Preparation of fertiliser requirement plan, calculating and preparing a monthly and yearly report of fertiliser consumption (PC).

(5) Collection of experimental datas which are then forwarded to Managers of Inspect and Disease Control Department and Research and Development Departments (I&D and R&D).

(6) Preparation of working and operation plan (I&D, R&D and PC).

(7) To supply other departments with up-dated instructions whenever corrections are being made (I&D and PC).

(8) To learn about pest and diseases and their control (I&D).

(9) To train staff and labourers (I&D, PC and R&D).

(10) To manage the labour force required in the Technical Department (I&D, R&D and PC).

(11) Keep statistics over quality, standards, environment, feeding solutions and cold store temperatures (PC).

3 Qualifications

3.01 Schools

A Bachelor Degree of similar in horticulture.

3.02 Experience

Preference should be given to a person with experience of chrysanthemum cutting production and plumosus production. Job experience from tropical conditions is an advantage.

PRODUCT CONTROL - CARNATIONSAWB : 220-4528 5295/220-4528 5306

Variety/Grade STANDARD	Box	Problem code	%age	Temperature °C	Number of stems	Cut stage	Flow diameter (cm)	Stem length	Stem strength
Mixed white	n11284	131 129	100 50	18	-	-	-	-	-
Mixed white	n11302	131 129	100 50	18	-	-	-	-	-
Mixed white	n11252	131 129	100 40	20	-	-	-	-	-
Mixed white	n11286	131	100	14	-	-	-	-	-
Mixed blue	n11406	131 129	100 50	20	-	-	-	-	-
Mixed blue	n11289	131	100	19	-	-	-	-	-
Mixed blue	n11334	131	100	17	-	-	-	-	-
Mixed blue	n11346	131	100	15	-	-	-	-	-
Karalis white	n11474	612	50	23	20	6-7	5,6	72	3
Imp new pink white	n11472	608	25	23	20	5-7	5,0	71	2
Scania white	n11468	131 608	100 10	22	20	6-7	5,3	67	2
Scania blue	nf1590	131	100	17	-	-	-	-	-
Scania yellow	nf1601	ok	-	15	-	-	-	-	-
Flamingo sim yellow	1u1008	131 254	100 15	12	20	7-9	6,9	48	0
Imp new pink yellow	1u1009	608	20	14	20	6-7	6,0	50	0
Mixed red	n11531	131	100	21	-	-	-	-	-
Mixed brown	n11500	131 129	100 50	19	-	-	-	-	-
Mixed brown	nf1150	ok	-	17	-	-	-	-	-

PRODUCT CONTROL - CARNATIONS

AWB : 220-4528 5295/220-4528 5306

Variety/Grade SPRAY	Box	Problem code	%age	Temperature °C	Number of stems	Cut stage	Flow diameter (cm)	Stem length	Stem strength
Tony white	n12036	ok	-	16	10	1-7	-	65	5
Red baron blue	lu1002	605	20	13	-	-	-	-	-
Red baron blue	lu1001	131 605	100 10	13	-	-	-	-	-
Red baron yellow	lu1005	605	50	15	10	1-7	-	50	0
Red baron yellow	lu1006	605 131	10 100	12	-	-	-	-	-
Sams pride white	n12037	053 140 253	50 100* 50	15	10	1-7	-	68	0
Tony white	n12026	ok	-	14	-	-	-	-	-
Sams pride white	n12042	ok	-	18	10	1-7	-	66	5
Sams pride white	n12032	053 253 140	50 30 100*	15	-	-	-	-	-
Sams pride white	n12033	254	20	14	-	-	-	-	-
Sams pride white	n12040	053 253 140	50 50 100*	15	-	-	-	-	-

* dark pink elegance

PRODUCT CONTROL REPORT

R E P O R T

CARNATIONS

APPENDIX 7(a)

For: DCK KENYA - LE

From: EVERGREEN - SD

Re: Product Control

Product: Carnations

Date: 5. 11. 75

1. Dep Nairobi _____ hrs _____ 75
2. Arr Frankft 12.55 z hrs 5. 11. 75 S. H. 13.30 z hrs 5. 11.
3. Transport hrs _____
4. AWB No 220-4528 5295/220-4528 5306
5. Carrier LH 7539
6. Split Shipmt NO
7. No of boxes arr 929+827 controlled 29
8. Temperatures Air 10 °C Standard 12-23 °C Spray 12-18

9. General Statement

- Standard: GOOD - EXCELLENT

- Spray : GOOD

10. Problem Summary

<u>Problem</u>	<u>Code</u>	<u>No Boxes with Problem</u>	<u>% of Problem</u>
wilted flowers	053	3	50
sliding of bundles	129	5	50
wet flowers	131	12	100
variety mixture	140	3	100
too tight cut stage	253	3	30-50
too open cut stage	254	2	15-20
calyx split	605	4	10-50
crooked stems	608	3	10-25
other flow. discolour	612	1	50

11. Comments

Standard Carnations : Condensed water, sliding of bundles in boxes and high temperature.

Spray carnations : Red baron: calyx split

Dark pink elegance : too early cut stage and wilted flowers high temperature.

PRODUCT CONTROL REPORT

REPORT

PLUMOSUS

APPENDIX 7(b)

For: DCK KENYA - LE

From: EVERGREEN - SD

Re: PRODUCT CONTROL

Product: PLUMOSUS

Date: 11. 9. 75

RECEIVED
15 SEP 1975

- 1. Dep Nairobi _____ hrs _____ 75
- 2. Arr Frankft 04.00z hrs 11. 9. 75 Kelst 08.00z hrs 11. 9.
- 3. Transport hrs _____
- 4. AWB No 094-7111 1941
- 5. Carrier LH 541
- 6. Split Shipmt NO
- 7. No of boxes arr 207 controlled 40 bundles
- 8. Temperatures Air 20 °C Box 13-16 °C
- 9. General Statement: GOOD

Boxes with Brown grade contain per box 2-3 bundles grey grade.
Half of the boxes are soaked.

Grade	No Stems per bdl	Needle Drop	Problems (No per bdl)			Weight per bdl	Dirt	Harvest Day/
			Length	Width	Br Tips			
White	50	2,2	ok,	2,0	7,6	475+/-75		1/37,2/37
Blue	50	1,9	ok.	-	4,0	305+/-35		"
Yellow	49	1,7	ok.	-	5,2	200+/-10		"
Green	50	1,4	2,0	-	3,0	140+/-15		"
Red/Sup	50	2,9	ok.	ok.	7,4	535+/-35		"
Red/Std	50	2,9	ok.	ok.	8,6	505+/-55		"
Brown	50	2,0	ok.	-	4,4	302+/-33		"
Grey	50	2,1	ok.	-	5,4	275+/-25		"

CARNATIONS

QUALITY SPECIFICATIONS

Grade	Stem length including flowers	Splitted calyx	Cut stage	Flowers per stem	Crooked stems	Small and hollow flowers	Bull heads	Slab sided flowers	Flushings	Diseases pests and scorch	Stem strength (cm)	Dirt	Wilted flowers	Sleepy flowers
<u>Standard Flowers</u>														
White	+65	Nil	5-9	1	Slight	Nil	Nil	Slight	Nil	Nil	Max 20	Slight	Slight	Nil
Blue	55-65	Nil	5-9	1	Slight	Nil	Nil	Slight	Nil	Nil	Max 20	Slight	Slight	Nil
Yellow	45-55	Nil	5-9	1	Slight	Nil	Nil	Slight	Nil	Nil	Max 20	Slight	Slight	Nil
Red	45-55	100%	5-9	1	Slight	Nil	Nil	Slight	Nil	Nil	Max 20	Slight	Slight	Nil
Brown	30-45	0-100%	5-9	1	Slight	Yes	Nil	Yes	Yes	Nil	Max 20	Slight	Slight	Nil
<u>Spray Flowers</u>														
White	+55	-	4-9	+4	Slight	-	-	-	-	Nil	-	Slight	Slight	Nil
Blue	45-55	-	4-9	+4	Slight	-	-	-	-	Nil	-	Slight	Slight	Nil
Yellow	30-45	-	4-9	+3	Slight	-	-	-	-	Nil	-	Slight	Slight	Nil

EXPLANATIONS AND DEFINITIONS OF QUALITY1 Splitted Flowers

A splitted flower has the calyx splitted more than 75% and having petals falling out through the splitted calyx. Double splitted flowers to be discarded.

2 Cut Stage

2.01 Cut stage is defining flowering stage. A picture set prepared in October 1973 is used for defining the cut stage.

2.02 Cut stage on spray varieties is defining the flowering stage of the more open flower on the stem.

3 Crooked Stems

The normal curve of the stem is not considered as crooked. Crooked stems are sharp bends and zigzag bends on the stem caused by the support netting.

4 Small and Hollow Flowers

Small flowers are flowers with less than 6.5 cm in diameter at cut stage 10. Hollow flowers are flowers with too few petals.

5 Bullheads

Calyx is large and ball-shaped. Flower form is not normal.

6 Slabsided Flowers

One side of flower with late developing petals.

7 Flushing

Red-blue or violet tones on white varieties only. The red stripes sometimes appearing are not flushing.

8 Diseases, Pests and Scorch

Any diseases on stem, leaves and flowers. Any virus symptoms and chlorosis on leaves. Any pests on stem, leaves and flowers. Any damage of petal edges, which is black or brown (scorch).

9 Dirt

Chemical residues and soil on stem, foliage and flower.

10 Flower Per Stem

This concerns only spray varieties. A flower bud is considered a flower when petals can be seen.

11 Wilted Flowers

Wilted leaves and petals which recover after having been placed in water for 24 hours.

12 Sleepy Flowers

Wilted incurved petals which do not recover after having been placed in water for 24 hours.

BIBLIOGRAPHY

The following papers were placed at the mission's disposal -

- DCK Development Plan, 1975-1980 and Appendix. June 1975
- Report on Floricultural and Agricultural Production in Kenya and Sales and Distribution in Europe. IAI October, 1975.
- Notes on Project Development. IAI 10.11.1975 ("green book").
- Product Cost Information DCK (East Africa) Ltd 19.11.1975 ("red book").
- Supplement to Product Cost Information DCK (East Africa) Ltd 18.12.1975.
- IAI Report on the Consolidated Trading Account for the Year ended 30th June 1975. Binder Dijker Otto & Co 10.11.1975.
- IAI Report on the Pro-forma Consolidated Balance Sheet as at 1st July 1975. Binder Dijker Otto & Co 10.11.1975. Kenya Balance Sheets, IAI.

Notes on -

- Market and Sales
- Product Description
- Group Expansion in Tropical Areas
- Outgrowers' Project
- Traffic and Transport Facilities
- Supply of Energy and Water
- The Project Companies in Kenya
- Management and Personnel in Kenya
- Leasehold and Freehold Land etc
- Description of Fixed Assets
- Investment Agreement with the Government of the Republic of Kenya
- Special State Approvals, Benefits, Duties and Obligations for the Group's Operations in Kenya
- Labour Agreements

The mission also consulted the following publications -

- The Market for Cut Flowers in Certain Western European Countries
International Trade Centre, Geneva, August 1973.
- European Horticultural Statistics, Non-edible Horticultural Products.
International Association of Horticultural Producers, Hanover 1975.

