

# COTTON MARKETING PROJECT

## Feasibility Study

**Annex 5 Grading and Testing**

**Annex 6 Telecommunications**

**Annex 7 Marketing, Organisation  
and Management**

**Annex 8 Financial and Economic Analysis**

SIR M MACDONALD & PARTNERS LIMITED  
in association with  
ASSOCIATED CONSULTANTS & PARTNERS  
THE BRITISH COTTON GROWING ASSOCIATION LIMITED  
HUNTING TECHNICAL SERVICES LIMITED  
MOTT, HAY & ANDERSON INTERNATIONAL LIMITED  
PEAT, MARWICK, MITCHELL & COMPANY

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## COTTON MARKETING PROJECT

### FEASIBILITY STUDY

The Final Report comprises the following four volumes:

1. Main Report
2. Annex 1 - Inventory
3. Annex 2 - Pest Control  
Annex 3 - Ginning  
Annex 4 - Transport and Storage
4. Annex 5 - Grading and Testing  
Annex 6 - Telecommunications  
Annex 7 - Marketing, Organisation and Management  
Annex 8 - Financial and Economic Analysis

# ANNEX 5

## CONTENTS

	Page No.
CHAPTER 1 INTRODUCTION	A5-1
CHAPTER 2 EXISTING ARRANGEMENTS	
2.1 Organisation and Staffing	A5-1
2.2 Seed Cotton Grading	A5-7
2.3 Grading and Classification of Lint	A5-4
2.4 Testing Facilities	A5-3
CHAPTER 3 FUTURE ARRANGEMENTS	
3.1 Grading and Classification Systems	A5-4
3.1.1 General	A5-4
3.1.2 Long Staple Cotton	A5-4
3.1.3 <b>ANNEX 5</b> Short Staple Cotton	A5-5
3.1.4 Short Staple Cotton	A5-7
3.2 Sampling	A5-8
<b>GRADING AND TESTING</b>	A5-8
3.2.1 Automatic Sampling	A5-8
3.3 Testing Requirements	A5-1
3.4 Organisation	A5-11
3.5 Grading Charges	A5-11
CHAPTER 4 HONEYDEW	
4.1 General	A5-13
4.2 Assessment of Honeydew Contamination	A5-14
CHAPTER 5 GRADING AND TESTING CENTRE	
5.1 Buildings and Facilities	A5-16
5.2 Testing Equipment	A5-18
5.3 Staffing	A5-18
CHAPTER 6 RECRUITMENT AND TRAINING	
6.1 General	A5-22
6.2 Training Facilities	A5-22
6.3 Proposed Training Programme	A5-22
6.3.1 Cotton Graders	A5-22
6.3.2 Lint Classifiers	A5-22
6.3.3 Laboratory Technicians	A5-24
6.4 Technical Assistants	A5-24

## ANNEX 5

### CONTENTS

	Page Nr
CHAPTER 1 INTRODUCTION	A5-1
CHAPTER 2 EXISTING ARRANGEMENTS	
2.1 Organisation and Staffing	A5-3
2.2 Seed Cotton Grading	A5-3
2.3 Grading and Classification of Lint	A5-4
2.4 Testing Facilities	A5-5
CHAPTER 3 FUTURE ARRANGEMENTS	
3.1 Grading and Classification System	A5-6
3.1.1 General	A5-6
3.1.2 Long Staple Cotton	A5-6
3.1.3 Medium Staple Cotton	A5-6
3.1.4 Short Staple Cotton	A5-7
3.2 Sampling	A5-8
3.2.1 Sampling Frequency	A5-8
3.2.2 Automatic Sampling	A5-8
3.3 Testing Requirements	A5-9
3.4 Organisation	A5-11
3.5 Grading Charges	A5-11
CHAPTER 4 HONEYDEW	
4.1 General	A5-13
4.2 Assessment of Honeydew Contamination	A5-14
CHAPTER 5 GRADING AND TESTING CENTRE	
5.1 Buildings and Facilities	A5-16
5.2 Testing Equipment	A5-18
5.3 Staffing	A5-18
CHAPTER 6 RECRUITMENT AND TRAINING	
6.1 General	A5-20
6.2 Training Facilities	A5-21
6.3 Proposed Training Programme	A5-22
6.3.1 Cotton Graders	A5-22
6.3.2 Lint Classifiers	A5-22
6.3.3 Laboratory Technicians	A5-24
6.4 Technical Assistance	A5-24

CONTENTS (cont.)

		Page Nr
APPENDIX I	Measurement of Cotton Properties	A5-25
APPENDIX II	List of Suppliers of Cotton Testing Equipment	A5-30
APPENDIX III	Improvements to Cotton Research Laboratory of ARC at Wad Medani	A5-32
APPENDIX IV	Fibre Testing Laboratory - Khartoum Polytechnic - List of Testing Equipment	A5-34
APPENDIX V	List of Useful Publications	A5-37
APPENDIX VI	Honeydew Rules of the Milan Arbitration House	A5-38
APPENDIX VII	Tests for Honeydew	A5-41

## LIST OF TABLES

Table Nr	Title	Page Nr
5.1	Costs of Grading and Testing Centre	A5-18
5.2	Costs of Equipment and Instruments Recommended for Testing Laboratory	A5-19
5.3	Staffing of Proposed Grading and Testing Centre	A5-18
6.1	Proposed Programme of Overseas Training Courses	A5-23
6.2	Costs of Training Courses	A5-24

## LIST OF FIGURES

Figure Nr	Title	Following Page Nr
5.1	Grading and Testing Centre Port Sudan - Elevation	A5-17
5.2	Grading and Testing Centre Port Sudan - Ground Floor Plan	A5-17
5.3	Grading and Testing Centre Port Sudan - Floor Plan	A5-17
5.4	Grading and Testing Centre Port Sudan - Floor Plan	A5-17

The grading, or classification, of cotton lint is necessary to identify for marketing purposes the characteristics of the lint on offer to intending purchasers, whether for local textile manufacture or for export. Lint is graded and classified according to its colour and degree of cleanliness, its staple length, and the strength, fineness and maturity of the fibres. A comprehensive and efficient lint grading and classification system will provide necessary and relevant information to the trade and the end-user and will place a value on the lint on which a marketing programme can be based, while identifying the place of such lint within the overall framework of world cotton production.

The better the grading and classification systems the higher the return which can be expected from the sale of the crop, with certain provisos:

## CHAPTER 1

### INTRODUCTION

Cotton grading and classification in the Sudan takes place at two stages :-

- (i) Seed cotton prior to ginning.
- (ii) Cotton lint after ginning.

Grading starts in the field with the farmer and his family and employed labour who start the process of segregation of seed cotton by :

- picking fully opened healthy mature locks of good colour;
- keeping early, middle and late crop pickings separate;
- keeping stained, diseased, damaged, and immature seed cotton separate;
- avoiding adulteration of good clean cotton with stained or damaged cotton, by picking over and sorting seed cotton prior to marketing;
- bagging different grades and pickings separately, avoiding contamination of bags with trash, sand, water, etc;
- timely picking when locks are at full maturity and before locks fall to the ground.

At the ginnery seed cotton is graded according to its relative colour and cleanliness on a visual basis by trained grading staff who have recourse to standard sample boxes of seed cotton grades for comparisons. Seed cotton is graded for two reasons :-

- (i) To reward the farmer for his efforts in producing higher quality seed cotton.
- (ii) To enable the ginner to obtain the best possible quality of lint from the cotton crop by segregating seed cotton according to grades, which are then ginned separately, with the aim of producing even running bales of lint within each grade standard.

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The better the grading and classification systems the higher the return which can be expected from the sale of the crop, with certain provisos :

(i) The farmer must be given sufficient incentive by ensuring that :

- the seed cotton price is acceptable to persuade him to grow cotton and to give the crop the full attention it requires;
- the differential price for higher grades is sufficient to reward the farmer for the effort in sorting and segregating the higher grades from the lower grades of seed cotton;
- the farmer receives timely and quick payment for his seed cotton;
- the farmer has complete trust in the marketing system - in the grading of his cotton and in the weighing and recording of same;
- the farmer receives full support from agricultural extension staff, the responsible producing authorities, and other government bodies.

(ii) Given well graded and good quality seed cotton, the ginning process must be carried out efficiently and quickly in order to maintain the quality of the cotton and to reduce the risk of deterioration of seed cotton by over-long storage. The bales of lint produced must be carefully stored and protected until such time as they are sold and despatched to the purchaser.

## CHAPTER 2

### EXISTING ARRANGEMENTS

#### 2.1 Organisation and Staffing

The grading of seed cotton, the setting of grade standards and the classification of lint have long been the responsibility of the Sudan Gezira Board, which employs cotton graders for the grading of seed cotton and cotton examiners for the classification of lint. The grading of seed cotton and the classification of lint come under the direction of the Chief Cotton Examiner whose base is at Port Sudan.

Seed cotton grading is under the supervision of a Chief Seedcotton Grader, whose headquarters are at Barakat, and who directs some 56 qualified cotton graders in the Gezira scheme and, together with the Chief Cotton Examiner, co-ordinates seed cotton grading in other cotton producing schemes. In addition the four private sector ginneries each employ their own qualified seed cotton graders. All seed cotton graders undergo six years of training and must pass an examination before being certificated as qualified graders. Non-qualified graders are not allowed to grade cotton but can assist the qualified graders during training.

At present the lint classification team in Port Sudan numbers seven cotton examiners, including the Chief Cotton Examiner, three of whom each have 30 years service and experience and four who have 25 years service and experience. Two experienced men have left since 1981, when there was a team of nine cotton examiners. The cotton examiners are assisted by a team of seven sampling technicians led by a Chief Sampling Technician with 30 years service and experience, the remaining members of the team having service ranging from 3 to 21 years. Additionally there are some twelve sampling labourers with service ranging between 10 and 29 years, three clerical staff, four drivers, and four messengers/miscellaneous workers.

The four export companies employ cotton classifiers at Port Sudan, but they are not recognised by the Chief Cotton Examiner as fully qualified cotton examiners.

#### 2.2 Seed Cotton Grading

The methods by which seed cotton grade standards are established are well-tried and tested. They were developed over many years under the Sudan Gezira Board management and historically were created for extra-long and long staple cotton. At the start of each cotton season the Chief Cotton Examiner and the Chief Cotton Grader, with their respective teams of examiners and graders, tour the cotton producing schemes where they inspect the crop to determine any seasonal differences and the quality of seed cotton likely to be presented for ginning. Samples are taken representing as many sections of each producing scheme as possible and these are taken to the appropriate ginnery where ginning tests are carried out under careful supervision. The seed cotton graders and the lint classifiers compare the new season's ginned lint from the various seed cotton samples with the lint grade

standards from the previous year and determine the comparable seed cotton grade standards required to produce the recognised standard Sudan lint grade samples.

The ginning tests also provide data on ginning performance, lint and seed outputs, and material for further testing at the Cotton Research Unit laboratory at Wad Medani.

The long staple cottons are graded from a top Grade 1 down to Grade 6 plus two residual grades. Medium staple cotton is graded from a top Grade 1 down to Grade 5.

Seed cotton grades are determined at the ginnery shortly after the cotton is received from collecting centres and prior to ginning. Each sack of cotton bears the identification of the grower, place of production, and whether it is first, second or third picking. Each sack is inspected by the grader and given an appropriate grade. Seed cotton grading is normally carried out in the early morning, from first full light until heat and glare diminish the graders perception, despite the protection of a sun shade or umbrella.

Each grade is stored separately in the ginnery yard, with the objective of being ginned by each individual grade into lots of 300 bales. This is achieved by delivering to the ginnery one thousand sacks of each grade from each picking. Seed cotton varies within the grade and within the picking and between pickings, but the system of grading and segregation does enable the ginner to produce a reasonably uniform grade of lint, and with further mixing and blending of seed cotton at the ginnery even running lots should be produced over most of the crop.

Farmers are paid on the grade given by the grading staff at the ginnery and on the weight which is determined at the ginnery after grading. While only a relatively small sample is taken from each sack for inspection and grading, if when the sack is finally emptied out at the ginnery it should contain excessive trash or damaged cotton, there is recourse to the grower by lowering the grade and value.

The link between the producing authority and the farmer is strong and mutual trust has developed as shown by the absence of malpractice on the part of the farmers and the acceptance by the farmers of the grades and weights awarded at the ginneries.

## **2.3 Grading and Classification of Lint**

Lint grading and classification is the responsibility of the Chief Cotton Examiner and his staff of examiners at Port Sudan, and is carried out there, including the sampling of bales at Port Sudan as they arrive. However, some sampling and classifying is also carried out at the ginneries by a team of examiners from Port Sudan.

The Chief Cotton Examiner is responsible for the preparation of standard grade samples of lint for the long staple varieties, duplicates of which are supplied to the international arbitration houses at Liverpool, Bremen, and Gdynia, and against which Sudan cotton is sold on the world market. Standard samples are not prepared for the medium staple cottons.

## 2.4 Testing Facilities

At present, no testing is carried out on the commercial cotton crop, and suitable facilities do not exist. There are existing cotton testing facilities at two laboratories in Sudan, the laboratory of the Cotton Research Unit of the ARC at Wad Medani, and the Cotton Fibre Testing Laboratory of the Department of Textile Technology at Khartoum Polytechnic.

The Cotton Research Unit laboratory has a comprehensive range of equipment, including a small scale spinning plant. These facilities are used by the research staff for testing new and improved strains of cotton varieties. Nevertheless some tests are at present carried out by the Research Unit on behalf of the Classification Unit of the SGB, and valuable information is provided. The laboratory is in need of spares, replacements and additional equipment in order to function effectively, and details of these requirements are given in Appendix III.

The Fibre Testing Laboratory at Khartoum Polytechnic has most of the basic instruments required for fibre testing, and also has yarn testing equipment and chemical testing apparatus. A list of the equipment available and of additional requirements is given in Appendix IV. The Polytechnic also has a small spinning unit and weaving equipment.

each year and the grade differentials examined and revised as appropriate, and the grading results of seed cotton and lint correlated. The base price should reflect the additional sales value of up-graded lint.

### 3.1.2 Long Staple Cotton

No change is envisaged or necessary in the system of grades for long staple cotton. The records show that the quantity of cotton of Grades 1 and 2 obtained at the ginneries has declined in recent years. This may be due to a number of factors. There are seasonal differences which can reduce or raise average quality of the crop. However, it is also possible that the price differential between medium and high grades is insufficiently attractive to farmers to encourage them to pick out what can be an extremely small percentage of Grade 1 and Grade 2 cotton in any crop. Long staple cotton is not machine-picked.

The present system of preparing standard sample boxes and pulling types for long staple cotton is adequate and satisfactory and is understood and accepted by the trade, although emphasis has been given to defining grades rather than differentiating staple lengths. For a hand-pulling classification the pulling types and standards for long staple are sufficiently accurate for the assessment of the spinning potential of the cotton and it would be difficult to differentiate 1/32's in the extra-long staple range of cottons by this method. Supplementary information could be supplied, however, from mechanical tests of the types and standards offered to the world market each year.

### 3.1.3 Medium Staple Cotton

Hand-picked medium staple cotton generally grades out between 1 and 3, but the two lower grades would be retained for mechanically harvested cottons. Should mechanical picking increase significantly it may become necessary to differentiate between machine picking methods.

Grades and lint classification of machine-harvested cottons will require further determination and separate categories.

## FUTURE ARRANGEMENTS

**3.1 Grading and Classification System****3.1.1 General**

It would appear from the comparison of seed cotton and lint grades that the grading system is operating satisfactorily from the point of view of both grower and ginner. It is to be expected that the ginning process will improve grades slightly, the roller ginning process to a lesser extent and the saw-ginnery to a greater extent. Both processes will improve the lower grades more than the higher grades of hand-picked seed cotton.

All grade improvements ultimately result in higher producer prices for the grower. At the same time if a substantial percentage of cotton was up-graded after ginning it could be argued that the seed cotton had been under-graded at the farmers' expense, and this is not evident. Nevertheless the producer price must be carefully reviewed each year and the grade differentials examined and revised as appropriate, and the grading results of seed cotton and lint correlated. The base price should reflect the additional sales value of up-graded lint.

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As much more medium staple cotton is being produced consideration should be given to improving the marketability of this cotton. The medium staple Acala is an American style cotton and should be treated similarly to American methods for marketing purposes.

Grade standard boxes should be established for medium staple cotton (similar to those established for the long staple varieties) covering a range of grades from 1 down to 5. Separate standard boxes should be prepared for roller-ginned and saw-ginned medium staple. Colour qualification can be included in sales contracts which would eliminate any concern about claims arising from loss of colour or discolouration of lint.

Medium staple cotton should be offered by staple description, i.e. 1.1/16" or 1.3/32" (or its metric equivalent). On this basis a fair average quality of the medium staple cotton could be established, which could be, for example -

Average Grade .... say .... Grade 2 G

Average Staple .... say .... 1.1/16"

Premiums would be required for cotton superior in grade and/or staple, while discounts would apply to inferior grades and/or staple.

It is appreciated that the foregoing changes in the grading and classification of medium staple cotton will increase the work-load of the classification department at Port Sudan, and that supplementary training will be required for the assessment of American upland styles of cotton, and this is discussed in Chapter 6.

It may be necessary in the short term to differentiate medium staple cottons by the production scheme (Rahad, Gezira, Suki, etc.) but in the long term it should be possible to establish a grade and staple classification for medium staple cotton which should be applicable to all production regardless of its source, although differentiation should remain for roller and saw gin processing.

It should be emphasised that staple length is vitally important to the spinner and thus any information on length of staple provides the spinner with an assessment of the potential spinning 'counts' which can be spun from the cotton. Generally staple may be considered more important than grade, although grade too is important. For example, should a spinner buy SM (Strict Middling grade) 1.1/8" staple and receive M/SM (a lower grade) 1.1/8" staple, he can still spin the required 'counts'; on the other hand, if he received SM 1.1/16" there is no possibility of the desired counts being spun. Staple length is more often than not stipulated in the sales contract, for example "American Orleans/Texas raw cotton equal to SM (Strict Middling) 1.1/16". If staple length is not mentioned the contract will probably read "equal all respects American Orleans/Texas type ABCD", which means equal in grade staple and character to that type, but both buyer and seller will have in their minds what grade and staple they consider the type to be.

### 3.1.4 Short Staple Cotton

Short staple cotton grown under rain-fed conditions is produced from the Nuba Mountains and from the Damazin areas. Nuba Mountains lint is of excellent quality and would be mostly in the top grades. Lint classification of short staple cotton could also follow the medium staple system proposed above, and sample boxes could be prepared. It would be necessary to have a grade category to cover machine-harvested cotton from the Damazin area, and, as

for medium staple the rain-fed short staple cottons could be covered by five grades from 1 down to 5, with the lower grades covering machine-harvested cottons. It may be necessary to differentiate between the method of mechanically picking the cotton if different machine types are used.

## 3.2 Sampling

### 3.2.1 Sampling Frequency

In order to improve the regularity and uniformity of bales offered for sale it might be worth reducing the size of lots from 300 to 100 bales (a common lot size in many producing countries) and sampling 5% of bales produced. This could be introduced for medium staple cotton first and could later be applied to long staple cotton if found successful. The 5% sampling of 100 bale lots would have the effect of classing upwards if decisions on quality and staple were determined on a 3 : 2 majority, i.e. if three samples out of five were higher grade the lot would be graded accordingly, and if three out of five were of lower grade the lot would be graded downwards. The present system downgrades 300 bales if three out of the twelve samples drawn from the lot are of lower grade (25% of the samples drawn or 1% of the 300 bales sampled) while the 3 : 2 system would downgrade on 60% of samples being of lower grade or nine out of fifteen samples from a 300 bale lot. Successful marketing should reflect a slight over-sell rather than an under-sell, or in this case, slightly over-classing rather than under-classing. The selling organisation that never receives a grade or classification claim from a buyer is under-valuing and under-selling its cotton, although naturally there are limitations. It requires a knowledgeable and technically competent organisation to market cotton to full advantage so those concerned in selling cotton should have considerable experience of the international marketing scene, and the selling team should include an experienced cotton classifier who can provide the buyer or end-user with the technical information required to assess spinning potential and other characteristics.

Introduction of the above changes would be dependent on further training of the cotton classifiers. It is proposed that further consideration of the matter should be deferred until the organisational changes affecting cotton classification have become established and the number of cotton classifiers has been increased.

Sampling 100% of production is not to be recommended at present but could be considered in the future. Uniformity, as already stated, can be achieved by careful selection and segregation of seed cotton and by selected ginning programmes for the medium staple cottons. Sampling the medium staple and the rain-fed short staple cottons on a 5% basis should provide a uniform grade and staple classification on 100 bale lots of hand-picked seed cotton.

### 3.2.2 Automatic Sampling

A possible improvement in the sampling of lint cotton would be the introduction of automatic cotton sampling equipment at the ginneries.

In effect an automatic sampler is a miniature packaging unit with the same characteristics as a full size baling press. The principle of operation is as follows. Ginned cotton lint is drawn from the lint flue by a fan, circulated through the sampling machine and returned to the lint flue. At pre-determined intervals a sample of lint is retained in the machine and partially compressed. This interval is governed by an electrical timing device and can be adjusted to give the required number of samples that are required throughout the bale

depending on the ginning rate. This cycle continues all the time the bale is being ginned. The number of samples taken throughout the bale can be adjusted to meet requirements. Once the bale is completed and the press starts to rotate a signal is sent to the sampler which puts the machinery into the packaging mode. The completed sample is then ejected automatically into a paper or plastic sleeve which can be pre-marked with consecutive bale number, gin name and other relevant information.

The advantages of automatic sampling over the more traditional methods, i.e. cutting the bale covering, are :-

- a true representative sample is produced showing the contents of the whole bale;
- the bale covering is not damaged in any way, leaving the bale completely covered and with a neat appearance;
- because there are no cuts in the bale covering there is no loose cotton lint hanging from the bale which could be a fire hazard.

Automatic sampling of cotton does, however, have some disadvantages. One is the extremely high initial cost of the equipment; the current cost of an automatic sampler complete with all controls, motors, fans and piping is in the order of US \$ 35 000 FOB. Another disadvantage is that in practice the equipment can prove unreliable. Care must be taken in selecting the point for the sample pickup connection and considerable experimentation may be necessary with the piping before a satisfactory arrangement is achieved. The equipment can of course only be installed where there is a fully mechanised lint handling system.

In view of these factors, it is proposed that automatic sampling should not be introduced at present. This question could be reconsidered at a future date should more reliable equipment become available.

### 3.3 Testing Requirements

The need for instrument testing to supplement the traditional hand grading and classification system was identified by the Cotton Marketing Study (1981). To provide testing facilities for the commercial crop, it was recommended that a new cotton testing laboratory should be set up at Port Sudan. Proposals for the new laboratory are given in Chapter 5. The existing facilities at the Cotton Research Unit laboratory at Wad Medani are geared to a research programme and are clearly inadequate for testing the commercial crop of one million bales or more. Similarly, it would be impossible to use the laboratory at Khartoum Polytechnic for routine testing of the commercial crop.

Details of the tests and associated equipment which would be appropriate to provide data on the principal properties of raw cotton and cotton yarn are described in Appendix I. Because cotton is a commodity which is traded internationally, it is essential that test methods which are internationally recognised are used. Many cotton producing countries have established independent standards for classification because each national crop is more or less unique, but for the measurement of fibre and yarn properties, universally accepted test procedures should be adopted. Many of these procedures originate in the USA because the cotton interests there were the first to recognise the importance of adequately describing their crop and have devoted the necessary technical effort to developing and refining test procedures.

Three stages of evaluation should be considered :-

- (i) Classification (grade, colour, staple).
- (ii) Fibre testing.
- (iii) Yarn testing.

In addition, there is a particular requirement for testing for honeydew which is discussed in Section 4.2.

The extent to which an organisation becomes involved in all three stages depends upon local conditions such as available funds, whether or not cotton is to be spun locally and/or exported as raw cotton, the availability of alternative testing facilities, and the technical expertise available. It is recommended that all equipment is kept as simple as possible, but that planning of the new laboratory should allow for the introduction of more sophisticated equipment in the future.

Classification would continue to depend on manual/visual methods. For fibre testing, facilities should be provided for the determination of :

- non-lint content
- fineness (micronaire value)
- maturity
- strength/elongation
- length/length uniformity

The ultimate test of fibre quality is the quality of the yarn which can be made from it, the percentage of fibre and other losses sustained during the process, and the speed of the conversion into yarn without successive breaks and downtime. Fibre tests can give some indication of these factors but a far better guide is to spin yarn so that its properties can be assessed. Such additional information can also be of great help to the seller of the raw cotton in his dealings with potential customers. However, the equipment required for small scale spinning is costly (US \$ 60 000). Since such facilities already exist in the Sudan at the Khartoum Polytechnic and at Wad Medani it is not recommended that a miniature spinning plant should be provided for the new laboratory, although this could be reconsidered at a future date. Similarly, the Fibre Testing Laboratory at Khartoum Polytechnic is equipped for carrying out yarn testing, and this laboratory could contribute useful data on the commercial cotton crop as an adjunct to the cotton Classification Unit and also to the Cotton Research Unit of the ARC.

Following the installation of the new fibre testing facilities at Port Sudan a programme of tests would be prepared for each season's production of cotton. At the beginning of the season when samples of the new season's crop are taken in the field and at the ginneries for setting the grade samples of seed cotton and determining lint grades, sufficient cotton should be collected for mechanical testing of the various cottons produced in Sudan. It is recommended that Micronaire and Pressley (strength) tests are carried out in the first instance and priority should be given to the supply of equipment for these two tests. It would be useful to be in a position to provide the international trade with both Micronaire and Pressley readings prior to launching the new season's crop on the market.

It is recommended that there should continue to be an exchange of information between the Classification Unit and the ARC, and the new laboratory at Port Sudan should provide copies of its fibre test reports to the ARC. If this is done it will be possible for the ARC to monitor varietal changes, or the trends of changes, in particular characteristics of the bulk commercial crop, which could trigger remedial research programmes if necessary, or alternatively provide confirmation of the smaller scale tests carried out at the ARC.

Finally it is necessary to stress that the manual and visual classification of raw cotton will continue to be the universal method of judging its characteristics and its value. Mechanical tests merely supplement this judgement. To quote Mr E Lord, formerly of the Shirley Institute, UK, some 20 years ago, "the eye and mind of a skilled cotton classifier become co-ordinated to such a high degree that the varying features of a prepared tuft (of cotton) are observed and analysed almost unconsciously, and the method of stapling becomes nearly automatic". These comments are just as valid today. It still takes many years of practical involvement to develop the awareness and experience needed to become a good cotton classifier, and to satisfy the cotton spinner's fibre needs with consistency and reliability.

### **3.4 Organisation**

The organisation of grading and classification is discussed in Annex 7. It is envisaged that seed cotton grading would remain the responsibility of the producing corporations, as at present. However, the arrangement whereby the SGB is responsible for lint classification at Port Sudan is an historical anomaly, and it would be preferable for the lint classifying organisation to be functionally autonomous. The main problem in implementing such a change is in identifying a suitable body to which the lint classifying organisation could be attached administratively, particularly with regard to personnel matters such as conditions of service and pensions. One possible solution would be to attach the lint classifying organisation to CPC. However, it is understood that the Study Working Party considers that lint classification should be completely independent. It is suggested that this matter should be resolved by the recently established Sudan Cotton Board at the earliest opportunity. Whatever arrangement is decided, it would still be necessary to maintain a formal link between seed cotton grading and lint classification for formulating and co-ordinating standards. It is proposed that this function should become the direct responsibility of the Sudan Cotton Board, and should be carried out by a Head of Cotton Classification attached to the secretariat of the board.

### **3.5 Grading Charges**

The costs of classification of lint by SGB staff in Port Sudan are at present covered by a separate budget heading within the SGB accounts. The budget for 1982/83 was LS 200 000 to cover the salaries of the 50 permanent staff and expenses. A fee of LS 0.25 per bale is charged to CPC for the classification of all non-SGB production. This apparently contributed some LS 90 000 to offset SGB's costs in the financial year 1981/82.

Any changes to the status of the lint classifying organisation would involve no extra cost to the cotton sector as a whole for existing staff. If the classification and testing of lint is to become an independent operation, then some form of fee payment by CPC should continue. This could be calculated on an annual budget basis, covering the costs of operation of the proposed new grading and testing centre at Port Sudan, and charged as a lump sum.

Alternatively, a fee could be applied on a sliding scale basis such that costs would be covered whatever the size of the crop within the expected range. If, on the other hand, lint classification and testing were to become part of CPC's operations, the costs would simply be another charge on CPC's general account. In either case the existing level of commissions and charges made by CPC should be able to cover the costs of lint classification and testing in view of the projected surplus generated from an increasing level of sales.

Honeydew (the name given to the droppings of the whitefly aphid) contains a high concentration of non-reducing sugars which drip from the leaf onto the open cotton bolls, becoming invisible to the naked eye. Cottons contaminated with honeydew are difficult to process due to stickiness which is activated by a combination of humidity and the heat generated by high speed machinery. The result is that the cotton fibres adhere to the machinery thereby reducing production and in severe cases bringing production to a halt whilst the machinery is cleaned. This is true for both ginning and spinning operations. The causes and effects of honeydew are described in more detail in Annex 2.

Contaminated cotton has to suffer a large discount in price. Many spinners are reluctant to use it at all, or are prepared to mix it in only very small percentages with other cottons. The present system of classifying lint does not take account of honeydew contamination. Although it is possible to differentiate the degree of contamination by scheme, there has been a general effect on the price of all Sudanese cotton, particularly of Acala cotton, which has been most seriously affected. This last point is most important in view of the present indications that Sudan must plant more Acala as against long staple styles.

The exact loss of foreign exchange earnings resulting from the reduced price is difficult to quantify, as fluctuations in the prices of raw cotton are due to many different factors. However, it may be estimated that the discounts are in the range of 5 to 15 cents/lb, depending on the scheme. Over the whole crop, the loss of earnings is probably at least US\$ 10 million and possibly as much as US\$ 20 million.

Marketing the crop in such a way as to ensure that uncontaminated cotton commands its full price presents many practical difficulties, and so long as a significant honeydew problem exists at all it will not be easy to regain the confidence of buyers. The only real solution is to deal with the cause of the honeydew in the field. However, until the problem is eradicated, or at least brought down to acceptable levels, it is recommended that the crop should be harvested and ginned in a segregated fashion according to the degree of honeydew contamination. The suggested procedures for segregation and assessment are described in the following section. The purpose of the segregation is two-fold:

- to enable the problem to be properly assessed and monitored;
- to assist in establishing buyer's confidence and maximising the overall earnings from the crop.

It must be emphasised that to date no international arbitration house has made any allowance for honeydew contamination. The Milan arbitration house has drawn up rules governing claims for honeydew, which are reproduced in Appendix VI, but these have not been accepted by the trade. This reluctance on the part of the trade is due partly to doubts about the practicability and usefulness of any system, such as the Milan rules, which is based on

## CHAPTER 4

### HONEYDEW

#### 4.1 General

Honeydew (the name given to the droppings of the whitefly aphid) contains a high concentration of non-reducing sugars which drip from the leaf onto the open cotton boll, becoming invisible to the naked eye. Cottons contaminated with honeydew are difficult to process due to stickiness which is activated by a combination of humidity and the heat generated by high speed machinery. The result is that the cotton fibres adhere to the machinery thereby reducing production and in severe cases bringing production to a halt whilst the machinery is cleaned. This is true for both ginning and spinning operations. The causes and effects of honeydew are described in more detail in Annex 2.

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quantitative limits of honeydew contamination. In these circumstances, the approach to marketing the crop should be to make a careful evaluation of the problem as the basis for direct negotiation with buyers.

#### 4.2 Assessment of Honeydew Contamination

There are several laboratory methods for measuring the sugar content of cotton. One of the most widely used methods is the rapid test known as the Perkins method, details of which are given in Appendix VII. An alternative rapid test which has been successfully used in Zimbabwe is also described in Appendix VII. However, even using these rapid tests, a full laboratory assessment of honeydew contamination on a commercial crop of around one million bales would be so time-consuming and expensive as to be impracticable. A particular problem is the great variability of contamination even within individual bales; studies have shown that as many as 18 to 24 samples per bale would have to be tested to provide a reliable assessment of the amount of honeydew present. Moreover, as already indicated, the practical value of precise quantitative evaluations in marketing terms is limited.

In view of these considerations, laboratory tests should be seen simply as an adjunct to a system of assessment based on observations in the field and during ginning. Observations, including insect counts, are already carried out by scheme staff to determine the degree and location of aphid infestations, and these provide as good an initial indication as any of honeydew contamination. If different sections of the crop are then harvested and ginned separately, the contamination will show up in the ginning process and this will confirm the initial appraisal.

Segregation should start at the collection centres. The seed cotton should be divided into categories of nil, light and heavy contamination. Any greater number of categories would increase the subjectiveness of the segregation and increase the complexity of handling and storage. A suitable size of geographical unit on which to base the assessment would have to be determined by experience according to the pattern of infestation in each scheme. Ideally the bags of seed cotton should be colour-coded, but it is possible that this might meet objections from farmers, and it will probably be necessary to rely on physical separation and on the documentation to distinguish the three categories.

At the ginnery, honeydew contamination is generally undetectable by the seed cotton graders except in the most severe cases. Lots should always be made up taking account of the segregation made at the collection centre. A further assessment should then be made by observation during ginning to confirm or revise the category initially assigned at the collection centre.

It is suggested that as a back-up to the system of segregation, chemical tests should be made on the following basis :

- Uncontaminated lots : 20% of bales at 1 sample per bale.
- Lightly contaminated lots : 4% of bales at 1 sample per bale.

These tests should preferably be carried out at the ginneries, particularly in the case of uncontaminated lots, with the samples being taken manually from the press during ginning. The cotton graders could readily be trained to perform the tests, and only very simple equipment would be needed. The main purpose of the tests would be to monitor the operation of the segregation procedure. The information obtained would also be useful when negotiating with potential customers. However, given the small sampling frequency

proposed, the tests results could not be regarded as providing an alternative basis for assessment of the lots, although in certain cases they might be used to downgrade a lot.

## GRADING AND TESTING CENTRE

### 5.1 Buildings and Facilities

It is proposed that there should be a new classification facility at Port Sudan, to be called the Grading and Testing Centre. This would be accommodated in a new building to be provided near the existing CPC administration headquarters and the existing classification centre. It is suggested that it should be constructed on the site at present occupied by the store immediately to the north of the CPC/SGB office. The store immediately to the south of the existing office would be sufficient for the storage of samples, but in the event that further space were required part of one of the main stores to the east of the office could also be allocated for storage of samples.

The proposed new building (see Figures 5.1 to 5.4) has been planned as a three storey building so that office accommodation could also be provided for CPC staff in Port Sudan. The grading and testing centre, including the classifying staff and the testing laboratory, would occupy the ground floor of the building. The other two storeys containing offices for CPC could be built at the same time as the ground floor or could be added later if required.

A plan of the ground floor accommodation is shown in Figure 5.2. It would include:

- a classification room 15 m long x 4.5 m wide x 4 m high this would have a suitable artificial illumination and would be provided with sampling tables approximately 1 m wide and 1 m high from floor level lengthwise along each side of the room;
- a sample conditioning room 4.5 m x 4.5 m x 6 m high;
- a main testing laboratory 7.5 m x 4.5 m x 4 m high;
- a separate laboratory room 4.5 m x 4.5 m x 4 m high to contain the Shirley analyser and air compressor.

In addition there would be offices for staff, space for records and storage and a library. Allowance has been made for a classifying team of about 14 cotton examiners.

For Port Sudan conditions it is recommended that a specially designed air conditioning unit be installed for the classification room, laboratories and conditioning room. Standard conditions for classification and fibre testing are relative humidity of  $65 \pm 2\%$  at a temperature of  $21 \pm 1$  deg.C. It is suggested that as the ambient air temperatures at Port Sudan can be as high as 45 deg.C., a reduction to 21 deg.C. may impose some hardship on classifiers and technicians and that a more acceptable working environment temperature would be around 25 deg.C. It is likely that dehumidification would be required, and it is proposed that individual room dehumidifiers should be provided for this purpose. Regular checks should be made on both temperature and humidity in the classification room, laboratories and conditioning room, and suitable instruments for measuring these would be provided. Other offices should be equipped with normal room air conditioners.

## CHAPTER 5

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It is recommended that a standby generator should be provided for the grading and testing centre. This should have sufficient capacity to run the air conditioning plant. A voltage regulator is also required to protect the laboratory equipment.

The estimated costs of the building and facilities are shown in Table 5.1.

TABLE 5.1

Costs of Grading and Testing Centre<sup>(1)</sup>

Item	FE cost (US\$)	Total cost <sup>(2)</sup> (LS)
<b>Building</b>		
- Ground floor	64 000	206 000
- Additional cost for upper floors	127 000	408 000
<b>Classification Room</b>		
- Special lighting units	18 000	35 000
- Cotton standard boxes (medium staple)	17 000	33 000
- Cotton calibration standards	9 000	17 000
<b>General Equipment</b>		
- Air conditioning plant and dehumidifiers	56 000	114 000
- Standby generator (50 kVA) and voltage regulator	20 000	45 000
- Furnishings, fitting, racks and storage units	16 800	42 400
- Photocopier	4 000	9 000

Note : (1) Excluding testing equipment - see Table 5.2

(2) Including taxes and duties

Figure 5.1  
Testing and Grading Centre  
Port Sudan  
Elevation

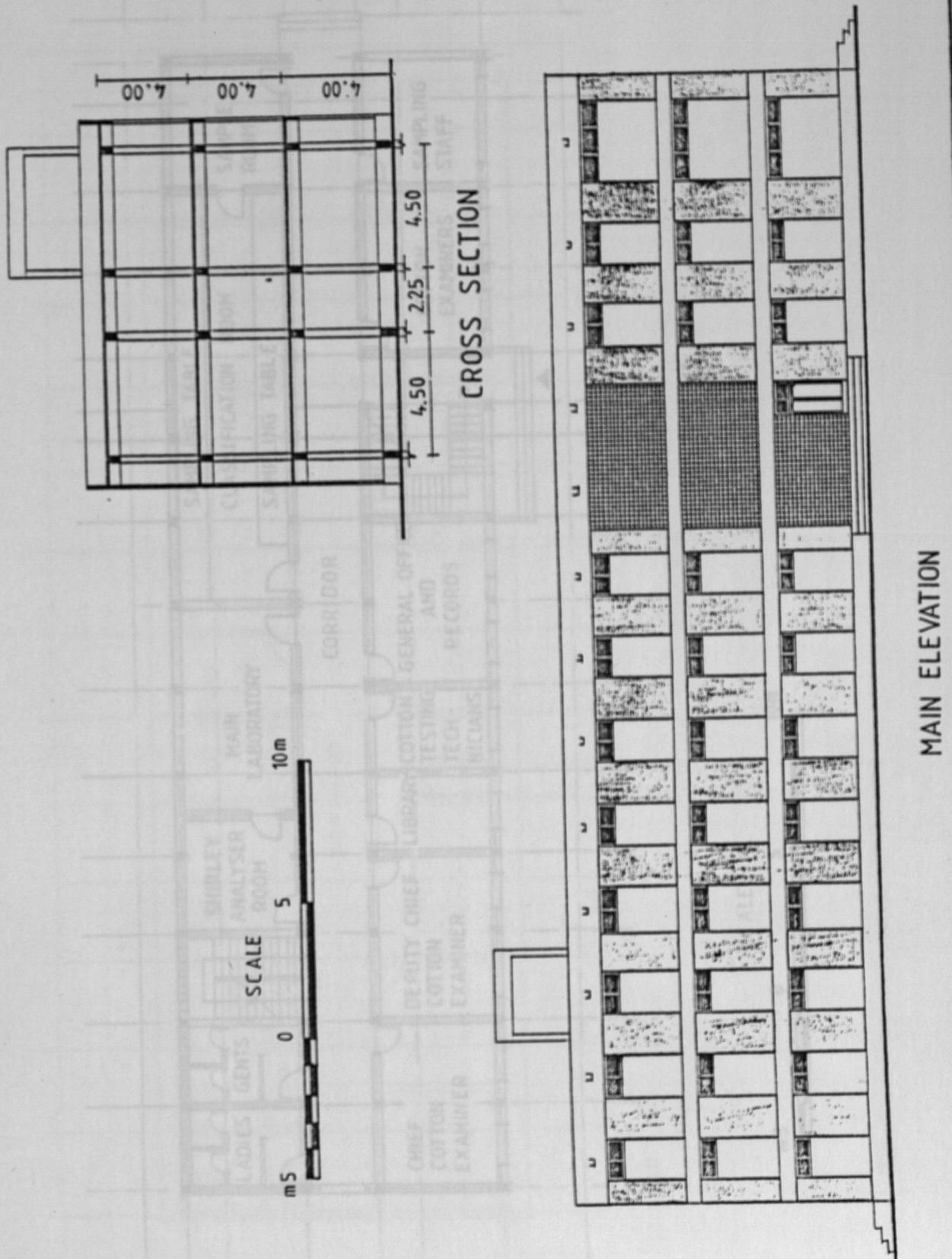
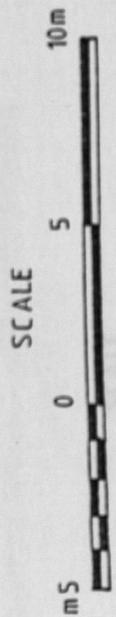
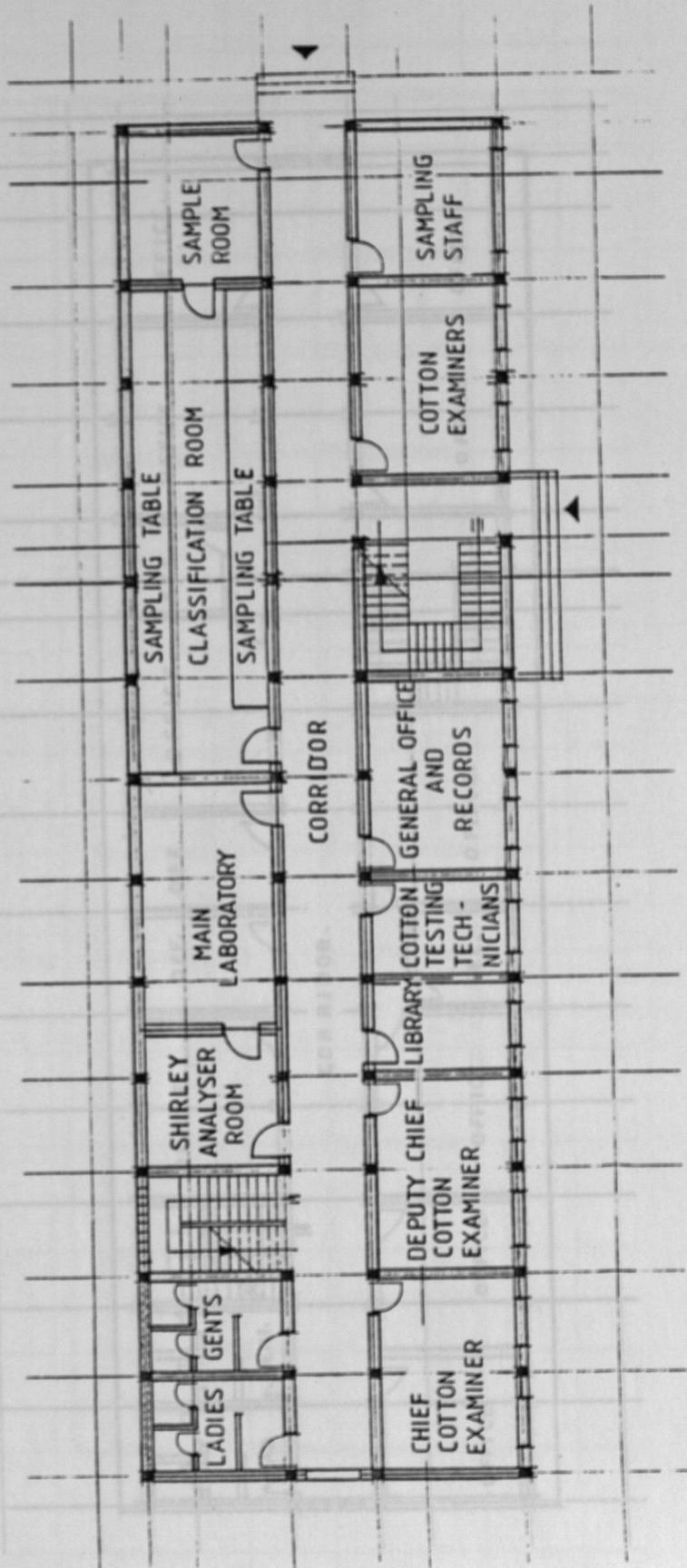


Figure 5.2

# Testing and Grading Centre Port Sudan Ground Floor Plan







## 5.2 Testing Equipment

A list of the equipment and instruments recommended for the testing laboratory is given in Table 5.2. Details of the equipment and instruments are described in Appendix I and the suppliers are listed in Appendix II.

It is proposed that the equipment would be provided in two phases. The equipment listed for the first phase is considered adequate to meet basic requirements. The equipment listed for the second phase could be added later should it be found that additional equipment was required to handle the workload or for standby duty; this would, however, be subject to review in the light of initial experience.

## 5.3 Staffing

The proposed staffing on which plans for the grading and testing centre have been based is given in Table 5.3. The existing staff numbers are also shown. As explained in the next chapter, it will require a few years to train the necessary new staff to build up to the numbers proposed.

**TABLE 5.3**  
**Staffing of Proposed Grading and Testing Centre**

Designation	Number of Staff	
	Existing (1)	Future
Chief Cotton Examiner	1	1
Cotton Examiners	6	13
Chief Sampling Technician	1	1
Sampling Technicians	6	9
Laboratory Technicians	-	8
Sampling Labourers	12	15
Clerical Staff	3	5
Drivers	4	4
Miscellaneous	4	4

TABLE 5.2

## Costs of Equipment and Instruments Recommended for Testing Laboratory

Item	Unit cost FOB (US\$)	First phase		Second phase	
		Number required	Cost FOB (US\$)	Number required	Cost FOB (US\$)
Shirley analyser	16 000	1	16 000	1	16 000
Micronaire instrument	4 000	3	12 000	1	4 000
Balance to suit above	900	3	2 700	1	900
IIC/Shirley fineness/maturity meter	12 000	1	12 000	1	12 000
Pressley tester	1 850	2	3 700	1	1 850
Balance to suit above	900	2	1 800	1	900
Stelometer	3 800	2	7 600	2	7 600
Electronic balance (Kahn 21)	3 500	2	7 000	-	-
Comb sorter	1 600	2	3 200	-	-
Pads, papers, diagrams, etc. for above	-	Lot	400	-	-
Fibrograph (Model 530)	45 000	1	45 000	1	25 000(1)
Electronic balance	6 000	1	6 000	-	-
Microscope	9 800	1	9 800	-	-
Ancillary equipment (2)	-	Lot	15 000	-	-
Initial spares (5%)	-	Lot	7 100	-	3 400
Total FOB			149 300		71 650
Insurance and freight			17 900		8 600
Total CIF (US\$)			167 200		80 250
Total costs (LS) <sup>(3)</sup>			323 900		155 400

- Notes : (1) Complete instrument not required for second phase  
(2) See Appendix I  
(3) Including taxes and duties

## CHAPTER 6

### RECRUITMENT AND TRAINING

#### 6.1 General

At present, the Sudan Gezira Board is responsible for providing cotton graders and cotton examiners. The cotton graders undergo at least six years of training and then must pass an examination before being certified as cotton graders. In theory, the cotton examiners are recruited from the ranks of graders and undergo further training in lint classification at Port Sudan and at courses outside the country before finally being certificated as cotton examiners. However, as noted earlier, the existing team of seven cotton examiners all have at least 25 years service, and there are no follow-up staff in training.

Seven cotton examiners can classify the entire Sudan crop of one million bales, but any increase in crop production will stretch their capacity to the limit and there could be delay in grading and classifying the crop. In the event that any cotton examiners should fall sick or retire or leave the service, there would be a serious problem. Moreover, under proposals made elsewhere in this report, staff would have to be found to fill the new posts of Head of Cotton Classification of the Sudan Cotton Board and cotton classifier at CPC headquarters in Khartoum. The need for younger cotton examiners in training to replace the older long-serving examiners is therefore pressing.

Attempts have been made to increase the size of the team and to have cotton examiners in training, and recently two seed cotton graders from SGB were nominated for training at Port Sudan in lint classification. Both are understood to have turned down the offer, the reasons given being that they would suffer financial loss. At present the cotton graders are provided with housing, but on transfer to Port Sudan as trainee cotton examiners they would not be provided with housing and would have to rent accommodation themselves. As rents are high in Port Sudan (between LS300 and LS500 per month) and the salary scale increase is LS200 per annum (or LS16.66 per month) the trainee examiners would find themselves much worse off financially. In addition they would have to bear extra costs of transport from Port Sudan to Khartoum or to Wad Medani where most have their permanent homes and families.

One solution would be to make use of the services of the cotton classifiers at present employed by the four Export Companies at Port Sudan, and it is possible that between six and eight classifiers could be found from this source. However, the classifiers from the Export Companies are not fully fledged cotton examiners and they would require to undergo further training, particularly on the seed cotton grading system. Nevertheless, they would provide a reasonably quick solution to the recruitment and training problem.

There will also be a need for further recruitment of sampling technicians when the cotton examining team expands as it should do over the next few years. These technicians supply the necessary samples of cotton drawn from each lot of bales, and also record the sampling and classification details, the pre-classification selection and handling of samples, and the post-classification storage and tabulation of samples in case of future claims or arbitration. However, the sampling technicians are confined to a closed salary scale which neither encourages entry into the service nor provides incentive to continue. Similarly, it is difficult to obtain sampling labourers.

The salary scales and terms of service for all those engaged in the classification of cotton at Port Sudan, and those who must be attracted to the service, and the new staff required for laboratory testing work, must be revised and improved. This is discussed in Annex 7.

## 6.2 Training Facilities

The existing arrangement for training cotton graders appear to be adequate.

Facilities for training cotton examiners or lint classifiers exist in the Sudan alongside the experienced team of examiners at their Port Sudan Headquarters, supplemented by training outside Sudan which in the past has included training courses in Egypt, the UK and USA.

Among classing courses currently available are those organised at the recently established cotton training centre of the Cotton Arbitration and Testing General Organisation at Alexandria, Egypt. With instruction in English and Arabic, the syllabus covers classifying and evaluation of both seed cotton and lint, ginning technology, fibre testing, the preparation of grade standards, and cotton marketing in Egypt and other producing countries. One course lasts for a complete season (beginning of October to end of May) and another is of four months duration, although shorter selective courses are available. Egypt is the natural venue for training Sudanese cotton classifiers, laboratory technicians and graders, particularly for long staple cottons.

With the substantial increase in medium staple varieties in Sudan it is essential that there should be further training with emphasis on the American upland types, and classification courses are offered in the USA at the Memphis Cotton Exchange School, Memphis, Tennessee. There are three courses per year and these embrace cotton classification theory and practice in all grades and staples, cotton buying and selling, the New York futures market, finance, the role of banks in merchandising, contracting, warehousing, shipment and invoicing, and visits to cotton fields, ginneries, etc. Another course is organised annually by the American Cotton Marketing Co-operatives, Bakersfield, California.

Poland offers yet another reputable venue with the Gdynia Cotton Association, whose cotton classing course usually commences in February each year and is of four months duration. Lectures in English cover theoretical and practical aspects of cotton classing, cotton spinning, testing, raw cotton marketing and transportation. In addition courses can be arranged in the UK through the British Cotton Growing Association in conjunction with international cotton merchants, the Bolton College of Textile Technology, Shirley Institute, etc., covering practical application of classification in a cotton sampling and classing room of a major international cotton merchant where cottons from world-wide origins can be examined and assessed.

It is essential that cotton classifiers should receive periodic refresher courses in other countries or centres of technology in order to maintain a knowledge and understanding of competitive cottons from other sources which the classer can relate to Sudanese cotton types.

Reference has been made to the Khartoum Polytechnic, College of Engineering and Scientific Studies, Department of Textile Technology, which provides courses for the training of technicians and technical managers for the Sudanese textile industry. The Polytechnic could also contribute to the training of instrument technicians. The Fibre Testing Laboratory contains most of the instruments recommended for the new testing laboratory at Port Sudan. It is recommended that all cotton examiners and technicians employed by the

Classification Unit be given a short course at the Fibre Testing Laboratory in the use of the relevant instruments they will be using, and given demonstrations of instruments for yarn and dye testing so that useful background knowledge is acquired.

It is also recommended that all cotton examiners and laboratory technicians employed at Port Sudan should have the opportunity of visiting the Cotton Research Unit at Wad Medani, and be given an outline of the cotton breeding programmes and related work, and some understanding of the growing of cotton and the development of the cotton plant, with particular reference to abnormalities resulting from stress conditions, insect attack, disease and poor husbandry.

### 6.3 Proposed Training Programme

#### 6.3.1 Cotton Graders

The procedure for the recruitment and training of cotton graders should continue as at present. However, it is recommended that each year at least twelve cotton graders in groups of three should spend one week at the Cotton Research Unit at Wad Medani and/or at the Cotton Fibre Testing Laboratory at Khartoum Polytechnic.

#### 6.3.2 Lint Classifiers

The proposed training programme for cotton examiners (lint classifiers) includes both training of new cotton examiners and regular in-service training for qualified cotton examiners.

##### (a) Trainee Cotton Examiners

To meet the future requirements for cotton examiners, it is recommended that arrangements should be made to train about 2 new cotton examiners over the next few years. These could include recruits selected from amongst the cotton graders and classifiers of the Export Companies. Following this initial training programme, requirements for further trainees should be kept under review in the light of wastage and retirements.

New trainees (ex-cotton graders) should spend their first year at Port Sudan in understudying/assisting experienced cotton examiners. In their second year they should take the four months course (Course Nr 2) at the International Cotton Training Centre in Alexandria, Egypt. The third year, as the first year, would be spent in on-the-job training in Port Sudan. In the fourth year depending on aptitude and ability shown to date one or both trainees would attend a three-month course at the Cotton Exchange School in Memphis, USA. An in-house examination/assessment would be held in the fifth year, at the end of which the trainees who have passed the examination or otherwise proved themselves would be made up into cotton examiners. In the sixth and every third year thereafter the new examiners would participate in the programme of refresher courses in the UK for all examiners.

Former classifiers of the Export Companies would undergo a much shorter training period, which would include training in seed cotton grading, but they would attend the same overseas courses as new trainees.

(b) Cotton Examiners

Spread over a period of six years each existing cotton examiner in turn (or in groups of two or three) should take the courses in Egypt and the USA. Concurrently and in turn all qualified examiners should take refresher courses in the UK every three years.

The proposed overall programme of overseas training courses during the project period is shown in Table 6.1. The programme must be flexible and adjustable as regards timing (all visits by experienced examiners to be in the "off-season" period), staff availability and work loads. By the end of Year 6 all existing cotton examiners would have taken the courses in both Egypt and the USA and the first intake of trainees should have been added to the cotton examiners' strength. The estimated costs of the training courses are given in Table 6.2; the total cost under the project would be about US\$ 290 000.

Internal courses and visits should be arranged as necessary and as work loads permit for trainee examiners and examiners to visit both the Research Unit at Wad Medani and the Fibre Testing Laboratory at Khartoum Polytechnic. No costs have been allowed for this.

TABLE 6.1

Proposed Programme of Overseas Training Courses in Lint Classification

Numbers attending courses

Year	Egypt		USA		UK	Total
	Q	T	Q	T	Q	
0	2	-	-	-	-	2
1	2	2	-	-	2	6
2	3	2	-	-	3	8
3	-	2	2	2	2	8
4	-	2	2	2	2	8
5	-	2	3	2	5	12
6	-	2	-	2	4	8

Note : Q - Qualified examiners  
T - Trainee examiners

TABLE 6.2

Costs of Training Courses (US\$)

Location	Egypt	USA	UK
Duration (months)	4	3	1.5
Fees	1 000	2 000	-
Subsistence	4 500	4 000	2 000
Travel	500	2 000	1 000
Cost per course	6 000	8 000	3 000
Number of courses	19	15	18
Total cost	114 000	120 000	54 000

6.3.3 Laboratory Technicians

It is proposed that training courses in fibre testing at Alexandria should also be provided for eight laboratory technicians (four per year over two years). The estimated cost per course is US \$ 6 000, as for the lint classification courses in Table 6.2.

6.4 Technical Assistance

It is recommended that a specialist in cotton fibre testing should be provided under technical assistance for a period of 18 months to assist in setting up the testing laboratory. His duties would include :

- supervising the installation and commissioning of laboratory equipment;
- establishing laboratory procedures;
- in conjunction with the lint classifying staff, formulating suitable testing programmes and arrangements;
- providing on-the-job training to laboratory staff;
- liaising with the testing laboratory of the ARC regarding testing procedures and standards.

## APPENDIX I

### MEASUREMENTS OF COTTON PROPERTIES

#### I.1 Principal Properties to be Measured

The measurement of cotton properties can be divided into the following categories :-

##### (a) Raw Cotton

Classification (manual/visual methods) :

- grade
- colour
- staple

Fibre testing (mechanical/instrument methods) :

- non-lint content
- fineness
- maturity
- strength/elongation
- length/length uniformity

##### (b) Cotton Yarn

Yarn testing (mechanical/instrument methods) :

- count
- twist
- evenness
- strength
- appearance
- dyeing behaviour

#### I.2 Classification

A useful account is given on pages 110 to 131 of Volume I of the American Cotton Handbook. Classification should be carried out in a special room with suitable illumination. The size of the room will normally be determined by local conditions but the lighting and the colour of the walls, tables, floor, etc, should conform to ASTM D 1684-81. Levels of temperature and humidity must be controlled relative to local conditions. Properties are assessed as follows :

##### (i) Grade

Most of the major cotton producing countries prepare their own standard boxes as those obtained from another country can never accurately represent the local crop in respect of colour, impurities, degree of entanglement, etc. The preparation of boxes is a fairly complex undertaking which normally forms one element in classing courses. The Classification Unit in Sudan already prepares standard boxes for extra-long and long staple cottons. It is

recommended that standard boxes are also prepared for medium staple Acala type cottons, and to assist in this it is recommended that appropriate sample boxes of this style of cotton be obtained from the USA (see Appendix II - Supplier B). The current prices (May 1983) are \$ 150 for air freight collect and \$ 180 for pre-paid surface freight for each 12-sample box. A complete set comprises 14 boxes, but not all may necessarily be required.

(ii) Colour

Colour can be described subjectively by reference to the samples in the reference boxes (e.g. white, light spotted, spotted, tinged, yellow stained), and is normally assessed by the eye of the experienced classifier. Colour measurements of greyness and yellowness can also be made using instruments such as the Nickerson-Hunter Colorimeter (ASTM D 2253-81). The colorimeter is manufactured by supplier D and costs in the region of \$ 29 000. It is not recommended that this instrument be provided at present.

(iii) Staple

Staple is usually estimated by hand pulling and this is the method employed by international cotton trading merchants (see American Cotton Handbook, pages 123 to 128).

To assist in the standardisation of length measurements (both instrumental and manual) throughout the world, the USDA offers calibration cotton samples for length and length uniformity. These are available from supplier B. These calibration samples would be of use for Sudan Acala styles.

Details of staple measuring by instruments are given below.

### **I.3 Fibre Testing**

(i) Non-lint Content

The non-lint content of raw cotton is invariably measured by means of the Shirley Analyser. This method covers the determination of non-lint content by feeding a known weight of raw cotton into the machine which, operating on mechanical/pneumatic principles, separates the foreign matter from the cotton and discharges the non-lint particles and lint cotton into separate chambers. The amounts of lint and non-lint recovered are calculated as a percentage of the original specimen mass. The instrument can be used on raw cotton lint, partially processed cotton, such as picker lap or sliver, or on ginning or processing waste. Applicable references are ASTM D 2812-81: D 123: D 1441.

The Shirley Analyser is available from supplier E at a price of about \$16 000. This instrument should be provided for the new testing laboratory.

Typical non-lint values range from about 2% for Good and Strict Middling cottons to 6% to 8% for Good Ordinary cottons.

## (ii) Fineness/Maturity

For many years the Micronaire instrument has been used to estimate maturity but it is now recognised that such use is only valid if the fineness of the samples being tested is approximately constant. In other words, the Micronaire reading is a composite of fineness and maturity (see publications by IIC - "The origin and Assessment of Cotton Fibre Maturity" and "The Meaning and Assessment of Cotton Fibre Fineness").

The only rapid and reliable instrument which gives good independent estimates of these two properties is the IIC-Shirley Fineness/Maturity Meter which is available from supplier J. The price of this instrument is in the range \$ 9 000 to \$ 14 000, depending on the degree of automation required in both operation and calculation. Its use is described in ASTM D 3818-79.

Despite the foregoing statement, however, Micronaire values are still widely quoted and used in commerce and in the international cotton trade and also used for blending purposes. The IIC-Shirley Fineness/Maturity Meter will give a reading of micronaire, but single purpose instruments for measuring micronaire are also available from suppliers D, F, J and G. Prices are in the range of \$ 3 000 to \$ 4 500 and their use is described in ASTM D 1448-79 and BS 3181.

It is recommended that one IIC-Shirley Fineness/Maturity Meter and at least two Micronaire instruments be supplied and installed in the new laboratory.

## (iii) Fibre Strength

Fibre strength is frequently measured by the Pressley tester manufactured by supplier H. A similar tester is manufactured by supplier I. The price of these instruments is in the region of \$ 1 850.

Alternatively the Stelometer instrument can be used, which gives a reading of the breaking elongation of the fibre bundle as well as the fibre strength. It is made by supplier D and costs approximately \$ 3 800.

Full description of the use of both instruments, sample preparation, test procedures, calculations, etc., is given in ASTM D 1445-75.

The Pressley apparatus is based on an inclined plane system with scales calibrated in pounds and the breaking load can be read on the beam scale to the nearest 0.1 lb (50 g).

The Stelometer apparatus is a pendulum type which measures both force and elongation on scales. The force scale is calibrated in kilogrammes and the elongation scale is calibrated in percent. The indicators can be read to the nearest 0.01 kg and 0.1% for force and elongation respectively.

It is important to stress that these tests demand considerable skill and patience on the part of the operators, and two skilled operators working in the same conditions can reach different conclusions. It is demanding work and the operators require the most conducive working environment and frequent changes of routine in order to maintain a constant standard of accuracy.

It is recommended that two Pressley instruments and two Stelometers are provided. At least two technicians should be trained in the use of these instruments, interchanging with each other, and providing contra-checking and comparisons of each other's results. It has been found that generally women are better suited to this type of instrument operation.

#### (iv) Staple Length and Length Uniformity

The instrument most commonly used is the Fibrograph available from supplier D. It costs in the range of \$ 40 000 to \$45 000, depending upon the ancillary equipment required. Details of its use and procedures for length measurement are fully described in ASTM D 1447-77. The instrument is in widespread use. The manufacturers claim the instrument can also be used to obtain estimates for fibre maturity and short fibre content.

Manual methods are available for estimating staple length and for producing fibre arrays but these methods are slow and tedious. Nevertheless, they do provide the standard against which the results from more sophisticated instruments are judged. This form of determination of fibre length is achieved by using the comb sorter instrument which can provide an array diagram. Full details of its use and application are given in the British Standard handbook - BS 4044:1966. Comb sorter instruments can be supplied by supplier J at a cost of about \$ 1 600 each.

It is recommended that two comb sorter instruments and one Fibrograph should be provided.

#### L4 Yarn Testing

It is useful to be able to spin small quantities of yarn from samples of raw cotton as the ultimate test of fibre quality is the quality of the yarn which can be made from it (see Manual of Cotton Spinning Volume 2, pages 294 to 297). The only commercial unit available for miniature spinning is the Shirley Miniature Spinning Plant which is manufactured and marketed by supplier E. It consists of three elements, card, drawframe and spinningframe, and adequate quantities of yarn can be produced for examination of yarn strength and dyeing behaviour. As little as 50 gms of raw cotton can be processed into yarn. The cost of the complete unit is about \$ 60 000. As there are already facilities in Sudan for carrying out small scale spinning tests it is not recommended that a miniature spinning unit be provided at the Grading and Testing Centre.

Facilities also exist at the Cotton Fibre Testing Laboratory, Khartoum Polytechnic, for carrying out the yarn tests listed in Section I.1 above. Some of this equipment requires servicing and spare parts and should be brought up to full operational capability. It is not considered necessary to provide yarn testing facilities for the laboratory at Port Sudan.

## L5 Ancillary Equipment

### APPENDIX II

In addition to the specialist equipment detailed above it is necessary to have a range of general purpose apparatus to measure moisture contents, the presence of honeydew, temperature and humidity, etc. This should include :

	Portable moisture meters	-	2 Nr Probe type
		-	2 Nr Cup type
Supplier Reference	Name		Address
	Balances	-	in addition to those weighing balances usually supplied with particular instruments; both manual and electrically operated.
A.	American Society for Testing and Materials		4841 Summer Avenue
B.	Standards Section Division AMS United States Department of Agriculture	-	useful in training classifiers to appreciate the form and composition of cotton fibre.
C.	Calculators		Standards Institute - calculation of results.
	General glassware		London W1A 2BS Telex : 266933
D.	Recording and sling hygrometers		PO Box 55 Knoxville Tennessee 37901 Telex : 55-7356
	Thermometers		Raustrasse 58 PO Box 150 CH-6048 Zurich
	Drying oven		
	Speciment boxes and cabinets		
	Vacuum cleaners	-	including hand-held type for use in classification room.
E.	Platt Saco Lowell		PO Box 55 Lancashire Telex : 63447
	Metric and imperial measuring tables, rules, scales, etc.		
	Chemicals and reagents		
F.	Sheffield Corporation		Dayton
The cost of ancillary equipment would be about \$ 15 000 depending upon the level of sophistication of the equipment.			
G.	Motion Control Inc.		Dallas Texas : 75267
H.	Joseph M. Doebrich & Sons Inc.		Tucson Arizona
I.	Keisokki Kogyo Co. Ltd.		3 Sugigane-cho Higashi-ku Osaka
J.	Shirley Developments Ltd.		Manchester M20 8AS Telex : 669 386
K.	Goodbrand & Co. Ltd.		Elm Works Mere Lane Rochdale OL11 3TE

## APPENDIX II

### LIST OF SUPPLIERS OF COTTON TESTING EQUIPMENT

Supplier Reference	Name	Address
A.	American Society for Testing and Materials	1916 Race Street Philadelphia 19103
B.	Standards Section Cotton Division AMS United States Department of Agriculture	4841 Summer Avenue Memphis Tennessee 38122
C.	British Standards Institute	2 Park Street London W1A 2BS Telex : 266933
D.	Spinlab Inc.	PO Box 55 Knoxville Tennessee 37901 Telex : 55-7356
	Spinlab AG	Rautistrasse 58 PO Box 150 CH-8048 Zurich Telex : 822472
E.	Platt Saco Lowell	PO Box 55 Accrington BB5 0RN Lancashire Telex : 63447
F.	Sheffield Corporation	Dayton Ohio 45400
G.	Motion Control Inc.	Dallas Texas 75247
H.	Joseph M. Doebrich & Sons Inc.	Tucson Arizona
I.	Keisokki Kogyo Co. Ltd.	3 Sugigama-cho Higashi-ku Osaka
J.	Shirley Developments Ltd.	Manchester M20 8AS Telex : 669 386
K.	Goodbrand & Co. Ltd.	Elm Works Mere Lane Rochdale OL11 3TE

- L. James H. Heal & Co. Richmond Works  
Lake View  
Halifax HX3 6EP  
Telex : 51450
- M. Zellweger AG Sonnenbergstrasse 10  
CH 8610 Zurich-Uster  
Telex : 53587
- N. Precision Scientific Co. 3737 West Cartland Street  
Chicago  
Illinois 60647
- O. Avery Dennison Ltd. Moor Road  
Leeds LS10 2DE
- P. Tekmatex Marubeni PO Boix 595  
4-2 Ohtemachi, 1-Chome  
Chiyoda-Ku  
Tokyo 100-91
- Q. Eiko Industrial Co. Ltd. Ohta Building  
Nr. 23 2-Chome  
Kitakyuhoji-Machi  
Higashi-Ku  
Osaka  
Telex : 05223832
- R. Purdy-Hodges Ltd. Standard Machine Works  
The Wells Road  
Nottingham
- S. Lawson-Hemphill Inc. 96 Hadwin Street  
Central Falls  
Rhode Island 02863  
Telex : 927725

APPENDIX III

IMPROVEMENTS TO COTTON RESEARCH LABORATORY OF ARC AT WAD MEDANI

As mentioned in Chapter 2, improvements are required to the Cotton Research Laboratory at Wad Medani to enable it to function effectively. The main air conditioning unit serving the laboratory is at present broken down, but it is understood that arrangements to carry out repairs are already in hand. It is proposed that the following improvements should be implemented under the Cotton Marketing Project :

- (i) General rehabilitation of the existing laboratory building, including :
  - lowering the ceiling;
  - replacing doors and frames;
  - providing insulation;
  - rewiring and plumbing.
- (ii) Construction of an extension to the existing spinning laboratory to provide a special room for honeydew testing (both carding tests and chemical tests), together with a small office.
- (iii) Provision of a standby generator.
- (iv) Provision of a photocopier.

The costs of these items are shown in Table III.1. In addition, it is proposed that spare parts and new equipment should be provided as indicated in Tables III.2 and III.3.

TABLE III.1

Costs of Improvements to Cotton Research Laboratory

Item	FE cost (US\$)	Total cost (LS)
1. Rehabilitation of existing laboratory	15 000	50 000
2. Construction of new honeydew laboratory	5 000	16 000
3. Standby generator	20 000	45 000
4. Photocopier	4 000	9 000

TABLE III.2

## Spare Parts Requirements

Instrument	Cost FOB (US\$)
Fibrograph 430 and 530	400
Adaptor HP97	1 000
Stelometer 154M	2 600
Fibre opener - blender Nr 338	6 500
Total FOB	10 500
Insurance and freight	1 260
Total CIF (US\$)	11 760
Total cost (LS)	22 800

TABLE III.3

## Proposed New Equipment

Item	Nr required	FE Cost (US \$)	Total cost (LS)
Thermo-hygrograph	4	2 200	4 300
Staple sorter	2	7 800	15 100
Torsion microbalance	2	2 500	4 800
Motor driven yarn reel	1	3 600	7 000
Uster yarn number tester	1	27 000	52 300
Shirley analyser	1	20 000	38 700
Miniature ring frame	1	83 000	160 800
Miniature gin 8" OD saw	1	4 300	8 300
Miniature gin 10" OD saw	1	4 500	8 700
Miniature gin 4½" OD roller	1	5 300	10 300
Colorimeter	1	800	1 500
Pressley fibre tester	4	16 000	31 000
Torsion balance	4	16 000	31 000
Shadowgraph balance	2	1 300	2 500
Skein strength tester	1	5 000	9 700
International calibration cotton standards	Set	4 700	9 100
Scales, glassware, etc.	Lot	22 000	42 600
Chemicals	Lot	9 000	17 400

APPENDIX IV

FIBRE TESTING LABORATORY - KHARTOUM POLYTECHNIC

List of Testing Equipment

IV.1 Existing Equipment

Nr	Item	Remarks
1	Shirley analyser	
1	Yarn appearance tester	
2	Twist tester (manual)	
1	Twist tester (electrical)	
1	Fibre fineness tester (Wira) with air compressor	
1	Comb sorter with black velvet pad	
1	Lap evenness tester (lapmeter)	Not working - requires 3 phase supply. Should be transferred to spinning workshop.
1	Fabric tensile strength tester (Frank) 20hp	Not in operation since arrival.
1	Uster evenness tester (6 units)	
1	Single thread tensile strength tester	
1	Uster strength tester with printer	
1	Lea strength tester	
1	Yarn reel (girth = 1.5 yards)	
1	Roving reel (girth = 1 yard)	
1	Quadrant balance for yarn lea count (120 yards)	
1	Quadrant balance for roving count (12 yards)	
1	Fabric stiffness tester (Frank)	

1	Air bursting tester (Frank)	Not working - needs air compressor and connections.
1	Abrasion tester (Frank)	Damaged - not working.
1	Pressley tester	
1	Hygrometer	
1	Dry bulb hygrometer	
1	Balance (Sartorius) 1 600 g	
1	Balance (Sartorius) 200 g	Not in operation since arrival.
1	Balance (Chyo) 160 g	Not in operation since arrival.
1	Quadrant balance for weight (g/sq.m)	
1	Balance (Textest) 10 mg	
1	Balance (Zweigle) 200 mg	
1	Balance (Textest) 100 mg	
1	Oven	
1	Microscope (Ortholux) with camera	
1	Crease recovery tester (Frank)	
1	Crease recovery tester (Textest)	
4	Cutting devices	
1	Fabric thickness tester (Frank)	Damaged
1	Yarn rigidity tester	
4	Stop watches	
1	Yarn tension device	
4	Speed testers	
1	Touro strobe	

## IV.2 Equipment Ordered but Not Yet Received

1 Comb sorter

1 Fibrograph

- Glassware for qualitative determination of sugar (cotton fibres)

- Kjeldahl equipment (for protein determination)

## IV.3 Further Equipment Required

Soxhlet extraction equipment (for fat content determination)

Glassware and equipment for quantitative determination of :

- Water content
- Ash
- Sugar

Phase contrast microscopes for :

- Entomological and pest studies
- Determination of fibre maturity levels of cotton cells.

5. Cotton Technology, July 1981, IIC, Manchester, UK

6. E. Lord, The Origin and Assessment of Cotton Fibre Maturity, IIC, Manchester, UK

7. H. Ramsey, The Meaning and Assessment of Cotton Fibre Fineness, IIC, Manchester, UK

A useful compendium of most of the above publications in pamphlet form can be obtained from the International Institute for Cotton, Technical Research Division, Didsbury, Manchester M20 8RD, UK, or from The British Cotton Growing Association, Old Hall Street, Liverpool L3 9PP, UK.

## APPENDIX V

### LIST OF USEFUL PUBLICATIONS

1. American Cotton Handbook Vol I, Interscience Publications, 1965. (ISBN 0.470.34640X)
2. Manual of Cotton Spinning, Vol 2, Part 1, The Characteristics of Raw Cotton, Textile Institute, Manchester, UK
3. American Society for Testing and Materials (ASTM) Standards -
  - D 1684 - 81 Lighting for classing rooms
  - D 2253 - 81 Colour of raw cotton
  - D 2812 - 81 Non-lint content
  - D 3818 - 79 Fineness-maturity testing
  - D 1448 - 79 Micronaire
  - D 1445 - 75 Fibre strength/elongation

For appreciation of yarn standards -

  - D 1907 - 80 Yarn colour
  - D 1422 - 82 Yarn twist
  - D 1423 - 82 Yarn twist
  - D 1425 - 81 Yarn unevenness
  - D 2255 - 79 Yarn appearance
  - D 1578 - 79 Yarn strength - hank
  - D 2256 - 80 Yarn strength - single end
4. British Standards -
  - BS 2010 - 63 Linear density of yarns
  - BS 2085 - 73 Twist
  - BS 4044 - 66 Fibre length (Comb Sorter Diagram)
  - BS 3181 - 68 Fibre fineness
5. Cotton Technology, July 1981, IIC, Manchester, UK
6. E. Lord, The Origin and Assessment of Cotton Fibre Maturity, IIC, Manchester, UK
7. H. Ramsey, The Meaning and Assessment of Cotton Fibre Fineness, IIC, Manchester, UK

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## APPENDIX VI

### HONEY-DEW RULES OF THE MILAN ARBITRATION HOUSE

Milan July 1982

CAMERA ARBITRALE COTONI SODI

#### PARTICULAR RULES GOVERNING CLAIMS FOR HONEY-DEW

**Rule 1** - With regard to "honey-dew" contracts can either not contain any provision whatsoever or the following clauses :

- "free from honey-dew"
- "no claim for honey-dew"

**Rule 2** - Application for honey-dew tests shall be filed with the Arbitration Chamber latest within 120 calendar-days :

- (a) from the last landing day at the port of destination when cotton is sold for shipment or afloat; whenever the documents are presented by the Seller after the arrival of the ship, the time limit shall start from the date of presentation of the said documents;
- (b) from the day of tender, when the cotton is sold on the spot or for delivery in Italy at a specific date.

The applicant has to give immediate notice to the counter-part.

The applicant shall specify :

- the name and address of the other party and, if that is the case, the name and address of his representative or agent;
- marks and number of bales composing the lot;
- the exact description of the quality as mentioned in the contract;
- for cotton sold for shipment: the name of the ship and the last landing day; for cotton sold for delivery: the last delivery day;
- the name of the controller who sealed the package containing the arbitration samples.

**Rule 3** - The samples for honey-dew tests must be drawn and packed in accordance with Rule 49 and the provisions of Rule 79 will apply.

**Rule 4** - The Secretary of the Arbitration Chamber takes, at random, the quantity necessary for the tests from each sample.

The same samples submitted for quality and/or micronaire arbitration may be used for this purpose.

Should these not be available, the buyer has the right to draw samples in accordance with Rule 7 of the particular Rules governing the purchase and sale of raw cotton with TIR transportation.

The test will be effected in a laboratory designated by the Managing Committee of the Arbitration Chamber in accordance with the Perkins method.

**Rule 5** - The parties are entitled to ask for a second test to be effected by some other recognised laboratory, designated by the Executive Committee of the Arbitration Chamber. In this case the results of both tests will have to be taken into consideration for the settlement of the dispute.

**Rule 6** - The costs of the tests are borne by the party requesting them.

**Rule 7** - The seller has to grant to the buyer an allowance:

- in all those cases where a contract contains the clause "free from honey-dew" and in which the honey-dew content is superior to 0.2 percent;
- in all those cases in which no reference whatsoever is made in the contract to honey-dew, and in which the honey-dew content is superior to 0.35 percent.

The allowance must be fixed so as to reflect the lower commercial value of cotton containing honey-dew.

If no friendly settlement can be arrived at between buyers and sellers the allowance will be fixed in commercial arbitration, in which case the By-Laws and Rules of the Arbitration Chamber will apply.

No allowance is due if the contract stipulates the clause "no claim for honey-dew".

If honey-dew in excess of 0.35 percent is ascertained on cotton delivered on the contracts stipulating "free from honey-dew" the buyer has the right to ask for the substitution of the cotton.

The present rules embodied as integrant part in the "By-Laws and Rules of the Arbitration Chamber - general terms governing the purchase and sale of raw cotton - August 1, 1971" have been approved by the Board of Directors of the Associazione Cotoneria Italiana on 20th July 1982 and considered valid for contracts stipulated from 1st November 1982.

#### VII.1 Parkine Method

The Parkine method is a rapid screening test which shows whether or not the sugar content of a small sample of cotton exceeds a pre-determined percentage. The test is reliable and simple and does not require elaborate laboratory equipment or special training of technicians. The test is described in the USDA Textile Bulletin, August 1971.

The method is based on the reaction of alkaline potassium ferricyanide with the reducing substances on cotton. A weighed sample of cotton is placed in a flask with distilled water and an exact amount of a potassium ferricyanide - sodium carbonate solution. The cotton sample weight and/or the amount of potassium ferricyanide are varied according to the required screening percentage. The mixture is boiled gently for 2½ to 3 minutes. The presence of a distinctive lemon-yellow colour when the solution is removed from the heat indicates that the sugar content is below the pre-determined percentage. Absence of this colour indicates a positive test for sugar.

#### VII.2 Alternative Rapid Test

A small sample of cotton is first sprayed with Benedict's solution, covering the surface with a thin film. The sample is then heated with a small amount of steam, say from a tea kettle, causing the honeydew to reduce the cupric ions. If the cotton is heavily contaminated, orange spots may be seen against the light blue background. With only a trace of honeydew these spots are difficult to see; the colour difference is therefore accentuated by spraying with phosphomolybdic acid. This colourless reagent reacts with Benedict's solution to give a colourless compound, so that the unaffected areas appear colourless. But the acid reacts with small amounts of cuprous oxide, formed by the honeydew, producing an intense deep blue colour that is easily distinguished from the light blue colour of Benedict's solution.

## APPENDIX VII

### TESTS FOR HONEYDEW

#### VII.1 Perkins Method

The Perkins method is a rapid screening test which shows whether or not the sugar content of a small sample of cotton exceeds a pre-determined percentage. The test is reliable and simple and does not require elaborate laboratory equipment or special training of technicians. The test is described in the USDA Textile Bulletin, August 1971.

The method is based on the reaction of alkaline potassium ferricyanide with the reducing substances on cotton. A weighed sample of cotton is placed in a flask with distilled water and an exact amount of a potassium ferricyanide - sodium carbonate solution. The cotton sample weight and/or the amount of potassium ferricyanide are varied according to the required screening percentage. The mixture is boiled gently for  $2\frac{1}{2}$  to 3 minutes. The presence of a distinctive lemon-yellow colour when the solution is removed from the heat indicates that the sugar content is below the pre-determined percentage. Absence of this colour indicates a positive test for sugar.

#### ANNEX 6

#### VII.2 Alternative Rapid Test

A small sample of cotton is first sprayed with Benedict's solution, covering the surface with a thin film. The sample is then heated with a small amount of steam, say from a tea kettle, causing the honeydew to reduce the cupric ions. If the cotton is heavily contaminated, orange spots may be seen against the light blue background. With only a trace of honeydew these spots are difficult to see; the colour difference is therefore accentuated by spraying with phosphomolybdic acid. This colourless reagent reacts with Benedict's solution to give a colourless compound, so that the unaffected areas appear colourless. But the acid reacts with small amounts of cuprous oxide, formed by the honeydew, producing an intense deep blue colour that is easily distinguished from the light blue colour of Benedict's solution.

## ANNEX 6

### CONTENTS

		Page Nr
1.	GENERAL	A6-1
2.	PRESENT SITUATION	A6-1
3.	OPTIONS	A6-2
4.	THE PREFERRED SYSTEM	A6-3
	4.1 General	A6-3
	4.2 Radio Links	A6-3
	4.3 Telex Equipment	A6-4
	4.4 Telephones	A6-4
	4.5 Power Supplies	A6-4
5.	THE NON-PREFERRED SYSTEM	A6-5
	<b>ANNEX 6</b>	
6.	TECHNICAL AND OPERATIONAL DESCRIPTION OF TYPICAL SYSTEM	A6-6
	<b>TELECOMMUNICATIONS</b>	
	6.1 System Network	A6-6
	6.2 Single Station Radio System	A6-6
	6.3 Antenna	A6-7
7.	MAINTENANCE	A6-7
8.	IMPLEMENTATION	A6-7
	8.1 Propagation Survey	A6-7
	8.2 Procurement Arrangements	A6-8
	8.3 Implementation	A6-8
9.	CPC OFFICE FACILITIES	A6-8
10.	COST ESTIMATES	A6-9
	10.1 CPC Preferred System	A6-9
	10.2 CPC Non-Preferred System	A6-9
	10.3 CPC Office Facilities	A6-10

# ANNEX 6

## CONTENTS

		Page Nr
1.	GENERAL	A6-1
2.	PRESENT SITUATION	A6-1
3.	OPTIONS	A6-2
4.	THE PREFERRED SYSTEM	A6-3
	4.1 General	A6-3
	4.2 Radio Links	A6-3
	4.3 Telex Equipment	A6-4
	4.4 Telephones	A6-4
	4.5 Power Supplies	A6-4
5.	THE NON-PREFERRED SYSTEM	A6-5
6.	TECHNICAL AND OPERATIONAL DESCRIPTION OF TYPICAL SYSTEM	A6-6
	6.1 System Network	A6-6
	6.2 Single Station Radio System	A6-6
	6.3 Antenna	A6-7
7.	MAINTENANCE	A6-7
8.	IMPLEMENTATION	A6-7
	8.1 Propagation Survey	A6-7
	8.2 Procurement Arrangements	A6-8
	8.3 Implementation	A6-8
9.	CPC OFFICE FACILITIES	A6-8
10.	COST ESTIMATES	A6-9
	10.1 CPC Preferred System	A6-9
	10.2 CPC Non-Preferred System	A6-9
	10.3 CPC Office Facilities	A6-10

## LIST OF FIGURES

Figure Nr	Title	Following Page Nr
1.	CPC Telecommunications - Preferred System	A6-3
2.	CPC Telecommunications - Non-preferred System	A6-5
	GENERAL	
	1.1. General	
	1.2. Radio Link	
	1.3. Telenet Equipment	
	1.4. Teletype	
	1.5. Power Supply	
	THE NON-PREFERRED SYSTEM	
	TECHNICAL AND OPERATIONAL DESCRIPTION	
	2.1. System Network	
	2.2. Single Section Radio System	
	2.3. Antenna	
	MAINTENANCE	
	IMPLEMENTATION	
	3.1. Propagation Survey	
	3.2. Procurement Arrangements	
	3.3. Implementation	
	CPC OFFICE FACILITIES	
	COST ESTIMATES	
	10.1. CPC Preferred System	
	10.2. CPC Non-Preferred System	
	10.3. CPC Office Facilities	

## ANNEX 6

### TELECOMMUNICATIONS

#### 1. General

An efficient telecommunications network linking CPC HQ Khartoum, CPC Port Sudan and all producing organisations, ginneries, research stations and other operational points is an essential requirement to enable CPC to promptly carry out its various duties (see Annex 7).

This telecommunications requirement would be most effectively fulfilled by a telex network linking all points, such that a 'hard copy' printout of all reports, instructions and other data is retained at the respective points of transmission and receipt. In addition, speech should be possible between the various points for engineering maintenance, special messages and other non-operational purposes. Arrangements should be made to ensure that all operational data is sent via telex to avoid ambiguities and to ensure complete operational records.

#### 2. Present Situation

Limited communications facilities are available, but these are unreliable, insufficient and not always freely available.

Field visits have produced the following information on the existing facilities at various ginneries/producing organisations.

Ginnery	Comments
Marangan ) Hasaheisa ) Bageir )	SGB radio link within scheme and to Khartoum. No link to Port Sudan.
Dueim	Unreliable STC telephone link between ginnery and Khartoum. No radio. Use made of Ministry of Agriculture 'crop protection' radio system.
Kosti ) Rabak )	STC telephone link between Kosti and Rabak but unreliable for external calls. No radio. Use made of Ministry of Agriculture 'crop protection' radio system.
Sennar	Unreliable STC telephone link between ginnery, Blue Nile Corporation offices and CPC Khartoum.
Hamadnallah	No communication facilities; reliance upon messengers.
Kassab	STC telephone link between ginnery, Suki Corporation HQ and Sennar.
Fau	Rahad Corporation and Ministry of Agriculture radio links to Khartoum. All equipment for extensive communication system linking project area to national network is on site awaiting installation.

Ginnery	Comments
New Halfa	No existing telecommunication facilities. Planning for system similar to Rahad is in hand but no contract awarded yet.
Zeidab	The Northern Agricultural Corporation has placed contract for radio system to connect Zeidab, Atbara, Damer, Dongola and HQ Khartoum. Ministry of Agriculture 'crop protection' system used at present.
Nuba Mountains Ginneries	Extensive system of radio links between ginneries and to Nuba Mountains Agricultural Corporation HQ in Khartoum.
Tokar/Port Sudan	STC telephone links between ginnery and Port Sudan and to Khartoum (unreliable). Some use made of Ministry of Agriculture 'crop protection' radio system.
Damazin	Mechanised Farming Corporation (MFC) link to MFC HQ in Khartoum.

CPC HQ Khartoum only have use of the public switched telephone networks (with inherent unreliability) and access to the Ministry of Agriculture 'crop protection' telex. The majority of their present communication is by messengers with associated delays.

### 3. Options

The major options available to CPC for meeting operational telecommunication requirements can be summarised as :

- (a) Rely on extension of the national network of telephone and telex services by STC to cover the area of operations and to be of sufficient quality and reliability.
- (b) Continue to use existing limited facilities without any operational control where systems belong to other organisations, e.g. Ministry of Agriculture 'crop protection' radio.
- (c) Provide an independent system to meet CPC requirements, which are principally for data transmission by telex, with the ability to have speech communication as necessary.

Enquiries and investigations indicate that the STC national system ((a) above) will not be able by 1990 to meet CPC requirements. It is unlikely that STC will have reliable telex facilities to fully meet CPC needs for many years after 1990.

Continued use of existing facilities ((b) above) would not meet CPC operational needs and would rely heavily upon the goodwill of the respective system owners to make their systems available to CPC.

The most effective option that would meet CPC operational needs by 1990 is an independent system ((c) above) tailored to the actual requirements. It is understood that STC would have no objection to this solution.

#### **4. The Preferred System**

##### **4.1 General**

The preferred system would comprise :

- (a) Fixed radio links between all producing organisation HQs (and the ARC Wad Medani) and the CPC offices in Khartoum and Port Sudan; also between CPC Khartoum HQ and CPC Port Sudan.

The exact type of radio link in each case would be determined by a site survey. Whilst VHF or UHF could be used for the shorter links, it would be necessary to use HF radio for the longer routes (over 50 km). All systems would be in accordance with relevant CCITT recommendations.

- (b) Telex and speech facilities such that messages can be sent over the appropriate radio links.

To eliminate the need for operator attendance at each telex machine throughout all working hours, it is proposed that a simple message queueing and switching system be incorporated, such that messages may be prepared for transmission and then automatically transmitted when the appropriate portion of the system becomes available.

##### **4.2 Radio Links**

The proposed arrangement for radio links is shown in Figure 1. The CPC representative at each producing HQ would have a link to CPC Khartoum and to CPC Port Sudan. A link between CPC HQ Khartoum and CPC Port Sudan would also be provided.

The system consists of a number of identical direct links without any switching. The advantages of this arrangement, compared with, say, a system involving switching through Khartoum to reduce the number of individual links, are :

- greater overall reliability, as failure of any or one link will not affect the others;
- simplicity of maintenance through having identical relatively simple systems.

It would be necessary for a full radio propagation survey to be carried out to ascertain :

- which links can be VHF/UHF and which should be HF;
- the location and height of each antenna mast/tower;
- availability of power;
- availability of accommodation for equipment.

It could be that the use of HF radio on all links would provide a more rational system. All proposals for radio links would be subject to the availability of suitable frequency allocations by STC, but the STC stated at the meetings to discuss the Draft Final Report that they could foresee no problems in allocating frequencies. All systems would be in accordance with relevant CCITT recommendations.

#### **4.3 Telex Equipment**

Telex machines would be of the latest design and have an Arabic character set. Such machines have a reduced number of mechanical components and hence would require less routine maintenance than older designs. Facilities would be included to enable messages to be prepared, checked and edited (as necessary) prior to transmission.

Each producing organisation should be provided with two complete telex machines to ensure continuity of service in the event of a machine fault. These could be used on a 'main/standby' basis or connected such that one machine is normally connected to Khartoum and the other to Port Sudan, with the possibility of easy changeover in the event of a machine fault.

The telex switching and queuing system would enable prepared messages to be held until it is possible for them to be automatically transmitted without further operator intervention. 'Override' facilities would enable CPC Khartoum and Port Sudan to send urgent messages.

Conventional VF telegraph equipment would be used to link telex machines to the radio links, all in accordance with relevant CCITT recommendations. The use of 'Speech plus Data' combiners would enable a single channel of the radio link to be used for simultaneous telex and speech.

#### **4.4 Telephones**

Speech would be by means of conventional telephone instruments over the dedicated channels. Each producing authority HQ would have two telephone instruments, each connected in parallel to the respective telex machine. Similar arrangements would exist at CPC HQ Khartoum and CPC Office in Port Sudan whereby one telephone instrument would be associated with each telex machine.

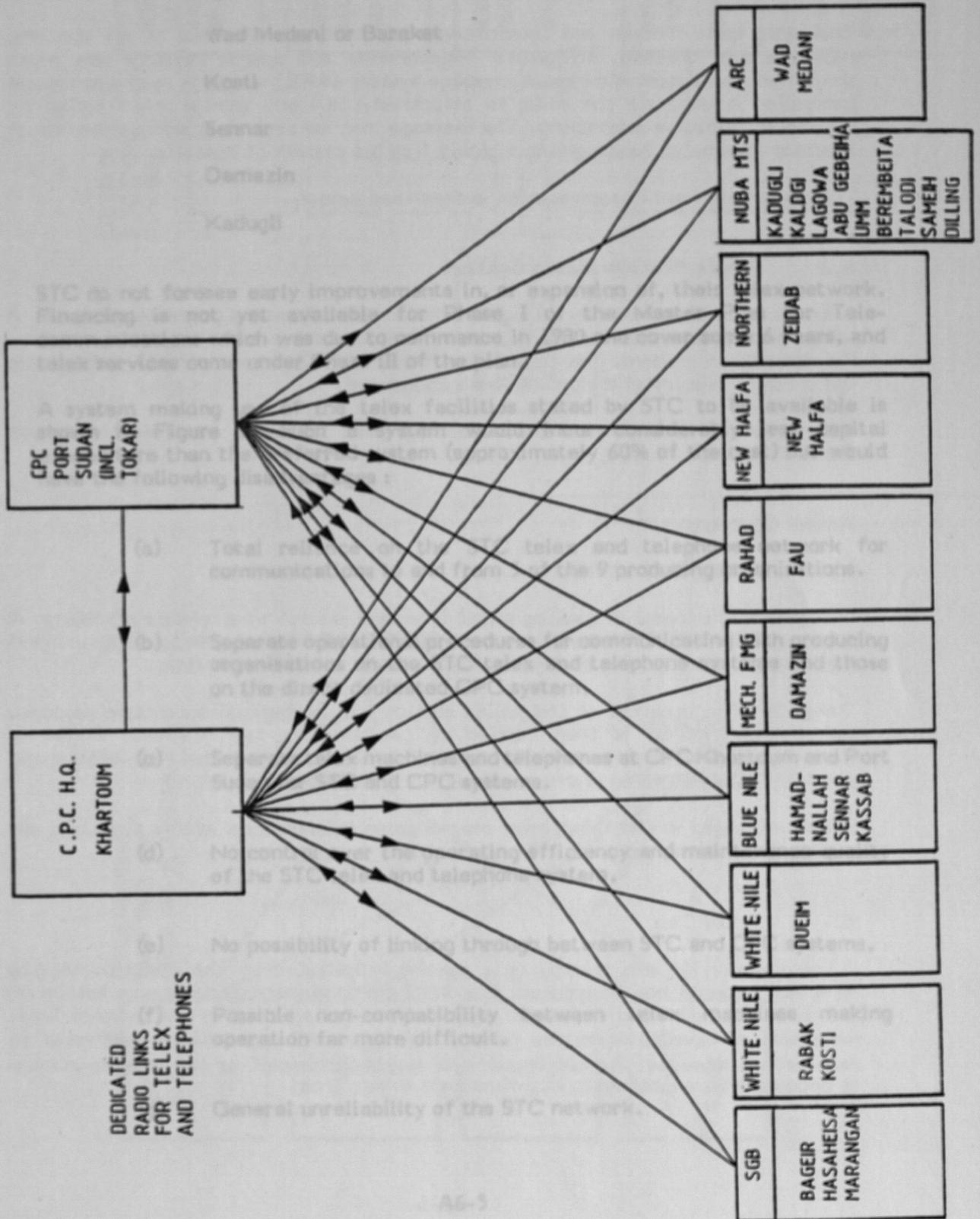
It would be advisable to have some form of key control of telephones at producing organisation sites to ensure that telephones are used only by authorised persons and for authorised purposes. This would help to ensure that all 'data' is sent by telex.

#### **4.5 Power Supplies**

Power for all telecommunications could be derived from 240 V 50 Hz single phase supplies. The load at each site would be very small (usually less than 200 W but never exceeding 1 kW) and would normally be fed from the local single phase AC mains supply.

It is proposed that a small portable-type standby generator should be supplied to each of the out-stations at the producing corporations, specifically for use with the telecommunications equipment. Standby power would be available at the other locations (ARC Wad Medani and CPC offices) from diesel generator sets provided for general standby purposes.

# C.P.C. Telecommunications Preferred System



## 5. The Non-preferred System

During meetings with STC it was stated that the national switched telex network is currently available at the following locations :

Khartoum  
Port Sudan  
Wad Medani or Barakat  
Kosti  
Sennar  
Damazin  
Kadugli

STC do not foresee early improvements in, or expansion of, their telex network. Financing is not yet available for Phase I of the Master Plan for Telecommunications which was due to commence in 1980 and cover some 6 years, and telex services come under Phase III of the plan.

A system making use of the telex facilities stated by STC to be available is shown in Figure 2. Such a system would incur considerably less capital expenditure than the preferred system (approximately 60% of the cost) but would have the following disadvantages :

- (a) Total reliance on the STC telex and telephone network for communications to and from 5 of the 9 producing organisations.
- (b) Separate operational procedures for communicating with producing organisations on the STC telex and telephone systems and those on the direct dedicated CPC system.
- (c) Separate telex machines and telephones at CPC Khartoum and Port Sudan for STC and CPC systems.
- (d) No control over the operating efficiency and maintenance quality of the STC telex and telephone system.
- (e) No possibility of linking through between STC and CPC systems.
- (f) Possible non-compatibility between telex machines making operation far more difficult.
- (g) General unreliability of the STC network.

## 6. Technical and Operational Description of Typical System

### 6.1 System Network

The system consists of twelve independent stations which utilise four frequencies in the 1.6 to 30 MHz band. Each station can be used to communicate with any other where power, distance and direction allow, but two main communications centres are used as information collection/distribution points. These centres are Khartoum and Port Sudan.

The radio telex modem and teleprinter equipment are identical at all stations, thus operator training, equipment maintenance and spares holdings are much simplified. An automatic repeat message system (ARQ) which is micro-processor controlled is used via the radio to selectively call and answer when called by the use of selective addressing. The message may be sent at specific times or on operator command, hence giving a highly flexible system of operation.

The equipment used in each station is described below.

### 6.2 Single Station Radio System

A single radio is powered by 24 V DC from a mains operated power supply unit. A teleprinter is connected via a V24 interface to a teleprinter interface and into the radio telex modem. The radio telex modem (ARQ) is connected via the audio and press to talk interface on the radio equipment.

The equipment is built into the base of a desk unit with the teleprinter unit above the desk.

#### System Operation

##### (a) Polling Call

The system is capable of making a poll from one station to a number of others. A station with the correct software will be opened up by the radio telex modem which automatically keys the transmitter and sends a selective code.

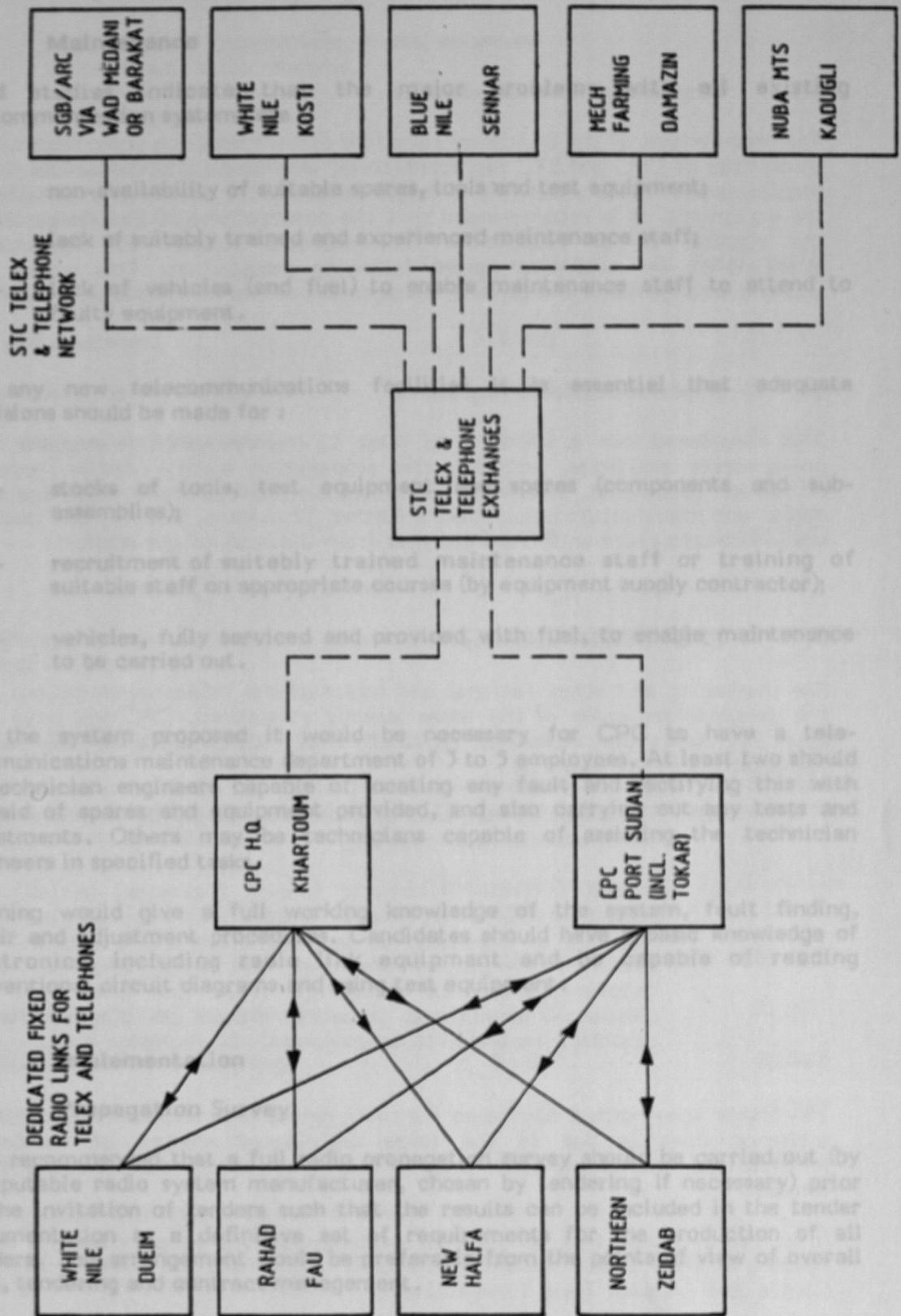
The code when received at the called station will prompt an automatic response and a 'conversation' is then carried on between the two stations. Errors in transmission prompt an automatic request (ARQ) for repeat and this will happen up to 30 times before an alarm is offered to the operator.

Stored messages in the teleprinter memory can be called up at any time and are dealt with automatically.

##### (b) Single Call

A transmission by one station to a second is initiated by the operator setting up a call code on his teleprinter. The ARQ working instruction is also set up on the same machine and messages are received/transmitted in the normal way. Selection of several addresses by the operator will allow those addresses to receive the message. An originator can establish himself as the master station or become a slave station to other masters as required.

# CPC Telecommunications Non-Preferred System



### 6.3 Antenna

A four frequency dipole is provided for use at all stations. This is a robust compact antenna for transportable use with optimum performance.

### 7. Maintenance

Field studies indicate that the major problems with all existing telecommunication systems are :

- non-availability of suitable spares, tools and test equipment;
- lack of suitably trained and experienced maintenance staff;
- lack of vehicles (and fuel) to enable maintenance staff to attend to faulty equipment.

For any new telecommunications facilities it is essential that adequate provisions should be made for :

- stocks of tools, test equipment and spares (components and sub-assemblies);
- recruitment of suitably trained maintenance staff or training of suitable staff on appropriate courses (by equipment supply contractor);
- vehicles, fully serviced and provided with fuel, to enable maintenance to be carried out.

For the system proposed it would be necessary for CPC to have a telecommunications maintenance department of 3 to 5 employees. At least two should be technician engineers capable of locating any fault and rectifying this with the aid of spares and equipment provided, and also carrying out any tests and adjustments. Others may be technicians capable of assisting the technician engineers in specified tasks.

Training would give a full working knowledge of the system, fault finding, repair and adjustment procedures. Candidates should have a basic knowledge of electronics, including radio link equipment and be capable of reading conventional circuit diagrams and using test equipment.

### 8. Implementation

#### 8.1 Propagation Survey

It is recommended that a full radio propagation survey should be carried out (by a reputable radio system manufacturer, chosen by tendering if necessary) prior to the invitation of tenders such that the results can be included in the tender documentation as a definitive set of requirements for the production of all tenders. This arrangement would be preferable from the points of view of overall cost, tendering and contract management.

If the survey were to be made the responsibility of the contractor, the tenders would include equipment and systems to meet the minimum stated performance requirements, assuming 'ideal' radio paths. It could be expected that following the propagation survey claims would be made for high performance equipment and systems to meet the conditions found during the survey.

## 8.2 Procurement Arrangements

The procurement of the telecommunications system would be supervised by a joint committee of CPC and STC representatives, who would also define the final user requirements. There should be a single contract for supply and installation of the equipment. It is recommended that the contract should include provision for the supplier to be responsible for technical support for operation and maintenance for a 2-year period following installation. This would include training arrangements and general management of the maintenance programme.

## 8.3 Implementation Programme

It is considered that a period of at least 12 months would be required for the pre-contract activities, including the propagation survey, design, preparation of tender documents, tendering and adjudication. Assuming that final system design and manufacture would take a further 12 months, shipping and installation would not take place until the third year from the start of the project.

## 9. CPC Office Facilities

For marketing and other national and international telecommunications outside the geographical scope of the areas already considered, CPC will have to rely upon STC telex and telephone facilities. The requirements for the new CPC headquarters office would be :

- (a) 3 to 6 telex machines connected to the public switched national/international telex network.
- (b) PABX (Private Automatic Branch Exchange) initially having approximately 75 internal extensions with telephone instruments, capable of expansion to approximately 150 extensions by the addition of plug-in units as and when required. Initially approximately 10 exchange lines (to the STC public National/International network) should be allowed for, with ultimate expansion to approximately 20 exchange lines.

The higher than normal allowance for telex machines, telephone instruments and exchange lines is due to the large anticipated amount of national and international marketing and dealing that will occur during seasonal peak periods.

It is also proposed that an internal exchange should be provided for the new building at Port Sudan containing the CPC offices and the Grading and Testing Centre (see Annexes 7 and 5 respectively).

## 10 Cost Estimates

### 10.1 CPC Preferred System

For the system illustrated on Figure 1 including :

- radio links (HF transceivers, masts, antennae)
- 50 Baud radio telex modems
- teleprinter interfaces
- teleprinter and paper
- switching equipment
- telephones for speech

the estimated cost is as follows :

	Foreign exchange (US\$)	Total cost <sup>(1)</sup> (LS)
Supply of equipment	530 000	1 115 000
Spares, tools, testing equipment	50 000	105 000
Installation and commissioning	25 000	100 000
Training and technical support	40 000	60 000
Total	645 000	1 380 000

Note : (1) Including taxes and duties.

In addition, the cost of standby generators at out-stations would be LS 21 000 (FE cost US \$ 10 000).

### 10.2 CPC Non-preferred System

For the system as above but limited to the sites shown on Figure 7.2 (facilities for all other sites to be provided by STC national network at appropriate tariffs), the estimated cost is :

	Foreign exchange US\$	Total cost <sup>(1)</sup> LS
Supply of equipment	290 000	609 000
Spares, tools and test equipment	34 000	71 000
Installation and commissioning	16 000	60 000
Training in Sudan	30 000	45 000
Total	370 000	785 000

Note : (1) Including taxes and duties.

In addition, there would be STC charges for provision of telex and telephone services on the national network.

### 10.3 CPC Office Facilities

The cost of a PABX system for the new CPC HQ, initially equipped for 75 extensions and 10 exchange lines but capable of subsequent expansion and extension, would be :

	Foreign exchange (US\$)	Total cost <sup>(1)</sup> (LS)
Supply	36 000	76 000
Spares, tools and test equipment	8 000	17 000
Installation and commissioning	8 000	18 000
Training in Sudan	8 000	8 000
<b>Total</b>	<b>60 000</b>	<b>121 000</b>

Note : (1) Including taxes and duties.

The estimated cost of an internal exchange for the Port Sudan office building is LS 67 000 (FE cost US \$ 30 000).

## ANNEX 7

## CONTENTS

	Page Nr
<b>CHAPTER 1 MARKET PROSPECTS</b>	
1.1 Introduction	A7-1
1.2 Market for Lint in Sudan	A7-1
1.3 Export Market	A7-4
1.3.1 Long Staple	A7-6
1.3.2 Medium Staple	A7-9
1.4 Market for Cottonseed	A7-10
 <b>CHAPTER 2 ORGANISATION OF GINNING AND CLASSIFICATION</b>	
2.1 The Present Situation	A7-13
2.1.1 Seed Cotton Production and Purchasing	A7-13
2.1.2 The <b>ANNEX 7</b> Producing Corporations	A7-14
2.1.3 The Private Sector	A7-15
<b>MARKETING, ORGANISATION AND MANAGEMENT</b>	A7-17
2.2 Ginning and Grading Board	A7-17
2.3 Sudan Cotton Board	A7-19
2.4 Ginning Inspectorate	A7-21
 <b>CHAPTER 3 MARKETING ARRANGEMENTS</b>	
3.1 General	A7-23
3.2 Communications	A7-23
3.3 Sales Promotion	A7-23
3.4 Export Sales Policies	A7-24
3.4.1 Long Staple	A7-25
3.4.2 Medium and Short Staple Cotton	A7-26
3.4.3 Assistance in Export Marketing	A7-28
3.5 Domestic Lint Sales	A7-29
3.6 Cottonseed Sales	A7-29
3.7 The Export Companies	A7-30
 <b>CHAPTER 4 MARKETING COSTS</b>	
4.1 Financing of Seed Cotton Purchases	A7-31
4.2 Costs for Export Cotton	A7-32
4.3 Costs for Domestic Lint	A7-34

## ANNEX 7

### CONTENTS

Page Nr

#### CHAPTER 1 MARKET PROSPECTS

- 1.1 Introduction A7-1
- 1.2 Market for Lint in Sudan A7-1
- 1.3 Export Market A7-4
  - 1.3.1 Long Staple A7-6
  - 1.3.2 Medium Staple A7-9
- 1.4 Market for Cottonseed A7-10

#### CHAPTER 2 ORGANISATION OF GINNING AND CLASSIFICATION

- 2.1 The Present Situation A7-13
  - 2.1.1 Seed Cotton Production and Purchasing A7-13
  - 2.1.2 The Role of the Producing Corporations A7-14
  - 2.1.3 The Private Sector A7-15
  - 2.1.4 Lint Classification A7-17
- 2.2 Ginning and Grading Board A7-17
- 2.3 Sudan Cotton Board A7-19
- 2.4 Ginning Inspectorate A7-21

#### CHAPTER 3 MARKETING ARRANGEMENTS

- 3.1 General A7-23
- 3.2 Communications A7-23
- 3.3 Sales Promotion A7-23
- 3.4 Export Sales Policies A7-24
  - 3.4.1 Long Staple A7-25
  - 3.4.2 Medium and Short Staple Cotton A7-26
  - 3.4.3 Assistance in Export Marketing A7-28
- 3.5 Domestic Lint Sales A7-29
- 3.6 Cottonseed Sales A7-29
- 3.7 The Export Companies A7-30

#### CHAPTER 4 MARKETING COSTS

- 4.1 Financing of Seed Cotton Purchases A7-31
- 4.2 Costs for Export Cotton A7-32
- 4.3 Costs for Domestic Lint A7-34

## CONTENTS (cont.)

		Page Nr
CHAPTER 5	ORGANISATION AND MANAGEMENT OF CPC	
	5.1 Introduction	A7-36
	5.2 Departmental and Divisional Responsibilities	A7-37
	5.2.1 CPC Headquarters	A7-37
	5.2.2 The Export Companies	A7-39
	5.2.3 CPC Stores	A7-40
	5.3 Staffing Problems	A7-40
CHAPTER 6	CPC MANAGEMENT INFORMATION	
	6.1 Present Reporting Arrangements	A7-42
	6.2 Possible Improvements	A7-43
	6.3 Export Market Research	A7-44
	6.4 CPC Financial Reports	A7-45
CHAPTER 7	FUTURE ORGANISATION OF CPC	
	7.1 Suggested Structure	A7-47
	7.2 CPC Headquarters	A7-48
	7.2.1 Staffing and Accommodation Requirements	A7-48
	7.2.2 New CPC Office Building	A7-50
	7.2.3 Office Equipment and Furniture	A7-51
	7.3 Branches of Export Companies in Port Sudan	A7-52
	7.4 CPC Housing at Producing Corporations	A7-52
	7.5 Training and Technical Assistance	A7-53
	7.5.1 Training	A7-53
	7.5.2 Technical Assistance	A7-53
APPENDIX I	CPC ACCOUNTS - 1980/81 and 1981/82	

### LIST OF TABLES

Table Nr		Page Nr
1.1	Deliveries of Cotton Lint to Local Mills 1974 to 1983	A7-1
1.2	Capacity of Spinning Mills in Sudan	A7-2
1.3	Estimated Cotton Requirements of Domestic Mills 1984/85 to 1990/91	A7-4
1.4	World Imports of Cotton and Exports of Sudan Cotton by Region, 1976 to 1982	A7-5

CHAPTER 1  
LIST OF TABLES (cont.)

MARKET PROSPECTS

Table Nr		Page Nr
1.5	Sudanese Exports of Cotton by Variety, 1972 to 1982	A7-6
1.6	Estimated Supply and Distribution of Extra Long Staple Cotton in Net Exporting Countries	A7-7
1.7	Estimated World Production of Extra Long Staple Cotton	A7-7
1.8	Exports of Sudan Extra Long Staple Cotton 1976 to 1982	A7-8
1.9	Exports of Sudan Medium Staple Cotton 1976 to 1982	A7-10
1.10	1983 Preliminary Allocation of Cottonseed to Local Oil Mills	A7-12
1.2 Market for Lint in Sudan		
2.1	Composition of Variety Committee	A7-13
2.2	Seed Cotton Prices for the 1982/83 Season	A7-14
2.3	Private Sector Ginning Costs and Net Worth 1981/82	A7-16
2.4	Composition of Sudan Cotton Board	A7-21
3.1	1982 ELS Sales and Average Contract Prices and 1983 ELS Policy Fixed Prices	A7-25
3.2	Deliveries of Cotton Lint to Local Mills 1974 to 1983	
3.2	1982 Sales and Average CIF Prices for Medium and Short Staple Cotton and Existing Fixed Prices for 1983	A7-27
	Long staple                      Medium staple                      Total	
4.1	Position of Seed Cotton Loans for 1980/81 and 1981/82 Crops as of April 1983	A7-31
4.2	Composition of Costs Associated with Seed Cotton Marketing in 1982	A7-33
4.3	Estimated Costs and Revenue of Lint Exports per Tonne of Seed Cotton in 1983	A7-35
5.1	Staffing of Cotton Public Corporation	A7-36
6.1	CPC Expenditure and Revenue for 1982/83 Estimated and 1983/84 Budget Proposal	A7-46
7.1	Accommodation Requirements for New CPC Headquarters	A7-49
7.2	Estimated Costs of New CPC Headquarters	A7-51

## LIST OF FIGURES

Figure Nr		Following Page Nr
5.1	Existing Organisation of CPC	A7-37
7.1	Suggested Future Organisation of CPC	A7-48
A7-7	Estimated World Production of Extra Long Staple Cotton	A7-17
A7-8	Exports of Sudan Extra Long Staple Cotton 1976 to 1982	A7-18
A7-10	Exports of Sudan Extra Long Staple Cotton 1983 to 1987	A7-19
A7-11	1987 Preliminary Allocation of Cottonseed to Local Oil Mills	A7-20
A7-12	Composition of Variety Composition	A7-21
A7-13	Seed Cotton Prices for the 1987/88 Season	A7-22
A7-14	Private Sector Ginning Costs and Net Worth 1981/82	A7-23
A7-15	Composition of Sudan Cotton Seed	A7-24
A7-16	1982 ELS Sales and Average Ginning Prices and 1987 ELS	A7-25
A7-17	1982 Sales and Average Ginning Prices for Medium and Short	A7-26
A7-18	Staple Cotton and Existing Yarn Prices for 1987	A7-27
A7-19	Position of Seed Cotton Sales for 1987/88 and 1988/89	A7-28
A7-20	Crops as of April 1987	A7-29
A7-21	Composition of Costs Associated with Seed Cotton	A7-30
A7-22	Marketing in 1987	A7-31
A7-23	Estimated Costs and Revenue of Lint Exports per Tonne	A7-32
A7-24	Staffing of Cotton Public Corporation	A7-33
A7-25	CPC Expenditure and Revenue for 1987/88 Estimated and	A7-34
A7-26	1987/88 Budget Proposal	A7-35
A7-27	Accommodation Requirements for New CPC Headquarters	A7-36
A7-28	Estimated Costs of New CPC Headquarters	A7-37

## CHAPTER 1

### MARKET PROSPECTS

#### 1.1 Introduction

The production of seed cotton has doubled during the past two seasons following improved prices to the farmer, the switch to an individual account system, and prompt payment to the farmer for his crop. The impact of the rehabilitation schemes to be implemented over the next few years and an expansion of the area under cotton are expected to increase the cotton crop by a further 60%. Production projections are discussed in Annex 3. A review of the market prospects for the projected output of the crop is given in this chapter, covering the domestic and international market for lint and the domestic market for cottonseed. This was requested by the Study Working Party at the review meeting of the Inception Report.

#### 1.2 Market for Lint in Sudan

No significant expansion in the domestic consumption of cotton by local spinning mills appears to have occurred over the last ten years. This is despite large increases in installed capacity by both the private and public sectors. Table 1.1 details deliveries to local spinning mills, by variety of cotton, since 1974. Deliveries over the period have averaged less than 10% of cotton production at 73 000 bales, 70% of the total being medium staple and 30% long staple cotton.

TABLE 1.1

Deliveries of Cotton Lint to Local Mills 1974 to 1983  
('000 bales)

	Long staple	Medium staple	Total
1974	10	76	86
1975	10	64	74
1976	22	40	62
1977	18	49	67
1978	20	29	49
1979	27	28	55
1980	29	61	90
1981	40	49	89
1982	13	23	36
1983*	38	87	125

Note: \* Provisional estimate.

Source : Cotton Public Corporation.

Deliveries in 1982 were particularly low at only 36 000 bales whereas 75 000 bales were expected. The reduced level of deliveries was due mainly to six mills, mainly in the private sector, not purchasing any supply. The circumstances involved large carry-over stocks, the closing of two mills and lack of power for production. The provisional estimate made by the Ministry of Industry for the 1983 local mill requirement is 125 000 bales but this may be subject to downward revision.

The installed capacity of local spinning mills is listed in Table 1.2, which also shows the year of installation.

**TABLE 1.2**  
**Capacity of Spinning Mills in Sudan**

Private sector	Year installed	Capacity in tonnes
Sudan Textile Industry	1961/80	14 700
Khartoum Spinning & Weaving	1964	4 050
Sennar Spinning Mill	1963	2 100
Red Sea Spinning	1976	2 100
International Spinning	1980	2 000
Wad Medani Spinning & Weaving	1978	2 100
CTM	1978	1 740
Gumeira	1981	1 440
Gematex	1982	1 500
Blue Nile Spinning & Weaving	1983	3 000
Blue Nile Spinning & Weaving Extension	1983	8 500
<b>Sub-total private sector</b>		<b>43 230</b>
<b>Public sector</b>		
Friendship Textile Mill	1976	2 160
Hag Abdalla Spinning Mill	1981	10 500
Port Sudan Spinning Mill +	1981	5 300
Gadow Spinning & Weaving*		1 800
Khartoum North Spinning*		2 100
<b>Sub-total public sector</b>		<b>21 860</b>
<b>Total</b>		<b>65 090</b>

Notes: + Not operative as still no electricity supply

\* Still under construction

Source : Development Prospects of the Sudanese Cotton Textile Industry, German Development Institute, 1982 and Ministry of Industry.

Capacity is based upon tonnes of spun yarn. In practice consumption of cotton is some 15% higher than yarn output, though the percentage of waste in Sudan has probably been higher with the low level of capacity utilisation and the discontinuity of production. A recent study by the German Development Institute of the Sudan Textile Industry showed that spinning mills operative between 1978 and 1981 achieved an average utilisation of only 34% of installed capacity, and an even lower level of utilisation was apparent amongst weaving mills. In 1981 productivity was less than 30% in the spinning sector and has since deteriorated further. The main reasons behind the low level of production may be summarised as follows:

- inadequate power supplies which lost the industry 16% and 20% of production time in 1980 and 1981 respectively. Port Sudan Spinning Mill which was completed in 1981 has waited for over two years for connection to the grid. Assistance has been given to mills for purchase of private generation equipment, but the mills are now experiencing shortages of gasoil;
- scarcity of spare parts due to lack of foreign exchange;
- lack of skilled manual labour, technicians and managers and high staff turnover have resulted in a low productivity of labour.

The combined effect of the above upon operating levels has led to cash flow problems, aggravated by the increased price of cotton supplies which were previously purchased at a substantial discount on the international price. Low operating levels have also limited the ability of domestic mills to compete with imported textiles. All mills are believed to be facing losses and three private sector spinning mills (Khartoum Spinning and Weaving, Gematex and Wad Medani Spinning and Weaving) with a combined capacity of 7 650 tonnes have reportedly closed.

Various measures are being undertaken to assist the textile industry. Restrictions have been imposed on imported cloth although significant quantities are still finding their way into Sudan. A committee, comprising the Ministry of Industry and Bank of Sudan, has been formed to study the problems of the industry. In the short term this will involve assisting cash flow problems by guaranteeing purchases of cotton lint, especially for private sector companies. Longer term measures involve examining the capability of the industry and planning development. Swiss consultants have also been appointed to examine the potential for more effective utilisation of the equipment in four major companies. A contract is also to be awarded to the Shirley Institute of the UK, dependent upon the availability of funding, to prepare a textile plan for Sudan.

Any improvement in the performance of the textile sector is likely to be slow. Indications are that there will be some contraction in the spinning sector to a possible 60 000 tonnes of spun yarn and that the capacity utilisation of the industry is unlikely to exceed 70% by 1990. This would imply a requirement for some 250 000 bales of cotton lint.

Such assumptions on performance appear reasonable in terms of the potential market for the textile sector. The potential market for the domestic textile sector was estimated by the German Development Institute's study to be 160 million metres of cloth, equivalent to 80% of the total market. This potential could be expected to grow to 200 million metres by 1990, equivalent to

some 205 000 bales. There is also scope for export of yarn, small quantities are apparently being exported at the present time, and possibly for export of cotton cloth provided capacity utilisation can be improved to make exports more competitive. A consumption of 250 000 bales by domestic mills could therefore be achievable.

An estimate of the future offtake by domestic mills is given in Table 1.3, increasing from an assumed 100 000 bales in 1984/5 to 250 000 bales in 1990/91. It is expected that requirements of the mills will continue to be 70% medium staple and 30% long staple.

**TABLE 1.3**  
**Estimated Cotton Requirements of Domestic Mills**  
**1984/85 to 1990/91**

	'000 bales
1984/85	100
1985/86	125
1986/87	150
1987/88	175
1988/89	200
1989/90	225
1990/91	250

### 1.3 Export Market

World consumption of cotton is expected to increase at about 2% per year, but of prime concern for Sudan is the trend in world trade. World imports of cotton between 1976 and 1982 averaged 4.4 million tonnes, equivalent to 23 million Sudanese bales, and the market share of Sudan averaged 3%, decreasing from 4% to 2% during the period. Data on world imports by region and the direction of Sudanese exports are given in Table 1.4 for the period 1976 to 1982. Despite a reduced level of exports, Sudan did increase its share of trade with China, the main growth market in the period, through its annual protocol sales. The major loss in market share occurred in the West European market which accounted for 21% of exports in 1982 compared with 40% in 1976.

The reduced level of exports has also been accompanied by an increasing switch to medium staple at the expense of long staple cotton. Exports of the latter were over 80% of Sudan's total cotton export ten years ago but were only 55% in 1982; this is shown in Table 1.5 where exports by variety are recorded since 1972. A fundamental factor in planning is to determine the relative volumes of long staple and medium on the basis of market prospects. Marketing of short staple cotton by comparison does not present particular problems as CPC is readily able to dispose of all available production which is rainfed and free from honeydew.

TABLE 1.4

World Imports of Cotton and Exports of Sudan Cotton by Region, 1976 to 1982  
('000 metric tonnes)

Region	1976	1977	1978	1979	1980	1981	1982
	Total Sudan						
North America	111	93	90	96	109	92	91
Asia (ex China)	1 827	1 694	1 898	1 836	2 034	1 842	1 880
China	195	130	347	520	889	737	564
Western Europe	1 299	1 159	1 214	1 137	1 251	1 059	1 088
Eastern Europe & USSR	689	691	645	701	686	653	608
Others (South America, Africa, etc.)	101	129	130	132	103	93	130
<b>Total</b>	<b>4 222</b>	<b>3 896</b>	<b>4 330</b>	<b>4 433</b>	<b>5 072</b>	<b>4 493</b>	<b>4 362</b>
	180	176	170	183	129	63	91

Source : International Cotton Advisory Statistics and CPC data.

TABLE 1.5

**Sudanese Exports of Cotton by Variety, 1972 to 1982**  
('000 bales (420 lb))

	Extra long staple	Acala	Short staple	Total exports	Total production
1972	1 086	151	50	1 287	1 283
1973	993	157	52	1 202	1 052
1974	365	121	32	518	1 253
1975	601	118	42	761	1 177
1976	833	120	37	990	581
1977	642	249	33	924	847
1978	536	323	30	889	1 079
1979	555	371	41	967	743
1980	384	266	24	674	609
1981	178	134	16	328	507
1982	260	195	20	475	813

### 1.3.1 Long Staple

In market terms, Sudanese long staple cotton falls within the category of extra long staple (ELS) cotton. The major problem for export prospects of ELS cotton is that, while consumption has remained stable, world wide trade has contracted significantly. According to the International Cotton Advisory Committee (Report on Extra Long Staple Cotton, October 1982) exports of major ELS exporting countries, principally Sudan, Egypt, Peru and United States, averaged 850 000 bales of 478 lb (960 000 Sudanese bales) in 1980/81 and 1981/82 compared with a million bales in the previous four years and over 1.5 million bales in the earlier 1970s. Estimates of the Cotton Public Corporation indicate that in the early 1970s world trade was as high as 2 million (478 lb) bales.

Much of the contraction in the world trade in ELS cotton is due to the disappearance of two major import markets. Both the USSR and India have expanded their own production of ELS cotton and are now self sufficient. India has apparently become an exporter of ELS cotton to the extent of 100 000 bales (478 lb) per year, but is reportedly now experiencing difficulties in disposing of the surplus production. A further pressure on the international market in recent years is that domestic consumption in net exporting countries of ELS cotton appears to have fallen, increasing export availability higher than might otherwise have been expected.

Details of estimated supply and distribution of ELS cotton since 1976 in major exporting countries, excluding India, are shown in Tables 1.6 and 1.7, while data on world production of ELS cotton by country are given in Table 1.7. Declining production in Sudan has to a large extent been balanced by increased availability from other exporting countries, namely Egypt, Peru and India. World production displayed a dramatic increase of 50%, an increase of one million bales, concentrated almost entirely in the USSR which was formerly a major market for ELS cotton from both Egypt and Sudan. It is uncertain if the increased production in the USSR is all consumed domestically or whether a proportion is exported to other East European countries.

TABLE 1.6

**Estimated Supply and Distribution of Extra Long  
Staple Cotton in Net Exporting Countries<sup>(1)</sup>**  
(<sup>0</sup>000 bales (478 lb))

Item	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82 est.
Stocks, August 1	930	925	825	635	580	670
Production	1 306	1 348	1 202	1 346	1 252	1 200
Supply	2 236	2 273	2 027	1 981	1 832	1 870
Exports to:						
Socialist countries	400	415	400	380	275	300
Elsewhere	615	680	675	665	525	600
Total	1 015	1 095	1 045	1 045	800	900
Consumption <sup>(2)</sup>	283	325	325	355	310	250
Stocks, July 31	925	825	635	580	670	720

- Notes : (1) Includes Egypt, Sudan, Peru and USA accounting for 85% of total, but excludes India and Zimbabwe.  
(2) Consumption of domestic cotton in producing countries.

Source : International Cotton Advisory Committee.

TABLE 1.7

**Estimated World Production of Extra Long Staple Cotton**  
(<sup>0</sup>000 bales (478 lb))

Country	1976/77	1977/78	1978/79	1979/80	1980/81 prel.	1981/82 est.
Egypt	705	662	663	778	715	585
India	415	365	385	500	440	500
Israel	10	14	20	21	25	18
Morocco	21	27	18	22	32	30
Peru	93	75	95	125	116	120
Yemen, PDR	6	10	7	6	5	5
Sudan	405	445	300	292	252	360
United States	64	112	93	99	104	80
Zimbabwe	-	25	42	45	53	30
Others	2	3	6	3	3	2
Sub-total	1 721	1 738	1 629	1 891	1 745	1 730
USSR	365	550	750	1 000	1 375	1 325
World total	2 086	2 288	2 379	2 891	3 120	3 055

Source : International Cotton Advisory Committee.

The market situation does not therefore appear promising, even allowing for possible errors in the data estimates, for Sudan to expand significantly its production and exports of ELS cotton. Prospects of world trade exceeding 1 million large bales, or 1.14 million Sudanese bales, are not encouraging.

The destinations of Sudan's exports of ELS since 1976 are given in Table 1.8, which shows where Sudan has lost its major markets. The disappearance of exports to the USSR and India reflects their own increased production referred to above. The most significant loss has been the absolute and relative decline in exports to Italy, from 192 000 bales (420 lb) in 1976, to 32 000 bales in 1982. Italian imports of all cotton have not declined in this period and it is unlikely that the pattern of consumption has changed, so the level of imports of ELS cotton should have remained unchanged. The main reasons for the large decline are apparently problems of honeydew and switching to Egyptian ELS cotton. By contrast the one export market that has held up well, while total exports of ELS have declined, has been Japan, where the level of exports has remained relatively stable since 1976. This has apparently been assisted by careful selection of lots for Japanese customers.

TABLE 1.8  
Exports of Sudan Extra Long Staple Cotton 1976 to 1982  
('000 bales (420 lb))

Destination	1976	1977	1978	1979	1980	1981	1982
Italy	191	170	108	109	107	27	32
Japan	83	50	75	91	93	75	73
Yugoslavia	83	74	80	77	57	29	31
China	57	106	46	78	33	1	17
USSR	49	27	21	58	-	-	-
USA	49	24	-	2	-	-	2
India	37	27	44	-	-	-	-
Hong Kong	33	12	7	6	3	3	13
W. Germany	27	20	16	11	8	3	17
UK	26	16	9	5	2	1	3
Thailand	21	19	13	11	8	2	7
Romania	17	8	12	45	4	19	11
Sub total	686	552	455	510	332	169	219
Others	111	89	81	44	52	9	41
Total	797	641	536	554	384	178	260

Source : Compiled from Cotton Public Corporation data.

1981 and 1982 with their low levels of ELS exports were also years of increasing stock levels and export availability. Export shipments in 1981 were at a low level of 187 000 bales, while the physical stock increased to over 200 000 bales and export sales were only 130 000 bales. Though export sales of ELS were

442 000 bales in 1982, compared with export shipments of 260 000 bales, carry-over stocks at the end of 1982 were over 370 000 bales, which represented 100 000 bales of free stock available for sale and a further 270 000 bales of committed stock awaiting shipment. By the end of March 1983, two months after the start of ginning the 1982/83 ELS crop, the free stocks of ELS from the 1981/82 crop had diminished marginally, while some 200 000 bales of the committed stock still remained to be shipped. The free stock carry-over of 1981/82 was also concentrated amongst the higher grades of ELS.

The slow turnover of stock indicates that at present it is difficult to sustain the level of sales achieved in 1982 (442 000 bales). This difficulty is likely to continue, as future prospects for world trade cannot be expected to exceed 1.2 million bales (420 lb) of ELS cotton. Maintaining the 1982 level of ELS sales, and hence export shipments, will require an intensive marketing effort to regain some of Sudan's former trade, which has since been lost to other ELS producers. It is also necessary to assume that the problem of honeydew will diminish.

Consideration of the international market prospects for Sudanese ELS cotton, and the potential offtake of domestic mills referred to in Section 1.2, suggest that production of ELS cotton should be limited to a maximum of 500 000 bales in future years.

### 1.3.2 Medium Staple

Medium staple cotton is regarded as the mainstay of the cotton trade and accounts for over 80% of all cotton consumed. Future low projections of world cotton consumption indicate an increase of 10 million bales (478 lb) by 1990 from an existing level of 66 million bales to 76 million bales. As world trade in cotton has averaged 20 million bales, or 30% of world consumption, over the last five years, the projected consumption could involve an additional 3 million bales in world trade by 1990, virtually all in medium staple.

Medium staple would appear to offer Sudan better market opportunities than long staple cotton. The restriction of ELS production to 500 000 bales implies that Sudan would have available 835 000 to 915 000 bales of medium staple for export, depending on the distribution of medium staple production between the Gezira and the pump schemes. The higher export availability would still be less than 5% of world trade, even if no growth in world trade was forthcoming.

There are also economic considerations favouring medium staple at the expense of ELS. Though medium staple commands a lower unit price than ELS this must be balanced against higher yield and ginning out-turn for medium staple. The ginning out-turn for medium staple is usually some 10% higher, ranging from about 9 to 14%, than for ELS. As the price differential is 20% higher for ELS, a 10% better yield in medium staple is necessary to obtain the same gross foreign exchange earnings. Average yields of medium staple in Gezira in recent years have been over 30% greater than those for ELS and this margin is not expected to fall in future years.

Recent years suggest that CPC has found medium staple more readily marketable in terms of volume than ELS. Medium staple has suffered higher levels of honeydew contamination than ELS. The effect has been to depress the prices obtainable on the international market, but the level of stocks, though increasing significantly in 1982, has not risen to the same extent as that for ELS.

Physical stock at the end of 1982 was equivalent to the annual shipment for the year and was equally split between free and committed stocks. At the end of 1981 and 1980 the ratios of physical stock to shipments were 60% and 33% respectively.

Exports of medium staple by country of destination are recorded in Table 1.9 for the period 1976 to 1982. The main factor to note is the dependence in recent years on China for a high proportion of sales. Since 1978 China has accounted for over 50% of medium staple exports. It will therefore be necessary to expand sales significantly to other existing markets, especially in Asia and West Europe, net importing regions where the best prospects for volume sales lie. This will require an intensive marketing effort and improvement in the honeydew situation.

TABLE 1.9

Exports of Sudanese Medium Staple Cotton 1976 to 1982  
('000 bales (420 lb))

Destination	1976	1977	1978	1979	1980	1981	1982
China	11	-	148	201	127	105	94
Thailand	23	15	7	16	12	6	22
Hong Kong	18	24	30	18	11	-	4
India	9	129	-	-	-	-	-
Taiwan	-	7	-	-	17	2	10
Burma	8	7	-	3	-	-	-
S. Korea	-	-	1	-	8	1	21
Italy	14	15	33	34	20	6	10
Portugal	-	5	15	22	12	-	-
Spain	5	2	1	8	2	2	10
W. Germany	-	-	6	7	7	-	-
Romania	9	-	-	-	15	-	-
Egypt	-	-	41	12	-	-	-
Sub-total	97	204	282	321	231	122	173
Others	24	45	42	50	35	11	22
Total	121	249	324	371	266	133	195

Source : Compiled from Cotton Public Corporation data.

#### 1.4 Market for Cottonseed

Sales of cottonseed make an important contribution towards the costs of purchasing seed cotton, ginning and marketing. The cottonseed available from the 1982/83 cotton crop is expected to realise sales of LS 74 million, all of which will be sold to local oil mills for crushing. The products of oil milling make an important contribution to the economy, supplying vegetable oil for human consumption and cottonseed cake for cattle feeding or export.

Where there are a total of 34 mills, all mechanical expeller plants, that rely solely upon cottonseed for crushing. These are all private sector companies, though three are joint venture investments between the government and the Arab Authority for Agricultural Investment and Development (AAAID). Total milling capacity is 560 000 tonnes per year, of which 250 000 tonnes of capacity has delinting equipment and can therefore utilise the white cottonseed of roller ginned medium staple or produced by saw ginneries without delinting equipment. Preliminary allocation of cottonseed for 1983 is detailed by mill in Table 1.10. The allocation figures reflect the relative size of mills as they are based upon individual mill capacity. A total of 270 000 tonnes was initially allocated but this has since been revised upwards and the final availability will be about 300 000 tonnes, which is equivalent to about 54% of available capacity.

Besides the mills that crush cottonseed there is a further large capacity of over 0.5 million tonnes for crushing other oilseeds such as groundnut and sesame.

Future market prospects for cottonseed are favourable as there is a strong demand for its end products of vegetable oil and animal cake. Cottonseed oil is popular in Sudan and is not permitted to be exported in order to satisfy domestic requirements to the maximum, so leaving higher value oilseeds, groundnuts and sesame, or their by-products for export. The total market for vegetable oil in Sudan is estimated by the Ministry of Industry to be 120 000 tonnes and increasing at between 6 and 12% per year. The production of cottonseed will yield some 40 000 tonnes of oil in 1983. Future seed cotton projections for 1990/91 indicate that the available cottonseed will yield sufficient oil to satisfy two thirds of present domestic consumption. Demand for animal cake is also currently strong and future increased production should find a ready market in Sudan, or in export markets where significant quantities were previously sold. Declining production of cotton and rising domestic consumption of animal cake resulted in exports of only 1 200 tonnes of cottonseed cake in 1981 whereas between 1970 and 1979 exports of cottonseed cake averaged over 90 000 tonnes.

There should not be any problems of disposing of increased cottonseed production and there already exists sufficient crushing capacity at 560 000 tonnes to process the level of availability projected in 1990/91 of up to 530 000 tonnes of cottonseed.

Seed cotton prices are announced at the start of picking in late November to December. The prices are set by the Ministry of Agriculture and Irrigation but the Ministry is advised by a special committee comprising the Head of the Prices Section of the CPC and the Chairman of Rahed Corporation. The prices are related to those of the international market as proposed in the 1981 Cotton Marketing Study. Early and consistent payment for seed cotton is a major factor which to an individual farmer has contributed to restoring production. The seed cotton prices fixed for the 1982/83 season are given in Table 2.2.

TABLE 1.10

1983 Preliminary Allocation of Cottonseed to  
Local Oil Mills

Name	Location	'000 tonnes	
		Allocation of cottonseed Black	White
African Oil Corporation	Khartoum North	11.6	-
Sudanese Oil Corporation	Khartoum North	11.3	-
Sudan Soap Factory	Khartoum North	5.4	-
Soan and Allied Ltd.	Khartoum North	9.7	9.1
Teital Oil Mill	Khartoum North	7.3	10.8
Gezira Oil Co.	Wad Medani	7.3	-
Malik Industrial Ltd.	Khartoum North	5.8	-
Marahab Oil Mill	Khartoum North	4.8	-
National Food Industry	Khartoum North	4.8	-
Kubani Oil Mill	Khartoum North	4.5	-
Nefeidi Oil Mill	Khartoum North	4.5	-
Abbas Ali Kemeir & Sons Ltd.	Khartoum North	4.0	-
Sheikh Industrial Co.	Khartoum North	3.4	-
Bahri Oil Mill	Khartoum North	3.4	-
El Madih Oil Mill	Omdurman	3.2	-
El Nafoura	Khartoum North	2.4	-
El Hamad	Omdurman	2.0	-
El Nekhalat	Omdurman	2.0	-
El Safa	Khartoum North	2.0	-
Ab El Mutasim Enterprises	Bageir	10.3	11.4
Oasis Oil Mill Ltd.	Khartoum North	2.9	-
El Kubaia Oil Co.	Khartoum North	2.0	-
Ibn El Hag Oil Mill	Hassa Heisa	2.0	-
New Omdurman Oil Mill	Omdurman	2.0	-
El Hidirbi Oil Mill	Khartoum North	2.0	-
El Fadl Oil Mill	Omdurman	1.0	5.0
Sami Oil Mill	Rabak	-	9.4
Rabak Oil Mill	Rabak	4.0	-
Adawai & Nadim Oil Mill	Dueim	3.0	-
Awad Moh'd Ali Oil Mill	El Obeid	2.0	-
Union Industrial	Bageir	-	88.5
El Debeitat Oil Mill	El Rahad	-	2.8
New Halfa Oil Mill	New Halfa - New Halfa	-	n/a
Port Sudan Oil Mill*	Bageir	-	3.0
<b>TOTAL</b>		<b>130.6</b>	<b>140.0</b>

Note : \* Since allocation this mill has been destroyed by fire.

## CHAPTER 2

### ORGANISATION OF GINNING AND CLASSIFICATION

#### 2.1 The Present Situation

##### 2.1.1 Seed Cotton Production and Purchasing

The availability of seed cotton for ginning, and therefore lint and cottonseed for marketing, is a function of variety mix, yields and the area under cotton. In January or February of each year, decisions are taken on the area to be put under cotton by variety within each scheme for the coming season, planting taking place from July onwards. The necessary decisions are made at a meeting of the Variety Committee which comprises the Ministry of Agriculture, the Agricultural Research Council (ARC) at Wad Medani, the Producing Corporations and the Cotton Public Corporation (CPC). The composition of the Variety Committee is shown in greater detail in Table 2.1. The CPC, responsible for marketing of cotton lint and cottonseed, provides the necessary advice on the relative proportions of long staple and medium staple that are appropriate to market requirements.

TABLE 2.1

#### Composition of Variety Committee

	Minister of Agriculture
	Head of Cotton Breeding, ARC
	Under Secretary, Ministry of Agriculture
	President, ARC
	Managing Director, CPC
	Deputy Managing Director, CPC
	Assistant Managing Director, Production, CPC
	Head of Production Department, CPC
4	Members from Sudan Gezira Board
3	Members from Rahad Corporation
3	Members from New Halfa Corporation
3	Members from White Nile Corporation
2	Members from Blue Nile Corporation
2	Members from Suki Corporation
2	Members from Mechanised Farming Corporation
16	Members from ARC
1	Member from Agricultural Bank
1	Member from Tenants' Union
45	Total

Seed cotton prices are announced at the start of picking in late November to December. The prices are set by the Ministry of Agriculture and Irrigation but the Ministry is advised by a small committee comprising the Head of the Prices Section of the CPC and the Chairman of Rahad Corporation. The prices are related to those of the international market as proposed in the 1981 Cotton Marketing Study. Early announcement of these prices and prompt payment plus the switch to an individual account system have contributed to restoring production. The seed cotton prices fixed for the 1982/83 season are given in Table 2.2.

TABLE 2.2

## Seed Cotton Prices for the 1982/83 Season

		LS/kantar
<b>Long Staple</b>		
Grade	1	104
Grade	2	100
Grade	3	96
Grade	4	92
Grade	5	88
Grade	6	83
Grade	7	78
Grade	8	73
Grade	9	69
<b>Medium Staple</b>		
Grade	1	72
Grade	2	70
Grade	3	68
Grade	4	66
Grade	5	64
<b>Short Staple</b>		
Grade	1	45
Grade	2	39
Grade	3	33

The CPC purchases seed cotton on behalf of the government, but in the case of rainfed short staple cotton the CPC pays for the lint at a fixed price on its delivery to Port Sudan. As from the 1982/83 cotton crop the CPC is also to reimburse the producing corporations for the costs of ginning, insurance and transportation of bales to Port Sudan. The latter expenses were formerly charged to the tenants by the producing corporations.

The costs of seed cotton purchase, ginning, insurance and transport are financed by a loan to the CPC from the Bank of Sudan. The loan is repayable out of the net proceeds of the CPC sales of lint and cottonseed. The CPC is responsible to the Ministry of Finance and Economic Planning which is appropriate in view of the importance of lint sales to export earnings. A more detailed description of CPC operations and the financing of cotton marketing is given in later chapters of this annex.

### 2.1.2 The Role of the Producing Corporations

The public sector ginneries are an integral part of the producing corporations, who also provide the agricultural services to production within their schemes, sharing the same administrative overheads and common facilities such as workshops. The producing corporations are responsible to the Ministry of Agriculture and Irrigation and report regularly, daily and weekly, to the Production Department within the ministry on the progress of the cotton crop and ginning.

The corporations organise deliveries of seed cotton to the ginneries, seed cotton grading (using their own graders), weighing, ginnery operations and despatch of lint and cottonseed. Besides the need for management to ensure the quality of ginning, the weighing and recording of seed cotton and ginning out-turns is very important. This is especially significant now that CPC purchases the seed cotton. All ginneries appear to maintain comprehensive documentation, from recording the weights of seed cotton arrivals to weights of out-turns. Mistakes and inaccuracies can and do occur with such large volumes involved and where seasonal staff are employed; recording weights of seed cotton arrivals can be a particular source of error. It is essential that the ginnery weight is recorded and not the field weight copied by mistake. Weighers at the ginneries should not receive copies of field weights, which should be kept separately. This is done by Sudan Gezira Board and should be standard practice.

The Blue Nile Corporation is the only producing corporation that does not operate a ginnery. Its seed cotton is ginned at the private ginneries of Sennar and Hamadnallah or at Kassab, operated by the Suki Corporation. It does however employ its own weighers, at each of these locations.

The producing corporations appear to be committed to the continued management and operation of their ginneries apart from the case of Rabak ginnery which comes under the White Nile Corporation. This ginnery has suffered frequent changes in ownership/control since nationalisation, switching between the SGB and the CPC and finally to the White Nile Corporation. There was also a recent possibility for control by the Regional Government. Reducing the uncertainty of any further change would increase the commitment of management.

### 2.1.3 The Private Sector

There are four private sector roller ginneries, two in White Nile at Dueim and Kosti and two in Blue Nile at Sennar and Hamadnallah. The ownership of each of the ginneries is as follows :

- El Dueim Ginning Company is owned by private individuals who were pump scheme operators. 90% of the equity is owned by Zahir, a Saudi Arabian, and 10% by Sayed al Fadil.
- Kosti and Hamadnallah are owned by Aboulela Cotton Ginning Company Ltd, part of a group of companies engaged in engineering and real estate. The company was a major operator of the pump schemes prior to nationalisation.
- Sennar Ginning Company is owned by a collection of several private investors. The main investors are the Contimachalos family (merchants), Hamad Homeda, Sudan Giza, Breri Engineering and Aboulela.

Each of the ginneries is controlled by a head, or associated, office in Khartoum to which it regularly reports.

The private ginneries operate on the basis of a ginning fee. The fee is determined retrospectively by the Ministry of Agriculture and Irrigation and approved by the Ministry of Finance. It is based upon the audited expenditure of the companies plus a profit element equivalent to 25% of their net worth. A committee, including the ginning engineer of the Department of Agricultural Engineering, an economist from the Ministry of Agriculture and an accountant

from the Ministry of Finance, plus a representative from the private sector, examines the accounts of the companies. These are analysed into fixed and variable costs and their net worth is determined. Table 2.3 shows the relevant details for 1981/2. The average cost of ginning was LS 6.54 per kantar of lint and the profit contribution was LS 1.09 per kantar of lint, equal to 25% of net worth divided by lint output. Determination of the net worth excludes any revaluation of assets. In 1980 Sennar Ginnery was revalued at LS 773 000 whereas its book value was approximately LS 30 000.

TABLE 2.3  
Private Sector Ginning Costs and Net Worth 1981/82

	Costs LS '000			Lint output* (kantars)	Cost per kantar (LS)	Net worth (LS '000)
	Fixed	Variable	Total			
Hamadnallah	163	260	423	64 593	6.564	316
Kosti	147	192	339	54 696	6.199	196
Sennar	115	104	219	30 241	7.243	134
Dueim	156	215	371	57 044	6.501	255
Total	580	1 015	1 352	206 574	6.544	901

Note : \* ELS cotton only.

Source : Private Ginning Companies.

The owners of the private ginneries were very opposed to the method of determining the ginning fee when it was introduced in the early 1970s. This was because of the limitation on the profit that could be earned. Subsequent decline in seed cotton production on the Blue and White Nile schemes drastically reduced the volume of lint ginned to between 25 and 30% of earlier production levels. As a result the owners have been grateful for a guaranteed profit on such low operating levels. The ginning fee, however, is paid at the same average rate and does not reflect the differing cost profiles of each ginnery. This is to the disadvantage of a ginnery that receives a particularly low volume of seed cotton when operating efficiently. This appears to have been the case of Sennar in 1981/82 (see Table 2.3). It recorded the highest average unit cost while having the lowest fixed costs and unit variable costs.

The private ginneries also receive a fee for the grading of seed cotton. This is at a rate of 10 piastres per kantar of seed cotton. Each of the private ginneries employs a Greek classifier for the season to grade all arrivals of seed cotton.

Costs of private sector ginning are paid by the appropriate producing corporation with whom the private ginneries appear to have a good working relationship. Advance notification of the projected arrivals of seed cotton is supplied by the producing corporation to the private ginneries and the growing areas are strictly defined. The main concerns of the private ginneries are the lack of available cotton for ginning and the problems of obtaining foreign exchange for replacements or spare parts.

The private ginneries appear to be performing well; they operate with a relatively low overhead staff and their average cost of ginning in 1981/82 compared favourably with public sector roller ginneries in view of their low throughputs. Their average cost of ginning was LS 6.54 per kantar of lint of ELS while the preliminary estimate is LS 6.2 per kantar of lint in the Gezira where roller ginneries were experiencing higher throughput, though some 20% of production was medium staple.

It does not seem necessary to bring these private ginneries into public ownership which would be against the general trend of government policy and could involve a cost of several times the combined net worth of LS 900 000 in Table 2.3 if the assets of the ginneries were independently valued. The present arrangement in determining the ginning fee exercises a suitable control and offers the owners a fair return. Indeed it seems appropriate to extend the same central analysis to all ginneries to facilitate planning and budgeting.

There is no real private sector involvement in the production of cotton. Damazin Agricultural Company, private sector, and the Sudanese Egyptian Integration Co. joint venture do grow a small amount of cotton. This is ginned at Damazin or Rahad, depending on the type of mechanical picking used, for a ginning fee. Production of the two schemes, however, is estimated to be only 6 000 bales of short staple out of a total 1 million bales of all varieties for the whole country in 1983. It is sold to the CPC at a fixed price per kantar of lint.

There have been exploratory discussions with the former owners of the pump schemes on the Blue and White Nile about possible privatisation. It appears, however, that the pre-conditions of the former owners would include :

- freedom to grow ELS cotton or whichever alternative crop showed the best return;
- freedom to market their own cotton.

Such requirements could be contrary to the long term prospects of cotton's contribution to the national economy.

#### 2.1.4 Lint Classification

Lint classification is carried out at Port Sudan and is organised for the entire Sudanese cotton crop by the Sudan Gezira Board (SGB), which employs the cotton examiners. The Chief Cotton Examiner is responsible for co-ordinating seed cotton grading and lint classification and for the setting of grade standards. A grading fee of LS 0.25 per bale is paid by CPC to SGB for the classification of all non-SGB production. The grading and classification system is described in more detail in Annex 5.

#### 2.2 Ginning and Grading Board

At the outset of the study it was requested that the proposal of the 1981 Cotton Marketing Study for establishing an independent Ginning and Grading Board should be explored. The object of the proposal was to relieve the producing corporations of the operational responsibility for the public sector ginneries so that they could concentrate their efforts on agricultural production. A further reason for the proposal was that the CPC now purchases the seed cotton

from the grower and as from 1983 reimburses the costs of ginning to the producing corporations. Cotton ginning was therefore seen as a secondary activity for the producing corporations. The private ginneries were to continue to operate but as contractors to the new Ginning and Grading Board.

The initial view expressed in the Inception Report was that no clear advantages could presently be gained by transferring control of the public sector ginneries to an independent board. Completion of the field visits supports this view. As previously explained, the ginneries are an integral part of the producing corporations' organisations, sharing the same administrative overheads and common facilities, such as workshops, while the ginney manager reports to the Head of Engineering within the producing corporation. The quality of lint being produced was found to be good despite the many problems encountered by management, such as lack of spare parts, old equipment, frequent stoppages and shortages of skilled labour.

Apart from resistance by the producing corporations and possibly the grower, certain problems of establishing a new board in respect of ginning were cited in the Inception Report. These were briefly :

- the information flow from production to marketing would not be improved. The CPC would deal with only one organisation but the latter would have the problem of control and obtaining the necessary information from 22 ginney locations;
- a new board would also require its own administrative staff at each ginney plus housing, both of which the producing corporations could not make fully available from existing resources. Additional costs would then be involved;
- there would be a shortage of suitably experienced personnel to staff the headquarters of the new board.

Though there appear to be no clear advantages in establishing an independent board for ginning, there is a need for a central authority to lay down ginning standards and practices and to monitor the ginning process. This would assist CPC in reconciling expenditure on seed cotton purchases and ginning out-turns. It is also suggested that at each of the main producing corporations there should be a resident CPC employee vested with the authority to check the weighing returns of seed cotton, lint and cotton seed.

In respect of grading of seed cotton and lint, the argument for independence on the grounds of confidence and integrity can be strong. However, under the new production arrangements the producing corporations have no financial interest in seed cotton grading, the grower being paid on weight and grade by the CPC. It is therefore proposed that control of seed cotton grading should remain with the producing corporations.

Lint classification for its part is backed up by the international arbitration safeguards on grade descriptions, and the system is well established and has the confidence of buyers. However, the present arrangement whereby lint classification is controlled by SGB is something of an anomaly. Classifying is an essential element in the marketing of cotton as it assigns a quality description which indicates its monetary value. Already the SGB classifying department sends daily reports of the lots graded to the head office of CPC and

shares the same building as CPC stores' management in Port Sudan. In view of the proposed establishment of a fibre testing laboratory as part of the classification facility at Port Sudan, it is recommended that the Cotton Classification Unit should become a separate entity. Although the work of classification and the identification of bales by grade and staple in the port storage are inseparable, and indeed there are many practical advantages in the Cotton Classification Unit sharing the same building as the CPC stores' management, it is considered preferable for the lint classification to be independent of CPC. From the international trading viewpoint the next few years will be critical with regard to marketing because of the honeydew problem, and it would be advantageous if assessments of 'free from honeydew' or 'light contamination' could be backed up by an independent organisation not within the province of the marketing authority. It is suggested that lint classification should come directly under the control of the recently established Sudan Cotton Board, but consideration would have to be given to the detailed administrative arrangements, particularly regarding the employment of staff.

Some formal link will need to be maintained between seed cotton grading and lint classification for formulating standards. It is suggested that this is done through the Sudan Cotton Board.

It was agreed by the Study Working Party at the review meeting on the Inception Report that a Ginning and Grading Board should be concerned with policy and not operational responsibility. It is felt that such a function would not at present warrant the establishment of a further separate board but should be incorporated into the Sudan Cotton Board and the Ginning Inspectorate, which has also been recently established.

### **2.3 Sudan Cotton Board**

The formation of the Sudan Cotton Board was announced by Ministerial Decree Nr 53 on April 2nd, 1983. The stated general objective is co-ordination in the fields of production, marketing, research and seed cotton pricing and collection of all information relating to statistics and research in cotton.

The Department of Agricultural Planning within the Ministry of Agriculture will form the secretariat to the Sudan Cotton Board. The board will also have the right to consult or request the assistance of any other appropriate bodies or individuals. The composition of the 25 member board is shown in Table 2.4. No detailed terms of reference for the board were available at the end of May 1983 and the Planning Administration had not received any directive as to how to execute its function as the board's secretariat. Also no meeting of the new board had yet taken place.

It is presumed that the Sudan Cotton Board will be the policy formulating body on all cotton affairs. To this end it is essential that it encourages a high degree of co-operation, commitment and communications among the producing corporations and the CPC, not just at senior but also at middle management level, and to consolidate the necessary information required for planning. The following recommendations are put forward regarding possible functions for the Board :

- (i) As suggested in the 1981 Cotton Marketing Study it is essential to maintain a sufficiently attractive price for the grower. A prime task should therefore be to monitor seed cotton prices in relation to production costs and the international prices of lint and cottonseed.

The Department of Agricultural Economics within the Planning Administration, which conducts its own surveys, and the producing corporations would be the main source of cost information while CPC would supply the international pricing information and details of selling expenses. Seed cotton production costs must be compiled on a more timely basis and should utilise the same standard format for each scheme, and ascertain the true return to the farmer including the family labour elements.

- (ii) The work of the Variety Committee referred to earlier could possibly be taken over by the Sudan Cotton Board. There is a significant duplication of members between the two, as can be seen by comparing Tables 2.1 and 2.4. It would seem appropriate if the Variety Committee were dispensed with in name and varietal decisions taken at a particular session of the Sudan Cotton Board.
- (iii) The ginning costs of the public sector ginneries should be analysed in a similar manner to that carried out already within the Planning Administration of the Ministry of Agriculture for the private sector. A standard form for analysing ginning costs should be prepared.
- (iv) Policies on ginning should be laid down in respect of practices, maintenance, fire safety, blending of seed cotton and segregation of honeydew cotton. A decision has already been made to introduce a Ginning Inspectorate, and a senior ginning engineer from the Department of Agricultural Engineering has been appointed as Inspector General of Ginning Factories from July 1983. It is intended that the Inspectorate should report to the office of the Ministry of Agriculture but it would be suitable for it to be included within the secretariat of the Sudan Cotton Board.
- (v) The Sudan Cotton Board could take over responsibility for co-ordinating the standards between seed cotton grading and lint classification as mentioned in the previous section. To exercise this function, a new post of Head of Cotton Classification would be created. He should be attached to the secretariat of the board and would make an annual report to the board on the quality of seed cotton and lint.
- (vi) Discussion of the needs for research into cotton production and defining priorities.

The executive staff of the secretariat should be of high calibre but should be kept to a minimum, under 15 persons in total. Their main functions would be preparing reports, policy recommendations and follow-up. In the case of the Inspector General of Ginning Factories and the Head of Cotton Classification it would be appropriate if they were included on the board itself in view of the importance of these positions within the industry.

The formation of a Sudan Cotton Board and its secretariat as described above could form the necessary nucleus should it be decided at some future date to proceed with the concept of an independent Ginning and Grading Board.

**TABLE 2.4****Composition of Sudan Cotton Board**

Minister of Agriculture (Chairman)  
 Chairman of CPC (Vice Chairman)  
 Managing Director of Sudan Gezira Board  
 First Under Secretary, Ministry of Agriculture  
 Chairman of New Halfa Corporation  
 Chairman of Rahad Corporation  
 Chairman of White Nile Corporation  
 General Manager of Suki Corporation  
 General Manager of Blue Nile Corporation  
 General Manager of ARC  
 Chairman of Mechanical Farming Corporation  
 Professor Khalifa  
 Head of Cotton Breeding, ARC  
 Deputy Managing Director, CPC  
 Head of Production and Public Relations Department, Ministry of Agriculture  
 General Manager of Nuba Mountains Corporation  
 General Manager Tokar Corporation  
 Representative from Ministry of Finance and Economic Planning  
 Representative from Bank of Sudan  
 Head of Agricultural Sector, Ministry of Finance and Economic Planning  
 Head of Sudan Farmers' Union  
 Head of Gezira Farmers' Union  
 Head of Sudan Union of Textile and Weaving Industry  
 Head of Planning Administration, Ministry of Agriculture  
 Representative from Ministry of Industry

**2.4 Ginning Inspectorate**

The main purpose of the new Ginning Inspectorate is to see that ginning standards are established and maintained and to advise on ginning. It is intended that ginnery inspections and ginning tests should be carried out at the start of each season, and provided these were completed to the satisfaction of the Inspectorate, a certificate would be issued authorising ginning to commence. Follow-up inspection visits would be made during the course of the season. Such procedures were originally contained in a Ginning Ordinance of 1926 whereby all ginning factories were licensed prior to the start of the ginning season.

Detailed terms of reference and procedures for the Inspectorate are now being prepared by the newly appointed Inspector General of Ginning Factories. It is planned to recruit two assistants (ginning inspectors) from the producing corporations. A team of three should be adequate to carry out the functions of the inspectorate for the time being.

The major question to be considered is to what extent the Inspectorate can or should be given formal powers or other means to ensure that ginning standards are observed. The issuing of the certificate at the start of each season would be the main means of enforcement available to the Inspectorate, but in practice even if the certificate was not issued, there would be great pressure to start ginning the crop. Similarly, if standards deteriorate after the start of ginning, it would be difficult to close down a ginnery, and such a course of action would require careful consideration of the consequences.

Two other possible ways in which ginning standards could be influenced would be:

- to introduce an adjustment to the amount of ginning costs paid by CPC to the producing corporations, depending on the standard of ginning;
- for the Inspectorate to exercise some direct control over senior ginning staff through a system of individual licensing of ginnery engineers.

However, such systems of control would probably be at best difficult to establish and at worst unworkable in practice, as they would depend to a large extent on subjective judgements. Assessment of the standard of ginning would have to balance many factors including the age and capability of the equipment, the size of the crop to be ginned in relation to capacity, the quality of the seed cotton presented, observance of safety rules and so on.

It is therefore considered that the most effective role for the Inspectorate to play would be one of monitoring and advising on deficiencies and courses of remedial action. The latter would cover matters both within and outside the control of the producing corporations and private ginning companies. The Inspectorate would make an annual report to the Sudan Cotton Board, and interim reports during the ginning season, and the board, on which the producing corporations are in any case strongly represented, would then decide on a case by case basis what steps to take to overcome shortcomings in ginning standards. The board would have recourse to the Minister of Agriculture as an ultimate sanction.

It must be emphasised that the view of the study team is that at present the ginneries are, on the whole, producing lint of a reasonable quality within the constraints imposed by factors largely outside their control. In these circumstances it is preferable that the role of the Inspectorate should be supportive rather than narrowly regulatory. It is to be hoped that a relationship would develop in which the ginneries would be prepared to follow informal advice given by the inspectors.

An important way in which the Inspectorate could influence ginning standards would be through the training of ginnery engineers. It should liaise closely with the proposed ginning training officer (see Annex 3), who could possibly be attached to the Inspectorate. The Inspectorate should be involved in drawing up the syllabus of the proposed training course for new ginnery engineers and could identify requirements, at an individual level, for further training of existing ginnery staff.

The Inspectorate could also maintain a central register of ginning equipment (for which the inventory prepared under this study would provide the initial basis) and play a part in the co-ordination of ordering and supply of spare parts and consumables. This would, of course, represent an extension of its functions and would require additional staff. The supply of spares is discussed further in Annex 3.

## CHAPTER 3

### MARKETING ARRANGEMENTS

#### 3.1 General

The Cotton Public Corporation, with its four export companies, is the sole marketer of Sudanese cotton. It faces two general constraints in the execution of its duties, namely poor communications and insufficient support for sales promotion activities.

#### 3.2 Communications

The most pressing problem for CPC is that of poor internal communications. The CPC headquarters in Khartoum needs constantly to monitor the cotton crop from the time of planting through to picking, ginning and transporting to Port Sudan. The information is required for planning the marketing strategy and budgeting and also to keep buyers of Sudanese cotton informed of likely quality and availability of grades. Poor communications restrict the flow of information from the producing corporations to CPC on progress of the crop and ginning. The situation has worsened during the past year as co-operation has not been so readily forthcoming. The formation of the Sudan Cotton Board to encourage greater co-ordination and the posting of a permanent CPC representative at each of the major producing corporations should improve the situation. Current arrangements involve using the telephone links of other organisations. The ideal solution, however, is for CPC to have its own direct communications with the producing corporations.

Equally important is for the CPC headquarters to have improved communications with its stores in Port Sudan; frequently there is no telephone contact for a week and communications then depend on written messages given to passengers travelling to Port Sudan by air. The main flow of information between CPC and its stores related to stock positions and expediting of shipping instructions. It is also necessary for the Port Sudan stores to have good direct communication links with the producing corporations. This would permit bale arrivals to be notified in advance and storage arrangements to be planned accordingly.

The problem of telecommunications and the preferred solution to the problem is discussed in detail in Annex 6. Any new system should include a telex facility because of the need for a hard copy in view of the large volume of factual information and data to be transmitted.

#### 3.3 Sales Promotion

Budget restrictions in recent years have limited the amount of overseas travel by CPC marketing staff; only two such visits were made by senior CPC staff in 1982. Managers of the export companies have not visited buyers overseas in recent years and there has been no representation at International Trade Fairs. There is also the additional burden of visits having to be planned three weeks in advance to obtain the necessary approvals from various ministries. Special invitations, however, are extended to cotton 'guests' to come to Sudan for inspection visits of the various producing schemes and of the Port Sudan export stores; in 1982 a group of 40 were invited.

The importance of overseas sales promotion must be recognised and cannot be ignored when the major competitor in ELS, Egypt, devotes much effort to this end. Increased commitment to sales promotion will be necessary to re-establish the image of Sudanese cotton following bad experiences with honeydew, and in view of the large projected increases in export availability.

Sales promotion should be directed not just to buyers, but also to the spinning mill as the ultimate user of the cotton on whose behalf the merchant takes a position when placing a contract. At the level of the spinning mill technical selling assumes a greater importance, as it is likely to be a technical person who will determine which cotton is preferred. The specifier is often remote from the merchant purchasing on behalf of a spinning mill. Export sales promotion should therefore involve not only top management but also middle management with a technical background and experience of the textile industry and cotton processing. The CPC should therefore consider the recruitment of two persons with the appropriate textile industry experience, preferably Sudanese with experience of working in textile industries overseas. Also an experienced cotton classifier is required at CPC headquarters who could show samples to overseas visitors and discuss the characteristics of each type of Sudanese cotton available for sale.

CPC should also investigate possible ways of speeding up official clearances for overseas visits. Rapid response can be very important, especially where a buyer may have a complaint on grade or quality. Personal contact enhances the prospects of a suitable compromise and this may result in savings on a possible adverse arbitration decision.

### **3.4 Export Sales Policies**

The sales methods employed by the CPC in the marketing of Sudanese cotton, which were extensively reviewed in the 1981 Cotton Marketing Study, seem appropriate to the international cotton market. The main concern of the CPC is striking the right balance between price and volume sold to maximise revenue. The pricing is therefore the crucial element in determining the market policy and is discussed in subsequent sub-sections.

The major problem in the marketing of Sudanese cotton is the incidence of honeydew and the reluctance of potential buyers to risk purchase, especially as it is not a factor for arbitration. Segregation of heavily contaminated cotton, from the field through to ginning, and subsequent separate marketing of identified lots is essential to increase the confidence of potential buyers.

A particular problem that can frustrate marketing efforts arises from cotton sales made in respect of bilateral trade agreements or as repayment of national loans. These protocol sales are particularly important, accounting for 50% of sales in recent years. However, careful consideration is required of trade deals which do not reflect a country's requirements. There is a danger that such cotton may be resold on the international market at a discount to CPC fixed prices. This can be harmful to the reputation of Sudanese cotton in the market. Where possible, sales in such instances should be at or above the fixed prices to prevent resale below CPC prices.

### 3.4.1 Long Staple

ELS cotton is sold at fixed prices, the same system employed by Egypt, the other major ELS exporter. This is advantageous to the buyers making an early commitment, as prices are usually held and are subject to upward rather than downward revision during the season, depending on the vagaries of the international cotton market.

Much care and attention is devoted to the formulation of each year's ELS policy. The CPC representative office in Geneva prepares a report expressing the views and position of merchants, the carry-over of both free and committed stocks is assessed, and the progress of Egyptian ELS sales is considered. A special board meeting of CPC is then held to discuss the terms proposed for the policy, and announcement of prices follows shortly afterwards. Decisions on pricing and timing for ELS sales occupy a disproportionate amount of time compared with those for medium staple which enjoys a much wider market.

Sales prices realised for ELS contracts during the 1982 calendar year and those fixed for the 1982/83 crop at the end of May 1983 are recorded in Table 3.1. The average price realised in contracts during 1982 was US cents 72 per lb. The usual price differentials have been US cents 3 between full grades and US cents 2 for the half grades. Differentials have been specifically changed in the 1983 ELS marketing policy, with larger price increases in the lower grades and lesser increases in the higher grades. This is because the free stock carry-over from the previous year is concentrated in the higher grades. There is therefore a reduced spread between the prices fixed for top and bottom grades.

TABLE 3.1

1982 ELS Sales and Average Contract Prices<sup>(1)</sup> and  
1983 ELS Policy Fixed Prices

Grade	1982 sales <sup>(2)</sup>		1983 Policy prices (US cents/lb)
	Bales sold	Average price (US cents/lb)	
X 2B	4 258	85.1	87.0
2B	5 868	83.5	85.0
X 3B	78 035	80.0	83.5
3B	65 807	78.0	82.0
X 4B	65 239	75.5	80.0
4B	28 651	73.6	78.5
X 5B	24 155	70.6	76.5
5B	47 945	67.3	75.0
X 6B	43 700	63.2	72.5
6B	32 080	62.1	70.0
C 6B	14 000	59.0	67.0
D 6B	11 400	56.0	64.0
Total	421 158		

Notes : (1) Barakat prices only; excludes V5 of which sales were 7 400 bales.

(2) No sales of grade 1B were recorded in 1982.

The main suggestion for possible amendment to the ELS policy is that it should be announced at the same time each year. In the past the date of its announcement has ranged from January to June. The reasons for the variations are: seeking the most opportune time in respect of price movements, insufficient information on the expected crop and market intelligence. It is suggested that it should be announced in late March to early April, directly opposite to the announcement for the Egyptian crop in October. At that time, after two months of ginning, an accurate assessment of the size and quality of the crop should be possible (given the proposed improvements recommended in communications) and stock would be available for shipment. Announcing the policy at the same time each year would also increase the confidence of the international cotton trade in Sudanese cotton.

It is also suggested that the terms of the ELS marketing policy should always include carrying charges for contracts remaining unshipped after the cut-off date for payment. At present storage is free after payment though insurance is the buyer's responsibility. At the end of March 1983 there were some 200 000 bales of ELS remaining after the cut-off date. It is desirable that such volumes should be minimised, though the market is restricted in the volumes it can absorb, and carrying charges at the usual 1.25% should be continued, if not increased to a more penal rate. The CPC is, however, to impose carrying charges after the cut-off date in the 1983 marketing policy.

#### **3.4.2 Medium and Short Staple Cotton**

Sales of medium staple Acala cotton are on a tender basis. These sales are either effected through successive tenders or a limited quantity is put out to tender, as in 1983, and prices are then fixed accordingly. This is the main method of sale employed by the world's major exporters of Acala cotton.

The main guide for determining the acceptance of tenders and subsequent fixing of prices is the Liverpool 'A' Index. As the latter is on a CIF Northern Europe basis, CPC comparisons include adjustments of US cents 7 to 8 per lb to account for freight costs of US cents 5 to 6 and up to US cents 2 for agents' commissions and letters of credit. A further reduction of US cents 6 is then applied to allow for the problem of stickiness. These deductions give a Gezira Acala price and comparative prices for Acala in other schemes are determined according to differentials established over time or making further reductions for honeydew.

The differences between grades of Acala are usually US cents 2 per lb between grades 1 and 2 and US cents 3 per lb between grades 2 and 3 and between grades 3 and 4.

The average prices of sales contracts for Acala during 1982 together with the numbers of bales sold are shown in Table 3.2. 1983 prices fixed following the February tender are also given. The average sales price for Acala in 1982 was US cents 53 per lb. This was particularly low, compared with the ELS average of US cents 72, mainly because of additional discounting for honeydew, especially in the case of Rahad for which the FOB price was reduced from US cents 55 to 45 per lb. The average price of Acala from other schemes excluding Rahad was over US cents 59 per lb, 80% of the average ELS price.

TABLE 3.2

**1982 Sales and Average CIF Prices for Medium and Short  
Staple Cotton and Existing Fixed Prices for 1983**

Type/grade <sup>(1)</sup>	1982 Sales		1983
	Bales sold	Average price (US cents/lb)	Existing fixed prices <sup>(2)</sup> (US cents/lb)
<b>Medium Staple</b>			
Gezira RG1	27 953	61.0	66.0
Rahad SG1	135 617	50.8	58.0
Rahad SG2	16 865	43.61	-
Rahad SG3	4 350	39.8	-
Girba SG1	49 683	58.4	61.0
Girba SG2	3 250	53.6	-
Suki RG1	7 075	56.1	62.0
Suki SG1	2 343	57.6	61.0
Zeidab RG1	3 900	63.0	69.0
RG2	320	60.0	-
Guneid RG2	1 991	59.5	-
Barac	6 569	60.0	-
<b>Total</b>	<b>259 316</b>		
<b>Short Staple</b>			
Nuba SG1	8 000	55.0	estimate 58.0
Agriain	12 996	52.0	estimate 56.0

Notes: (1) SG = saw ginned; RG = roller ginned.

(2) Existing prices relate up to June 1983.

Source: CPC Research Department, data for 1982 are preliminary.

A further differential in pricing is applied to Suki Acala in respect of a premium for roller-ginned over saw-ginned cotton. The premium is US cent 1 per lb. Though there is a certain sector of the textile industry willing to pay a premium because of the particular nature of roller-ginned cotton, the premium in the international market is generally for saw-ginned. The premium amounts to some US cents 5 per lb in Turkey, where both methods of ginning are employed for the same cotton. Increased production of saw-ginned Acala should therefore involve a careful re-evaluation by CPC of differentials for roller- and saw-ginning.

There is greater scope for making advanced tenders for Acala prior to the start of ginning in January and export bales becoming available in Port Sudan by March. This is because of the wider market for Acala, and because a large proportion of production is of a single grade, grade 1. Advance sales may additionally be sought to exploit the opportunity of a rising market. The ability of the CPC to make advance tenders, however, depends on an accurate estimate of expected availability; this again underlines the importance of monitoring the progress of the cotton crop. Regular advance tenders are desirable as market and price indicators and to ensure continuity in the level of export shipments during periods of peak storage requirements. In an effort to reduce storage requirements the Acala tender and contracts in 1983 stipulate a cut-off date of October 31st for payment, compared with December 31st in previous years.

Short staple cotton is sold on a tender basis later in the year, after the initial Acala tender and announcement of the ELS marketing policy. This is due to problems in determining the precise availability in the more remote locations where rainfed cotton is grown. It is free of honeydew and the price obtained (see Table 3.2), is usually comparable with the Liverpool 'B' index, less deductions for freight to give an equivalent FOB Port Sudan price.

### 3.4.3 Assistance in Export Marketing

The CPC has been responsive to the general market situation in determining its marketing policies. It is, however, felt appropriate, particularly in view of the increasing proportion of Acala to be marketed, that the CPC should obtain the services, under technical assistance, of an experienced international cotton trader with specialist inside knowledge of trading operations of the middleman/stockholder. His role would be to advise senior management on all aspects of marketing policy, specifically:

- to advise on the pricing structure and on the true value of Sudan cotton. This is especially important in view of the recommendations for selling Acala on staple length and the differentials applied between the different schemes;
- to advise on the strategy for sales promotion, public relations and broadening the customer base.

It is suggested that the person be appointed for up to eighteen months, to span two marketing seasons. His presence would be beneficial not only to top management but also for the experience and inside knowledge that he could impart to middle management.

### 3.5 Domestic Lint Sales

Sales to the local spinning mills were previously made at the FOB export price for the equivalent grade or variety of cotton less the differential for transport between the ginnery and Port Sudan. Because of acute problems within the local textile sector, the Ministry of Industry reduced the selling price in 1982 by 10% below the equivalent export price. At the end of May 1983 prices for 1983 were still not fixed but expectations are that they will be at least 20% below the equivalent export prices.

The requirements of the local mills are usually determined in February each year, the Ministry of Industry coordinating the public sector mill requirements. The Prices and Contracts Department within the CPC arranges the contracts with the mills. Sales to the private sector require a bank guarantee before the purchasers take delivery at the ginnery. The inability of some mills to obtain such a guarantee, because of financial problems, led to a particularly low off-take in 1982. The Ministry of Industry and the Bank of Sudan are investigating possible support for 1983 purchases.

The domestic mills take delivery of their cotton in late May or early June after signing of the contracts. Payments are made in six monthly instalments between October and March, with interest charged on outstanding balances. The possible improvements to present arrangements are that the process of determining requirements and the signing of contracts should take place as early as possible. This would make it possible to provide better indications of likely export availability by grades. Mills could also then take delivery earlier, reducing storage in the ginning yards.

### 3.6 Cottonseed Sales

Estimates of cottonseed availability are prepared by the production department of CPC by early January. These are passed to the Ministry of Industry which allocates supplies to the 34 private sector cottonseed expeller plants in conjunction with the Association of Oil Millers. Allocations are on the basis of plant capacity and are received by the CPC in February, together with the prices for black and white seed, which are controlled and fixed at LS 300 and LS 200 per tonne respectively for 1983. Sales are then handled by the accounts department of CPC and contracts are drawn up for the individual mills. After signature, delivery can be taken. Sales are by letter of guarantee payable at the end of September, or by cash in advance of delivery.

It is advisable that oil mills should commence their off-take much earlier in the ginning season, preferably in late January. This will require earlier estimates of cottonseed availability, at the picking stage, by the production department of CPC, earlier allocation by the Ministry of Industry and prices to be fixed in December. There do not appear to be any administrative problems in advancing the sales allocation of cottonseed. Supplementary contracts are already necessary under the present conditions because of under-estimation of availability and payments can always be adjusted for over-estimates. From the oil millers' point of view there should not be any problems as there is a strong demand for their products and they are working at low levels of capacity utilisation because of a shortage of cottonseed.

Source: CPC Accounts Department.

The present arrangements for marketing cottonseed otherwise appear to work well. The Ministry of Industry's task in making allocations is simplified in that it is only dealing with one organisation in obtaining estimates of availability, rather than the nine producing corporations. The workload for the CPC accounts department is relatively light, usually some three man-months. Increased volumes of cottonseed in future years should not require an increase in the amount of work, as the number of contracts with the existing mills will remain the same.

### 3.7 The Export Companies

The four export companies - Alaktan Trading, National Cotton and Trading, Port Sudan Cotton Company and Sudan Cotton Company - are subsidiaries of the CPC and are responsible for communicating the marketing policy and tenders to buyers, receiving offers and executing cotton contracts for shipment.

As marketing policies are centrally fixed by the CPC, the role of these export companies is primarily one of organising cotton shipments. All sales contracts also have to be certified at CPC head office to check that they conform to the terms of policy. Although their managers are on the board of the CPC, the export companies' function as marketers is therefore limited to providing a good service to buyers, responding rapidly to telex inquiries and sending samples to potential buyers as they become available. Their special personal contacts with their customers have probably not developed significantly as overseas travel has been restricted in recent years.

A large proportion of the sales of the export companies, currently about 50%, are protocol sales. These are arranged through the CPC head office and the Ministry of Commerce and sales contracts are allocated to the export companies for execution. There are no specific target markets for each of the companies nor do they specialise in the marketing of cotton of a particular scheme or variety. There are also instances of shared customers.

In view of the above, it is proposed that the export companies should be consolidated as a single department within the CPC, with particular sections dealing with specific markets, such as Europe, the Far East or protocol sales, mainly China, Korea and Eastern Europe. Such a proposal would have the advantages of improving efficiency and internal departmental communications within the CPC.

## CHAPTER 4

### MARKETING COSTS

#### 4.1 Financing of Seed Cotton Purchases

The purchase of seed cotton was introduced for the 1980/81 season. Previously tenants had waited up to one year or more to receive the proceeds from the sale of the crop. The purchase of seed cotton in the 1980/81 and 1981/82 seasons was made by CPC through a loan from the Bank of Sudan, guaranteed by the Ministry of Finance. Estimates of seed cotton production were prepared in April and the requisite loan was determined. CPC then paid the producing corporations at the end of June, and the accounts of the tenants were settled after deduction of the costs of services and inputs provided, advances, ginning and transport to Port Sudan. The net sale proceeds of lint and cottonseed, after deductions of taxes and the commissions of CPC and its export companies, are used to liquidate the loan. The outstanding position of CPC loans from the Bank of Sudan for the purchase of seed cotton is given in Table 4.1. A surplus of LS 16 million is expected on the 1980/81 crop and a deficit of LS 8.2 million on the 1982 crop.

**TABLE 4.1**

**Position of Seed Cotton Loans for 1980/81 and 1981/82 Crops  
as at April 1983**

	LS million	
	1980/81	1981/82
Purchase of seed cotton	126.3	246.1
Bank interest	<u>8.3</u>	<u>11.8</u>
	134.6	257.9
<b>Less net proceeds</b>		
- Export sales of lint	64.7	25.2*
- Domestic sales of lint	13.7	5.4
- Cottonseed sales	<u>31.4</u>	<u>37.9</u>
	109.8	68.5
Estimated value of unsold cotton	<u>40.8</u>	<u>181.2*</u>
	150.6	249.7
Surplus/deficit	16.0	(8.2)

Note : \* Relates to October 1982 data.

Source : CPC Accounts Department.

The purchase of seed cotton also includes the cost of purchasing lint from the rainfed short staple cotton areas, Nuba Mountains Corporation and Mechanised Farming Corporation. Lint is purchased on a delivered Port Sudan price. Total cost was LS 2.2 million in 1981/82, less than 1% of seed cotton purchases of LS 246.1 million.

The arrangements for the 1982/83 crop are that CPC will additionally meet the costs of ginning, transport and insurance which had been charged to the tenant in previous seasons. The costs of ginning, transport and insurance are budgeted to be LS 64.2 million, at an average of LS 16 per kantar of lint. Seed cotton purchases are estimated to be LS 315 million. Total loan requirements will then be LS 379 million. The budget costs of ginning, transport, and insurance, prepared by the Ministry of Agriculture, appear particularly high at LS 16 per kantar of lint. Information gained during field visits, though incomplete, suggests that the average cost is unlikely to exceed LS 12 per kantar.

#### 4.2 Costs for Export Cotton

The costs involved in the marketing of cotton, in the broadest sense from purchase of seed cotton to export sale of lint, are listed in Table 4.2.

Taxes comprise the development tax on the FOB price of lint, the National Equalisation Fund charge on the ex-store price and central and local government taxes on cottonseed sales, amounting to LS 24.5 per tonne on white seed and LS 38 per tonne on black seed.

The commission of CPC, 2% on the ex-store price of lint and 1% on cottonseed sales, and a further 2% charge for storage operations, publicity and claims are the main sources of CPC income. All operating surpluses of the CPC pass to the Ministry of Finance. The profit and loss accounts and balance sheets of the CPC for 1980/81 and 1981/82 (audited) are given in Appendix I. The CPC also maintains the Stabilisation Fund, intended for support of seed cotton prices. This has not been drawn upon and amounted to LS 460 000 in April 1983. The four export companies receive 1% commission to cover their costs and all surpluses are also absorbed by the Ministry of Finance.

The budgeted costs for ginning, insurance and transportation represent an average estimated by the Ministry of Agriculture and make no distinction by scheme, type of ginning, variety of cotton or location. No details were obtainable as to the basis of estimation. Information obtained in the course of the study suggests the following range of costs:

- transport costs range from LS 0.5 per lint kantar from Tokar to LS 2.5 from Semeih, the remotest location. Some road transport had been undertaken by Kassab at nearly LS 4 per lint kantar;
- insurance costs appear to be LS 0.3 per kantar of lint, though a figure as high as LS 0.65 was quoted by one insurance company;
- 1982/83 budget estimates of ginning costs originally received by the Bank of Sudan ranged from LS 3.2 per kantar of lint in Rahad to LS 7 per kantar of lint in the Blue Nile Corporation. Limited available information from the ginneries suggests that the average of cost ginning is higher, around LS 8 per kantar.



In view of the above the average cost of ginning, transportation and insurance is unlikely to exceed LS 12 per lint kantar.

The various costs involved in export marketing are compared in Table 4.3 with revenues at the fixed mid 1983 prices by variety of cotton. The costs relate to the marketing of one tonne of seed cotton. The following assumptions were used in drawing up the table:

- prices for long staple cotton relate to seed cotton average Grade 4 and lint Grade 4;
- prices for medium and short staple cotton assume the average grades for seed cotton and lint;
- the exchange rate used is LS 1.425 = US \$ 1, as per the CPC 1983/84 budget assumption, to allow for converting 25% of proceeds at the open market rate and 75% at the fixed exchange rate;
- all costs are as those stated in Table 4.2, including the budget assumption of LS 16 per kantar of lint for ginning, transportation and insurance.

On the basis of the above each variety shows a surplus of revenue over costs. The small surplus for Rahad reflects its relatively low price compared to other medium staple cottons while the large surplus for short staple is due to a low price for seed cotton reflecting lower production costs in rainfed areas. The estimated surplus of revenues over costs indicates that the additional costs of ginning, transport and insurance, which were previously charged back to the grower, can be absorbed. This is despite possible over-estimation of the costs of ginning, transport and insurance.

#### 4.3 Costs for Domestic Lint

Domestic sales are made on an ex-ginnery basis. The price is based on the export price less the cost of transport to Port Sudan. The following charges, amounting to 3.5% of sales value, are incurred:

- 1% CPC commission,
- 2% National Equalisation Fund,
- 0.5% Stabilisation Fund.

Domestic sales at the equivalent export price less the transport differential would show a substantial surplus. It is expected that the 1983 price may be fixed at 20% below the export price less the transport differential, in which case such sales would probably show a deficit, especially for Rahad cotton.

TABLE 4.3

**Estimated Costs and Revenue of Lint Exports per tonne of  
Seed Cotton in 1983 (LS)**

## 3.1 Introduction

	Long staple	Gezira	Medium staple Rahad	Zeidab	Others*	Short staple
<b>Lint</b>						
- weight (kg)	340	370	370	370	370	330
- price (LS per kg)	2.45	2.07	1.82	2.16	1.92	1.79
<b>Revenue</b>	836	766	673	799	710	591
<b>Less</b>						
- FOB charges	65	62	56	64	58	49
- Ex-store charges	50	46	40	48	42	35
- Ginning, transport and insurance	120	130	130	130	130	116
- Purchase of seed cotton	644	504	504	504	504	315
- Bank interest	34	28	28	28	28	19
<b>Plus</b>						
Net value of cottonseed	170	107	107	107	107	114
<b>Surplus</b>	93	103	22	132	55	171

Note : \* Relates to Pump Schemes, New Halfa and Suki.

## Staffing of Cotton Public Corporation

	Officials	Employees	Total
CPC headquarters	127*	37	162
Port Sudan stores	127*	279*	407
National Cotton Co.	42	21	63
Sudan Cotton Co.	45	20	65
Alakten Cotton Co.	41	22	63
Port Sudan Cotton Co.	40	20	60
<b>TOTAL</b>	<b>420</b>	<b>398</b>	<b>818</b>

A7-35

Note : \* data has been amended following interviews with departments

Source : CPC

## ORGANISATION AND MANAGEMENT OF CPC

## 5.1 Introduction

The CPC was originally formed from a department within the Ministry of Finance and Economic Planning responsible for the cotton sector. The board of directors comprises eighteen people: the top management of CPC; representatives from the Ministries of Finance, Agriculture and Commerce, and from the Bank of Sudan; the head of cotton breeding at the Agricultural Research Centre; representatives of the major producing corporations; and the managers of the four export companies.

The CPC includes a headquarters staff, split between two offices in Khartoum, the four export companies and the CPC stores in Port Sudan. Total permanent staff is approximately 820 persons as indicated in Table 5.1. The total number of positions according to the budget for salaries and wages is 920. The shortfall in staffing is due to some twenty vacant positions of official grade at CPC headquarters and a further eighty vacant positions in Port Sudan stores, mainly of employee grade. The former do not appear to be affecting the level of efficiency in the operation of CPC headquarters but the latter vacancies impose pressure on the existing staff in Port Sudan.

The present organisation of CPC is shown in Figure 5.1. The structure displays a wide span of control. Weekly meetings of senior management and department heads, however, provide the main focus for reviewing operations and control.

TABLE 5.1

## Staffing of Cotton Public Corporation

	Officials	Employees	Total
CPC headquarters	127*	37	162
Port Sudan stores	127*	279*	407
National Cotton Co.	42	21	63
Sudan Cotton Co.	45	20	65
Alaktan Cotton Co.	41	22	63
Port Sudan Cotton Co.	40	20	60
TOTAL	420	398	818

Note : \* data has been amended following interviews with departments

Source : CPC

## 5.2 Departmental and Divisional Responsibilities

### 5.2.1 CPC Headquarters

There are seven main departments within CPC headquarters in Khartoum as listed below, together with numbers of staff :

Administration (including personnel service)	36
Sales and Allocations	8
Prices and Contracts	6
Production	9
Statistics and Research	16
Publicity	8
Accounts	34
Internal Audit	10

The various functions and responsibilities of each of the main departments within CPC headquarters are summarised below.

#### (a) Prices and Contracts department

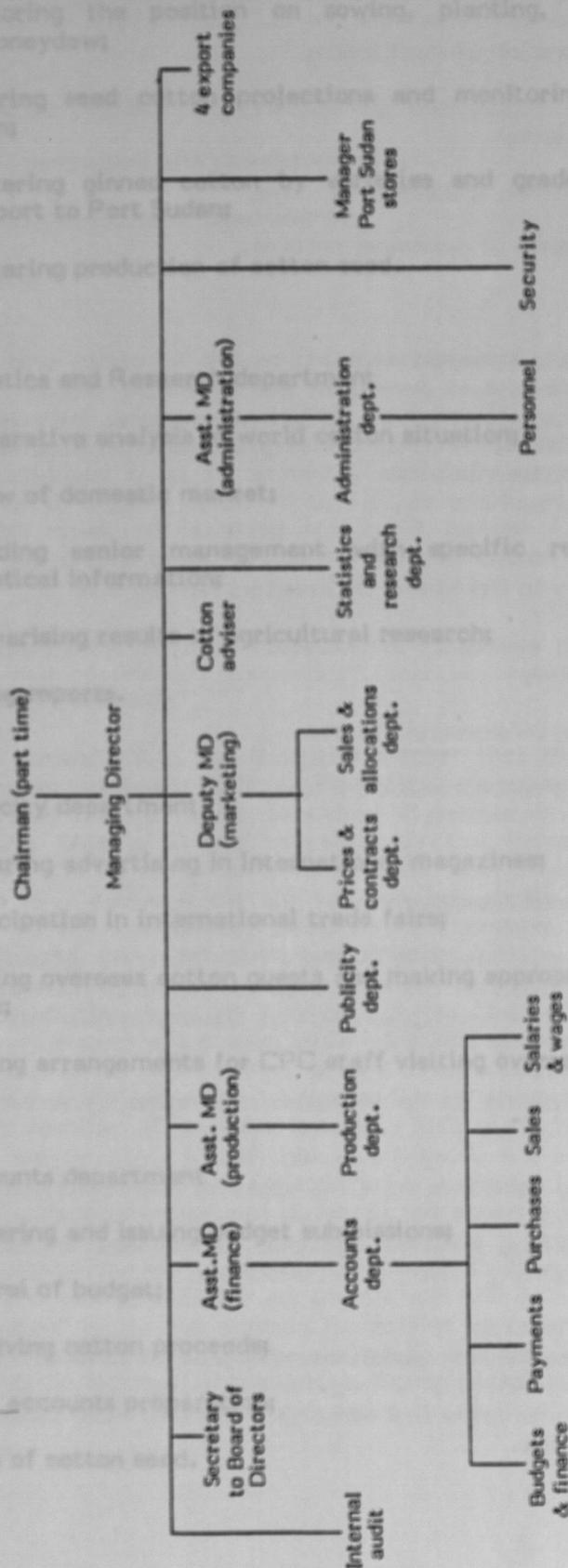
- reviewing daily sales contracts of the export companies to ensure prices are in accordance with the marketing policy;
- preparing a weekly schedule of appropriate cross exchange rates for other major currencies, for sales other than in US dollars;
- determining CIF prices and ex-store prices to export companies by variety and grade;
- registering contracts with the Bank of Sudan;
- follow-up of allocation and shipment, summarising position of shipments and outstanding contracts;
- preparing terms of tenders for medium and short staple cotton and sales of scarto and lugatta;
- sales to local textile mills.

#### (b) Sales and Allocations department

- recording free stocks for sale by variety and scheme, arrivals at Port Sudan, reclassification grade;
- preparing position on free stocks by grade, scheme and variety;
- analysis of tenders;
- allocation of cotton to export companies according to sales contracts.

FIGURE 5.1

Existing Organisation of CPC



(c) Production department

- follow-up of land preparation and proposed areas of cultivation;
- monitoring the position on sowing, planting, irrigation, fertilisers and honeydew;
- preparing seed cotton projections and monitoring deliveries of seed cotton;
- registering ginned cotton by varieties and grades, plus follow-up of transport to Port Sudan;
- registering production of cotton seed.

(d) Statistics and Research department

- comparative analysis of world cotton situation;
- review of domestic market;
- providing senior management with specific requested market and statistical information;
- summarising results of agricultural research;
- issuing reports.

(e) Publicity department

- preparing advertising in international magazines;
- participation in international trade fairs;
- inviting overseas cotton guests and making appropriate arrangements for visits;
- making arrangements for CPC staff visiting overseas.

(f) Accounts department

- preparing and issuing budget submissions;
- control of budget;
- receiving cotton proceeds;
- final accounts preparation;
- sales of cotton seed.

- (g) Personnel department
  - general administration and purchasing internal supplies;
  - preparing Chapter 1 of budget (salaries and wages);
  - administration of staff loans;
  - applying regulations of Ministry of Labour, relating to all public corporations;
  - appointments, transfers, holidays;
  - maintenance of personnel records.
  
- (h) Internal Audit department
  - auditing accounts of the CPC headquarters, Port Sudan stores and the export companies to ensure regulations are followed, and reporting any irregularities.
  
- (i) Secretary to the Board of Directors (one person)
  - preparing agenda in consultation with the chairman, and arranging its distribution;
  - preparing background papers;
  - informing appropriate departments of board decisions.

### 5.2.2 The Export Companies

The export companies each have their own separate offices in Khartoum and branches in Port Sudan. The staffing, as indicated in Table 5.1, is equally split between the two locations. Each of the companies has sales, shipping and accounts departments in Khartoum. The main functions are :

- communicating terms of the marketing policy and tenders to potential buyers;
- preparing contracts for CPC approval and registering of contracts with commercial banks for payment, requesting allocation of cotton specified and obtaining customs approval for release of cotton for shipment, communicating shipping instructions to Port Sudan.

The branch offices in Port Sudan each have a department responsible for the supervision and expediting of shipments and a technical department of samplers and classifiers who prepare lint samples for buyers and check the uniformity of lots prior to shipment.

### 5.2.3 CPC Stores

The operation of the 46 export stores in Port Sudan involves 50% of the total permanent staff of the CPC. The main functions are stores control, weighing of bales, maintaining stock records, allocations to buyers, accounts and personnel. The official grades of staff number 129 and are distributed as follows :

Administration (accounts, personnel)	32
Stores (controllers and storekeepers)	54
Stock and allocations departments	9
Weighing	30

The main shortages relate to the weighing section and storekeepers. A further 278 permanent manual labourers are employed as workshop staff, watchmen, checkers, handlers of weighing equipment, drivers and messengers. There are apparently over sixty vacancies for watchmen out of the number required to guarantee an adequate level of security, especially at night. Additionally a casual labour force, varying from 30 to 100, is employed on a daily basis for the cleaning and repair of damaged cotton. A further 210 labourers are also employed on a piece rate basis for the handling of cotton bales into and out of the stores.

### 5.3 Staffing Problems

It was initially mentioned in the Inception Report that there appeared to be a relatively high turnover of staff. Information subsequently supplied by the personnel department suggests that less than 50 persons have left the CPC in the last three years. This is in fact a relatively low turnover of staff, though there are known to be some omissions. It is noticeable, however, that the persons leaving have included certain valuable key staff, such as the managers of two of the export companies, three senior members of the statistics and research department, and accounting and shipping clerks. The main reasons for persons leaving are apparently better salaries and prospects in the private sector or opportunities in Saudi Arabia and the Gulf states. Salaries in the private sector are reportedly double those of public corporations. The maximum salary, of the most senior management in CPC is LS 6 000 per year. The CPC does offer preferential staff loans for houses and cars which have possibly assisted in limiting the number of persons leaving. Also staff bonuses of up to two months salary are payable, though not guaranteed, and senior management do receive other additional allowances amounting to some LS 200 per month.

Each member of staff on joining the CPC receives a detailed job specification and annual assessments are undertaken. The CPC as a public corporation is governed by rules and regulations on promotions and pay scales. At junior and middle management levels this appears to restrict opportunities for advancement and has detrimental effects upon demonstrating initiative and acquiring a wider knowledge of the business. Consequently, departmental staff tend to be rather insular. Management also appears reluctant or uncertain about exercising its authority.

Greater freedom for the CPC in determining promotions and pay as proposed in the original Cotton Marketing Study would be beneficial. This would involve some change in the charter of the CPC to enable it to operate within a more commercial framework. This has reportedly occurred in the Gum Arabic Corporation. The main intention, however, would not be to carry out a wholesale upgrading of salaries and wages but to ensure that sufficient incentives can be offered to attract and retain skills and specialist knowledge which are scarce. Such freedom from restrictions should also extend to the ability of CPC staff to undertake business travel at short notice, as referred to in Chapter 3.

The main changes relate to the weighting of staff and stockpiles. A further 178 permanent manual labourers are employed as workshop staff, watchmen, cleaners, drivers and messengers. There are also approximately 100 casual labourers employed on a daily basis for the cleaning and repair of damaged cotton. A further 110 labourers are also employed on a piece rate basis for the handling of cotton bales into and out of the stores.

### 2.3 Staffing Problems

It was initially mentioned in the Inspector's Report that there appeared to be a relatively high turnover of staff. Information supplied by the personnel department suggests that less than 20 persons have left the CPC in the last three years. This is in fact a relatively low turnover of staff, though there are known to be some omissions. It is noticeable, however, that the persons leaving have included certain valuable staff such as the inspectors and senior members of the statistics and accounts departments. The main reasons for the persons leaving are generally better salaries and prospects in the private sector or opportunities in local areas and the Gulf States. Salaries in the private sector are reportedly about 20% higher than the maximum salary of the most senior management in CPC is £2,500 per year. The CPC does not offer a pension scheme and staff who have recently assisted in limiting the number of persons leaving. Also staff bonuses of up to two months salary are payable, though not guaranteed, and senior management do not receive a bonus which is normally about 10% of their monthly salary.

Each member of staff on joining the CPC receives a detailed job specification and annual assessment and evaluation. The CPC is a public corporation and is governed by rules and regulations on promotions and pay scales. At junior and middle management levels this appears to restrict opportunities for advancement and has had a detrimental effect on the recruitment of specialist staff. The knowledge of the business is generally poor and this is a major factor in its management. It is suggested that a specialist recruitment authority should be established to recruit staff prior to the present authority.

## CHAPTER 6

### CPC MANAGEMENT INFORMATION

#### 6.1 Present Reporting Arrangements

The reports prepared at present by the various departments of the CPC are discussed below, excluding the financial reports which are discussed Section 6.4.

The Statistics and Research department produces three main reports :

- a Monday Report, issued fortnightly, which summarises trends in the world cotton situation, CPC sales and exports;
- a quarterly bulletin detailing monthly exports by scheme, grade and variety and by country of destination. Available research papers into cotton production are also included;
- an annual review summarising production by scheme, grade and variety, local consumption and exports by country of destination. The preparation and issue of this report are currently very slow because of problems in reconciling data and printing.

The Production department prepares monthly reports on each scheme during the growing season, adjusting data according to the effective area planted, expected yields and ginning out-turn. Records are updated during the ginning season on arrivals of seed cotton at ginneries, lint production and the progress of evacuation of bales to Port Sudan, and the position is reported at weekly management meetings. Reports prepared during the growing season are dependent mainly upon information obtained from field visits by staff. During the ginning season the increased volume of information is dependent upon the producing corporations providing written reports to CPC in Khartoum on the progress of ginning, or on contact via the radio telephone network of the Crop Protection Unit of the Ministry of Agriculture. The supply of such information on ginning, though available at the producing corporations, has deteriorated recently, the problem being not only poor communications but also lack of co-operation. The flow of information could be improved by having CPC staff permanently stationed at the seven major producing corporations with their own telecommunications link with CPC headquarters in Khartoum. Tokar and the Northern Agricultural Corporation at Zeidab would not require permanent staff because of their low production and in any case the former is in close proximity to the CPC stores in Port Sudan.

The Prices and Contracts department prepares two regular reports :

- a fortnightly sales and shipments report showing sales of the individual export companies by buyers, variety and grade and shipments by variety;
- monthly shipments position by buyer;

Various ad hoc reports are also produced for senior management, such as an input paper for formulation of the marketing policy.

CPC stores management in Port Sudan provides CPC headquarters with a monthly report on arrivals and shipments by scheme and variety plus data on the physical stock position. CPC headquarters also receives from Port Sudan a written daily report on the reclassification of bales from the SGB cotton classifiers.

The CPC representative in Geneva also provides irregular, though usually monthly, reports. These cover information on the position of cotton traders and their commitments regarding other competitors wherever possible. A special report is prepared prior to formulation of the marketing policy.

## 6.2 Possible Improvements

The reporting of individual departments is regular and comprehensive, apart from the present problems encountered by the Production department in the flow of information.

Two possible minor improvements are :

- production information could be supplemented by close liaison with the Production and Public Relations department within the Ministry of Agriculture, which receives daily and weekly reports from the producing corporations on the progress of the crop;
- the position of free stocks can be determined daily from the Sales and Allocations department. No reports are prepared on a regular basis for circulation which would assist the Export Managers in responding to telex inquiries. Any reports are requested on an ad hoc basis at varying time intervals. This restricts any comparative analysis of trends over time. It is suggested that the free stocks position be prepared on the last day of each month to coincide with the physical stock position prepared by Port Sudan stores and the contract commitments prepared by the Prices and Contracts department.

Reports and information produced by the various departments are often not readily available for future reference due to insufficient care in retaining data in an orderly manner.

The main weakness of the present reporting system, however, is that there is a lack of a single central source of information monitoring all operations from seed cotton production to shipments of lint. This information should be readily available to management in the form of a comprehensive summary report. Ideally, the present Statistics and Research department should be made a more effective unit for this purpose. It does, however, suffer from being located away from the main CPC headquarters building and thus does not have easy access to the necessary information from the departments of Production, Prices and Contracts, and Sales and Allocations. The proposal for a new CPC headquarters will therefore be beneficial.

The information that should be consolidated centrally for monitoring the crop during the course of each year should include the following :

- expected crop production by scheme and variety;

- seed cotton arrivals by scheme, variety and grade;
- cottonseed production by type (black or white seed);
- lint production by scheme, variety and grade;
- bales despatched by scheme, variety and grade;
- arrivals at CPC stores by scheme, variety and grade;
- reclassification by scheme, variety and grade;
- sales by scheme, variety and grade;
- free stocks by scheme, variety and grade;
- committed stocks by scheme, variety and grade;
- physical stock by scheme, variety and grade;
- shipments by scheme, variety and grade.

The above information should be updated daily by a Statistics unit and a regular weekly report produced for management. It is suggested that a microcomputer is acquired for this purpose, also enabling ad hoc reports to be readily produced. Further applications for the microcomputer could initially be budgeting and determining estimates of cotton availability from the time of planting.

### **6.3 Export Market Research**

The Statistics and Research department of the CPC receives a good supply of published information relating to the international cotton market. The main sources of information used are :

- Cotton Outlook, published weekly by Liverpool Cotton Services, surveying the world cotton situation by country and price movements;
- Telex Outlook, a telex subscription service providing similar information on a daily basis;
- Pyramid Surveys, analysing prospects for cotton production in particular countries;
- the Egyptian Cotton Bulletin;
- Cotton World Statistics, a statistical monthly bulletin of the International Cotton Advisory Committee (ICAC) providing data by country on production, consumption, stocks and exports;
- Cotton Monthly Review of the World;
- Cotton International.

Publications of the US Department of Agriculture are also received infrequently. The above represent the respected key sources of information on the cotton industry and trade. These publications are supplemented by reports from the CPC representative in Geneva, referred to in Section 6.1.

A large proportion of the work undertaken by the Statistics and Research department involves preparing summary abstracts of the above publications for senior management and other departments. More effort, however, appears to be required in undertaking research and analysis apart from summarising available market information. This would provide an important input for long term market planning and briefing for management travelling overseas.

Research and analysis should concentrate on :

- identifying country market opportunities where Sudanese cotton shows a low penetration;
- preparing profiles on the textile industries of export markets;
- examining the long term supply and demand prospects for cotton in both export markets and those of competitors;
- comparing costs of production and marketing of Sudanese cotton with those in other countries, using such data as in the ICAC cost of production surveys;
- making comparisons of the prices of Sudanese cotton with other growths and continually monitoring their movements.

Effective research into the aspects identified above will involve maximising the use of available information, developing further sources of information and training. The following appropriate action is thought necessary :

- an overseas study tour for two persons from the Statistics and Research department for three months, to be split between the headquarters of the ICAC in Washington and Liverpool Cotton Services. This would enable personnel to review all possible sources of information, obtain first hand experience of how data are originated with an understanding of the limitations and gain some experience in the producing of reports;
- technical assistance of a market/business analyst for up to one year to train and develop the skills of the department in market research and analysis;
- briefing overseas embassies, and any CPC staff travelling overseas, to acquire information and data on the cotton and textile industries of particular countries.

#### **6.4 CPC Financial Reports**

The profit and loss accounts and balance sheets for the CPC for 1980/81 (audited) and 1981/82 (unaudited) are reproduced in Appendix I. The net profits in the respective years were LS 1.0 million and LS 0.29 million. The estimated expenditure and revenue for 1982/83 and for the 1983/84 budget proposal are contained in Table 6.1, which shows increasing surpluses due to an increased volume of sales and devaluation.

TABLE 6.1

CHAPTER 7  
**CPC Expenditure and Revenue for 1982/83 Estimated and  
 1983/84 Budget Proposal (LS '000)**

7.1 Suggested Structure	1982/83		1983/84	
	Expenditure	Revenue	Expenditure	Revenue
CPC headquarters	1 573.8	5 151.4	2 009.6	10 499.4
Port Sudan stores	2 264.1	201.2	4 356.8	3 341.0
Export companies	1 258.8	1 503.5	1 688.0	3 341.0
<b>Total</b>	<b>5 096.7</b>	<b>6 856.1</b>	<b>8 054.4</b>	<b>14 192.9</b>

Source : CPC Accounts department.

The report and accounts of the CPC are not usually prepared until the February following the close of the financial year, on June 30th. It takes a further nine months for the accounts to be audited after submission to the office of the Auditor General.

The Expenditure and Revenue Budget of the CPC is submitted in April, prior to the start of the financial year, to the Department of Public Corporation Budgets in the Ministry of Finance. The expenditure relates only to the administration, operating expenses and capital expenditure of the CPC headquarters, Port Sudan stores, the four export companies and the Geneva office. It excludes the cost of purchasing seed cotton for which a separate purchase budget is prepared. The purchase budget also includes, from the 1982/83 season, the costs of ginning, transport and insurance, as discussed in Chapter 4. The purchase budget is submitted usually in April, though it was delayed in the current year because of the new arrangements, direct to the Minister of Finance to authorise the necessary loan from the Bank of Sudan. A purchase report is also produced in July/August summarising actual expenditure on the purchase of seed cotton by scheme.

An annual budget analysis is submitted in March/April following the end of the financial year. This is the only formal report prepared on variances from the budget but the CPC Accounts department regularly monitors the level of expenditure. An analysis of proceeds of lint sales by export company, scheme and variety of cotton is prepared monthly.

(f) The position of Finance Director would be upgraded and include responsibility for administration.

The above suggestions may raise particular problems in fitting existing grades of staff within the new structure, especially in the case of the Export Managers. This should not involve any loss of benefits and it is presumed that CPC will be permitted greater scope in fixing salary levels, particularly of specialist staff.

## CHAPTER 7

### FUTURE ORGANISATION OF CPC

#### 7.1 Suggested Structure

It is proposed that several changes be made in the organisation of CPC in view of the observations made in previous chapters. These would involve giving CPC a wider range of responsibilities but at the same time encompass a narrower span of control. A suggested organisation chart is shown in Figure 7.1.

The proposed changes envisage the following arrangements :

- (a) The post of Regional Manager should be created at Port Sudan to co-ordinate the activities of stores and shipping and to liaise with the lint classifying organisation.
- (b) The four existing export companies would become a single department within the structure of CPC. The export managers would report directly to the Marketing Director, and they would be directly served by the departments of prices and contracts, and sales and allocations, and new departments of shipping and marketing services.
- (c) A new shipping department would be formed by the amalgamation of the export companies' shipping staff.
- (d) The marketing services department would be formed from the existing statistics and research department with three separate sections: a statistics section to update continuously the progress of the cotton crop from arrival at the ginnery through to shipment and to co-ordinate all information; a market research and analysis section; and a technical advisory section with two textile specialists and a classifier to assist the export managers in sales promotion activities.
- (e) The production department should have seven permanent field staff at the major producing corporations to guarantee the timely flow of information and check on weighing returns of seed cotton against out-turns. These staff would be stationed at Gezira, Rahad, White Nile, New Halfa, Nuba Mountains, Mechanised Farming Corporation and Sennar (to cover both Blue Nile and Suki).
- (f) The position of Finance Director should be upgraded and include responsibility for administration.

The above suggestions may raise particular problems in fitting existing grades of staff within the new structure, especially in the case of the Export Managers. This should not involve any loss of benefits and it is presumed that CPC will be permitted greater scope in fixing salary levels, particularly of specialist staff.

## 7.2 CPC Headquarters

### 7.2.1 Staffing and Accommodation Requirements

There is a clear need to have all the CPC staff in Khartoum within one building. The departments of statistics and research, publicity and internal audit are located in a separate building away from the present headquarters. The four export companies meanwhile each have their separate premises in various locations. A central headquarters would facilitate the daily contacts necessary between the various functions of shipping, contracts and stock control. It would also assist in making statistics and research a more effective department. A preferred location for the new CPC headquarters would be close to the Bank of Sudan and the Ministry of Finance.

The basis for the outline design of the new building is shown in Table 7.1 which details the number of personnel requiring office space and the necessary other accommodation to be provided. The requirements were determined as follows :

- 20 senior management offices to accommodate the chairman; the managing director; the assistant managing directors; the cotton adviser; managers from the four export companies; the eight department heads; and the secretary to the board. It is suggested that five of the 20 offices should be of a superior size to reflect the status of the top management;
- the accommodation for individual departments was determined through discussions with these departments on future staffing levels and allowing for some improvement in efficiency;
- the accounts staff would be increased by up to 12 persons, an increase of about 30%, with consolidation of the existing four export companies into the structure of CPC. This would assist in upgrading the accounts department;
- the internal audit department would be reduced from ten to three persons following consolidation of the export companies;
- the actual numbers in the shipping department may be greater than the 16 indicated because of the need for shift working, in the afternoons and Fridays, so that CPC remains in contact with the international cotton trade. This should not, however, increase space requirements;
- there would be increases in the departments of production, sales and allocations and prices and contracts to cater for the increased volume of work;
- no increase is envisaged in the statistics and research department, which should become a marketing services function. Though possibly two persons might be transferred for running of the library, these would be replaced by two persons with technical textile experience. No increases are envisaged in the publicity department and administration. The latter would also be responsible for senior secretaries, reception, telex, and library;
- an additional 10% of identified space requirements has been included for purposes of contingency or further staff expansion;
- other special requirements include a sample room, a show room and an auditorium.

TABLE 7 Suggested Future Organisation of CPC

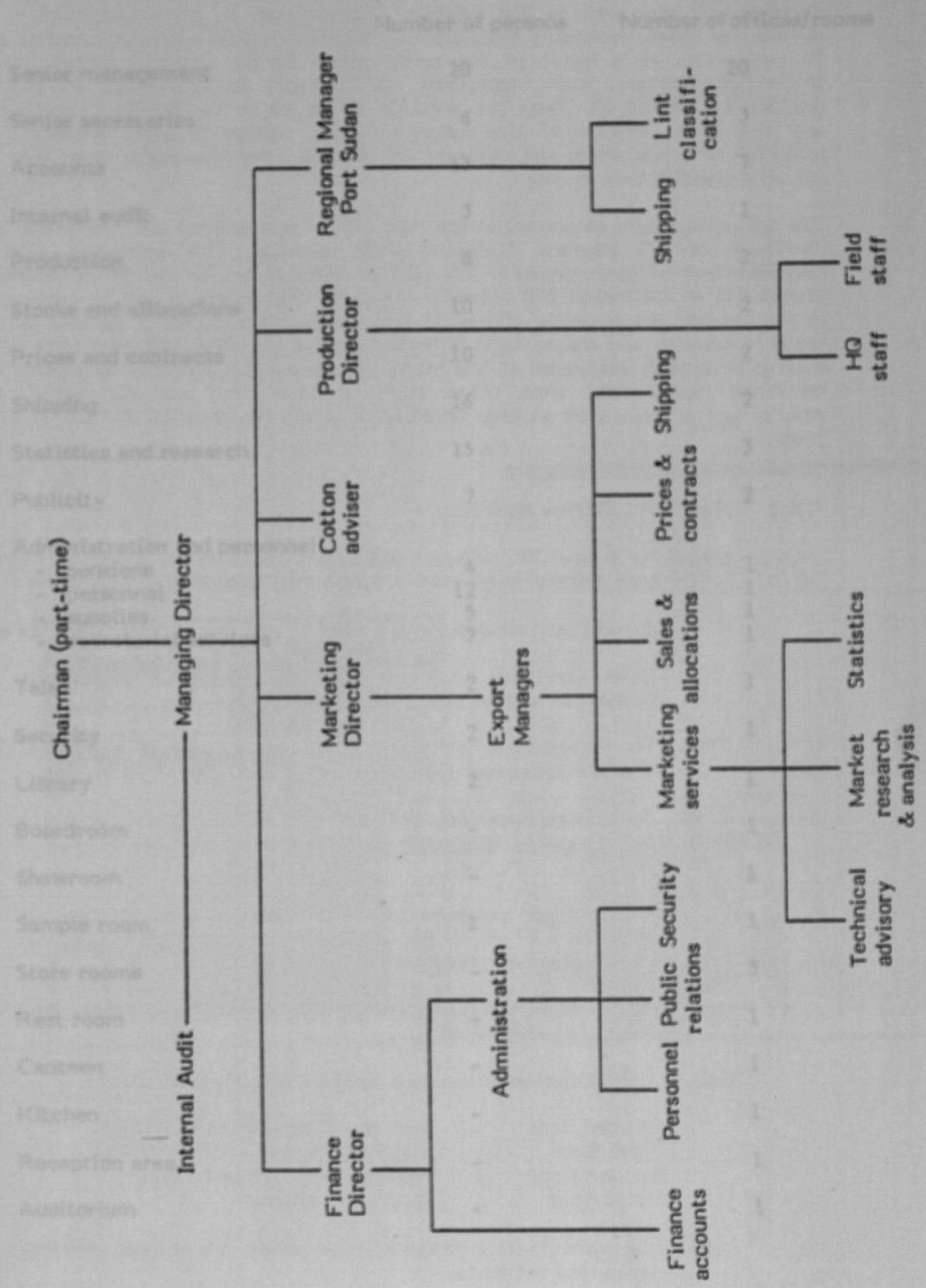


TABLE 7.1

Accommodation Requirements for New CPC Headquarters

	Number of persons	Number of offices/rooms
Senior management	20	20
Senior secretaries	6	3
Accounts	43	7
Internal audit	3	1
Production	8	2
Stocks and allocations	10	2
Prices and contracts	10	2
Shipping	16	2
Statistics and research	15	3
Publicity	7	2
Administration and personnel		
- pensions	4	1
- personnel	12	1
- supplies	5	1
- secretarial services	7	1
Telex	2	1
Security	2	1
Library	2	1
Boardroom	-	1
Showroom	-	1
Sample room	1	1
Store rooms	-	3
Rest room	-	1
Canteen	-	1
Kitchen	-	1
Reception area	-	1
Auditorium	-	1

A total of 175 staff, of official grades, are specifically identified as requiring office accommodation. At least ten more people would work on a shift basis, mainly in the shipping department and possibly also in prices and contracts, or sales and allocations, together with a telex operator. Other employees including messengers, drivers, cook, waiters, guards, caretaker and cleaners will also work in the building. There should be some reduction in the numbers of these, especially messengers, compared with the present total of over 50 employees, as a result of the consolidation of six separate offices into a single headquarters. Such employees will probably number about 30 and are unlikely to exceed 40. They are unlikely all to be in the building together at any one time because of the nature of their duties or shift working. The provision of a rest room and canteen will provide accommodation when they are not on a specific task or duty.

The actual numbers employed in the new CPC headquarters will therefore be a maximum of 235 persons, including shift workers. This compares with an establishment of approximately 275 (225 of official grades and 50 of employee grade) and an estimated 250 actually employed (200 officials and 50 employees) in the present six separate offices in Khartoum. No substantial savings will be made in salaries and wages as it is proposed that the CPC will also have seven staff permanently stationed at the major producing corporations, and these will be more highly paid than those staff in jobs that are eliminated with amalgamation. Maximum savings on salaries would be some LS 25 000 in a full year.

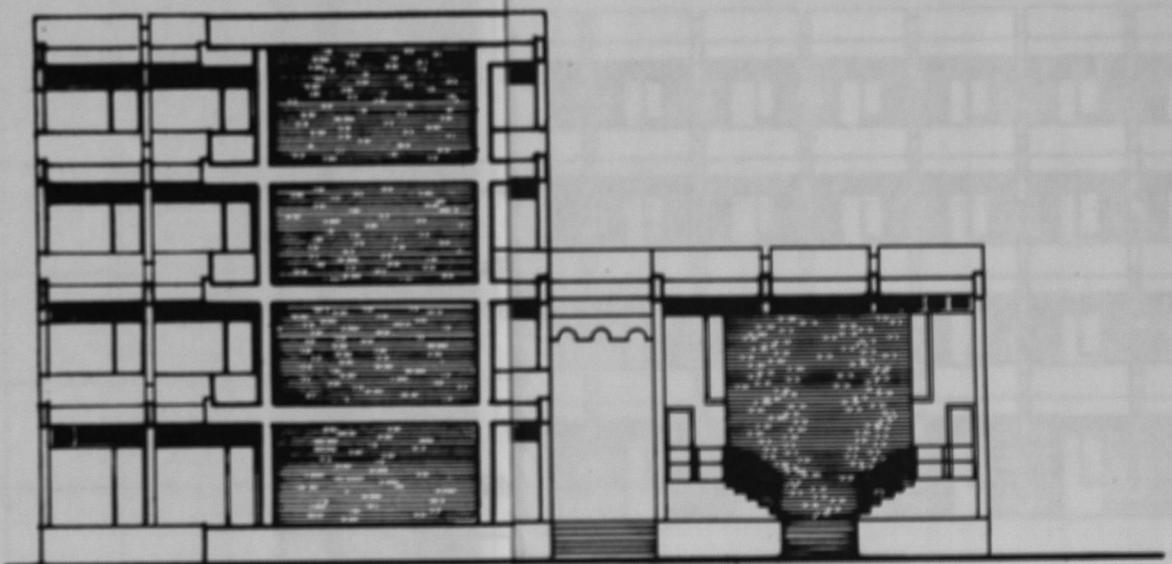
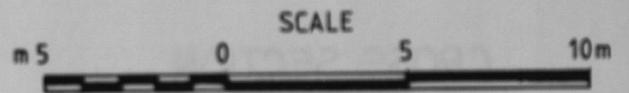
### 7.2.2 New CPC Office Building

Outline designs for a new CPC office building in Khartoum are shown on Figures 7.2 to 7.5. The main principles adopted in preparing the outline design were:

- (i) A courtyard arrangement is used to suit the climatic conditions.
- (ii) Open corridors and verandahs are used for circulation and protection against sun and rain.
- (iii) The maximum width of a building around a courtyard is 6 m. This allows natural ventilation and fans to be used effectively.
- (iv) The minimum spacing of columns is 3.00 m. Other dimensions are based on a module of 3.00 m in order to give conformity to the buildings.
- (v) A reinforced concrete frame structure is used for flexibility in utilisation of available span. It is proposed that walls are constructed with red brick.
- (vi) It is proposed that the main entrance should be on the south or north side of the building.
- (vii) The allocation of the four floors is proposed as follows:

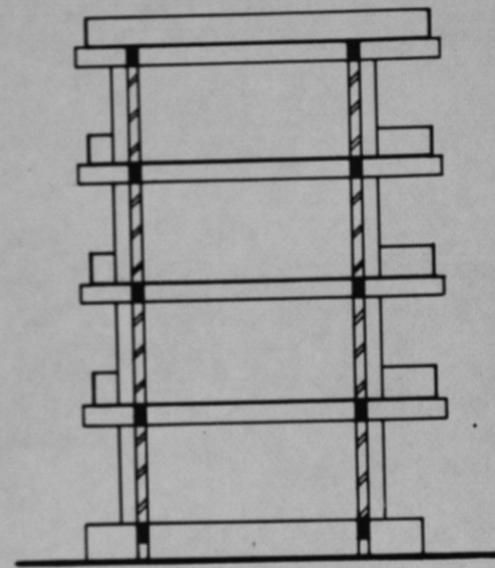
Ground floor	-	mainly accounts + other offices
First floor	-	mainly personnel + other offices
Second floor	-	management + other offices
Third floor	-	future expansion
- (viii) The auditorium is designed as an annex to the main building with a separate entrance.

Figure 7.2  
C.P.C. Office  
Khartoum  
Elevation

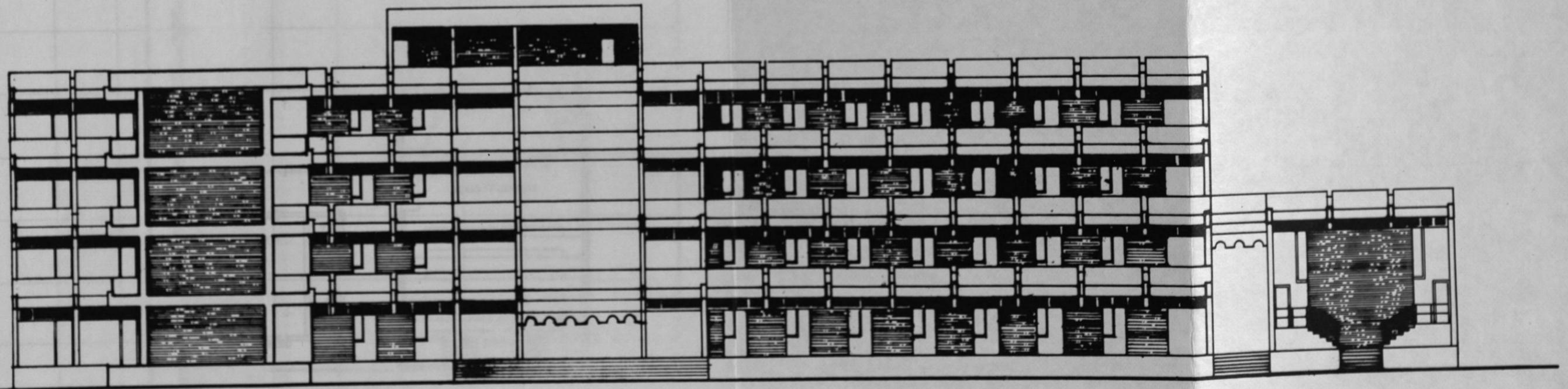
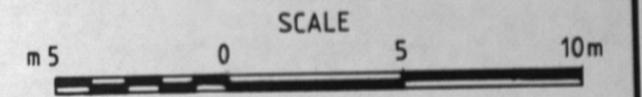


MAIN ELEVATION

Figure 7.2  
C.P.C. Office  
Khartoum  
Elevation



CROSS SECTION



MAIN ELEVATION

Figure 7.3  
 C.P.C. Office  
 Khartoum  
 Ground Floor Plan

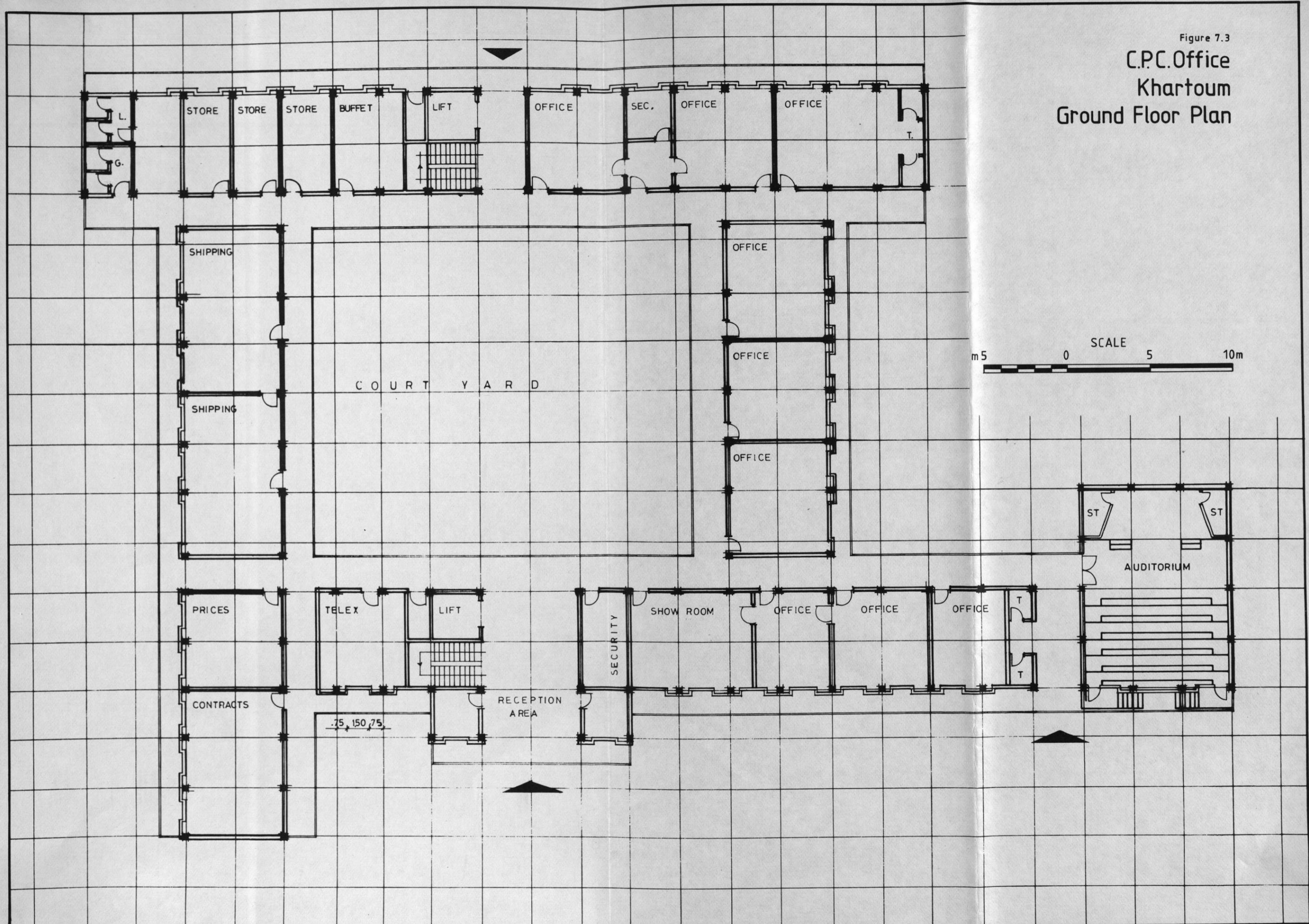


Figure 7.4  
C.P.C. Office  
Khartoum  
First Floor Plan

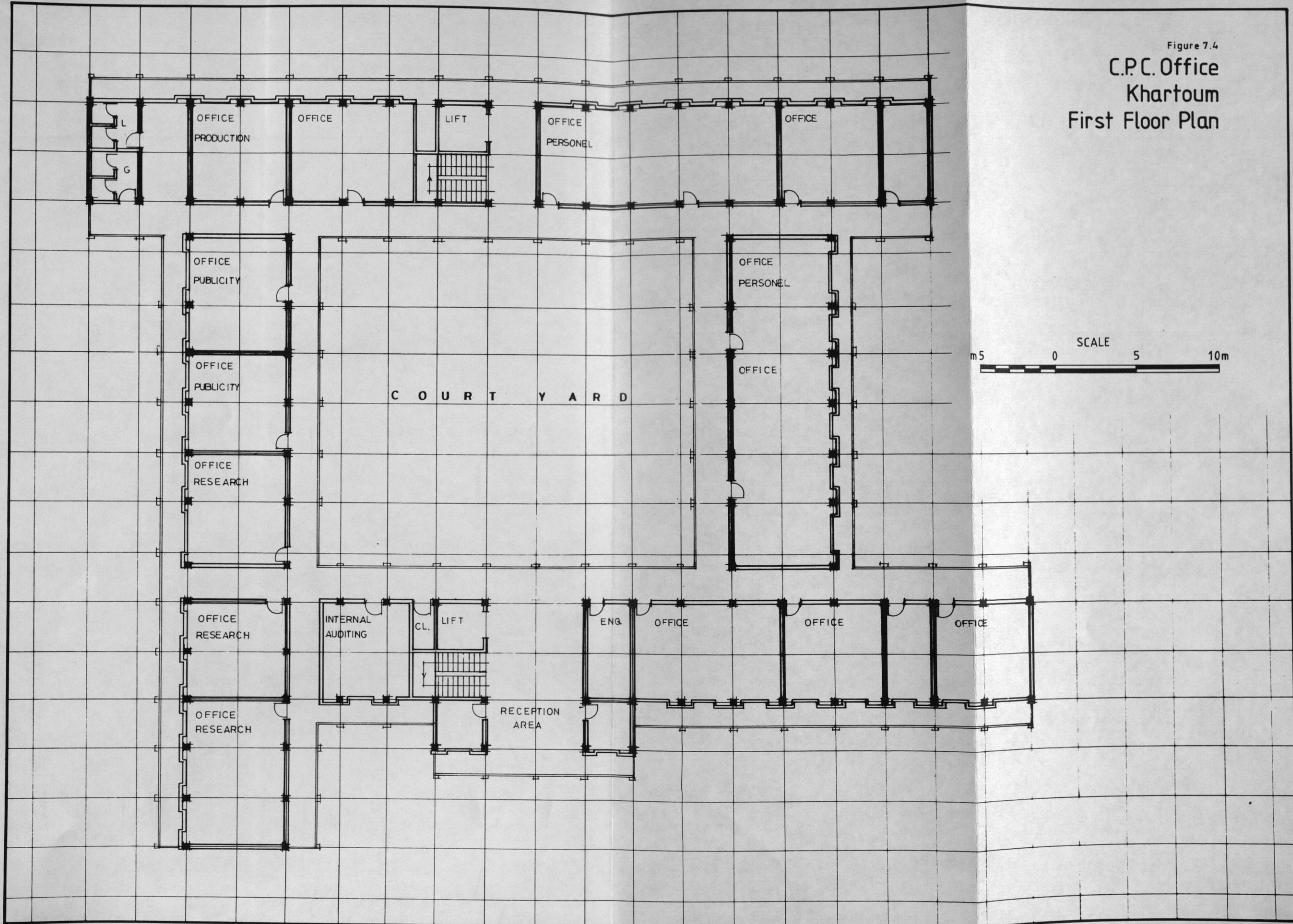
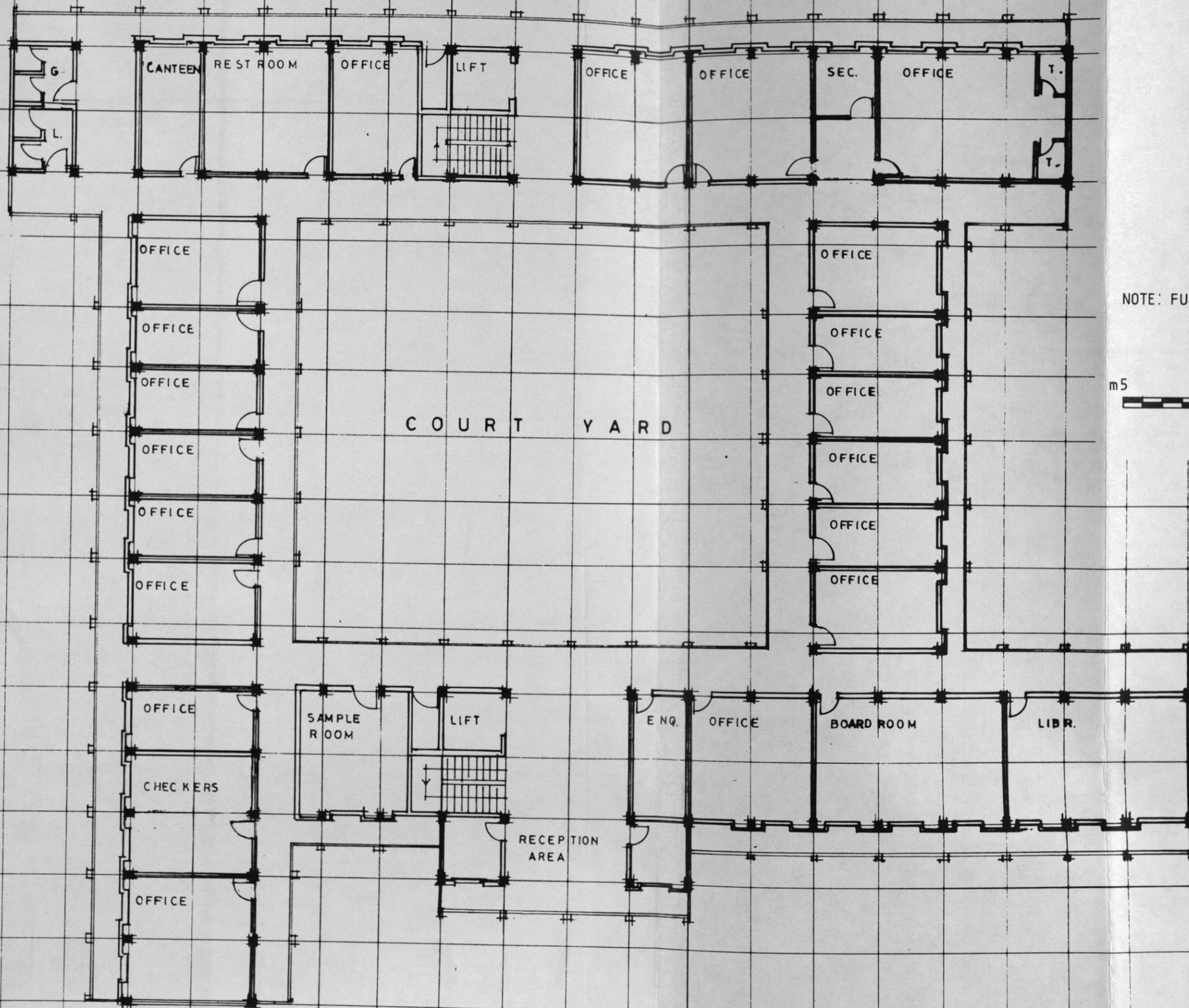


Figure 7.5

# C.P.C. Office Khartoum Second Floor Plan



NOTE: FUTURE THIRD FLOOR SIMILAR



A total of 175 staff, of official grades, are specifically identified as requiring office accommodation. At least ten more people would work on a shift basis, mainly in the shipping department and possibly also in prices and contracts, or sales and allocations, together with a telex operator. Other employees including messengers, drivers, cook, waiters, guards, caretaker and cleaners will also work in the building. There should be some reduction in the numbers of these, especially messengers, compared with the present total of over 50 employees, as a result of the consolidation of six separate offices into a single headquarters. Such employees will probably number about 30 and are unlikely to exceed 40. They are unlikely all to be in the building together at any one time because of the nature of their duties or shift working. The provision of a rest room and canteen will provide accommodation when they are not on a specific task or duty.

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Outline designs for a new CPC office building in Khartoum are shown on Figures 7.2 to 7.5. The main principles adopted in preparing the outline design were:

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- (iii) The maximum width of a building around a courtyard is 6 m. This allows natural ventilation and fans to be used effectively.
- (iv) The minimum spacing of columns is 3.00 m. Other dimensions are based on a module of 3.00 m in order to give conformity to the buildings.
- (v) A reinforced concrete frame structure is used for flexibility in utilisation of available span. It is proposed that walls are constructed with red brick.
- (vi) It is proposed that the main entrance should be on the south or north side of the building.
- (vii) The allocation of the four floors is proposed as follows:

Ground floor	-	mainly accounts + other offices
First floor	-	mainly personnel + other offices
Second floor	-	management + other offices
Third floor	-	future expansion
- (viii) The auditorium is designed as an annex to the main building with a separate entrance.

It is suggested that a four storey building be constructed to allow space for expansion. The area allocated for expansion could be sublet until such time as it is required by CPC.

The estimated building costs of the CPC office are given in Table 7.2. If the CPC office was limited to a three storey building the cost could be reduced to LS 1 750 000. No allowance has been made for the cost of land as it is assumed that this would be made available from the existing stock of government owned land.

**TABLE 7.2**

**Estimated Costs of New CPC Headquarters**

Item	FE cost (US\$ '000)	Total cost (LS '000)
New office building	723	2 350
Equipment, etc.		
- Microcomputer (1 Nr)	11	26
- Photocopier (2 Nr)	8	19
- Office furniture (20 sets)	19	46
- Library shelving	2	5
- Special lighting units for sample room (2 Nr)	2	5

There would be some savings in existing rents to be balanced against the cost of the new building. These are relatively small as each of the buildings is on a long term lease benefiting from low rents, and the savings in a full year would be LS 44 000.

**7.2.3 Office Equipment and Furniture**

From interviews with the various departments of the CPC and an examination of the inventory of office equipment and furniture, there appears to be no immediate shortage of office equipment in CPC.

The following additions, however, are suggested:

- The acquisition of a microcomputer, as referred to in Chapter 6, to assist in monitoring day-to-day operations and preparing comprehensive management reports and budgets and forecasting out-turns of crop estimates. Major equipment suppliers such as NCR, IBM and AES are well represented in Khartoum. The budgeted cost is based upon equipment from NCR, which at the present time appears to have the largest number of microcomputers already installed in Khartoum and also has the necessary back-up support. Choice of equipment should however be delayed until a market/business analyst is appointed, under technical assistance, who could assist in appraising proposals for the most suitable equipment that may be available at the time and who would also be responsible for training personnel in the use of the computer. No shortage of basic electric and electronic calculators was apparent.

- Though CPC and the export companies do have photocopying equipment, there is a need for equipment with a reduction facility. This is because of the large summary tables that are prepared, such as analyses of production of lint by scheme, grade and quality.
- There is an adequate supply of typewriters but these are all manual. In the current budget three English typewriters are, however, proposed. It is suggested that three Arabic electric typewriters are also acquired for the senior secretaries.
- Two special lighting units will be required for the sample room to be included in the new CPC headquarters.

As it is intended that CPC should have a new centralised office block, consideration has been given to including an allowance for new office furniture. Existing furniture, though serviceable, could benefit from upgrading. Its book value possibly overstates any realisable value because of the low rates of depreciation applied. An improvement in the standard furniture might be considered justifiable on the grounds of providing a suitable environment for receiving foreign buyers in Khartoum and of promoting staff morale. A cost estimate has been made based upon refurnishing the 20 senior and middle management offices of the proposed new office block with chairs, desks and filing cabinets. Furniture released from existing management offices could be used to upgrade and improve the facilities for junior staff. An additional allowance has been included for the necessary racking and shelving for a new library.

The estimated costs of furniture and equipment are given in Table 7.2.

Specifications for CPC telecommunications equipment are given in Annex 6. A standby generator would be a necessity to maintain telex communications.

### **7.3 Branches of Export Companies in Port Sudan**

As it is proposed to integrate the existing four export companies into the CPC, it would appear logical to amalgamate the staff of their branches in Port Sudan into the CPC stores building. Some 16 classifying and sampling staff would be integrated into the classifying department which will be housed in a new building (see Annex 5). A further 20 staff, the 4 branch managers and 16 assistants would form a single shipping and expediting department. Additional facilities would also be required for some 20 other ancillary staff, labourers, messengers and drivers. These would have to be found additional accommodation within the new/extended building proposed for CPC stores. These personnel could be housed in offices vacated by the classifying department. Any other branch staff could be readily found positions within the other CPC stores departments as there are often several unfilled positions.

Potential savings would be equal to the rent of three of the branch offices, some LS 10 000 per year. The other branch office, that of the National Cotton and Trading Company, would be retained as part of the building is used as the CPC guest house for Port Sudan.

### **7.4 CPC Housing at Producing Corporations**

To house the seven CPC representatives at the producing corporations, as suggested in Section 7.1, it is proposed that new houses should be built under the project. The estimated total cost is LS 420 000 (FE cost US\$ 129 000).

## **7.5 Training and Technical Assistance**

### **7.5.1 Training**

Much of the staff training undertaken by the CPC is basic on-the-job training gained from the time of joining a department. The main exceptions are the persons sent to Egypt, usually from the production department, for short courses of two to three months duration in cotton classification. Nine persons from the CPC have benefited from this in the last two years.

Suggested training for CPC personnel should include the following :

- Courses on ginning technology, possibly in Egypt, for the production department personnel to gain a more intimate knowledge of the operations they are monitoring. Estimated cost for a one month course for up to ten persons is LS 26 000.
- The accounts staff of CPC apparently includes only two persons with a formal local accounting qualification. The overall standard should be improved with the integration of the export companies into a single CPC headquarters. However, arrangements should be made for staff to attend the regular term courses in accounting and finance run by the Management Development Centre in Khartoum, established by the UNDP and ILO. The courses are relatively low cost and could be readily financed by CPC. Other courses are also available in marketing and administration.
- In Chapter 6, it was proposed that two members of the existing statistics and research department should benefit from a study tour of three months to study sources of market information and data analysis for the cotton industry in the USA and the UK. Total estimated cost is LS 30 000.

### **7.5.2 Technical Assistance**

It was recommended in previous sections that the CPC should have the services of a market/business analyst for one year and an international cotton trader for a period of 18 months.

The main brief for the market/business analyst would be to supervise and train existing staff in the preparation of market research reports, assist in the selection and application of a microcomputer, and provide input for senior management into the analysis of particular operational problems. The requirement is for someone with a minimum of ten years experience in market research, especially relating to cotton, including the managing of market research projects, training and financial modelling.

The services of an international cotton trader to perform the tasks proposed in Chapter 3 would be required for an 18 month period. Ideally, the person appointed should have a minimum of 20 years experience, especially of trading in acala cottons, but also with experience of ELS.

TABLE L1

THE COTTON PUBLIC CORPORATION

Treasury, Profit and Loss Account for the Year Ended 30.4.1981

Particulars	L.S./m/m	Particulars	L.S./m/m
Operating costs	51 708.254	Proceeds of sale of first cotton	431 928.776
Cost of cotton purchased	417 556.579	Proceeds of sale of rebleed cotton	59.008
Labouratory work	126 338.752		
	302 978.338		
Other profit C/D	89 063.338		431 987.776
<b>Operating Expenses</b>			
Provision for expenses	763 034.211	Commission on export sales	1 736 669.031
Research section expenses	217 704.491	Commission on local sales	132 475.398
Cotton publicity expenses	84 597.210	Commission on sales of cotton seed	379 291.759
General cotton centre expenses	98 704.370	or 10% (country by charges)	1 691 234.937
Part Sudan stores expenses	1 063 678.440	Net profit	98 325.808
Part Sudan retail stores expenses	5 327.380	Part Sudan stores revenue	1 443 678.448
Net profit before tax C/D	2 633 186.318	Subsidy revenue	84 597.210
	3 045 445.239	Proceeds of sales of scrap material	1 235.308
	5 659 571.329		5 658 571.329
Provision for development tax 5%	152 272.361		
Provision for business profit tax	1 820 617.151	Net profit before tax B/D	3 045 445.239
Provision for business profit tax 1979/80	96 208.920		
Net profit C/D	2 029 078.342		
	1 016 346.877		
	3 045 445.239		3 045 445.239
		Appropriation account	
		Ministry of Finance - balance of net profit	1 016 346.877
		Net profit B/D	1 016 346.877

APPENDIX I  
CPC ACCOUNTS

1980/81 and 1981/82

TABLE I.1

THE COTTON PUBLIC CORPORATION

Trading, Profit and Loss Account for the Year Ended 30.6.1981

Particulars	L.S.m/ms	Particulars	L.S.m/ms
Opening stock	51 708.254	Proceeds of sale of lint cotton	431 928.776
Add cotton purchases	417 554.439	Proceeds of sale of mixed cotton	59,000
Less closing stock	469 262.693		
	126 338.255		
	<u>342 924.438</u>		
Gross profit C/D	89 063.338		
	<u>431 987.776</u>		<u>431 987.776</u>
	=====		=====
<b>General Expenses:</b>		Gross profit B/D	89 063.338
Headquarter expenses	763 034.211	2% commission on export sales	1 736 669.031
Research section expenses	217 784.491	1% commission on local sales	132 475.398
Cotton publicity expenses	84 597.210	1% commission on sales of cotton seed	379 291.759
General cotton centre expenses	98 704.370	Other income (carrying charges)	1 691 234.937
Port Sudan stores expenses	1 443 678.448	Interest received	98 325.908
Port Sudan rest house expenses	5 327.380	Port Sudan stores revenue	1 443 678.448
	<u>2 613 126.110</u>	Publicity revenue	84 597.210
Net profit before tax C/D	3 045 445.219	Proceeds of sales of scrap material	3 235.300
	<u>5 658 571.329</u>		<u>5 658 571.329</u>
	=====		=====
Provision for development tax 5%	152 272.261	Net profit before tax B/D	3 045 445.219
Provision for business profit tax	1 820 617.131		
Provision for business profit tax 1979/80	56 208.950		
	<u>2 029 098.342</u>		
	1 016 346.877		
Net profit C/D	3 045 445.219		<u>3 045 445.219</u>
	=====		=====
		<b>Appropriation account</b>	
		Ministry of Finance - balance of net profit	1 016 346.877
			<u>1 016 346.877</u>
			=====

TABLE I.2

## THE COTTON PUBLIC CORPORATION

Balance Sheet as at 30th June 1981

79/80 LS	LIABILITIES	LS.m/ms	79/80 LS	ASSETS	LS.m/ms	LS.m/ms
2 864 279	Reserves	2 864 279.090		Fixed Assets:	1 430 992.180	1 119 035.334
4 632 383	General reserve	4 632 382.648		At cost	311 956.846	314 821.209
	Special storage reserve			Less depreciation		1 433 856.543
			7 496 661.738	Building under construction		
1 053 947	Current liabilities	57 003.996	1 419 445	Current assets:	28 542 919.186	126 338.255
25 109	1/4 % Prices Stabilisation Fund	2 033 338.392	51 708	Cotton stocks	6 834 954.400	
22 183 464	1/4 % National Equalisation	143 672 424.227	14 099 050	Cotton debtors	755 902.241	
157 310	Cotton creditors	175 144.484	319 410	Staff loans and advances		
1 185 467	Sundry creditors	2 201 814.234	15 977 869	Sundry debtors	28 542 919.186	
	Ministry of Finance	3 505 915.026	30 396 329	Cottonseed debtors	64 275 502.632	64 198 202.632
	(Share of Profit)		62 300	Less Prov. for bad debts	77 300.000	90 413 469.666
	Cotton seed creditors			S. Government A/C (80/81)		
1 806 344	Creditor balances	2 835 442.305		Deposits		6 307.500
331 312	Provision for business	443 870.061	6 307 500	Cash at Bank	1 249 788.660	
143 584	profit tax	161 219.600		El Nilein Bank Khartoum	938 086.643	
61 212	Provision for staff			Bank of Sudan C/A	77 807.010	
212 122	Provision for Rent of	2 145.777		Sudan Commercial Bank	979 444.806	
	SGB assets	168 280.795		P. Co-operative Bank (Savings	4 530.219	
	ation and reclassifications			account)	164 978.575	
	Provision for job evalu-			Unity Bank (Savings account)	3 122 694.240	
	welfare fund			Fisal Islamic Bank		
	Accrued charges			Bank of Sudan C/Seed		
				El Nilein Bank P/S	6 556 995.427	
				Geneva Cotton Center Bank A/c	18 090.612	6 575 086.039
						162 753 260.635
						=====
(Signed)	Osman A/Alla Medani		(Signed)	Abu Obeida Ali Osman		
	Managing Director			Financial Manager		

## Audit Report

We have examined the annexed Balance sheet and the annexed Profit and Loss account which are in agreement with the books of accounts. In our opinion and to the best of our information and according to the explanations given to us, the annexed Balance Sheet shows a true and fair view of the state of the affairs of the Corporation as at 30th June 1981 and the attached profit and loss account gives a true and fair view of the profit for the year then ended.

(Signed) Hussein A/Rahiem  
Auditor General

TABLE I.3

## THE COTTON PUBLIC CORPORATION

Trading, Profit and Loss Account for the Year Ended 30th June 1982

Particulars	L.S.m/ms	Particulars	L.S.m/ms
Opening stock	126 338.255	Proceeds of sale of lint cotton	24 185.669
Less closing stock	105 119.882	Proceeds of sale of mixed cotton	5 881.500
	<u>21 218.373</u>		<u>30 067.169</u>
Gross profit C/D	8 848.796		=====
	<u>30 067.169</u>		=====
<b>General Expenses:</b>		Gross profit B/D	8 848.796
Headquarter expenses	893 880.102	2% commission on export sales	1 309 603.249
Research section expenses	37 997.364	1% commission on local sales	156 788.927
Cotton publicity expenses	327 818.580	1% commission on sales of cottonseed	411 252.157
Geneva cotton centre expenses	160 941.777	Other income (carrying charges)	209 284.817
Port Sudan stores expenses	1 533 898.445	Other income (interest received)	168 985.010
Port Sudan rest house expenses	7 227.406	Port Sudan stores revenue	1 533 898.445
	<u>2 961 763.674</u>	Publicity revenue	327 818.580
Net profit before tax C/D	1 189 282.557	Profit on sale of fixed assets	24 566.250
	<u>4 151 046.231</u>		<u>4 151 046.231</u>
	=====		=====
Provision for development tax	59 464.127	Net profit before tax B/D	1 189 282.557
Provision for business profit tax	706 919.534		
Adjustment of provision for taxes 1980/81	136 447.860		
	<u>902 831.521</u>		
Net profit C/D	286 451.036		
	<u>1 189 282.557</u>		<u>1 189 282.557</u>
	=====		=====
Ministry of Finance - balance of net profit	286 451.036	Net profit C/D	286 451.036
	=====		=====



ANNEX 8

CONTENTS

	Page No
CHAPTER 1 APPROACH TO ANALYSIS	
1.1 General	A8-1
1.2 Choice of Investment	A8-1
1.3 Total Cost Production Protection	A8-1
1.4 Presentation of the Analysis	A8-1
CHAPTER 2 PROJECT CAPITAL COSTS	
2.1 Project Investment	A8-3
2.2 Project Cost	A8-3
CHAPTER 3 ASSESSMENT OF PROJECT BENEFITS	
3.1 Introduction	A8-5
3.2 Benefit	A8-5
3.2.1 Benefit Stream	A8-5
3.2.2 Benefit Stream	A8-5
3.2.3 Benefit Stream	A8-5
3.2.4 Benefit Stream	A8-5
3.2.5 Benefit Stream	A8-5
3.2.6 Benefit Stream	A8-5
3.2.7 Benefit Stream	A8-5
3.2.8 Benefit Stream	A8-5
3.2.9 Benefit Stream	A8-5
3.2.10 Benefit Stream	A8-5
3.2.11 Benefit Stream	A8-5
3.2.12 Benefit Stream	A8-5
3.2.13 Benefit Stream	A8-5
3.2.14 Benefit Stream	A8-5
3.2.15 Benefit Stream	A8-5
3.2.16 Benefit Stream	A8-5
3.2.17 Benefit Stream	A8-5
3.2.18 Benefit Stream	A8-5
3.2.19 Benefit Stream	A8-5
3.2.20 Benefit Stream	A8-5
3.2.21 Benefit Stream	A8-5
3.2.22 Benefit Stream	A8-5
3.2.23 Benefit Stream	A8-5
3.2.24 Benefit Stream	A8-5
3.2.25 Benefit Stream	A8-5
3.2.26 Benefit Stream	A8-5
3.2.27 Benefit Stream	A8-5
3.2.28 Benefit Stream	A8-5
3.2.29 Benefit Stream	A8-5
3.2.30 Benefit Stream	A8-5
3.2.31 Benefit Stream	A8-5
3.2.32 Benefit Stream	A8-5
3.2.33 Benefit Stream	A8-5
3.2.34 Benefit Stream	A8-5
3.2.35 Benefit Stream	A8-5
3.2.36 Benefit Stream	A8-5
3.2.37 Benefit Stream	A8-5
3.2.38 Benefit Stream	A8-5
3.2.39 Benefit Stream	A8-5
3.2.40 Benefit Stream	A8-5
3.2.41 Benefit Stream	A8-5
3.2.42 Benefit Stream	A8-5
3.2.43 Benefit Stream	A8-5
3.2.44 Benefit Stream	A8-5
3.2.45 Benefit Stream	A8-5
3.2.46 Benefit Stream	A8-5
3.2.47 Benefit Stream	A8-5
3.2.48 Benefit Stream	A8-5
3.2.49 Benefit Stream	A8-5
3.2.50 Benefit Stream	A8-5
3.2.51 Benefit Stream	A8-5
3.2.52 Benefit Stream	A8-5
3.2.53 Benefit Stream	A8-5
3.2.54 Benefit Stream	A8-5
3.2.55 Benefit Stream	A8-5
3.2.56 Benefit Stream	A8-5
3.2.57 Benefit Stream	A8-5
3.2.58 Benefit Stream	A8-5
3.2.59 Benefit Stream	A8-5
3.2.60 Benefit Stream	A8-5
3.2.61 Benefit Stream	A8-5
3.2.62 Benefit Stream	A8-5
3.2.63 Benefit Stream	A8-5
3.2.64 Benefit Stream	A8-5
3.2.65 Benefit Stream	A8-5
3.2.66 Benefit Stream	A8-5
3.2.67 Benefit Stream	A8-5
3.2.68 Benefit Stream	A8-5
3.2.69 Benefit Stream	A8-5
3.2.70 Benefit Stream	A8-5
3.2.71 Benefit Stream	A8-5
3.2.72 Benefit Stream	A8-5
3.2.73 Benefit Stream	A8-5
3.2.74 Benefit Stream	A8-5
3.2.75 Benefit Stream	A8-5
3.2.76 Benefit Stream	A8-5
3.2.77 Benefit Stream	A8-5
3.2.78 Benefit Stream	A8-5
3.2.79 Benefit Stream	A8-5
3.2.80 Benefit Stream	A8-5
3.2.81 Benefit Stream	A8-5
3.2.82 Benefit Stream	A8-5
3.2.83 Benefit Stream	A8-5
3.2.84 Benefit Stream	A8-5
3.2.85 Benefit Stream	A8-5
3.2.86 Benefit Stream	A8-5
3.2.87 Benefit Stream	A8-5
3.2.88 Benefit Stream	A8-5
3.2.89 Benefit Stream	A8-5
3.2.90 Benefit Stream	A8-5
3.2.91 Benefit Stream	A8-5
3.2.92 Benefit Stream	A8-5
3.2.93 Benefit Stream	A8-5
3.2.94 Benefit Stream	A8-5
3.2.95 Benefit Stream	A8-5
3.2.96 Benefit Stream	A8-5
3.2.97 Benefit Stream	A8-5
3.2.98 Benefit Stream	A8-5
3.2.99 Benefit Stream	A8-5
3.2.100 Benefit Stream	A8-5
3.3 Benefit Stream	A8-15
3.4 Marketing and Other Costs	A8-19
CHAPTER 4 FINANCIAL ANALYSIS	
4.1 Summary of Results	A8-21
CHAPTER 5 ECONOMIC ANALYSIS	
5.1 Capital Costs	A8-22
5.2 Domestic Rates of Return	A8-22
5.3 Domestic Effects	A8-22

## ANNEX 8

### CONTENTS

		Page Nr
CHAPTER 1	APPROACH TO ANALYSIS	
	1.1 General	A8-1
	1.2 Classes of Investment	A8-1
	1.3 Seed Cotton Production Projections	A8-1
	1.4 Presentation of the Analysis	A8-2
CHAPTER 2	PROJECT CAPITAL COSTS	
	2.1 Project Components	A8-3
	2.2 Capital Costs	A8-3
CHAPTER 3	ASSESSMENT OF PROJECT BENEFITS	
	3.1 Introduction	A8-6
	3.2 Ginning	A8-6
	3.2.1 Capacity Benefits	A8-6
	3.2.2 Lint Prices	A8-11
	3.2.3 Quality Benefits	A8-12
	3.2.4 Labour Savings	A8-13
	3.2.5 Other Ginning Benefits	A8-15
	3.3 Storage Benefits	A8-15
	3.4 The CPC	A8-16
CHAPTER 4	INCREMENTAL OPERATING COSTS	
	4.1 Introduction	A8-17
	4.2 Costs of Seed Cotton	A8-17
	4.3 Ginning Costs	A8-18
	4.4 Marketing and Other Costs	A8-19
CHAPTER 5	FINANCIAL ANALYSIS	
	5.1 Summary of Results	A8-21
CHAPTER 6	ECONOMIC ANALYSIS	
	6.1 Capital Costs	A8-22
	6.2 Economic Rates of Return	A8-22
	6.3 Economic Effects	A8-22

## CONTENTS (cont.)

APPENDIX I	Capital Cost Schedules
APPENDIX II	Ginning Capacity Models
APPENDIX III	Cash Flows at Constant Financial Prices
APPENDIX IV	Summary Cash Flows at Constant Financial Prices
APPENDIX V	Cash Flows at Economic Prices
APPENDIX VI	Summary Cash Flows at Economic Prices

## LIST OF TABLES

Table Nr	Title	Page Nr
2.1	Summary of Capital Costs	A8-4
2.2	Customs Duties	A8-5
3.1	Capacities of Existing Ginneries	A8-8
3.2	Capacity Benefits of Project Rehabilitation, Improvements and Additions	A8-9
3.3	Projected Lint Prices	A8-11
3.4	Basis for Valuation of Quality Benefits	A8-13
3.5	Average Quality Benefits by Scheme	A8-14
3.6	Labour Savings	A8-14
3.7	Net Scarto Benefits	A8-15
4.1	Provisional Seed Cotton Production Costs in Gezira and Rahad in 1982/83	A8-17
4.2	Variable Ginning Costs	A8-18
5.1	Summary of Internal Rates of Return at Constant Financial Prices	A8-21
6.1	Capital Costs at Economic Prices	A8-23
6.2	Summary of Economic Rates of Return	A8-24
6.3	Estimated Gross Foreign Exchange Earnings in 1990/91	A8-24

## CHAPTER 1

### APPROACH TO ANALYSIS

#### 1.1 General

The financial and economic analysis of the project is concerned with appraising the investments identified in Annexes 3 to 7. Only the incremental effect of the project, in terms of the net benefits arising from the proposed investments, has been examined.

#### 1.2 Classes of Investment

The proposed investments have been categorised under three separate classes: rehabilitation, improvements and additions. The class of each item is indicated in the capital cost schedules included in Appendix I.

Rehabilitation relates to expenditure which is considered necessary to restore and maintain the existing facilities and capacity of the sector. Such expenditure includes replacement of worn-out or obsolete equipment, supply of spares, and overhauls and repairs to compensate for inadequate maintenance in previous years. In most cases such investments do not provide positive benefits compared with the present situation, but if they were not implemented there would be a detrimental effect on the sector, resulting in dis-benefits. These dis-benefits would generally become apparent through a decline in performance and in some cases would include reductions in the life of existing plant. Investment in rehabilitation would therefore provide a net benefit compared with the 'without project' situation.

Improvements are those investments which upgrade existing facilities and capacity. These will provide benefits mainly in terms of increasing the quality and value of lint, increasing the capacity of the sector and providing labour savings.

Additions are defined as investments in new capacity which are necessary, in addition to rehabilitation and improvements, to meet the projected volumes of seed cotton production expected up to 1990/91, as well as investments in completely new facilities such as a testing laboratory for the commercial crop.

It should be noted that these categories inevitably overlap. Some items (for example firefighting systems) do not fall neatly into any of the classes as defined above in that no direct benefits can readily be quantified. Such items must be regarded as having an essential ancillary role to other project investments, or to existing plant in handling increased crop production.

#### 1.3 Seed Cotton Production Projections

Three differing sets of seed cotton production projections have been drawn up as detailed in Annex 3, Chapter 4. The differences between these cases relate only to the Gezira and the Blue and White Nile pump schemes. Both Cases A and B are based upon a 500 000 bale maximum limit of long staple production. Case A limits the area of medium staple cotton in Gezira to 150 000 feddans, concentrating the

balance of medium staple in the pump schemes. Case B assumes that the Blue and White Nile pump schemes grow exclusively long staple cotton and that Gezira is the balancing factor in producing the required volume of long staple cotton with the remainder of its production area devoted to medium staple. Case C assumes that medium staple is confined to 20 000 feddans in Gezira and the pump schemes grow only medium staple; because of the limit on medium staple production in Gezira, total long staple production is larger, at 610 000 bales.

It is considered that Case C represents an extreme situation which is unlikely to occur in practice. Financial and economic analyses have therefore only been carried out for Cases A and B. Investments in rehabilitation and improvement measures do not vary for the different cases and their respective seed cotton production projections. Although the location and timing varies, proposals for additional new ginning capacity are the same for each case. Total project capital costs therefore do not vary according to case. Incremental operating costs and project benefits do, however, vary as they are to a large extent directly related to actual production.

For the purpose of the analysis, production is assumed to remain constant after 1990/91.

#### 1.4 Presentation of the Analysis

Summary capital costs and cash flows have been prepared at constant 1983 financial prices and constant 1983 economic prices. The economic analysis involves converting financial prices to economic prices as follows:

- (i) Imported equipment and materials are valued at the fixed exchange rate but excluding local taxes and duties which are money transfers and not economic costs. Export revenues are also converted at the fixed exchange rate, rather than at the preferential rate used in the financial analysis (LS 1.425 to US\$ 1) which is a subsidy to exporters.
- (ii) Other local taxes also have a nil economic value, for example taxes on the sale of cottonseed.
- (iii) A standard conversion factor is applied to other local cost components, representing the difference between domestic and international price levels. The factor is 0.6, which was previously advised by the World Bank at the outset of the study, and is determined by dividing the fixed exchange rate by the free market rate. In mid-1983 the fixed exchange rate was LS 1.3 to US\$ 1 while the free market rate was LS 2.1 to US\$ 1, the rate commercial banks had found necessary to obtain foreign currency. This tends to support the use of a standard conversion factor of 0.6.

The capital costs of the project represent the necessary investments required to meet projected seed cotton production up to 1990/91, after which date production is held constant. Project cash flows are extended a further twenty years after 1990/91 but no terminal values have been assigned to the original investment. Internal rates of return are determined for the main sub-components by case to compare the viability of the various parts of the project.

## CHAPTER 2

### PROJECT CAPITAL COSTS

#### 2.1 Project Components

The project is divided into the following components :

- A. Ginning
- B. Storage (at Port Sudan)
- C. Grading and Testing
- D. Cotton Public Corporation (headquarters facilities)
- E. Implementation

The ginning component, which accounts for over 80% of the total capital costs, has been divided into sub-components corresponding to individual existing ginneries and proposed new ginning factories. Other components have been divided into suitable sub-components comprising buildings, equipment and training and technical assistance. (For convenience of the analysis, to avoid allocating costs between ginneries, the costs of ginning training have been included in the implementation component.)

#### 2.2 Capital Costs

The capital costs of the project are shown in detail in Appendix I, which includes a separate capital cost schedule for each sub-component. A summary of total capital costs by sub-component is given in Table 2.1.

All costs relate to mid-1983 prices, using an exchange rate of US\$1 = LS 1.3. The costs are broken down into foreign exchange costs, taxes and duties and local costs, and are phased according to the proposed implementation programme. Taxes and duties on imported equipment and materials are based on the 1983 schedule for Customs Duties with addition of a further 21.5% of CIF costs to cover Defence Tax, "Additional" Import Tax and port dues. The rates of customs duty used for the principal categories of items are listed in Table 2.2.

Allowances for physical contingencies have been made at the rate of 15% for civil and building works and 10% for mechanical and electrical installations and miscellaneous equipment.

TABLE 2.1

## Summary of Capital Costs (1983 constant prices)

Component Sub-component	Foreign exchange cost (US\$ '000)	Taxes and duties (LS '000)	Other local costs (LS '000)	Total local costs (LS '000)	Total costs (LS '000)
<b>A. Ginning</b>					
1. Marangan ginnery	9 260	5 966	2 122	8 178	20 216
2. Hasaheisa ginnery	10 927	6 873	2 447	9 320	23 525
3. Bageir ginnery	648	444	147	591	1 433
4. SGB - all ginneries	3 790	2 583	134	2 717	7 644
5. Sennar ginnery	844	556	174	730	1 827
6. Hamadnallah ginnery	633	403	102	505	1 328
7. Kassab ginnery	3 071	1 884	850	2 734	6 726
8. Dueim ginnery	918	589	183	772	1 965
9. Kosti ginnery	846	532	162	694	1 794
10. Rabak ginnery	3 957	2 452	1 014	3 466	8 610
11. Fau ginnery	1 664	1 123	648	1 771	3 934
12. Fau new factory	2 361	1 492	803	2 295	5 364
13. New Halfa ginnery	1 089	747	371	1 118	2 534
14. Zeidab ginnery	108	76	13	89	229
15. Port Sudan ginnery	259	196	42	238	575
16. Nuba Mountains ginneries	1 863	1 190	437	1 627	4 049
17. Damazin ginnery	245	163	44	207	526
18. New saw gin factory <sup>(1)</sup>	2 773	1 855	848	2 703	6 308
Component total	45 256	29 124	10 631	39 755	98 587
<b>B. Storage</b>					
1. Port Sudan stores	6 113	5 235	2 593	7 828	15 775
Component total	6 113	5 235	2 593	7 828	15 775
<b>C. Grading and Testing</b>					
1. Grading and Testing Centre	555	349	263	612	1 334
2. Training and technical assistance	468	-	-	-	608
3. ARC Laboratory	289	182	41	223	599
Component total	1 312	531	304	835	2 541
<b>D. CPC</b>					
1. Buildings	852	554	1 108	1 662	2 770
2. Telecommunications	745	539	82	621	1 590
3. Headquarters equipment	42	46	-	46	101
4. Training and technical assistance	343	-	75	75	521
Component total	1 982	1 139	1 265	2 404	4 982
<b>E. Implementation</b>					
1. Consultancies	1 480	-	744	744	2 668
2. Project Management Unit	2 109	579	1 788	2 367	5 109
3. Ginning training	1 258	60	140	200	1 835
Component total	4 847	639	2 672	3 311	9 612
Project total excluding contingencies	59 510	36 668	17 465	54 133	131 497
Project total including contingencies	66 049	40 697	19 384	60 081	145 946

Note: (1) Located on White Nile under Case A or Gezira under Case B.

TABLE 2.2

Customs Duties

ASSESSMENT OF PROJECT BENEFITS

Category	Customs duty <sup>(1)</sup> (%)
Mechanical plant (ginning equipment)	25
Electrical plant	40
Water pumps, steel pipes	25
Mechanical handling equipment	50
Telecommunications equipment	40
Laboratory equipment	25
Office equipment, office furniture	60
Structural steelwork	50
Cement <sup>(2)</sup>	20
Steel reinforcement <sup>(2)</sup>	30
Spare parts	as original equipment

Notes: (1) In addition to customs duty, other taxes on the CIF costs comprise:

Defence tax	10%
Additional import tax	10%
Port dues	1½%

(2) For general, civil and building works, the total amount of taxes and duties has been taken as 50% of the foreign exchange component. This implies an average rate of customs duty of 28.5%.

## CHAPTER 3

### ASSESSMENT OF PROJECT BENEFITS

#### 3.1 Introduction

Quantifiable benefits relate mainly to ginning, with minor benefits attributable to the components of storage and the CPC. No benefits are quantified in relation to grading and testing, but the measures recommended should improve the marketability of Sudanese cotton and make an essential contribution to realising the project benefits associated with increased crop production and improved quality. Improvements to grading and testing arrangements should also assist directly in raising the average lint price obtainable; a more detailed description of the lint offered for sale will increase its appeal to potential buyers and will probably have a favourable effect on the price it commands. The average price of lint should also increase marginally through an overall grade improvement if and when it is decided to implement the proposed change in the basis for classifying decisions with 5% sampling.

#### 3.2 Ginning

The main benefits under ginning are concerned with throughput capacity, lint quality and labour savings.

##### 3.2.1 Capacity Benefits

Capacity benefits are the result of increases in ginning capacity due to rehabilitation and improvements at existing ginneries and the addition of new factories, measured against the different cases of projected seed cotton production (i.e. benefits are only assigned to increased capacity to the extent that it is actually employed). For the purpose of the analysis, capacity increases at existing ginneries are determined by comparing the future 'with project' and 'without project' situations, and thus take into account two effects of the project:

- the conservation of that proportion of present capacity which would be lost through further deterioration and obsolescence if the proposed investments in rehabilitation were not made;
- the enhancement of capacity at existing ginneries resulting from proposed improvements and additions.

The 'without project' capacity has been determined by estimating a percentage decline in capacity from the present figure up to 1990/91. Estimating this percentage is obviously a matter of subjective judgement, but two points should be made. First, the decline in capacity is related to the expected effects of not making the specific investments proposed under the project, but does not necessarily imply that if the project were not implemented some or all of the required expenditure on spares and replacements would not be funded from alternative sources. Second, the decline in capacity would mainly take the form of increased downtime. It has been indicated in the report that failure to implement remedial measures could lead to a complete loss of capacity in some cases, for example through breakdown of one of the presses at Fau. However, it

must be assumed for the 'without project' situation that in such an event at least the minimum essential expenditure would be made to put the factory back into operation. In this case, the benefit of project expenditure, by forestalling possible breakdowns, would be avoidance of the loss of production during the period while repairs were being arranged.

The assumed decline in capacity for each factory or group of factories in the 'without project' situation is shown in Table 3.1. For both the 'without project' and 'with project' situations, it is assumed in the analysis that capacity remains constant after 1990/91.

'Without project' capacity and 'with project' capacity both without and with additions are modelled by producing corporation against the seed cotton production projections in Appendix II. Blue Nile and Suki Corporations are treated as a single scheme for the purpose of analysis as seed cotton from Blue Nile is ginned at Kassab. The following further points should be noted:

- (i) Capacities are based upon a six day per week ginning regime to permit sufficient time for routine repair and maintenance. It will also relieve the onus on ginning labour of working continuously seven days per week for up to five months. Six day week working will also provide sufficient reserve capacity to cope with a particularly large crop or other contingencies or to allow for a situation where the addition of a new ginning factory may not be fully justified.
- (ii) It is further assumed that capacity is limited to production up to the end of May because of the onset of rains which may damage seed cotton, lint and cotton seed during June. There is also the tendency of contractors labour in the ginnery to leave before or at the end of May to tend to their own farms. Further limitations to extending the ginning season are that no live seed should remain in the ginning yards at the end of June prior to sowing of the new crop, and that up to five months are required after completion of ginning for cleaning the ginnery, holidays of permanent staff, and stripping down and overhauling equipment prior to gin tests in December.
- (iii) In the case of Gezira, 'without project' capacity takes account of expected increases resulting from the Gezira Rehabilitation Project.
- (iv) For producing corporations producing both long and medium staple cotton, roller ginning capacity is (for the purpose of the analysis) allocated between long and medium staple processing, such that total long and medium staple ginning capacities at 100% utilisation are in the same proportion as crop production, subject to the limit on roller ginning capacity for long staple.
- (v) In the cases of Rabak ginnery and the Nuba Mountains ginneries at Semeih, Umm Berembeita and Dilling, it is assumed that in the 'with project' situation there is the same decline in capacity as in the 'without project' situation up to the year in which proposed investments are implemented.

TABLE 3.1

**Capacities of Existing Ginneries  
(tonnes seed cotton per day)**

Ginnery	Present capacity (1984)	Long staple Capacity in 1991		Medium/short staple Capacity in 1991			Capacity loss without project <sup>(1)</sup> (%)
		without project	with project	Present capacity (1984)	without project	with project	
<b>Gezira</b>							
- Nr 1, 2 & 3	663	564	777	411	349	522	15
- Nr 4, 5 & 6	663	713 <sup>(2)</sup>	777	411	479 <sup>(2)</sup>	522	5
- Nr 7, 8 & 13	520	312	973	313	188	653	40
- Nr 11, 12 & 14	722	733 <sup>(2)</sup>	800	460	490 <sup>(2)</sup>	537	5
- Nr 10	51	48	51	32	30	32	5
<b>Total Gezira</b>	<b>2 619</b>	<b>2 370</b>	<b>3 378</b>	<b>1 627</b>	<b>1 536</b>	<b>2 266</b>	
<b>Blue Nile/Suki</b>							
- Sennar & Hamadnallah	380	342	394	243	219	252	10
- Kassab Nr 1	96	0	288	67	0	193	100
- Kassab Nr 2	-	-	-	118 <sup>(3)</sup>	100	129	15
- Kassab Nr 3	-	-	-	228	217	228	5
<b>Total Blue Nile/Suki</b>	<b>476</b>	<b>342</b>	<b>682</b>	<b>656</b>	<b>536</b>	<b>802</b>	
<b>White Nile</b>							
- Dueim & Kostl	335	301	335	224	202	224	10
- Rabak	282	0	389	188	0	261	100
<b>Total White Nile</b>	<b>617</b>	<b>301</b>	<b>724</b>	<b>412</b>	<b>202</b>	<b>485</b>	
<b>Fau</b>	-	-	-	776	660	913	15
<b>New Halfa</b>	-	-	-	513	462	564	10
<b>Zeidab</b>	-	-	-	62	46	56 <sup>(4)</sup>	25
<b>Port Sudan</b>	90	68	81 <sup>(4)</sup>	-	-	-	25
<b>Nuba Mountains</b>							
- Group 1 <sup>(5)</sup>	-	-	-	410	349	410	15
- Group 2 <sup>(6)</sup>	-	-	-	252	0	192	100
<b>Total Nuba Mountains</b>	-	-	-	<b>662</b>	<b>349</b>	<b>602</b>	
<b>Damazin</b>	-	-	-	216	205	216	5

Notes: (1) This is the assumed total percentage loss in capacity from 1984 to 1991 if works proposed under the project are not implemented.

(2) Figures allow for improvements under GRP; increases due to GRP are offset by percentage loss given.

(3) Assumes electrification of factory is implemented.

(4) At Zeidab and Port Sudan, a 10% decline in capacity by 1991 is assumed for the with project situation in view of the age of the equipment at these ginneries.

(5) Kadugli, Kalogi, Abu Gebeiha, Lagowa and Talodi.

(6) Umm Berembeita, Semeih and Dilling.

TABLE 3.2

Capacity Benefits of Project Rehabilitation, Improvements and Additions  
('000 tonnes of seed cotton processed)(1)

	REHABILITATION AND IMPROVEMENTS										ADDITIONS										TOTAL							
	1985		1986		1987		1988		1989		1990		1991		1985		1986		1987		1988		1989		1990		1991	
	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS	LS	MS
<b>Case A</b>																												
Gezira	4	4	8	8	14	14	26	33	33	40	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blue Nile/Suki	2	2	4	4	8	8	14	19	19	23	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Nile	-	-	-	-	4	4	10	22	22	30	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	1	1	10	15	15	13	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	6	14	14	22	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rahad	2	2	21	21	23	23	25	27	27	29	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
New Halfa	1	1	6	6	10	10	10	11	11	12	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mechanised farming	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nuba Mountains	-	-	-	-	-	-	-	-	-	2	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total Case A</b>	4	4	8	8	15	15	36	48	48	53	58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	5	31	31	45	45	65	93	93	116	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	1	1	1	3	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Case B</b>																												
Gezira	2	2	5	5	9	9	16	25	25	32	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blue Nile/Suki	3	3	6	6	11	11	22	40	40	60	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White Nile	-	-	-	-	2	2	8	13	13	19	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others(2)	3	3	27	27	33	33	35	38	38	41	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	1	1	1	3	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total Case B</b>	2	2	5	5	12	12	40	64	64	87	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	6	32	32	45	45	57	78	78	101	109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	1	1	1	3	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes : (1) Based on 6 day/week operation.

(2) As case A: Rahad + New Halfa (MS); Mechanised Farming + Nuba Mountains (SS).

The volume benefits of additional ginning throughput as a result of rehabilitation and improvements at existing ginneries and the addition of new factories are summarised in Table 3.2, based upon a six day working week.

The new saw ginneries not only permit a larger volume of medium staple to be ginned but also release roller ginning capacity from medium staple production so increasing the volume of long staple ginned. This occurs for example in Case B for Gezira and Case A for White Nile (see Table 3.2). There are no benefits for the Tokar or Northern Corporations as the 'without project' capacities are sufficient to gin the projected 1990/91 seed cotton production.

In some instances there is still a shortfall of capacity after completion of the project which will require additional shift working or an extension to the ginning season to process the whole of the projected production. For the purpose of analysis the project is not credited with the benefits of any additional production that requires working more than six days a week or extending the length of the ginning season. These shortfalls occur as follows in 1990/91:

- Case B in Gezira where there are shortfalls of 6 000 tonnes of long staple seed cotton and 13 000 tonnes of medium staple which are equivalent to an extra six days ginning;
- a shortfall of just under 10 000 tonnes of medium staple on Blue Nile/Suki under Case A, equivalent to an extra 12 days ginning;
- a shortfall of under 5 000 tonnes at Rahad, requiring just over 4 extra ginning days;
- a shortfall of 15 000 tonnes at New Halfa, requiring an extra 27 days ginning. A new factory has not, however, been phased in as projections are based upon increases both in yield and area under cotton, and a fourth factory would have only 50% utilisation of capacity. It is suggested that this should be kept under review;
- a shortfall of 8 400 tonnes at Damazin. However, for the purpose of the analysis, the capacity model has been based on continued restriction to 18 hour operation per day. If improvements are made to the electricity supply to allow 24 hour operation, the shortfall would be almost completely eliminated.

Theoretically it could be possible with existing capacity, provided rehabilitation measures were carried out but if no improvements or additions were implemented, to gin the additional volumes of seed cotton. However, this would require working seven days per week, 24 hours per day, and extending the season well beyond the end of May. Ginning would extend to mid July on White Nile in Case A, to the end of June in Gezira for Case B and to the end of July on White Nile in Case C. The effect would be to neglect routine repair and maintenance, pose problems of retaining contractors' labour and increase the risk of rain damage to the crop. There would also be no reserve capacity to gin an above average crop.

The value benefits of incremental ginnery production have been determined as follows:

- the volumes of seed cotton are as given in Table 3.2, with lint out-turns of 34% for long staple and 37% for medium staple and cotton seed out-turns of 65% and 61% respectively;

- out-turns of lint are sold at international prices (see Section 3.2.2 below) and cottonseed is sold at 1983 domestic prices less CPC commissions and local taxes;
- allowances are made for incremental operating costs covering purchase of seed cotton, ginning, transport and marketing expenses (see Chapter 4);
- only 10% of the net benefit, or margin, after deduction of the above costs from revenues is credited to the ginnery. This is because surplus proceeds are intended to revert to the grower under the new production arrangements. Ideally the amount credited to ginning should be in relation to the respective capital investment, but appropriate data are not available. The figure of 10% is based upon relative international production costs of the growing and ginning of cotton as contained in the latest survey of cotton production costs conducted by the International Cotton Advisory Committee;
- benefits of increased capacity are phased in the year after the relevant expenditure on improvements or additions is made. No capacity is taken out of commission during improvements.

### 3.2.2 Lint Prices

Lint revenues are based upon the World Bank price projections as described in the Inception Report. These have been changed marginally to take account of the most up-to-date expectations. The changes involve a slight improvement in the short term but a reduction in the longer term to take account of probable lower than expected future oil prices and hence more competitive polyester prices. The World Bank data are based upon an equivalent medium staple Acala CIF North European price. The price for Sudanese ELS is expected to average 20% above the Acala price. The Ministry of Finance and Economic Planning use a similar basis for cotton price projections. The price projections used in this study are based upon the same differential and are shown in Table 3.3 below. These are 1983 constant prices on an FOB Port Sudan basis after making a deduction for transport from the equivalent North European price.

TABLE 3.3

**Projected Lint Prices  
(US \$/tonne at constant 1983 prices)**

	ELS	Acala
1983	2 180	1 800
1985	2 444	2 020
1990	2 540	2 100
1995	2 600	2 150

Present prices of Sudanese cotton are significantly below the average level of international prices mainly because of discounting due to problems of honeydew. It will take up to three years before benefits of the proposed investments of this project start to accrue. By that time the medium term effects of measures to combat honeydew should have taken effect. This should enable prices for Sudanese cotton to reflect projected international prices during the second half of the 1980's, providing appropriate marketing measures are taken.

Two further assumptions are made in respect of lint prices.

- all Acala is sold at the same average price with no differentials between schemes. Apparently, the technical properties are similar excluding allowances for honeydew, and lint from all schemes should command the same price for a given grade and staple length;
- all production resulting from the project commands the equivalent FOB price and is sold on the international market. No account has been taken of domestic lint sales to local textile mills as it is assumed that their requirements would remain unchanged even if the investments identified in this study were not implemented.

### 3.2.3 Quality Benefits

Certain of the project investments in ginning will result in an improved quality of lint, which will therefore command a higher price. Mixing and blending facilities and cleaning systems in roller ginneries will produce cleaner cotton and even running bales, while humidification systems will also improve quality. The effects of such improvements in terms of improved prices are estimated in Table 3.4 by scheme, ginnery and variety (in the case of roller ginneries). The highest premium relates to long staple cotton in the roller ginneries. The estimated increases in average lint price are US cents 2.5/lb due to seed cotton cleaning, US cents 1.25/lb due to mixing and blending and US cents 0.5/lb due to humidification. However, it is expected that only 60% of long staple throughput will benefit, mainly the middle and lower grades. For medium staple, and short staple in the Nuba Mountains, the premiums represent an overall improvement in all grades as a high proportion is already Grade 1. For medium staple in roller ginneries there are estimated increases of US cents 0.5/lb each as a result of cleaning and mixing and blending, while humidification is expected to give a further increase of US cents 0.5/lb on 50% of total throughput. In saw ginneries, the addition of humidification systems is expected to give an average increase in lint price of US cents 2.0/lb at New Halfa and the Nuba Mountains ginneries and US cents 1.0/lb at Kassab Factory Nr 2.

The quality benefits in Table 3.4 have been apportioned in terms of relative capacity (after improvements) for each scheme to determine the average benefits per tonne of seed cotton ginned. The latter are shown in Table 3.5, which gives the foreign exchange benefit and the benefit at 1983 constant financial prices and economic prices. No quality benefits are expected in the cases of Tokar, Northern Corporation, Mechanised Farming Corporation and Rahad.

Quality benefits relate to total production after improvements, based upon a six day week. The costs which must be deducted to determine net benefits include variable costs of increased power consumption and marketing expenses (which are based on the value of lint sold, not volume), and repair and maintenance expenditure. It should further be noted that though quality benefits have been separated they are also to an extent dependent upon capacity increases.

TABLE 3.4

**Basis for Valuation of Quality Benefits<sup>(1)</sup>**  
**(Increase in average lint price - US cents/lb)**

	Long staple (60% of throughput)	Medium staple (100% of throughput)
<b>Gezira</b>		
- Factories Nr 1,2,3,7,8,13	4.25	1.25
- Factories Nr 4,5,6,11,12,14	1.25	0.5
- Factory Nr 10	0.5	0.25
<b>Blue Nile/Suki</b>		
- Sennar	3.0	0.75
- Hamadnallah	2.5	0.5
- Kassab Nr 1	4.25	1.25
- Kassab Nr 2	-	1.0
<b>White Nile</b>		
- Rabak	4.25	1.25
- Kosti	3.0	0.75
- Dueim	3.0	0.75
<b>New Halfa</b>	-	2.0
<b>Nuba Mountains</b>	-	2.0 <sup>(2)</sup>

Notes : (1) No quality benefits are assigned for factories not listed.  
 (2) Short staple.

The average wage of contractors' labour is assumed to be LS 2 per day. Savings per ginnery in relation to total capacity have been determined to arrive at the savings per tonne of seed cotton ginned at each scheme, either long staple or medium staple. Financial and economic cost savings in 1983 prices have been determined by variety. The economic savings, however, are possibly understated by use of the standard conversion factor because of the scarcity of labour in Sudan.

Labour savings, like quality benefits, relate to total production after improvements and not incremental production. Benefits associated with labour savings are phased in the same year as the relevant investment which realises the saving.

### 3.2.4 Labour Savings

The savings in labour are achieved through the modernisation of the roller ginneries of Gezira, White Nile, Blue Nile and Suki and relate to contractors' labour. Labour savings by scheme and ginnery are given in Table 3.6.

TABLE 3.5

**Average Quality Benefits by Scheme  
(per tonne of seed cotton)**

	Long staple			Medium staple		
	Foreign exchange (US\$)	Local currency (LS)		Foreign exchange (US\$)	Local currency (LS)	
		Financial	Economic		Financial	Economic
Gezira	12.6	17.9	16.4	5.8	8.3	7.6
Blue Nile/Suki	15.0	21.4	19.6	5.3	7.6	6.9
White Nile	16.5	23.5	21.5	8.3	11.8	10.8
New Halfa	-	-	-	16.3	23.2	21.2
Nuba Mountains	-	-	-	14.5(1)	20.7(1)	18.9(1)

Note: (1) Short staple.

TABLE 3.6

**Labour Savings**

Scheme/ginnery	Labour saving (Nr/day(1))	Cost saving (LS/tonne of seed cotton)			
		Long staple		Medium staple	
		Financial prices	Economic prices	Financial prices	Economic prices
<b>Gezira</b>					
- Factories 1, 2 & 3	552 )				
- Factories 7 & 8	580 )	0.76	0.46	0.93	0.57
- Factory 13	148 )				
<b>Blue Nile/Suki</b>					
- Sennar	44 )				
- Hamadnallah	124 )	1.25	0.75	1.07	0.64
- Kassab 1	260 )				
<b>White Nile</b>					
- Rabak	400 )				
- Kosti	88 )	1.59	0.95	2.39	1.43
- Dueim	88 )				

Note: (1) Two shifts.

### 3.2.5 Other Ginning Benefits

Lesser benefits relate to the following improvements:

- (i) The replacement of scarto gin stands at roller ginneries will improve the rate of scarto recovery. Potential scarto out-turns (as a percentage of total seed cotton) are taken as 0.44% for long staple and 0.63% for medium staple. It is assumed that without replacement of the existing gins, future average efficiency of scarto recovery would be only 50%. Half of the value of the scarto lint is thus assigned as a project benefit. The scarto lint price is taken as US cents 50/lb. The net benefits by scheme per tonne of seed cotton are given in Table 3.7.
- (ii) The installation of new lugatta cleaning plants and the replacement of existing plants will enable the lugatta lint from the ginnery sites concerned to command a higher price, which is estimated to show an improvement of US cents 5/lb. However lugatta forms a very small percentage of output, the lint averaging 0.23% of total seed cotton processed, so benefits are low.
- (iii) Connection of Hamadnallah and Dueim ginneries to an electricity supply will substantially reduce their power costs, currently supplied by private generation using diesel fuel.

TABLE 3.7

**Net Scarto Benefits  
(per tonnes of seed cotton - 1983 prices)**

	Long Staple			Medium Staple		
	Foreign exchange (US \$)	Local currency (LS) Financial - Economic		Foreign exchange (US \$)	Local currency (LS) Financial - Economic	
Gezira	2.38	2.78	2.89	2.80	3.26	3.39
Blue Nile/Suki	2.38	2.77	2.88	1.90	2.20	2.29
White Nile	2.38	2.76	2.88	3.41	3.95	4.12
Northern	-	-	-	3.41	3.98	4.14
Tokar	2.38	2.82	2.91	-	-	-

### 3.3 Storage Benefits

Storage benefits are those associated with the erection of new warehouses for export bales in Port Sudan. The potential savings relate to the alternative of renting additional storage facilities. The rent of an equivalent warehouse is LS 72 000 per year, though it is unlikely, and at best uncertain, that the necessary storage space can be found elsewhere in Port Sudan. Annual savings are assumed to be LS 720 000 per year at 1983 financial prices, LS 432 000 at economic prices, on the basis of a requirement for 10 new stores.

### 3.4 The CPC

### CHAPTER 4

Quantifiable benefits relating to the CPC are given in Annex 7 and are summarised as follows:

- savings in head office salaries of LS 25 000;
- savings on existing office rents in Khartoum with the provision of a single headquarters building, equivalent to LS 44 000 per year;
- savings of LS 10 000 per year equal to the rents of three branch offices of the Export Companies.

The above savings total LS 79 000 at constant 1983 prices to offset the expenditure of a new headquarters building, housing for CPC staff at the producing corporations and new equipment for CPC.

Provisional estimates of costs and returns to the grower were obtained from Gezira and Rahad for 1982/83 as shown in Table 4.1 below. These are based on the average yield for each scheme and the average price received by the grower for seed cotton, LS 92/kantar for long staple and LS 71/kantar for medium staple. The margin represents the average return to the grower per feddan; total returns will depend on the size of holding.

TABLE 4.1  
Provisional Seed Cotton Production Costs in  
Gezira and Rahad in 1982/83

Variety	Gezira		Rahad
	Long staple	Medium staple	Medium staple
Average yield (kantara/feddan)	4.3	3.9	7.2
Variable cost (LS/kantar)	11	11	11.5
Variable cost (LS/feddan)	47	63	83
Fixed cost (LS/feddan)	250	250	278
Total cost (LS/feddan)	297	315	361
Revenue (LS/feddan)	396	419	511
Margin (LS/feddan)	99	104	150

## CHAPTER 4

### INCREMENTAL OPERATING COSTS

#### 4.1 Introduction

The various assumptions involved in determining the incremental annual operating costs associated with the project are discussed in the following sections. The major share of annual operating costs again relates to ginning, especially in connection with increases in capacity.

#### 4.2 Costs of Seed Cotton

In the case of benefits of increased capacity the analysis starts from the purchase of seed cotton at the ginnery gate. Insufficient up-to-date information was available on production costs of seed cotton within each of the producing corporations. Seed cotton prices in 1982/83 are, however, supposed to be sufficient for the producing corporations to recover from the grower the costs involved in providing the necessary agricultural inputs and services, and at the same time provide the latter with a sufficiently attractive return to maintain interest and effort in seed cotton production.

Provisional estimates of costs and returns to the grower were obtained from Gezira and Rahad for 1982/83 as shown in Table 4.1 below. These are based on the average yield for each scheme and the average price received by the grower for seed cotton, LS 92/kantar for long staple and LS 71/kantar for medium staple. The margin represents the average return to the grower per feddan; total returns will depend on the size of holding.

**TABLE 4.1**

**Provisional Seed Cotton Production Costs in  
Gezira and Rahad in 1982/83**

Variety	Gezira		Rahad
	Long staple	Medium staple	Medium staple
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Variable cost (LS/feddan)	47	65	83
Fixed cost (LS/feddan)	250	250	278
Total cost (LS/feddan)	297	315	361
Revenue (LS/feddan)	396	419	511
Margin (LS/feddan)	99	104	150

Analysis of ginning capacity benefits assumes the same average prices for long staple and medium staple seed cotton as used above, equivalent to LS 644/tonne and LS 497/tonne respectively.

### 4.3 Ginning Costs

Variable ginning costs relating to incremental production in existing plants, in excess of without project capacity, and to a new saw ginnery are given in Table 4.2. These have been determined for both long staple and medium staple varieties and the costs are shown in foreign exchange and in local currency at financial and economic prices.

**TABLE 4.2**  
**Variable Ginning Costs**  
**(per tonne of seed cotton - 1983 prices)**

	Long staple			Medium staple		
	Foreign exchange (US\$)	Local currency (LS)		Foreign exchange (US\$)	Local currency (LS)	
		Financial	Economic		Financial	Economic
<b>Gezira</b>						
- imported	11.32	20.18	15.23	14.29	25.55	19.25
- local	-	19.07	11.42	-	24.29	14.57
<b>Total</b>	<b>11.32</b>	<b>39.25</b>	<b>26.65</b>	<b>14.29</b>	<b>49.84</b>	<b>33.82</b>
<b>Blue Nile/ Suki</b>						
- imported	11.32	20.18	15.23	13.85	24.50	18.54
- local	-	17.12	10.26	-	20.30	12.17
<b>Total</b>	<b>11.32</b>	<b>37.30</b>	<b>25.49</b>	<b>13.85</b>	<b>44.80</b>	<b>30.71</b>
<b>White Nile</b>						
- imported	11.32	20.18	15.23	14.29	25.55	19.25
- local	-	16.91	10.12	-	22.06	13.23
<b>Total</b>	<b>11.32</b>	<b>37.09</b>	<b>25.35</b>	<b>14.29</b>	<b>47.61</b>	<b>32.48</b>
<b>New Halfa</b>						
- imported	-	-	-	13.33	23.28	17.70
- local	-	-	-	-	17.09	10.28
<b>Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>13.33</b>	<b>40.37</b>	<b>27.98</b>
<b>New saw ginnery</b>						
- imported	-	-	-	13.33	23.28	17.70
- local	-	-	-	-	20.10	12.05
<b>Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>13.33</b>	<b>43.38</b>	<b>29.75</b>

Imported items principally consist of baling materials. These include hessian cloth, bale ties, twine and cottonseed sacks. Variable costs for such items are higher for medium staple because of the higher lint out-turn and the lower density of white cottonseed compared to the black seed of long staple. Other costs for imported items relate to consumables and spares: gin leather and glue for roller ginneries and gin saws, ribs and brush sticks for saw ginneries.

Local costs comprise mainly contractors' labour and are based upon rates of LS 1.75/kantar for long staple and LS 2.0/kantar for medium staple in roller ginneries and LS 1.5/kantar in saw ginneries. Other local costs include the costs of power, oils and greases. Though the above costs relate to the incremental ginning costs for increased capacity, improvements will also effect the variable costs of utilising existing capacity in respect of power consumption. In most instances average unit power consumption will increase as a result of improvements so that power consumption within the limits of existing capacity will also be higher. In White Nile (Rabak) and New Halfa, however, the increase in capacity is proportionally greater than the increase in power consumption, so reducing the average consumption and hence cost per tonne of seedcotton. The effect of improvements to ginning equipment on the power consumption relating to existing capacity is shown separately in the cash flows of the project analysis.

Variable costs of a new saw ginnery, whether in Rahad, Gezira or the White Nile pump schemes, are marginally higher than for an existing ginnery, such as New Halfa (see Table 4.2). This is because there are higher additional costs for seasonal staff and other miscellaneous expenditure in a new plant compared with the costs of incremental production at an existing plant.

Incremental fixed cost expenditure relating to capacity increases in existing ginneries is based on annual repair and maintenance allowances equal to 5% of capital cost on mechanical and electrical equipment and 1% on civil works, applied only to improvement items and not to rehabilitation items. (The same basis of repair and maintenance expenditure is also applied to all other improvements/additions apart from office buildings where an allowance of 1.5% on capital cost is used.) Fixed costs of a new saw gin plant comprise a repair and maintenance allowance calculated as above and a further sum estimated at LS 132 000 to cover salaries and bonuses of permanent staff, standing charges for electricity, and overhead and miscellaneous expenditure.

Incremental ginnery costs associated with quality benefits comprise mainly additional power consumption and repair and maintenance expenditure. No specific ginning costs are attributable to the benefits of lugatta cleaning equipment as they are expected to reduce rather than increase.

#### 4.4 Marketing and Other Costs

There are various marketing expenses, relating to CPC, and taxes to be taken into account in determining quality and capacity benefits for lint. These are assessed mainly on a value rather than volume basis and comprise the following:

- Development tax: 5% of FOB Port Sudan price;
- Quay dues: 0.5% of FOB Port Sudan price;
- Export commission: 1% of FOB Port Sudan price;  
(FOB price less above charges equals ex-store price)

- CPC commission: 2% of ex-store price;
- CPC storage and publicity charge: 2% of ex-store price;
- Stabilisation fund: 0.5% of ex-store price;
- Insurance: 0.5% of ex-store price;
- Equalisation fund: 2% of ex-store price.

The above charges are equivalent to a total of 13% of the FOB price at financial prices and 3.3% at economic prices. Deductions have been made accordingly in determining the net quality benefits for lint and lugatta. The charge for insurance is included as under the new production arrangements this is to be paid by CPC.

For the marketing expenses related to capacity benefits, which are based upon volume, it is necessary to include a shipping agency charge of LS 1.5/kantar of lint plus the ex-store deduction of 7%. The additional cost per tonne of seedcotton is therefore LS 12/kantar for long staple and LS 13/kantar for medium staple.

Capacity benefits also incur other costs not referred to previously. These include the following:

- costs of transport of lint from ginneries to Port Sudan;
- a grading charge of LS 0.25 per bale;
- bank interest (at 9% for six months) on the loan to CPC to finance the purchase of seedcotton and the costs of ginning and transport, based upon the 1983 budget estimates.

These costs are expressed per tonne of seedcotton in the cash flows and are aggregated with the costs of seedcotton purchase.

Marketing and Other Costs

Development tax: 2% of FOB Port Sudan price	17.71
Grading charge: 0.25% of FOB Port Sudan price	13.05
Export commission: 1% of FOB Port Sudan price	29.75
(FOB price less above charges equals ex-store price)	

## CHAPTER 5

### FINANCIAL ANALYSIS

#### 5.1 Summary of Results

Detailed cash flows of the project for each producing corporation and for the other components are contained in Appendix III. These show the benefits, associated incremental operating costs and capital costs. Summary net cash flows for the project for each case of projected seed cotton production are given in Appendix IV.

The major contribution to net benefits tends to be that resulting from quality improvements as these are wholly attributable to ginning and relate to total production in existing ginneries. Capacity benefits relate only to incremental production and then only 10% of the margin is credited to ginnery investment as its utilisation is dependent upon the increased production of seed cotton by the growers. However, capacity benefits under Case B for Gezira exceed the quality benefits because of the large volumes of medium staple involved, the latter having a lower quality benefit in roller ginneries.

The internal rates of return are summarised by main components and for each case in Table 5.1. The only positive rates of return relate to ginning, and these concern seven schemes. Case B shows the highest internal rate of return at 13.0%. The higher rates of return for Case B reflect:

- a larger volume of medium staple cotton available for ginning;
- a higher level of capacity utilisation.

**TABLE 5.1**

**Summary of Internal Rates of Return  
at Constant Financial Prices**

	Case A	Case B
A. Ginning (all ginneries)	18.7	20.0
- Gezira	14.2	15.3
- Blue Nile/Suki	23.6	26.7
- White Nile	18.0	25.3
- Rahad	21.8	21.8
- New Halfa	66.6	66.6
- Nuba Mountains	19.6	19.6
- MFC	6.4	6.4
B. Storage	Negative	Negative
C. Testing and grading	-	-
D. CPC	Negative	Negative
E. Implementation	-	-
<b>TOTAL PROJECT</b>	<b>11.6</b>	<b>13.0</b>

## CHAPTER 6

### ECONOMIC ANALYSIS

#### 6.1 Capital Costs

The capital costs of the project at economic prices are reduced by 35% compared with those at financial prices. This is due to the elimination of duties and taxes and the revaluation of other local costs. Capital costs at economic prices become LS 95 360, the proportions of foreign and local costs being 80% and 20% respectively.

A summary of capital costs for Case A at 1983 economic prices is given in Table 6.1. The costs for Case B are the same except that a new saw ginnery is provided in Year 3 on Gezira instead of in Year 6 on White Nile.

#### 6.2 Economic Rates of Return

Cash flows of the ginning component by producing scheme for each case and for the other components of the project are contained in Appendix V. Summary net cash flows for each case are included as Appendix VI.

The economic rates of return for each case are summarised in Table 6.2. At economic prices the rates of return improve in all cases compared with those at financial prices. This is due to the following factors :

- the capital costs are lower as noted above;
- operating expenses fall to a greater extent than revenues.

Export revenues are reduced by 9%, the effect of removing the export subsidy whereby export revenues are converted at LS 1.425 to US\$ 1 instead of the fixed exchange rate of LS 1.3 to US\$ 1. The reduction in operating expenses is because of the large local element within the total and the removal of taxes and duties. The main operating expenses comprising marketing costs (and the associated taxes), ginning and seed cotton purchase reduce at economic prices by 75%, 30% and 40% respectively.

As in the financial evaluation, Case B shows the highest rate of return, 27.5%, at economic prices.

#### 6.3 Economic Effects

Foreign exchange earnings are of prime importance to the Sudanese economy. The seed cotton projections relating to Case B have the most favourable effect when compared with those of Cases A and C. Table 6.3 compares the gross foreign exchange earnings of the three cases, showing seed cotton production projections, lint out-turn, availability of lint for export and gross export earnings.

TABLE 6.1

## Capital Costs at Economic Prices (LS '000)

Description	Phased Expenditure							Total
	Yr.0	Yr.1	Yr.2	Yr.3	Yr.4	Yr.5	Yr.6	
<b>GINNING</b>								
Gezira Board								
Marangan Ginnery	0	3,152	1,308	3,425	3,425	3,511	0	14,821
Hasa Heisa Ginnery	0	1,037	2,023	3,473	5,647	5,134	0	17,314
Bageir Ginnery	0	104	803	129	0	0	0	1,036
All Ginneries	0	5,508	0	0	0	0	0	5,508
Blue Nile & Suki								
Senner Ginnery	0	276	0	948	0	0	0	1,224
Hamadnallah Ginnery	0	473	0	0	502	0	0	975
Kassab	0	552	1,213	0	3,224	0	0	4,989
White Nile								
Dueim Ginnery	0	512	0	820	0	109	0	1,441
Kosti Ginnery	0	370	0	962	0	0	0	1,332
Rabak Ginnery	0	0	0	0	6,346	0	0	6,346
New Saw Ginnery	0	0	0	0	0	0	4,592	4,592
Rahad								
Fau Ginnery	0	2,440	401	0	0	0	0	2,841
New Fau Ginnery	0	3,360	602	0	0	0	0	3,962
New Halfa Ginnery	0	1,652	169	0	0	0	0	1,821
Northern								
Zeidab Ginnery	0	125	27	11	0	0	0	163
Tokar								
Port Sudan Ginnery	0	403	0	0	0	0	0	403
Nuba Mountains								
All Ginneries	0	309	472	392	1,268	559	0	3,000
Mechanised Farming Corporation								
Damazin Ginnery	0	291	93	0	0	0	0	384
<b>Total - Ginning</b>	<b>0</b>	<b>20,564</b>	<b>7111</b>	<b>10160</b>	<b>20,412</b>	<b>9,313</b>	<b>4,592</b>	<b>72,152</b>
<b>STORAGE</b>								
Port Sudan Stores	0	346	1,872	4,355	4,355	0	0	10,928
<b>GRADING &amp; TESTING</b>								
Grading & Testing Centre	0	341	566	0	116	0	0	1,023
Training & Technical Assistance	18	43	184	201	73	95	56	670
ARC Cotton Research Laboratory	0	440	0	0	0	0	0	440
<b>Total - Grading &amp; Testing</b>	<b>18</b>	<b>824</b>	<b>750</b>	<b>201</b>	<b>189</b>	<b>95</b>	<b>56</b>	<b>2,133</b>
<b>C.P.C.</b>								
Buildings	0	998	1,041	0	0	0	0	2,039
Telecommunications	0	530	590	0	0	0	0	1,120
Headquarters Equipment	0	27	33	0	0	0	0	60
Training & Technical Assistance	238	302	0	0	0	0	0	540
<b>Total - C.P.C.</b>	<b>238</b>	<b>859</b>	<b>623</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,720</b>
<b>IMPLEMENTATION</b>								
Consultancies	792	619	642	203	191	160	0	2,607
Project Management Unit	674	1,162	1,066	680	280	204	0	4,066
Training	253	522	362	271	173	173	0	1,754
<b>Total - Implementation</b>	<b>1,719</b>	<b>2,303</b>	<b>2,070</b>	<b>1,154</b>	<b>644</b>	<b>537</b>	<b>0</b>	<b>8,427</b>
<b>GRAND TOTAL</b>	<b>1,975</b>	<b>24,896</b>	<b>12,426</b>	<b>15,870</b>	<b>25,600</b>	<b>9,945</b>	<b>4,648</b>	<b>95,360</b>

TABLE 6.2

## Summary of Economic Rates of Return (%)

	Case A	Case B
A. Ginning (all ginneries)	35.8	37.8
- Gezira	27.0	29.8
- Blue Nile/Suki	41.0	40.2
- White Nile	34.9	44.7
- Rahad	46.0	46.0
- New Halfa	116.2	116.2
- Nuba Mountains	27.2	27.2
- MFC	12.0	12.0
B. Storage	Negative	Negative
C. Grading and testing	-	-
D. CPC	Negative	Negative
E. Implementation	-	-
TOTAL PROJECT	25.5	27.5

TABLE 6.3

Estimated Gross Foreign Exchange Earnings in 1990/91  
(constant 1983 prices)

	Long staple	Medium staple	Short staple	Total
FOB price (US\$/tonne) <sup>(2)</sup>	2 540	2 100	1 995	
<b>Case A</b>				
Seed cotton production	281	542	71	
Lint production	95.5	200.5	23.4	
Domestic lint sales	14.3	33.4	-	
Export lint sales	81.2	167.1	23.4	
Export lint revenue (US\$ million)	206.2	350.9	46.7	603.8
<b>Case B</b>				
Seed cotton production	281	562	71	
Lint production	95.5	207.9	23.4	
Domestic lint sales	14.3	33.4	-	
Export lint sales	81.2	174.5	23.4	
Export lint revenue (US\$ million)	206.2	366.4	46.7	619.3
<b>Case C</b>				
Seed cotton production	350	447	71	
Lint production	119.0	165.4	23.4	
Domestic lint sales	14.3	33.4	-	
Export lint sales	104.7	132.0	23.4	
Export lint revenue (US\$ million)	265.9	277.2	46.7	589.8

Note: (1) Production and sales expressed as thousands of tonnes.  
(2) Related to 1990 price



## Key to capital cost schedules

### (i) Disbursement categories:

- 1 - ICA/LIT goods and works
- 2 - LCB works
- 3 - Training, technical assistance and consultancies
- 5 - Administration

### (ii) Classes of investments:

- R - Rehabilitation
- I - Improvements
- A - Additions

### (iii) Types of investment:

- M - Mechanical
- E - Electrical installations
- C - Civil and building works
- V - Vehicle equipment
- S - Spare parts

## APPENDIX I

## CAPITAL COST SCHEDULES

Notes: All costs are expressed in thousands of Sudanese pounds (LS) or thousands of US dollars (US\$) where indicated.

**Key to capital cost schedules**

No. Description	Class	Type	Port Taxes/ Other		Total	Total	Expenditure by year								
			Cost	Local			Cost	0	1	2	3	4	5	Cont	
			(US\$)	Costs	Costs	Cost									
<b>GENERAL</b>															
<b>(i) Disbursement categories:</b>															
1. Hardstandings				172	245	347	411		501	501					1001
2. Neighbouridge (50% civil)						25	71			1001					1001
3. Neighbouridge civils/office						15	35			1001					1001
Total															
<b>ACWA SEED TREATMENT PLANT</b>															
<b>(ii) Classes of investment:</b>															
4. Building				145	48	153	314		1001						1001
5. Machinery & equipment				406	37	493	1,367		1001						1001
6. Seed store				315	144	459	944		1001						1001
Total				826	279	1,105	2,623								
<b>FACTORIES</b>															
<b>(iii) Types of investment:</b>															
7-17. Various															
7. Civil works				54	120	190	301				331	331	341		1001
8. Electrical installations						94	225				331	331	341		1001
9. Seed cotton conveyors						70	993	2,487			331	331	341		1001
10. Separators & piping							519	900			331	331	341		1001
11. Inclined cleaners								188			331	331	341		1001
12. Feed control units								122			331	331	341		1001
13. Overflow systems				259	156	46	224	581			331	331	341		1001
14. Lint conveyors, condensers				773	467	202	665	1,674			331	331	341		1001
15. Humidification systems				336	203	44	247	694			331	331	341		1001
16. Press pits				37	24	40	72	170			331	331	341		1001
17. Bale presses 25x19x5 1/2 density 12 per factory				1,915	1,158	249	1,407	3,897			331	331	341		1001
18. Various								1,397			201	201	201	201	201
19. Conveying equip.				1,360	130	100	1,110	2,904			201	201	201	201	201
20-22. Logistics cleaning plant															
20. Building steelwork				5	8	8	8	28			1001				1001
21. Erection, civil work				5	3	7	10	37			1001				1001
22. Cleaning machinery				77	47	18	57	157			1001				1001
23. Replace scarto gin stands				179	108	24	152	345			1001				1001
Total				7,392	4,742	1,465	6,407	16,277							
<b>YARD EQUIPMENT</b>															
24. Tractors s/c transport 15 hr				249	250	4	209	609			1001				1001
Total				249	250	4	209	609							
Sub Component Total				9,226	5,766	2,212	9,175	29,216							

**Note:** All costs are expressed in thousands of Sudanese pounds (LS) or thousands of US dollars (US\$) where indicated.









Project: SUDAN COTTON  
 Document: Capital Cost Schedule A/5  
 Project Component: A. GINNING  
 Project Sub Component: Sudan Blue Nile - Senner Ginnery  
 Exchange Rate 1.30

File Name: CCSA5

No. Description	Disb.	Class	Type	Forex	Taxes/	Other	Total	Total	% Expenditure by year						
				Cost	Duties	Local	Local		Cost	0	1	2	3	4	5
				(\$US)		Costs	Costs								
<b>GENERAL</b>															
1. Replace fence	2	R	C	7	5	9	14	23					100%		15%
2. Overhead tank-potable water	1	R	C	18	14	2	16	39					100%		15%
3. Roads	2	I	C	5	4	7	11	18					100%		15%
4-5 Fire fighting system															
4. Tank & pump	1	R	C	33	27	4	31	74					100%		15%
5. Hydrant system	1	R	C	90	56	36	92	209					100%		15%
<b>Total</b>				<b>153</b>	<b>106</b>	<b>58</b>	<b>164</b>	<b>363</b>							
<b>POWER SUPPLY</b>															
6. Increase NEC power supply	1	I	E	36	29	22	51	98					100%		15%
7. Add alternator to engine	1	I	E	22	18	3	21	50					100%		15%
<b>Total</b>				<b>58</b>	<b>47</b>	<b>25</b>	<b>72</b>	<b>147</b>							
<b>FACTORIES</b>															
8-9 Add Cleaning Equipment															
8. Inclined cleaners	1	I	M	76	46	10	56	155					100%		10%
9. Civil works	2	I	C	13	8	16	24	41					100%		15%
10. Raised platform s/c feeding	1	I	C	24	19	9	28	59					100%		15%
11. Conveyor distributors	1	I	M	101	61	13	74	205					100%		10%
12. Humidification system	1	I	M	112	68	14	82	228					100%		10%
13. Add electric drives	1	I	E	8	6	1	7	17					100%		10%
14-15 Lugatta cleaning plant															
14. Building	1	I	C	14	11	7	18	36					100%		15%
15. Cleaning machinery	1	I	M	77	47	10	57	157					100%		10%
16. Replace scarto gin stands	1	R	M	18	11	5	16	39					100%		10%
<b>Total</b>				<b>443</b>	<b>277</b>	<b>85</b>	<b>362</b>	<b>938</b>							
<b>SPARES</b>															
17. Ruston main engine	1	R	S	66	40	2	42	128	100%						10%
18. Bale presses	1	R	S	31	19	1	20	60	100%						10%
19. Gin stands	1	R	S	22	13	1	14	43	100%						10%
20. Workshop tools & eqpt	1	R	V	11	7	0	7	21	100%						10%
21. Electrical Spares	1	R	S	57	45	2	47	121	100%						10%
22. Electrical Maintenance Tools	1	R	V	3	2	0	2	6	100%						10%
<b>Total</b>				<b>190</b>	<b>126</b>	<b>6</b>	<b>132</b>	<b>379</b>							
<b>Sub Component Total</b>				<b>844</b>	<b>556</b>	<b>174</b>	<b>730</b>	<b>1,827</b>							



Project: SUDAN COTTON  
 Document: Capital Cost Schedule A/7  
 Project Component: A. GINNING  
 Project Sub Component: Blue Nile/Suki - Kassab Ginnery  
 Exchange Rate 1.30

File Name: CCSA7

No. Description	Disb. Class Type	Forex Taxes/ Other Total		Total Cost	% Expenditure by year										
		Cost (\$US)	Duties Local Costs		Local	Local	Cost	0	1	2	3	4	5	6 Cont	
<b>GENERAL</b>															
1. Roads	2	I	C	15	10	20	30	50		100%					15%
2. Hardstanding	2	I	C	124	80	159	239	400		100%					15%
3. Weighbridge: 50T x 3m x 1.8m	1	I	M	35	21	4	25	71		100%					10%
4. Weighbridge civils/office	2	I	C	8	5	10	15	25		100%					15%
5. Fire hydrant system	1	R	C	102	69	32	101	234		100%					15%
6. Packaged water treatment sys	1	R	M	92	55	34	89	209		100%					10%
7. Seed hopper building	1	R	C	9	8	12	20	32		100%					15%
8. Standby Generators-lighting	1	I	E	18	14	1	15	38	100%						10%
<b>Total</b>				<b>403</b>	<b>262</b>	<b>272</b>	<b>534</b>	<b>1,058</b>							
<b>FACTORIES</b>															
9-25 Factory No.1 Modernisation															
9. Civil works	2	I	C	31	20	40	60	100				100%			15%
10. Re-lay floor	2	I	C	24	16	31	47	78				100%			15%
11. Replace gin stands & feeders	1	I	M	800	476	204	680	1,720				100%			10%
12. Replace seed handling system	1	I	M	90	53	22	75	192				100%			10%
13. Add new seed gribble	1	I	M	56	33	14	47	120				100%			10%
14. Modify s/c elevators/pipes	1	I	M	22	13	6	19	48				100%			10%
15. Separators/vacuum wheel	1	I	M	56	33	14	47	120				100%			10%
16. Inclined cleaners	1	I	M	76	45	20	65	164				100%			10%
17-18 Mixing & Blending Facilities															
17. Buildings & apron	1	I	C	53	45	21	66	135				100%			15%
18. Conveying equipment	1	I	M	138	83	18	101	280				100%			10%
19. Humidification system	1	I	M	112	67	28	95	241				100%			10%
20. Replace scarto gin stands	1	I	M	18	11	5	16	39				100%			10%
21. Lint conveyors, condenser	1	I	M	129	77	32	109	277				100%			10%
22. Replace bale press	1	I	M	318	189	41	230	643				100%			10%
23. Press pit civil works	2	I	C	13	8	16	24	41				100%			15%
24. New LV switchboard	1	I	E	30	24	4	28	67				100%			10%
25. Electrical distribution sys.	1	I	E	40	32	5	37	89				100%			10%
26-30 Factory No.2															
26. Replace part cladding	2	R	M	1	0	1	1	2				100%			15%
27. Add humidification system	1	I	M	55	33	7	40	112				100%			10%
28. Modify tramper drive	1	R	M	7	4	1	5	14				100%			10%
29. Replace cotton seed blower	1	R	M	6	3	1	4	12				100%			10%
30. Replace piping	1	R	M	6	3	1	4	12				100%			10%
31-32 Factory No.3															
31. Replace pipework/trunking	1	R	M	56	33	7	40	113				100%			10%
32. Renovate trash cyclones	1	R	M	56	33	7	40	113				100%			10%
33-34 Lugatta cleaning plant															
33. Building	1	I	C	14	11	7	18	36				100%			15%
34. Cleaning machinery	1	I	M	77	46	10	56	156				100%			10%
<b>Total</b>				<b>2,284</b>	<b>1,391</b>	<b>563</b>	<b>1,954</b>	<b>4,923</b>							
<b>SPARES</b>															
35. Short term spares- Factory 1	1	R	S	50	30	2	32	97	100%						10%
36. Gin & Press spares-Factory 2	1	R	S	84	50	3	53	162	100%						10%
37. Gin & Press spares-Factory 3	1	R	S	84	50	3	53	162	100%						10%
38. Workshop tools/equipment	1	R	V	56	33	2	35	108	100%						10%
39. Electrical spares	1	R	S	85	53	2	55	166	100%						10%
40. Electrical maintenance tools	1	R	V	3	2	0	2	6	100%						10%
<b>Total</b>				<b>362</b>	<b>218</b>	<b>12</b>	<b>230</b>	<b>701</b>							
<b>YARD EQUIPMENT</b>															
41. Conveyors bagged s/c (2 Hr)	1	I	V	22	13	3	16	45	100%						10%
<b>Total</b>				<b>22</b>	<b>13</b>	<b>3</b>	<b>16</b>	<b>45</b>							
<b>Sub-Component Total</b>				<b>3,071</b>	<b>1,884</b>	<b>850</b>	<b>2,734</b>	<b>6,726</b>							









Project: SUDAN COTTON  
 Document: Capital Cost Schedule A/12  
 Project Component: A. GINNING  
 Project Sub Component: Rahad - New Fau Ginnery  
 Exchange Rate 1.30

File Name: CCSA12

No. Description	Disb.	Class	Type	Forex Taxes/ Other Total		Total Cost	% Expenditure by year								
				Cost (\$US)	Duties		Local Costs	Local Costs	0	1	2	3	4	5	6 Cont
<b>GENERAL</b>															
1. Hardstanding	2	A	C	19	12	24	36	61	50%	50%					15%
2. Roads	2	A	C	35	23	45	68	114	50%	50%					15%
3. Houses (31 Nr)	2	A	C	257	167	334	501	835	50%	50%					15%
4-5 Fire-fighting system															
4. Tank	1	A	C	18	14	2	16	39		100%					15%
5. Hydrants	1	A	C	94	58	36	94	216		100%					15%
6. Stillage	1	A	C	0	0	54	54	54		100%					15%
<b>Total</b>				<b>423</b>	<b>274</b>	<b>495</b>	<b>769</b>	<b>1,319</b>							
<b>POWER SUPPLY</b>															
7. NEC capital contribution	1	A	E	0	0	10	10	10	100%						10%
<b>Total</b>				<b>0</b>	<b>0</b>	<b>10</b>	<b>10</b>	<b>10</b>							
<b>FACTORY</b>															
8. Ginnery building	1	A	C	102	87	40	127	260	100%						15%
9. Power roas	1	A	C	16	13	6	19	40	100%						15%
10. Mixing room	1	A	C	45	38	17	55	114	100%						15%
11. Seed room	1	A	C	22	19	9	28	57	100%						15%
12. Seed cotton unloading system	1	A	M	110	66	14	80	223	100%						10%
13. Double suction fans	1	A	M	15	9	2	11	31	100%						10%
14. Inclined cleaner system	1	A	M	112	68	14	82	228	100%						10%
15. Conveyor/distributor system	1	A	M	67	41	9	50	137	100%						10%
16. Gin stands (3 Nr)	1	A	M	176	107	23	130	359	100%						10%
17. Feeders extractors	1	A	M	119	72	15	87	242	100%						10%
18. Lint flue system	1	A	M	21	13	3	16	43	100%						10%
19. Battery condenser	1	A	M	48	29	6	35	97	100%						10%
20. Battery lint cleaner	1	A	M	115	70	15	85	85	100%						10%
21. Bale press	1	A	M	392	237	51	288	798	100%						10%
22. Lint moisture unit	1	A	M	6	3	1	4	12	100%						10%
23. Trash handling system	1	A	M	15	9	2	11	31	100%						10%
24. Seed handling system	1	A	M	35	21	4	25	71	100%						10%
25. Humidification system	1	A	M	55	34	7	41	113	100%						10%
26. Trash cyclone	1	A	M	40	24	5	29	81	100%						10%
27. Seed bagging equipment	1	A	M	103	62	13	75	209	100%						10%
28. Miscellaneous	1	A	M	10	6	1	7	20	100%						10%
29. Motors, console, starters, etc	1	A	E	314	190	41	231	639	100%						10%
<b>Total</b>				<b>1,938</b>	<b>1,218</b>	<b>298</b>	<b>1,516</b>	<b>3,886</b>							
<b>Sub Component Total</b>				<b>2,361</b>	<b>1,492</b>	<b>903</b>	<b>2,295</b>	<b>5,215</b>							

Project: SUDAN COTTON  
 Document: Capital Cost Schedule A/13  
 Project Component: A. GINNING  
 Project Sub Component: New Halfa Ginnery

File Name: CCSA13

Exchange Rate 1.30

No.	Description	Disb.	Class	Type	Forex Taxes/ Other Total			Total Cost	% Expenditure by year							
					Cost (\$US)	Duties	Local Costs		Local	Local	0	1	2	3	4	5
<b>GENERAL</b>																
1.	Hardstanding	2	I	C	113	73	147	220	367	50%	50%					15%
2.	Roads and Culverts	2	I	C	28	18	36	54	90	50%	50%					15%
	<b>Total</b>				<b>141</b>	<b>91</b>	<b>183</b>	<b>274</b>	<b>457</b>							
<b>POWER SUPPLY</b>																
3.	Provide 1 Nr generator & ancillary equipment	1	I	E	190	152	49	201	448	100%						10%
4.	Building for 3 Nr Generators	1	I	C	43	39	40	79	135	100%						10%
	<b>Total</b>				<b>233</b>	<b>191</b>	<b>89</b>	<b>280</b>	<b>583</b>							
<b>FACTORIES</b>																
5.	Widen factories	1	I	C	19	16	7	23	48	100%						15%
6.	Extend mixing rooms	1	I	C	28	24	11	35	71	100%						15%
7.	S/c suction piping, Fac.1,2,3	1	I	M	24	14	3	17	48	100%						10%
8.	Humidification sys. Fac.1,2,3	1	I	M	165	100	21	121	336	100%						10%
9.	Replace press pumps	1	R	M	168	102	22	124	342	100%						10%
10.	Building for lugatta plant	1	R	C	14	11	7	19	36	100%						10%
11.	Extra lugatta equipment	1	R	M	40	24	5	29	81	100%						10%
	<b>Total</b>				<b>458</b>	<b>291</b>	<b>76</b>	<b>367</b>	<b>952</b>							
<b>SPARES</b>																
12.	Bin & press spares, Fac.1,2,3	1	R	S	101	61	13	74	205	100%						10%
13.	Workshop tools & equipment	1	R	V	56	34	7	41	114	100%						10%
14.	Electrical spares	1	R	S	97	77	3	80	206	100%						10%
15.	Electrical maintenance tools	1	R	V	3	2	0	2	6	100%						10%
	<b>Total</b>				<b>257</b>	<b>174</b>	<b>23</b>	<b>197</b>	<b>531</b>							
	<b>Sub Component Total</b>				<b>1,089</b>	<b>747</b>	<b>371</b>	<b>1,118</b>	<b>2,534</b>							











Project: SUDAN COTTON

File Name: CCSA18B

Document: Capital Cost Schedule A/18B

Project Component: A. GINNING

Project Sub Component: Sudan Gezira Board - New Saw Ginnery - Case B

Exchange Rate 1.30

No.	Description	Disb.	Class	Type	Forex Taxes/ Other Total			Total year							
					Cost (\$US)	Duties	Local Costs	Local	Cost	0	1	2	3	4	5
<b>GENERAL</b>															
1.	Hardstanding	2	A	C	19	12	24	36	61				100%		15%
2.	Roads	2	A	C	46	30	60	90	150				100%		15%
3.	Office	2	A	C	27	18	35	53	88				100%		15%
4.	Small stores (2 Nr)	1	A	C	54	45	21	66	136				100%		15%
5.	Workshop	1	A	C	6	5	8	13	21				100%		15%
6.	Fence	2	A	C	10	6	12	18	31				100%		15%
7.	Houses (31 Nr)	2	A	C	257	167	334	501	835				100%		15%
	8-9 Fire-fighting system														
8.	Tank	1	A	C	18	14	2	16	39				100%		15%
9.	Hydrants	1	A	C	125	77	49	126	289				100%		15%
	<b>Total</b>				<b>562</b>	<b>374</b>	<b>545</b>	<b>919</b>	<b>1,650</b>						
<b>FACTORY</b>															
10.	Ginnery building	1	A	C	102	87	40	127	260				100%		15%
11.	Seed room	1	A	C	22	19	9	28	57				100%		15%
12.	Mixing room	1	A	C	45	38	17	55	114				100%		15%
13.	Power room	1	A	C	16	13	6	19	40				100%		15%
14.	S/c unloading/feeding system	1	A	M	109	66	14	80	222				100%		10%
15.	Seed cotton cleaning group	1	A	M	196	119	25	144	399				100%		10%
16.	Conveyor/distributor	1	A	M	26	16	3	19	53				100%		10%
17.	Ginning system	1	A	M	269	163	35	198	548				100%		10%
18.	Submerged lint flue	1	A	M	21	12	3	15	42				100%		10%
19.	Riser sect./batt'y condensor	1	A	M	58	35	7	42	117				100%		10%
20.	Battery lint cleaner	1	A	M	115	70	15	85	235				100%		10%
21.	Bale press	1	A	M	338	204	43	247	686				100%		10%
22.	Bale conveyor & scale	1	A	M	24	14	3	17	48				100%		10%
23.	Seed transport system	1	A	M	84	51	11	62	171				100%		10%
24.	Trash system & cyclones	1	A	M	101	61	13	74	205				100%		10%
25.	Motors, console, starters.etc	1	A	M	313	189	40	229	636				100%		10%
26.	Piping & transitions	1	A	M	15	9	2	11	31				100%		10%
27.	S/c, lint humidification sys.	1	A	M	55	34	7	41	113				100%		10%
	<b>Total</b>				<b>1,909</b>	<b>1,200</b>	<b>293</b>	<b>1,493</b>	<b>3,975</b>						
<b>YARD EQUIPMENT</b>															
28.	Module handling system	1	A	V	224	208	7	215	506				100%		10%
29.	Module building system	1	A	V	78	73	3	76	177				100%		10%
	<b>Total</b>				<b>302</b>	<b>281</b>	<b>10</b>	<b>291</b>	<b>684</b>						
	<b>Sub Component Total</b>				<b>2,773</b>	<b>1,855</b>	<b>848</b>	<b>2,703</b>	<b>6,308</b>						



Project: SUDAN COTTON  
 Document: Capital Cost Schedule C/1  
 Project Component: C. GRADING & TESTING  
 Project Sub Component: Grading & Testing Centre  
 Exchange Rate 1.30

File Name: CCSC1

No. Description	Disb.	Class	Type	Forex	Taxes/	Other	Total	Total	% Expenditure by year						Cont
				Cost (\$US)	Duties	Local Costs	Local Costs	Cost	0	1	2	3	4	5	
<b>GENERAL</b>															
1. Ground floor	2	A	C	64	41	82	123	206	100%						15%
2. Additional cost 2nd/3rd flrs	2	A	C	127	81	162	243	408	50%	50%					15%
<b>Total</b>				<b>191</b>	<b>122</b>	<b>244</b>	<b>366</b>	<b>614</b>							
<b>CLASSIFICATION ROOM</b>															
3. Special lighting units	1	A	V	18	11	1	12	35		100%					10%
4. Cotton standard boxes	1	A	V	17	10	1	11	33	100%						10%
5. Cotton calibration standards	1	A	V	9	5	0	5	17	100%						10%
<b>Total</b>				<b>44</b>	<b>26</b>	<b>2</b>	<b>28</b>	<b>85</b>							
<b>TESTING LABORATORY</b>															
6. Instruments & eqpt-1st phase	1	A	V	167	101	5	106	323		100%					10%
7. Instruments & eqpt-2nd phase	1	A	V	80	48	3	51	155				100%			10%
<b>Total</b>				<b>247</b>	<b>149</b>	<b>8</b>	<b>157</b>	<b>478</b>							
<b>GENERAL</b>															
8. Air conditioning plant	1	A	M	56	34	7	41	114		100%					10%
9. Furnishings, fittings, storage	1	A	V	17	18	2	20	42		100%					10%
10. Standby generator	1	A	E	20	16	3	19	45		100%					10%
11. Photocopier	1	A	V	4	4	0	4	9		100%					10%
<b>Total</b>				<b>73</b>	<b>52</b>	<b>9</b>	<b>61</b>	<b>156</b>							
<b>Sub Component Total</b>				<b>555</b>	<b>349</b>	<b>263</b>	<b>612</b>	<b>1,334</b>							







Project: SUDAN COTTON  
 Document: Capital Cost Schedule D/2  
 Project Component: D. CPC  
 Project Sub Component: Telecommunications

File Name: CCSD2

Exchange Rate 1.30

No. Description	Disb. Class Type	Forex Cost (\$US)	Taxes/ Duties	Other Local Costs	Total Local Costs	Total Cost	% Expenditure by year						Cont
							0	1	2	3	4	5	
GENERAL													
1. CPC telecommunications sys.	1 A E	645	472	70	542	1,381	50%	50%					10%
2. CPC HQ telex	1 A E	60	35	8	43	121	50%	50%					10%
3. PBX - Port Sudan	1 A E	30	24	4	28	67			100%				10%
4. Standby generators	1 A E	10	8	0	8	21			100%				10%
Total		745	539	82	621	1,590							
TECHNICAL ASSISTANCE													
Sub Component Total		745	539	82	621	1,590							
Cotton Trader (18 months)													
Total		380	0	75	75	465							
Sub Component Total		343	0	75	75	521							





Project: SUDAN COTTON  
 Document: Capital Cost Schedule E/1  
 Project Component: E. Implementation  
 Project Sub Component: Consultancies

Exchange Rate 1.30

No. Description	Disb.	Class	Type	Forex Cost (\$US)	Taxes/ Duties	Other Local Costs	Total Local Costs	Total Cost	% Expenditure by year						
									0	1	2	3	4	5	6 Cont
OVERSEAS CONSULTANCIES															
1. Ginneries	3	-	-	1,220	0	0	0	1,586	30%	23%	23%	8%	8%	8%	10%
2. Grading & testing	3	-	-	60	0	0	0	78	67%	33%					10%
3. Telecommunications	3	-	-	200	0	0	0	260	40%	20%	40%				10%
Total				1,480	0	0	0	1,924							
LOCAL CONSULTANCIES															
4. Ginneries	3	-	-	0	0	344	344	344	19%	28%	21%	14%	9%	9%	10%
5. Grading & testing	3	-	-	0	0	80	80	80	30%	40%	30%				10%
6. Port Sudan stores	3	-	-	0	0	176	176	176	5%	14%	27%	27%	27%		10%
7. CPC headquarters	3	-	-	0	0	144	144	144	34%	33%	33%				10%
Total				0	0	744	744	744							
Sub Component Total				1,480	0	744	744	2,668							



Project: SUDAN COTTON  
 Document: Capital Cost Schedule E/3  
 Project Component: E. Implementation  
 Project Sub Component: Training

File Name: CCSE3

Exchange Rate 1.30

No. Description	Disb. Class Type	Forex Cost (\$US)	Taxes/ Duties	Other Local Costs	Total Local Costs	Total Cost	% Expenditure by year						Cont
							0	1	2	3	4	5	
GENERAL													
1. Training Officer (36 Months)	3 - -	360	0	90	90	558	17%	33%	33%	17%			10%
2. Training Equipment/Facility	3 - -	100	60	50	110	240		100%					0%
3. Overseas Training - Ginning	3 - -	798	0	0	0	1,037	15%	17%	17%	17%	17%	17%	0%
<b>Total</b>		<b>1,258</b>	<b>60</b>	<b>140</b>	<b>200</b>	<b>1,835</b>							
<b>Sub Component Total</b>		<b>1,258</b>	<b>60</b>	<b>140</b>	<b>200</b>	<b>1,835</b>							





TABLE II.2

Ginning Capacity Model - Gezira - Case B

Project: SUDAN COTTON Document: CAPACITY MODEL File Name: CAPGE2B  
Producing Corporation: BEZIRA BOARD - Case B

	CROP PROJECTIONS							CALCULATION OF OUTPUT AFTER REHABILITATION AND IMPROVEMENTS							CALCULATION OF OUTPUT AFTER ADDITIONS						
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Long Staple:	290	273	257	240	223	207	190	290	273	257	240	223	207	190	290	273	257	240	223	207	190
Area (Thousand feddans)	4.50	4.58	4.67	4.75	4.83	4.92	5.00	4.50	4.58	4.67	4.75	4.83	4.92	5.00	4.50	4.58	4.67	4.75	4.83	4.92	5.00
Yield (Kantars/Feddans)	187	179	171	163	154	145	136	187	179	171	163	154	145	136	187	179	171	163	154	145	136
Production (Ktonnes)	210	227	243	260	277	293	310	210	227	243	260	277	293	310	210	227	243	260	277	293	310
Area (Thousand feddans)	6.00	6.08	6.17	6.25	6.33	6.42	6.50	6.00	6.08	6.17	6.25	6.33	6.42	6.50	6.00	6.08	6.17	6.25	6.33	6.42	6.50
Yield (Kantars/Feddans)	180	197	214	232	251	269	288	180	197	214	232	251	269	288	180	197	214	232	251	269	288
Production (Ktonnes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Area (Thousand feddans)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yield (Kantars/Feddans)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Production (Ktonnes)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ratio LS:MS	1.04	.91	.80	.70	.61	.54	.47	1.04	.91	.80	.70	.61	.54	.47	1.04	.91	.80	.70	.61	.54	.47
GINNING SEASON																					
Long Staple (Days)	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
Medium Staple (Days)	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
EXISTING CAPACITY (Tonnes Seed Cotton per day)																					
Roller Gins:																					
Long Staple	2565	2555	2592	2535	2479	2425	2370	2619	2682	2811	2940	3159	3378	3378	2619	2682	2811	2940	3159	3378	3378
Medium Staple	1594	1608	1672	1638	1604	1570	1536	1627	1689	1815	1920	2093	2266	2266	1627	1689	1815	1920	2093	2266	2266
Saw Gins:																					
Medium Staple	0	250	500	500	500	500	500	0	250	500	500	500	500	500	0	250	500	500	500	500	500
Short Staple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total:	2565	2555	2592	2535	2479	2425	2370	2619	2682	2811	2940	3159	3378	3378	2619	2682	2811	2940	3159	3378	3378
Medium Staple	1594	1858	2172	2138	2104	2070	2036	1627	1939	2315	2420	2593	2766	2766	1627	1939	2315	2420	2593	2766	2766
Short Staple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALCULATION OF WORKING DAYS																					
Days worked per week	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Days roller ginning LS	47	50	53	49	45	41	37	47	50	52	48	43	39	35	47	50	52	48	43	39	35
Days roller ginning MS	73	70	67	71	75	79	83	73	70	68	72	77	81	85	73	70	68	72	77	81	85
Total days	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (Ktonnes)																					
Roller Gins:																					
Long Staple	121	129	138	124	111	100	88	123	134	147	140	136	132	119	123	134	147	140	136	132	119
Medium Staple	116	112	112	117	121	124	127	119	118	123	139	161	184	192	119	118	123	130	152	176	185
Saw Gins:																					
Medium Staple	0	30	60	60	60	60	60	0	30	60	60	60	60	60	0	30	60	60	60	60	60
Short Staple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total:	121	129	138	124	111	100	88	123	134	147	140	136	132	119	123	134	147	140	136	132	119
Medium Staple	116	142	172	177	181	184	187	119	148	183	199	221	244	252	119	148	183	220	242	266	275
Short Staple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calculated Ratio LS:MS	1.04	.91	.80	.70	.61	.54	.47	1.04	.91	.80	.70	.61	.54	.47	1.04	.91	.80	.70	.61	.54	.47
SHORTFALL With Existing Capacity (Ktonnes per season)																					
(i.e. crop less ginning capacity)																					
Long Staple	66.08	50.26	33.91	39.14	43.10	45.92	47.57	63.57	44.68	24.90	23.27	13.68	16.92	63.57	44.68	24.90	8.84	5.13	1.77	6.17	
Medium Staple	63.80	55.47	42.37	55.80	70.15	84.84	100.9	61.38	49.31	31.11	33.18	29.67	25.28	35.88	61.38	49.31	31.11	12.60	8.35	3.27	13.09
OUTPUT (Ktonnes per season)																					
Long Staple	121	129	138	124	111	100	88	123	134	147	140	136	132	119	123	134	147	140	136	132	119
Medium Staple	116	142	172	177	181	184	187	119	148	183	199	221	244	252	119	148	183	220	242	266	275
Short Staple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0











TABLE II.8

Ginning Capacity Model - New Halfa

Project: SUDAN COTTON Document: CAPACITY MODEL File Name: CAPMNC  
Producing Corporation: NEW HALFA

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	
	1985	1986	1987	1988	1989	1990	1991		1985	1986	1987	1988	1989	1990	1991	
<b>CROP PROJECTIONS</b>																
Long Staple:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Area (Thousand feddans)	.00	.00	.00	.00	.00	.00	.00		0	0	0	0	0	0	0	
Yield(Kantars/Feddans)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Production(KTonnes)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple:	90	92	93	95	97	98	100		90	92	93	95	97	98	100	
Area (Thousand feddans)	5.00	5.17	5.33	5.50	5.67	5.83	6.00		5.00	5.17	5.33	5.50	5.67	5.83	6.00	
Yield(Kantars/Feddans)	64	68	71	75	78	82	86		64	68	71	75	78	82	86	
Production (kTonnes)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Short Staple:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Area (Thousand feddans)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Yield(Kantars/Feddans)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Production (kTonnes)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Ratio LS:MS	.00	.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00	.00	
<b>GINNING SEASON</b>																
Long Staple (Days)	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple (Days)	125	125	125	125	125	125	125		125	125	125	125	125	125	125	
<b>EXISTING CAPACITY (Tonnes Seed Cotton per day)</b>																
Roller Gins:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Long Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Saw Gins:	506	498	491	484	476	469	462		513	564	564	564	564	564	564	
Medium Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Short Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Total:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Long Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple	506	498	491	484	476	469	462		513	564	564	564	564	564	564	
Short Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
<b>CALCULATION OF WORKING DAYS</b>																
Days worked per week	6	6	6	6	6	6	6		6	6	6	6	6	6	6	
Days roller ginning LS	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Days roller ginning MS	125	125	125	125	125	125	125		125	125	125	125	125	125	125	
Total days	125	125	125	125	125	125	125		125	125	125	125	125	125	125	
<b>CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (kTonnes)</b>																
Roller Gins:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Long Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Saw Gins:	63	62	61	61	60	59	58		64	71	71	71	71	71	71	
Medium Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Short Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Total:	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Long Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple	63	62	61	61	60	59	58		64	71	71	71	71	71	71	
Short Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Calculated Ratio LS:MS	.00	.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00	.00	
<b>SHORTFALL With Existing Capacity (kTonnes per season)</b>																
(i.e. crop less ginning capacity)	.00	.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00	.00	
Long Staple	.00	.00	.00	.00	.00	.00	.00		.00	.00	.00	.00	.00	.00	.00	
Medium Staple	1.10	5.48	9.81	14.22	18.83	23.40	28.05		.23	.00	.68	4.22	7.83	11.53	15.30	
<b>OUTPUT (kTonnes per season)</b>																
Long Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Medium Staple	63	62	61	61	60	59	58		64	68	71	71	71	71	71	
Short Staple	0	0	0	0	0	0	0		0	0	0	0	0	0	0	

TABLE II.9

Ginning Capacity Model - Northern Corporation

Project: SUDAN COTTON Document: CAPACITY MODEL File Name: CAPMCK  
Producing Corporation: NORTHERN

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
	1985	1986	1987	1988	1989	1990	1991		1985	1986	1987	1988	1989	1990	1991		1985	1986	1987	1988	1989	1990	1991
<b>CRUP PROJECTIONS</b>																							
Long Staple:	0	0	0	0	0	0	0	: CALCULATION OF OUTPUT AFTER ADDITIONS															
Area (thousand feddans)	0	0	0	0	0	0	0	:-----															
Yield(Kantars/Feddam)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:-----															
Production(KTonnes)	0	0	0	0	0	0	0	:-----															
Medium Staple:	6	6	6	6	6	6	6	: CALCULATION OF OUTPUT AFTER ADDITIONS															
Area (thousand feddans)	4.00	4.17	4.33	4.50	4.67	4.83	5.00	:-----															
Yield(Kantars/Feddam)	3	4	4	4	4	4	4	:-----															
Production (Ktonnes)	0	0	0	0	0	0	0	:-----															
Short Staple:	0	0	0	0	0	0	0	:-----															
Area (thousand feddans)	0	0	0	0	0	0	0	:-----															
Yield(Kantars/Feddam)	0	0	0	0	0	0	0	:-----															
Production (Ktonnes)	0	0	0	0	0	0	0	:-----															
Ratio LS:MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:-----															
<b>GINNING SERSEN</b>																							
Long Staple (Days)	105	105	105	105	105	105	105	:CAPACITY INCREMENTS (Tonnes Seed Cotton per day)															
Medium Staple (Days)	125	125	125	125	125	125	125	:-----															
:Roller Gins:																							
Long Staple	0	0	0	0	0	0	0	:CAPACITY AFTER ADDITIONS															
Medium Staple	60	57	55	53	50	48	46	:-----															
:Saw Gins:																							
Medium Staple	0	0	0	0	0	0	0	:-----															
Short Staple	0	0	0	0	0	0	0	:-----															
Total:	0	0	0	0	0	0	0	:-----															
Long Staple	0	0	0	0	0	0	0	:-----															
Medium Staple	60	57	55	53	50	48	46	:-----															
Short Staple	0	0	0	0	0	0	0	:-----															
<b>CALCULATION OF WORKING DAYS</b>																							
Days worked per week	6	6	6	6	6	6	6	:CALCULATION OF WORKING DAYS															
Days roller ginning LS	0	0	0	0	0	0	0	:-----															
Days roller ginning MS	125	125	125	125	125	125	125	:-----															
Total days	125	125	125	125	125	125	125	:-----															
<b>CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (KTonnes)</b>																							
Roller Gins:	0	0	0	0	0	0	0	:CAPACITY AT 100% UTILISATION															
Long Staple	8	7	7	7	6	6	6	:-----															
Medium Staple	0	0	0	0	0	0	0	:-----															
Saw Gins:	0	0	0	0	0	0	0	:-----															
Medium Staple	0	0	0	0	0	0	0	:-----															
Short Staple	0	0	0	0	0	0	0	:-----															
Total:	0	0	0	0	0	0	0	:-----															
Long Staple	0	0	0	0	0	0	0	:-----															
Medium Staple	8	7	7	7	6	6	6	:-----															
Short Staple	0	0	0	0	0	0	0	:-----															
Calculated Ratio LS:MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:-----															
<b>SHORTFALL With Existing Capacity (Ktonnes per season)</b>																							
i.e. crop less ginning capacity)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:SHORTFALL (Ktonnes per season)															
Long Staple	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:-----															
Medium Staple	0.00	0.00	0.00	0.00	0.00	0.00	0.00	:-----															
<b>OUTPUT (Ktonnes per season)</b>																							
Long Staple	0	0	0	0	0	0	0	:OUTPUT (Ktonnes per season)															
Medium Staple	3	4	4	4	4	4	4	:-----															
Short Staple	0	0	0	0	0	0	0	:-----															

TABLE II.10

Ginning Capacity Model - Tokar

Project: SUDAN COTTON Document: CAPACITY MODEL File Name: CAPTOK  
Producing Corporation: TOKAR

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
	1985	1986	1987	1988	1989	1990	1991
<b>CROP PROJECTIONS</b>							
Long Staple:							
Area (Thousand feddans)	20	21	22	22	23	24	25
Yield(Kantars/Feddani)	1.50	1.58	1.67	1.75	1.83	1.92	2.00
Production(Ktonnes)	4	5	5	6	6	7	7
Medium Staple:							
Area (Thousand feddans)	0	0	0	0	0	0	0
Yield(Kantars/Feddani)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production (Ktonnes)	0	0	0	0	0	0	0
Short Staple:							
Area (Thousand feddans)	0	0	0	0	0	0	0
Yield(Kantars/Feddani)	0	0	0	0	0	0	0
Production (Ktonnes)	0	0	0	0	0	0	0
<b>CAPACITY AFTER REHABILITATION AND IMPROVEMENTS</b>							
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
	1985	1986	1987	1988	1989	1990	1991
Roller Gins:							
Long Staple	2	2	1	3	2	1	2
Medium Staple	0	0	0	0	0	0	0
Saw Gins:							
Long Staple	0	0	0	0	0	0	0
Medium Staple	0	0	0	0	0	0	0
Short Staple	0	0	0	0	0	0	0
Total:	2	2	1	3	2	1	2
<b>CAPACITY INCREMENTS (Tonnes Seed Cotton per day)</b>							
Roller Gins:							
Long Staple	0	0	0	0	0	0	0
Medium Staple	0	0	0	0	0	0	0
Saw Gins:							
Long Staple	0	0	0	0	0	0	0
Medium Staple	0	0	0	0	0	0	0
Short Staple	0	0	0	0	0	0	0
Total:	0	0	0	0	0	0	0
<b>CAPACITY AFTER ADDITIONS</b>							
Roller Gins:							
Long Staple	89	88	86	85	84	82	81
Medium Staple	0	0	0	0	0	0	0
Saw Gins:							
Long Staple	0	0	0	0	0	0	0
Medium Staple	0	0	0	0	0	0	0
Short Staple	0	0	0	0	0	0	0
Total:	89	88	86	85	84	82	81
<b>CAPACITY AT 100% UTILISATION</b>							
Days worked per week	6	6	6	6	6	6	6
Days roller ginning LS	120	120	120	120	120	120	120
Days roller ginning MS	0	0	0	0	0	0	0
Days roller ginning HS	0	0	0	0	0	0	0
Total days	120	120	120	120	120	120	120
<b>CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (Ktonnes)</b>							
Roller Gins:							
Long Staple	10	10	9	9	9	8	8
Medium Staple	0	0	0	0	0	0	0
Saw Gins:							
Long Staple	0	0	0	0	0	0	0
Medium Staple	0	0	0	0	0	0	0
Short Staple	0	0	0	0	0	0	0
Total:	10	10	9	9	9	8	8
<b>SHORTFALL With Existing Capacity (Ktonnes per season)</b>							
Long Staple	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medium Staple	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Short Staple	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>OUTPUT (Ktonnes per season)</b>							
Long Staple	4	5	5	6	6	7	7
Medium Staple	0	0	0	0	0	0	0
Short Staple	0	0	0	0	0	0	0

TABLE II.11

Ginning Capacity Model - Nuba Mountains

Project: SUBFW COTTON Document: CAPACITY MODEL File Name: CAPNUB  
 Producing Corporation: NUBA MOUNTAINS

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
	1985	1986	1987	1988	1989	1990	1991		1985	1986	1987	1988	1989	1990	1991		1985	1986	1987	1988	1989	1990	1991
<b>CROP PROJECTIONS</b>																							
Long Staple:																							
Area (Thousand feddans)	0	0	0	0	0	0	0																
Yield (Kantars/feddans)	.00	.00	.00	.00	.00	.00	.00																
Production (Ktonnes)	0	0	0	0	0	0	0																
Medium Staple:																							
Area (Thousand feddans)	0	0	0	0	0	0	0																
Yield (Kantars/feddans)	.00	.00	.00	.00	.00	.00	.00																
Production (Ktonnes)	0	0	0	0	0	0	0																
Short Staples:																							
Area (Thousand feddans)	120	137	153	170	187	203	220																
Yield (Kantars/feddans)	1.10	1.13	1.17	1.20	1.23	1.27	1.30																
Production (Ktonnes)	19	22	26	29	33	37	41																
<b>GINNING SEASON</b>																							
Short Staple (days)	90	90	90	90	90	90	90																
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	617	572	528	483	438	394	349																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	617	572	528	483	438	394	349																
<b>EXISTING CAPACITY (Tonnes Seed Cotton per day)</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	626	590	554	516	478	440	402																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	626	590	554	516	478	440	402																
<b>CAPACITY AFTER REHABILITATION AND IMPROVEMENTS</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	626	590	554	516	478	440	402																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	626	590	554	516	478	440	402																
<b>CAPACITY INCREMENTS (Tonnes Seed Cotton per day)</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	9	9	8	37	101	44	46																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	9	9	8	37	101	44	46																
<b>CAPACITY AFTER ADDITIONS</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	626	590	554	516	478	440	402																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	626	590	554	516	478	440	402																
<b>CAPACITY AT 100% UTILISATION</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	56	53	50	49	54	54	54																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	56	53	50	49	54	54	54																
<b>CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (Ktonnes)</b>																							
Roller Gins:																							
: Long Staple	0	0	0	0	0	0	0																
: Medium Staple	0	0	0	0	0	0	0																
Saw Gins:																							
: Medium Staple	0	0	0	0	0	0	0																
: Short Staple	56	53	50	49	54	54	54																
Total:	0	0	0	0	0	0	0																
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	56	53	50	49	54	54	54																
<b>SHORTFALL With Existing Capacity (Ktonnes per season)</b>																							
(i.e. crop less ginning capacity)																							
Long Staple	.00	.00	.00	.00	.00	.00	.00																
Medium Staple	.00	.00	.00	.00	.00	.00	.00																
Short Staple	.00	.00	.00	.00	1.37	9.49																	
<b>SHORTFALL (Ktonnes per season)</b>																							
Long Staple	0	0	0	0	0	0	0																
Medium Staple	0	0	0	0	0	0	0																
Short Staple	19	22	26	29	33	37	41																
<b>OUTPUT (Ktonnes per season)</b>																							
Long Staple	0	0	0	0</																			

TABLE II.12

Ginning Capacity Model - Mechanised Farming Corporation

		File Name: CAPMFC						
		Document: CAPACITY MODEL						
		Producing Corporation: MECHANISED FARMING CORPORATION						
		Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
		1985	1986	1987	1988	1989	1990	1991
<b>CROP PROJECTIONS</b>								
Long Staple:		0	0	0	0	0	0	0
Area (thousand feddans)		.00	.00	.00	.00	.00	.00	.00
Yield(Kantars/Feddans)		0	0	0	0	0	0	0
Production(Ktonnes)		0	0	0	0	0	0	0
Medium Staple:		0	0	0	0	0	0	0
Area (thousand feddans)		.00	.00	.00	.00	.00	.00	.00
Yield(Kantars/Feddans)		0	0	0	0	0	0	0
Production (Ktonnes)		0	0	0	0	0	0	0
Short Staple:		65	72	78	85	92	98	105
Area (thousand feddans)		1.80	1.83	1.87	1.90	1.93	1.97	2.00
Yield(Kantars/Feddans)		17	19	21	23	25	28	30
Production (Ktonnes)		100	100	100	100	100	100	100
<b>GINNING SEASON</b>								
Short Staple (Days)		2	1	2	1	2	1	2
<b>EXISTING CAPACITY</b> (Tonnes Seed Cotton per day)								
Roller Gins:		0	0	0	0	0	0	0
Long Staple		0	0	0	0	0	0	0
Medium Staple		0	0	0	0	0	0	0
Saw Gins:		0	0	0	0	0	0	0
Medium Staple		214	213	211	210	208	207	205
Short Staple		0	0	0	0	0	0	0
Total:		0	0	0	0	0	0	0
Long Staple		0	0	0	0	0	0	0
Medium Staple		0	0	0	0	0	0	0
Short Staple		214	213	211	210	208	207	205
<b>CALCULATION OF WORKING DAYS</b>								
Days worked per week		6	6	6	6	6	6	6
Total days		100	100	100	100	100	100	100
<b>CAPACITY AT 100% UTILISATION Using Crop Projection Ratio (Ktonnes)</b>								
Roller Gins:		0	0	0	0	0	0	0
Long Staple		0	0	0	0	0	0	0
Medium Staple		0	0	0	0	0	0	0
Saw Gins:		21	21	21	21	21	21	21
Medium Staple		0	0	0	0	0	0	0
Short Staple		21	21	21	21	21	21	21
Total:		0	0	0	0	0	0	0
Long Staple		0	0	0	0	0	0	0
Medium Staple		0	0	0	0	0	0	0
Short Staple		21	21	21	21	21	21	21
<b>SHORTFALL With Existing Capacity (Ktonnes per season)</b> (i.e. crop less ginning capacity)								
Long Staple		.00	.00	.00	.00	.00	.00	.00
Medium Staple		.00	.00	.00	.00	.00	.00	.00
Short Staple		.00	.00	.00	2.09	4.63	6.86	9.53
<b>OUTPUT (Ktonnes per season)</b>								
Long Staple		0	0	0	0	0	0	0
Medium Staple		0	0	0	0	0	0	0
Short Staple		17	19	21	21	21	21	21

Year	0	1	2	3	4	5	6	7	8	9	10	11-25
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUBRITY</b>												
Net Benefit	0	0	0	113	117	119	121	122	122	122	122	122
<b>2. SCARTS</b>												
Net Benefit	0	0	0	1092	1098	1116	1134	1140	1140	1140	1140	1140
<b>3. QUALITY EFFECTS</b>												
Benefit	0	0	307	1007	2055	3074	3544	3624	3624	3624	3624	3604
Variable Cost	0	0	87	284	510	879	1253	1270	1270	1270	1270	1270
Net Variable Effect	0	0	237	721	1745	2195	2291	2354	2354	2354	2354	2334
Fixed Cost	0	0	29	89	177	298	421	421	421	421	421	421
Net Quality Effect	0	0	208	632	1568	1897	1870	1933	1933	1933	1933	1913
<b>4. LABOR SAVINGS</b>												
Benefit	0	0	0	0	79	136	115	119	119	119	119	119
<b>5. CAPACITY EFFECT</b>												
Benefit-Lint	0	3867	13115	27467	45323	51068	74691	87038	87448	87658	88269	88679
Net Benefit-Cotton Seed	0	891	1708	3234	5918	7443	9261	10772	10772	10772	10772	10772
Operating Variable Costs												
Power	0	59	184	189	186	189	187	34	34	34	34	34
Costs - Imports	0	132	214	427	882	1121	1593	1613	1613	1613	1613	1613
Cost - Local	0	125	259	461	826	1094	1321	1328	1328	1328	1328	1328
Fixed Cost	0	0	90	79	297	940	1287	1287	1287	1287	1287	1287
Other Variable Costs												
SC, Transport, etc	0	2844	7389	13994	20327	23963	40064	46319	46319	46319	46319	46319
Marketing Expenses - Lint	0	707	1822	3346	6151	8022	9811	11432	11434	11539	11593	11646
Net Capacity Effect	0	3667	9100	18297	18840	24433	29975	30770	30758	30112	30449	30826
Benefit To Binery	0	257	545	1021	1894	2444	2998	3540	3375	7611	3547	3693
<b>6. ADDITIONS (See Site Plant)</b>												
Benefit - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit - Cotton Seed	0	0	0	0	0	0	0	0	0	0	0	0
Variable Operating Costs												
Imports	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Net Variable Effect	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Costs												
Repair & Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs												
SC, Transport, etc	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect of Additions	0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Binery	0	0	0	0	0	0	0	0	0	0	0	0
<b>7. CAPITAL COSTS</b>												
	0	15186	6292	39208	12536	12945	0	0	0	0	0	0
<b>8. NET BENEFIT</b>												
	0	-14919	-5539	-7562	-8780	-4229	8438	7063	7099	9134	9179	8296
<b>9. INTERNAL RATE OF RETURN</b>												
	14.21%											

APPENDIX III

CASH FLOWS AT CONSTANT FINANCIAL PRICES









Project: SUDAN COTTON

Document: Financial Appraisal - Constant Prices

Producing Corporation: White Nile Corporation - Case A

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	Year:											11-26 1995-2010
	0 1984	1 1985	2 1986	3 1987	4 1988	5 1989	6 1990	7 1991	8 1992	9 1993	10 1994	
<b>1. LUGATTA - RABAK</b>												
Net Benefit	0	0	0	4	9	21	21	22	22	22	22	22
<b>2. SCARTO</b>												
Net Benefit	0	0	0	0	89	224	234	291	291	291	291	291
<b>3. DUEIM POWER</b>												
Net Benefit	0	0	0	0	0	0	56	59	59	59	59	59
<b>4. QUALITY EFFECTS</b>												
Benefit	0	0	0	0	423	1190	1096	979	979	979	979	979
Variable Cost	0	0	0	0	76	221	210	192	192	192	192	192
Net Variable Effect	0	0	0	0	347	969	887	787	787	787	787	787
Fixed Cost	0	0	0	74	133	133	133	133	133	133	133	133
Net Quality Effect	0	0	0	-74	214	836	754	654	654	654	654	654
<b>5. LABOUR SAVINGS</b>												
Benefit	0	0	0	0	38	133	139	138	138	138	138	138
<b>6. CAPACITY EFFECT</b>												
Benefit-Lint	0	0	0	1202	18680	33639	40357	48708	48938	49168	49398	49628
Net Benefit-Cotton Seed	0	0	0	170	2342	4048	4564	5502	5502	5502	5502	5502
Ginning Variable Costs:												
Power	0	0	0	0	40	37	33	30	30	30	30	30
Costs - Imports	0	0	0	20	355	660	824	987	987	987	987	987
Cost - Local	0	0	0	17	301	562	705	760	760	760	760	760
Fixed Cost	0	0	0	0	351	351	351	351	351	351	351	351
Other Variable Costs												
SC,Transport,etc	0	0	0	694	10186	17988	20935	25183	25183	25183	25183	25183
Marketing Expenses - Lint	0	0	0	158	2454	4420	5304	6401	6431	6461	6491	6521
Net Capacity Effect	0	0	0	483	7334	13667	16768	20499	20699	20899	21099	21299
Benefit To Ginney	0	0	0	48	733	1367	1677	2050	2070	2090	2110	2130
<b>7. ADDITIONS (Saw Gin Plant)</b>												
Benefit - Lint	0	0	0	0	0	0	0	13350	13413	13477	13540	13603
Net Benefit - Cotton Seed	0	0	0	0	0	0	0	1284	1284	1284	1284	1284
Variable Ginning Costs												
Imports	0	0	0	0	0	0	0	279	279	279	279	279
Local	0	0	0	0	0	0	0	241	241	241	241	241
Net Variable Effect	0	0	0	0	0	0	0	14113	14177	14240	14303	14366
Fixed Costs:												
Repair & Maintenance	0	0	0	0	0	0	168	168	168	168	168	168
Other	0	0	0	0	0	0	132	132	132	132	132	132
Other Variable Costs												
SC,Transport,etc	0	0	0	0	0	0	0	6466	6466	6466	6466	6466
Marketing Expenses - Lint	0	0	0	0	0	0	0	1891	1891	1891	1891	1891
Net Effect of Additions	0	0	0	0	0	0	-300	5456	5520	5583	5646	5709
Benefit to Ginney	0	0	0	0	0	0	-30	546	552	558	565	571
<b>8. CAPITAL COSTS</b>												
	0	1317	0	2675	9499	178	7045	0	0	0	0	0
<b>9. NET BENEFIT</b>												
	0	-1317	0	-2697	-8417	2403	-4194	3760	3786	3813	3839	3865
<b>10. INTERNAL RATE OF RETURN</b>												
	18.02%											

Project: SUDAN COTTON  
 Document: Financial Appraisal - Constant Prices  
 Producing Corporation: White Nile Corporation - Case B  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUGATTA - RABAK</b>													
Net Benefit		0	0	0	4	9	21	23	24	24	24	24	24
<b>2. SCARTO</b>													
Net Benefit		0	0	0	0	79	185	199	210	210	210	210	210
<b>3. DUEIM POWER</b>													
Net Benefit		0	0	0	0	0	0	42	45	45	45	45	45
<b>4. QUALITY EFFECTS</b>													
Benefit		0	0	0	0	554	1575	1693	1787	1787	1787	1787	1787
Variable Cost		0	0	0	0	94	269	289	305	305	305	305	305
Net Variable Effect		0	0	0	0	459	1307	1404	1482	1482	1482	1482	1482
Fixed Cost		0	0	0	74	133	133	133	133	133	133	133	133
Net Quality Effect		0	0	0	-74	327	1174	1271	1349	1349	1349	1349	1349
<b>5. LABOUR SAVINGS</b>													
Benefit		0	0	0	0	33	107	114	121	121	121	121	121
<b>6. CAPACITY EFFECT</b>													
Benefit-Lint		0	0	0	1202	19411	31694	44303	54404	54659	54915	55171	55427
Net Benefit-Cotton Seed		0	0	0	170	2720	4420	6120	7480	7480	7480	7480	7480
Ginning Variable Costs:													
Power		0	0	0	0	31	28	24	22	22	22	22	22
Costs - Imports		0	0	0	20	323	525	726	888	888	888	888	888
Cost - Local		0	0	0	17	271	440	609	744	744	744	744	744
Fixed Cost		0	0	0	0	351	351	351	351	351	351	351	351
Other Variable Costs													
SC,Transport,etc		0	0	0	694	11096	18031	24966	30514	30514	30514	30514	30514
Marketing Expenses - Lint		0	0	0	158	2548	4161	5816	7141	7174	7208	7241	7274
Net Capacity Effect		0	0	0	483	7511	12579	17930	22223	22446	22669	22891	23114
Benefit To Ginnery		0	0	0	48	751	1258	1793	2222	2245	2267	2289	2311
<b>7. ADDITIONS (Saw Gin Plant)</b>													
Benefit - Lint		0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit - Cotton Seed		0	0	0	0	0	0	0	0	0	0	0	0
Variable Ginning Costs													
Imports		0	0	0	0	0	0	0	0	0	0	0	0
Local		0	0	0	0	0	0	0	0	0	0	0	0
Net Variable Effect		0	0	0	0	0	0	0	0	0	0	0	0
Fixed Costs:													
Repair & Maintenance		0	0	0	0	0	0	0	0	0	0	0	0
Other		0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs													
SC,Transport,etc		0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - Lint		0	0	0	0	0	0	0	0	0	0	0	0
Net Effect of Additions		0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Ginnery		0	0	0	0	0	0	0	0	0	0	0	0
<b>8. CAPITAL COSTS</b>													
		0	1317	0	2675	9499	178	0	0	0	0	0	0
<b>9. NET BENEFIT</b>													
		0	-1317	0	-2697	-8301	2566	3442	3971	3993	4015	4038	4060
<b>10. INTERNAL RATE OF RETURN 25.29%</b>													

Project: SUDAN COTTON

Document: Financial Appraisal - Constant Prices

Producing Corporation: Rahad

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUGATTA CLEANING PLANT</b>												
Benefit	0	0	0	51	52	52	52	52	52	52	52	52
Marketing Expenses	0	0	0	7	7	7	7	7	7	7	7	7
Net Benefit	0	0	0	44	45	46	46	46	46	46	46	46
<b>2. REPAIR AND MAINTENANCE OF IMPROVEMENTS</b>												
Repair and Maintenance	0	47	60	60	60	60	60	60	60	60	60	60
<b>3. CAPACITY EFFECT</b>												
Benefit-Lint	0	2130	22587	24860	27285	29610	32110	34487	34651	34814	34978	35141
Net Benefit-Cotton Seed	0	214	2247	2461	2675	2889	3103	3317	3317	3317	3317	3317
Ginning Variable Costs												
Power	0	0	0	0	0	0	0	0	0	0	0	0
Costs - Imports	0	49	515	564	613	662	711	760	760	760	760	760
Costs - Local	0	40	422	462	503	543	583	623	623	623	623	623
Other Variable Costs												
SC, Transport, etc.	0	1078	11315	12392	13470	14548	15625	16703	16703	16703	16703	16703
Marketing Expenses - Lint	0	303	3209	3531	3872	4200	4551	4886	4908	4929	4950	4971
Net Capacity effect	0	874	9374	10372	11503	12547	13743	14833	14975	15117	15259	15401
Benefit to Ginnery	0	87	937	1037	1150	1255	1374	1483	1497	1512	1526	1540
<b>4. ADDITIONS</b>												
Benefit - Lint	0	0	0	28102	31651	33997	34324	34487	34651	34814	34978	35141
Net Benefit - Cotton Seed	0	0	0	2782	3103	3317	3317	3317	3317	3317	3317	3317
Variable Ginning Costs												
Imports	0	0	0	605	675	722	722	722	722	722	722	722
Local	0	0	0	523	583	623	623	623	623	623	623	623
Net Variable Effect	0	0	0	29757	33496	35969	36296	36460	36623	36787	36950	37113
Fixed Costs:												
Repair & Maintenance	0	221	327	3209	3531	3872	4200	4551	245	245	245	245
Other	0	132	132	132	132	132	132	132	132	132	132	132
Other Variable Costs												
SC, Transport, etc.	0	0	0	14009	15625	16703	16703	16703	16703	16703	16703	16703
Marketing Expenses - Lint	0	0	0	3991	4492	4823	4865	4886	4908	4929	4950	4971
Net Effect of Additions	0	-353	-459	8415	9716	10440	10396	10187	14636	14778	14920	15062
Benefit to Ginnery	0	-35	-46	842	972	1044	1040	1019	1464	1478	1492	1506
<b>5. CAPITAL COSTS</b>												
	0	8652	1553	0	0	0	0	0	0	0	0	0
<b>6. NET BENEFIT</b>												
	0	-8647	-721	1863	2107	2284	2400	2488	2947	2975	3004	3032
<b>7. INTERNAL RATE OF RETURN</b>												
	21.83%											



Project: SUDAN COTTON

Document: Financial Appraisal - Constant Prices

Producing Corporation: TOKAR

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-25
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
Cost Index: SUDAN	100	100	100	100	100	100	100	100	100	100	100	100
Cost Index: WORLD	100	100	100	100	100	100	100	100	100	100	100	100
Exchange Rate - Export Sales	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425
Lint Price Long Staple (US\$)	2336	2444	2468	2480	2504	2516	2540	2552	2564	2576	2588	2600
Lint Price Medium Staple (US\$)	1930	2020	2040	2050	2070	2080	2100	2110	2120	2130	2140	2150
Lint Price Long Staple (£S)	3329	3483	3517	3534	3568	3585	3620	3637	3654	3671	3688	3705
Lint Price Medium Staple (£S)	2750	2879	2907	2921	2950	2964	2993	3007	3021	3035	3050	3064
<b>1. SCARTO</b>												
Net Benefit	0	14	14	17	17	20	20	20	20	20	20	20
<b>2. CAPITAL COSTS</b>												
	0	640	0	0	0	0	0	0	0	0	0	0
<b>3. NET BENEFIT</b>												
	0	-640	14	14	17	17	20	20	20	20	20	20

INTERNAL RATE OF RETURN 19.2%

Project: SUDAN COTTON  
 Document: Financial Appraisal - Constant Prices  
 Producing Corporation: Nuba Mountains Corporation  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	Year:	0	1	2	3	4	5	6	7	8	9	10	11-26	12	13
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Cost Index: SUDAN		100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cost Index: WORLD		100	100	100	100	100	100	100	100	100	100	100	100	100	100
Exchange Rate - Export Sales		1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425
Lint Price (US\$) Current		1920	1938	1947	1966	1976	1995	2004	2014	2023	2033		2042	2042	2042
Lint Price (£S) Current		2736	2762	2774	2802	2816	2843	2856	2870	2883	2897		2910	2910	2910
<b>1. QUALITY EFFECTS</b>															
Price		0	0	0	135	336	512	766	766	766	766	766	766	766	766
Variable Cost		0	0	0	24	59	90	135	135	135	135	135	135	135	135
Net Variable Effect		0	0	0	111	277	422	631	631	631	631	631	631	631	631
Fixed Cost		0	0	0	8	18	25	33	33	33	33	33	33	33	33
Net Quality Effect		0	0	0	103	259	397	598	598	598	598	598	598	598	598
<b>2. CAPACITY EFFECT</b>															
Benefit-Lint		0	0	0	0	0	0	1876	9424	9471	9513	9560	9603	9603	9603
Benefit-Cotton Seed		0	0	0	0	0	0	228	1140	1140	1140	1140	1140	1140	1140
Ginning Variable Costs:															
Power		0	0	0	0	0	0	0	1	1	1	1	1	1	1
Costs - Imports		0	0	0	0	0	0	47	233	233	233	233	233	233	233
Cost - Local		0	0	0	0	0	0	38	192	192	192	192	192	192	192
Fixed Cost		0	0	0	14	25	33	33	33	33	33	33	33	33	33
Other Variable Costs															
SC, Transport, etc		0	0	0	0	0	0	670	3350	3350	3350	3350	3350	3350	3350
Marketing Expenses		0	0	0	0	0	0	295	1484	1490	1497	1503	1510	1510	1510
Net Capacity Effect		0	0	-8	-14	-25	-33	1021	5272	5313	5349	5389	5425	5425	5425
Benefit To Ginnery		0	0	-1	-1	-3	-3	102	527	531	535	539	543	543	543
<b>3. CAPITAL COSTS</b>															
		0	454	717	591	1911	855	0	0	0	0	0	0	0	0
<b>4. NET BENEFIT</b>															
		0	-454	-718	-490	-1655	-461	700	1125	1129	1133	1137	1141	1141	1141
<b>5. INTERNAL RATE OF RETURN 19.59%</b>															



Project: SUDAN COTTON  
 Document: Financial Appraisal - Constant Prices  
 Port Sudan Stores

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	0	1	2	3	4	5	6	7	8	9	10	11-26
Year:	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
1. BENEFITS												
Stores Rental Saving	0	0	0	0	720	720	720	720	720	720	720	720
2. OPERATING COSTS												
Repair & Maintenance	0	0	0	0	125	125	125	125	125	125	125	125
3. CAPITAL COSTS												
	0	541	3,172	7,214	7,214	14,975	14,975	0	0	0	0	0
4. NET BENEFIT	0	-541	-3,172	-7,214	-6,619	-14,380	-14,380	595	595	595	595	595

Project: SUDAN COTTON ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Document: Financial Appraisal - Constant Prices

CPC

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	95/96-10/11
1. Capital Costs:												
Buildings	0	1,559	1,626	0	0	0	0	0	0	0	0	0
Telecommunications	0	826	923	0	0	0	0	0	0	0	0	0
Headquarters Equipment	0	50	60	0	0	0	0	0	0	0	0	0
Training & Technical Assistance	251	322	0	0	0	0	0	0	0	0	0	0
Total	251	2,757	2,609	0	0	0	0	0	0	0	0	0
2. Repair & Maintenance	0	23	48	48	48	48	48	48	48	48	48	48
3. Savings	0	0	0	94	94	94	94	94	94	94	94	94
4. Net Benefit	-251	-2,780	-2,657	46	46	46	46	46	46	46	46	46

APPENDIX IV

SUMMARY CASH FLOWS AT CONSTANT FINANCIAL PRICES

Project: SUDAN COTTON

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Document: Financial Appraisal - Constant Prices

Grading & Testing

	Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1195-2010
1. Repair & Maintenance		0	82	117	117	117	117	117	117	117	117	117	117
2. Capital Costs													
Grading & Testing Centre		0	527	860	0	171	0	0	0	0	0	0	0
Training & Technical Assistance		18	43	184	201	73	95	56	0	0	0	0	0
ARC Cotton Research Laboratory		0	659	0	0	0	0	0	0	0	0	0	0
3. Total Costs		18	1,311	1,161	318	361	212	173	117	117	117	117	117

Project: 2025W COTTON  
 Account: Financial Appraisal - Constant Prices  
 Summary Cashflow  
 Line A

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	10	11-25
<b>Seedling</b>													
Sietra	0	-15,919	-5,539	-7,562	-3,129	-4,329	8,438	1,865	9,499	9,134	9,178	9,178	9,286
White Nile	0	-1,317	0	-2,497	0	2,483	-4,194	3,768	3,766	3,813	3,859	3,859	3,815
Blue Nile & Selt	0	-1,335	-1,818	350	-1,100	1,791	2,324	2,454	2,348	2,385	2,389	2,389	2,412
Rohad	0	-8,467	-721	4,883	2,264	2,264	2,468	2,488	2,947	2,973	3,004	3,004	3,032
Blue Weils	0	-2,489	1,329	4,887	1,890	1,890	1,758	1,762	1,967	1,973	1,979	1,979	1,984
Naba Mountains	0	-484	-718	-498	788	788	1,125	1,125	1,129	1,132	1,137	1,137	1,141
Toker	0	-540	11	11	29	29	29	29	29	29	29	29	29
Northern Corporation	0	-195	-48	-17	0	0	0	0	0	0	0	0	0
N.F.C.	0	-137	-145	0	53	53	53	53	53	53	53	53	53
<b>Total Seedling</b>	0	-31,855	-9,658	-6,792	11,797	24,916	29,529	29,496	29,801	29,801	29,801	29,801	29,915
<b>Internal Rate of Return</b>	19.87%												
<b>Storage</b>	0	-541	-1,172	-7,214	-11,359	-11,359	-11,380	-995	-285	-995	-995	-995	-995
<b>Feeding &amp; Breeding</b>	-12	-1,211	-1,141	-118	-312	-312	-323	-117	-117	-117	-117	-117	-117
<b>C.P.C.</b>	-251	-2,789	-4,457	46	46	46	46	46	46	46	46	46	46
<b>Implementation</b>													
Consultancies	-857	-787	-726	-245	-228	-174	0	0	0	0	0	0	0
Project Management Feit	-7,813	-1,398	-1,281	-975	-460	-265	0	0	0	0	0	0	0
Training	-246	-415	-375	-217	-173	-173	0	0	0	0	0	0	0
<b>Implementation Total</b>	-2,156	-2,772	-2,386	-1,797	-647	-713	0	0	0	0	0	0	0
<b>Project Total</b>	-2,276	-30,379	-17,624	-15,385	-26,751	-13,143	-2,860	21,442	22,494	22,210	22,325	22,325	22,439
<b>Internal Rate of Return</b>	11.61%												

APPENDIX IV

SUMMARY CASH FLOWS AT CONSTANT FINANCIAL PRICES





Projects: BIRDY COTTON  
 Subjects: Economic Appraisal - Cashflow Prices  
 Producing Corporations and Selling Cooperatives - Case 4  
 ALL COSTS IN THOUSANDS OF DOLLARS PRICES 1978-1988

Year	1	2	3	4	5	6	7	8	9	10	11	12
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
<b>1. LIBRATA</b>												
Net Benefit	1	2	3	18	25	34	45	58	73	88	105	125
<b>2. SCARD</b>												
Net Benefit	2	2	3	14	21	29	39	51	65	81	98	118
<b>3. QUALITY EFFECTS</b>												
Benefit	0	0	20	30	40	50	60	70	80	90	100	110
Variable Cost	0	0	20	30	40	50	60	70	80	90	100	110
Net Variable Effect	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Cost	0	0	0	0	0	0	0	0	0	0	0	0
Net Quality Effect	0	0	0	0	0	0	0	0	0	0	0	0
<b>4. LABOR SAVINGS</b>												
Benefit	0	0	0	0	0	0	0	0	0	0	0	0
<b>5. CAPACITY EFFECT</b>												
Benefit-List	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit-Cotton Seed	0	0	0	0	0	0	0	0	0	0	0	0
Benefit-List	0	0	0	0	0	0	0	0	0	0	0	0
Power	0	0	0	0	0	0	0	0	0	0	0	0
Costs - Imports	0	0	0	0	0	0	0	0	0	0	0	0
Cost - Local	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Cost	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs	0	0	0	0	0	0	0	0	0	0	0	0
SC, Transport, etc	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - List	0	0	0	0	0	0	0	0	0	0	0	0
Net Capacity Effect	0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Ginners	0	0	0	0	0	0	0	0	0	0	0	0
<b>6. ADDITIONS (See Bio Plants)</b>												
Benefit - List	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit - Cotton Seed	0	0	0	0	0	0	0	0	0	0	0	0
Variable Standing Costs	0	0	0	0	0	0	0	0	0	0	0	0
Imports	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Net Variable Effect	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Costs	0	0	0	0	0	0	0	0	0	0	0	0
Repair & Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs	0	0	0	0	0	0	0	0	0	0	0	0
SC, Transport, etc	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - List	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect of Additions	0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Ginners	0	0	0	0	0	0	0	0	0	0	0	0
<b>7. CAPITAL COSTS</b>												
	0	1881	4028	7823	11772	16845	0	0	0	0	0	0
<b>8. NET BENEFIT</b>												
	0	1209	2842	3823	4172	4945	10013	11177	11212	11248	11284	11322
<b>9. INTERNAL RATE OF RETURN</b>												
	25.70%											

APPENDIX V

CASH FLOWS AT ECONOMIC PRICES







Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: Blue Nile & Suki Corporations - Case 9  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUGATTA-KASSAB &amp; SENNAR</b>												
Net Benefit	0	0	0	12	18	19	20	21	21	21	21	21
<b>2. SCARTO</b>												
Net Benefit	0	0	0	0	48	224	240	254	254	254	254	254
<b>3. HAMADNALLAH POWER</b>												
Net Benefit	0	0	0	0	0	25	28	30	30	30	30	30
<b>4. QUALITY EFFECTS</b>												
Benefit	0	0	0	48	283	1250	1342	1427	1427	1427	1427	1427
Variable Cost	0	0	0	4	19	78	83	88	89	88	88	88
Net Variable Effect	0	0	0	44	265	1172	1259	1339	1339	1339	1339	1339
Fixed Cost	0	0	0	5	13	44	44	44	44	44	44	44
Net Quality Effect	0	0	0	38	251	1128	1215	1295	1295	1295	1295	1295
<b>5. LABOUR SAVINGS</b>												
Benefit	0	0	0	0	6	60	64	68	68	68	68	68
<b>6. CAPACITY EFFECT</b>												
Benefit-Lint	0	0	0	2192	8854	14457	21331	28200	28332	28465	28597	28730
Net Benefit-Cotton Seed	0	0	0	232	928	1508	2204	2900	2900	2900	2900	2900
Ginning Variable Costs:												
Power	0	0	0	17	17	17	17	17	17	17	17	17
Costs - Imports	0	0	0	21	82	133	195	257	257	257	257	257
	0	0	0	30	122	198	289	381	381	381	381	381
Fixed Cost	0	1	15	38	166	166	166	166	166	166	166	166
Other Variable Costs												
SC, Transport, etc	0	0	0	831	3322	5399	7891	10383	7391	7891	7891	7891
Marketing Expenses - Lint	0	0	0	288	1164	1900	2803	3705	3722	3739	3757	3774
Net Capacity Effect	0	-1	-15	1199	4909	8152	12174	16192	18800	18915	19030	19146
Benefit To Ginnery	0	0	-2	120	491	815	1217	1619	1880	1891	1903	1915
<b>7. ADDITIONS (Saw Gin Plant)</b>												
Benefit - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit - Cotton Seed	0	0	0	0	0	0	0	0	0	0	0	0
Variable Ginning Costs												
Imports	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Net Variable Effect	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Costs:												
Repair & Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs												
SC, Transport, etc	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect of Additions	0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Ginnery	0	0	0	0	0	0	0	0	0	0	0	0
<b>8. CAPITAL COSTS</b>												
	0	775	662	948	3726	0	0	0	0	0	0	0
<b>9. NET BENEFIT</b>												
	0	-775	-664	-777	-2912	2271	2784	3286	3547	3559	3570	3582
<b>10. INTERNAL RATE OF RETURN 10.20%</b>												

Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: White Nile Corporation - Case A  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUGATTA - RABAK</b>													
Net Benefit		0	0	0	4	9	22	22	23	23	23	23	23
<b>2. SCARTO</b>													
Net Benefit		0	0	0	0	93	234	244	304	304	304	304	304
<b>3. DUEIM POWER</b>													
Net Benefit		0	0	0	0	0	0	29	31	31	31	31	31
<b>4. QUALITY EFFECTS</b>													
Benefit		0	0	0	0	386	1085	1000	893	893	893	893	893
Variable Cost		0	0	0	0	28	85	83	78	78	78	78	78
Net Variable Effect		0	0	0	0	358	1001	917	815	815	815	815	815
Fixed Cost		0	0	0	50	90	90	90	90	90	90	90	90
Net Quality Effect		0	0	0	-50	268	911	827	725	725	725	725	725
<b>5. LABOUR SAVINGS</b>													
Benefit		0	0	0	0	22	79	83	82	82	82	82	82
<b>6. CAPACITY EFFECT</b>													
Benefit-Lint		0	0	0	1096	17042	30688	36817	44435	44645	44855	45065	45275
Net Benefit-Cotton Seed		0	0	0	116	1598	2762	3114	3754	3754	3754	3754	3754
Ginning Variable Costs:													
Power		0	0	0	0	24	22	20	18	18	18	18	18
Costs - Imports		0	0	0	15	268	498	621	744	744	744	744	744
Cost - Local		0	0	0	10	181	337	423	455	455	455	455	455
Fixed Cost		0	0	0	0	236	236	236	236	236	236	236	236
Other Variable Costs													
SC,Transport,etc		0	0	0	416	6112	10793	12562	15110	15110	15110	15110	15110
Marketing Expenses - Lint		0	0	0	39	585	1045	1239	1497	1504	1511	1517	1524
Net Capacity Effect		0	0	0	732	11234	20518	24830	30129	30332	30535	30738	30941
Benefit To Ginnery		0	0	0	73	1123	2052	2483	3013	3033	3053	3074	3094
<b>7. ADDITIONS (Saw Gin Plant)</b>													
Benefit - Lint		0	0	0	0	0	0	0	12179	12237	12294	12352	12410
Net Benefit - Cotton Seed		0	0	0	0	0	0	0	876	876	876	876	876
Variable Ginning Costs													
Imports		0	0	0	0	0	0	0	212	212	212	212	212
Local		0	0	0	0	0	0	0	145	145	145	145	145
Net Variable Effect		0	0	0	0	0	0	0	12698	12756	12813	12871	12929
Fixed Costs:													
Repair & Maintenance		0	0	0	0	0	0	179	179	179	179	179	179
Other		0	0	0	0	0	0	79	79	79	79	79	79
Other Variable Costs													
SC,Transport,etc		0	0	0	0	0	0	0	6466	6466	6466	6466	6466
Marketing Expenses - Lint		0	0	0	0	0	0	0	479	479	479	479	479
Net Effect of Additions		0	0	0	0	0	0	-258	5496	5554	5611	5669	5727
Benefit to Ginnery		0	0	0	0	0	0	-26	550	555	561	567	573
<b>8. CAPITAL COSTS</b>													
		0	882	0	1782	6346	109	4592	0	0	0	0	0
<b>9. NET BENEFIT</b>													
		0	-882	0	-1755	-4830	3189	-929	4728	4754	4780	4806	4832
<b>10. INTERNAL RATE OF RETURN</b>													
		34.89%											

Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: White Nile Corporation - Case B  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. LUGATTA - RABAK</b>												
Net Benefit	0	0	0	4	9	22	24	25	25	25	25	25
<b>2. SCARTO</b>												
Net Benefit	0	0	0	0	82	193	207	219	219	219	219	219
<b>3. DUEIM POWER</b>												
Net Benefit	0	0	0	0	0	0	21	23	23	23	23	23
<b>4. QUALITY EFFECTS</b>												
Benefit	0	0	0	0	505	1437	1544	1630	1630	1630	1630	1630
Variable Cost	0	0	0	0	32	90	97	103	103	103	103	103
Net Variable Effect	0	0	0	0	474	1347	1447	1528	1528	1528	1528	1528
Fixed Cost	0	0	0	50	90	90	90	90	90	90	90	90
Net Quality Effect	0	0	0	-50	384	1257	1358	1438	1438	1438	1438	1438
<b>5. LABOUR SAVINGS</b>												
Benefit	0	0	0	0	19	64	68	72	72	72	72	72
<b>6. CAPACITY EFFECT</b>												
Benefit-Lint	0	0	0	1096	17708	28914	40416	49631	49865	50098	50331	50565
Net Benefit-Cotton Seed	0	0	0	116	1856	3016	4176	5104	5104	5104	5104	5104
Ginning Variable Costs:												
Power	0	0	0	0	19	17	15	13	13	13	13	13
Costs - Imports	0	0	0	15	244	396	548	670	670	670	670	670
Cost - Local	0	0	0	10	162	263	364	445	445	445	445	445
Fixed Cost	0	0	0	0	236	236	236	236	236	236	236	236
Other Variable Costs												
SC,Transport,etc	0	0	0	416	6658	10819	14980	18308	18308	18308	18308	18308
Marketing Expenses - Lint	0	0	0	39	624	1019	1424	1749	1757	1765	1773	1781
Net Capacity Effect	0	0	0	732	11622	19180	27025	33313	33538	33764	33989	34214
Benefit To Ginnery	0	0	0	73	1162	1918	2702	3331	3354	3376	3399	3421
<b>7. ADDITIONS (Saw Gin Plant)</b>												
Benefit - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Benefit - Cotton Seed	0	0	0	0	0	0	0	0	0	0	0	0
Variable Ginning Costs												
Imports	0	0	0	0	0	0	0	0	0	0	0	0
Local	0	0	0	0	0	0	0	0	0	0	0	0
Net Variable Effect	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Costs:												
Repair & Maintenance	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs												
SC,Transport,etc	0	0	0	0	0	0	0	0	0	0	0	0
Marketing Expenses - Lint	0	0	0	0	0	0	0	0	0	0	0	0
Net Effect of Additions	0	0	0	0	0	0	0	0	0	0	0	0
Benefit to Ginnery	0	0	0	0	0	0	0	0	0	0	0	0
<b>8. CAPITAL COSTS</b>												
	0	882	0	1782	6346	109	0	0	0	0	0	0
<b>9. NET BENEFIT</b>												
	0	-882	0	-1755	-4689	3345	4380	5108	5131	5153	5176	5198
<b>10. INTERNAL RATE OF RETURN</b>												
	44.70%											



Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: New Halfa Corporation  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
<b>1. QUALITY EFFECTS</b>												
Price	0	0	1442	1505	1505	1505	1505	1505	1505	1505	1505	1505
Variable Cost	0	0	69	72	72	72	72	72	72	72	72	72
Net Variable Effect	0	0	1372	1433	1433	1433	1433	1433	1433	1433	1433	1433
Fixed Cost	0	0	10	10	10	10	10	10	10	10	10	10
Net Quality Effect	0	0	1363	1423	1423	1423	1423	1423	1423	1423	1423	1423
<b>2. CAPACITY EFFECT</b>												
Benefit-Lint	0	972	5887	9861	9957	11005	12121	12179	12237	12294	12352	12410
Benefit-Cotton Seed	0	73	438	730	730	803	876	876	876	876	876	876
Ginning Variable Costs:												
Power	0	0	6	5	5	5	5	5	5	5	5	5
Costs - Imports	0	0	106	177	177	195	212	212	212	212	212	212
Cost - Local	0	0	62	103	103	113	123	123	123	123	123	123
Fixed Cost	0	0	10	10	10	10	10	10	10	10	10	10
Other Variable Costs												
SC, Transport, etc	0	321	1927	3212	3212	3533	3854	3854	3854	3854	3854	3854
Marketing Expenses	0	0	241	403	407	449	494	496	497	499	501	503
Net Capacity Effect	0	723	3974	6680	6773	7503	8298	8354	8410	8466	8522	8578
Benefit To Ginnery	0	72	397	668	677	750	830	835	841	847	852	858
<b>3. CAPITAL COSTS</b>												
	0	1652	169	0	0	0	0	0	0	0	0	0
<b>4. NET BENEFIT</b>												
	0	-1580	1591	2091	2100	2173	2253	2259	2264	2270	2275	2281
<b>5. INTERNAL RATE OF RETURN</b>												
	116.19%											



Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: TOKAR  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995-2010
1. SCARTO												
Net Benefit	0	0	15	15	17	17	20	20	20	20	20	20
2. CAPITAL COSTS	0	4	0	0	0	0	0	0	0	0	0	0
3. NET BENEFIT	0	-4	15	15	17	17	20	20	20	20	20	20

Project: SUDAN COTTON

Document: Economic Appraisal - Constant Prices

Producing Corporation: Nuba Mountains Corporation

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
<b>1. QUALITY EFFECTS</b>												
Price	0	0	0	123	307	468	699	699	699	699	699	699
Variable Cost	0	0	0	24	59	90	135	135	135	135	135	135
Net Variable Effect	0	0	0	99	248	377	564	564	564	564	564	564
Fixed Cost	0	0	0	6	12	17	22	22	22	22	22	22
Net Quality Effect	0	0	0	94	235	361	542	542	542	542	542	542
<b>2. CAPACITY EFFECT</b>												
Benefit-Lint	0	0	0	0	0	0	1558	7823	7862	7898	7937	7972
Benefit-Cotton Seed	0	0	0	0	0	0	156	780	780	780	780	780
Ginning Variable Costs:												
Power	0	0	0	0	0	0	0	1	1	1	1	1
Costs - Imports	0	0	0	0	0	0	35	174	174	174	174	174
Cost - Local	0	0	0	0	0	0	23	115	115	115	115	115
Fixed Cost	0	0	5	9	17	22	22	22	22	22	22	22
Other Variable Costs												
SC, Transport, etc	0	0	0	0	0	0	400	2000	2000	2000	2000	2000
Marketing Expenses	0	0	0	0	0	0	78	389	391	392	394	395
Net Capacity Effect	0	0	-5	-9	-17	-22	1156	5903	5940	5974	6011	6045
Benefit To Ginnery	0	0	-1	-1	-2	-2	116	590	594	597	601	604
<b>3. CAPITAL COSTS</b>												
	0	309	472	392	1268	559	0	0	0	0	0	0
<b>4. NET BENEFIT</b>												
	0	-309	-473	-299	-1034	-200	658	1132	1136	1140	1143	1147
<b>5. INTERNAL RATE OF RETURN 27.22%</b>												

Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Producing Corporation: Mechanised Farming Corporation - Dazazin  
 ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

Year: 0 1 2 3 4 5 6 7 8 9 10 11-26  
 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995

2. CAPACITY EFFECT

Benefit-Lint	0	0	0	0	768	771	779	782	786	790	794	797
Benefit-Cotton Seed	0	0	0	0	78	78	78	78	78	78	78	78
Ginning Variable Costs:												
Power	0	0	0	0	0	0	0	0	0	0	0	0
Costs - Imports	0	0	0	0	17	17	17	17	17	17	17	17
Cost - Local	0	0	0	0	1	1	1	1	1	1	1	1
Fixed Cost	0	0	0	0	0	0	0	0	0	0	0	0
Other Variable Costs												
SC, Transport, etc	0	0	0	0	198	198	198	198	198	198	198	198
Marketing Expenses	0	0	0	0	38	38	39	39	39	39	39	40
Net Capacity Effect	0	0	0	0	591	594	602	605	609	612	616	619
Benefit To Ginnery	0	0	0	0	59	59	60	60	61	61	62	62

3. CAPITAL COSTS

	0	291	93	0	0	0	0	0	0	0	0	0
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4. NET BENEFIT

	0	-291	-93	0	59	59	60	60	61	61	62	62
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5. INTERNAL RATE OF RETURN

12.02%



Project: SUDAN COTTON  
 Document: Economic Appraisal - Constant Prices  
 Grading & Testing

ALL COSTS IN THOUSANDS OF SUDANESE POUNDS UNLESS OTHERWISE SPECIFIED

	Year:	0	1	2	3	4	5	6	7	8	9	10	11-26
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1195-2010
1. Repair & Maintenance		0	45	68	68	68	68	68	68	68	68	68	68
2. Capital Costs													
Grading & Testing Centre		0	341	566	0	116	0	0	0	0	0	0	0
Training & Technical Assistance		18	43	184	201	73	95	56	0	0	0	0	0
ARC Cotton Research Laboratory		0	440	0	0	0	0	0	0	0	0	0	0
3. Total Costs		18	869	818	269	257	163	124	68	68	68	68	68

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APPENDIX VI

SUMMARY CASH FLOWS AT ECONOMIC PRICES