GAZANKULU DEPARTMENT OF AGRICULTURE AND FORESTRY
REF. 6/8/3-2-7

HOXANI IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II
"DEVELOPING A PROJECT CONCEPT"
THIRD INTERIM REPORT

OCTOBER 1989

ADDENDUM : JUNE 1990
ADDENDUM : AUG. 1990
LETTER : 90/11/13

DBSA PROJECT LEADER : G. MASHILE

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GAZANKULU DEPARTMENT OF AGRICULTURE AND FORESTRY

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I N D E X

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THIRD INTERIM REPORT

SUMMARY

The consultants are presenting the Steering Committee in this further interim study report with a preliminary proposal of a water distribution scheme together with costings and how the provision of water will influence the financial position of participating farmers. Based on typical farming models obtained during the Phase I part of the study it appears that farmers will benefit financially should such development proposals be implemented. These proposals are conceptual and refinements thereto will have to be done, (if needed to prove financial viability) during study phase III. Detailed optimisation is normally only required during the design phase; the latter falling outside the normal scope of this preparatory study.

This study further covers a number of outstanding items brought forward from study phase I, as well as proposals from the DBSA technical team for possible optimisation of the water distribution system.

If the proposals contained herein meet the approval at the next Steering Committee meeting arranged for 89-11-15, further studies into the full financial and economic implications as well as institutional arrangements that are required in order to implement the proposals, can proceed; namely study phase III.

GAZANKULU DEPARTMENT OF AGRICULTURE AND FORESTRY

HOXANI IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME
PREPARATORY STUDIES PHASE II
"DEVELOPING A PROJECT CONCEPT"

THIRD INTERIM REPORT

1. INTRODUCTION

1.1 General

Phase I of the preparatory studies has now been completed after acceptance of the Report (herein referred to as the July '89 Report) by the Steering Committee on 89-07-11 at a meeting held at Mkhuhlu.

This further report now cover descriptions, proposals and findings that have been prepared to comply with the Phase II part of the study in which various development proposals are to be conceptualised; all in terms of the project requirements as described in Annexures 3 and 4 of the July '89 Report.

1.2 Scope

1.2.1 At the above meeting a number of outstanding items were presented for attention in the proposed studies for Phase II. These items are scheduled in par. 4b) of Annexure 1.1.

1.2.2 In accordance with the terms of reference, the scope of study Phase II is primarily to solve technical problems in the provision of water in an appropriate farmer support program.

1.3 General extent of proposed scheme

1.3.1 It was found that 64 existing farm plots with a total nett area of 565ha plus a further 77ha, totalling a project extent of 642ha, could readily be developed.

Such development would be feasible within the constraint of the accepted regional irrigation development in the Sabie river catchment and an annual volume assurance of 98% for primary use and

80% for irrigation use of the annual low flow in the Sabie river to facilitate the minimum flow requirements of the K.N.P.

Run of the river water from the Sabie could be used with phased in augmentation from sewage effluent.

The above areas could not readily be increased using run of the river flow due to fixed commitments to other riparian users (RSA, Lebowa, Kangwane and downstream Gazankulu). The gross areal extent of irrigation in Hoxani's 'Sabie Irrigation' area could in future be increased if damming in one of the major tributaries, particularly the Saringwa river, is undertaken. This seems a better proposition than off-channel storage of surplus flow occurring in the Sabie river due again to the riverine commitments of such flows as well as the relative costs of such development. None of these two water source augmentation schemes have been studied in detail in this farmer support programme proposals mainly because it was considered to fall outside the defined scope of requirements.

1.3.2 The first draft interim report was tabled to S.C. on 89-09-27 at which meeting the consultants were requested to report on other alternatives of water supply. Notes on this meeting are contained in Annexure 1.2. A second draft interim report was then prepared for discussion purposes by the technical engineering members of GAZDAF, DBSA and EVN which convened in Pietersburg on 89-10-13, at which the following matters were agreed upon to be included in the (this) third interim report on Phase II:

a) <u>Availability of water from the Sabie run of the river flow</u>:
Short term and/or seasonal shortages of water is expected to occur from time to time which situation may require restrictions to irrigation water usage or reduction in cultivated land

areas during some years, particularly during the early Spring periods. Short to long term storage provision in the Sabie river, as proposed in the Sabie Basin Study, is assumed to be an accepted fact and any development described in this report can only be undertaken under such a pre-condition.

NB

Water augmentation schemes such as seasonal storage weirs in the Sabie river will have to be considered if the above storage schemes do not materialise in the near future. This technical committee therefore urges the authorities to expedite the proposed programme of further impounding schemes in the Sabie river.

The hydrological data on which the average availability of direct river flow was based, as described in Section 3 and Annexure 9 of the Phase I report, is acceptable.

b) The proposed communal pumped supply system is compatible with water supply under a F.S.P. programme because of the following circumstances at Hoxane:

i) Each farmer still has the choice to either pump from the pipeline traversing his land in order to reach the optimum sprinkler irrigation pumping head; to reach all extremities of is farming plot or to use gravity for in-land supply or surface gravity irrigation.

ii) The alternative of pumping directly from the river by each farmer is not practically feasible and is over costly.

c) Optimisation proposals

A number of optimisation proposals in order to improve the envisaged communal water supply system were tabled by Mr A. Wallace of the DBSA. These are further attended to in paragraph 2.4 of this report.

d) Incremental cost of supplying water to new plots:

On request by the DBSA, the following cursory estimates were made in order to determine the incremental costs of supplying water to the nearby presently undeveloped irrigable blocks.

	Ten Farms		Cork	
	Including Block TF'A' (Given)	Excluding Block TF'A' and by pumping directly into system	Including Blocks CS 'A'&'B' (Given)	Excluding Blocks CS'A' & 'B'
Area (ha)	231	180	133	121
. Main supply pipeline costs	R 660 000	R 580 000	R 430 000	R 382 000
. Pump station and ancillary	R1 180 000	R 900 000	R 630 000	R 608 000
	R1 840 000	R1 480 000	R1 060 000	R 990 000
Cost per ha	R7 965	R8 222	R7 970	R8 181
Incremental advantage of including block(s)		R257/ha		R211/ha

From the above cost values it can therefore be concluded that it is financially feasible to include the nearby blocks of land into the proposed development plan.

The incremental cost of supplying Mkhuhlu plot no. 10 (Tribal Authority) was not determined because the supply of water to this plot is deemed to be a fixed requirement of the overall development of the scheme.

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HOXANE IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

Review of matters that were discussed and agreed upon during a meeting on 89-07-11 at Mkhuhlu.

1. **ATTENDANCE**

GAZDAF

P. v.d. Merwe
P.T. de Witt
I.N. Mdaka
Z.B. Mohlaba
A.M. Matukane
M.K. Silinda
P. Terwin

DBSA

G. Mashile
P. Mkalipe
N.J. Jooste
W. Pretorius
J. Swart
J.W. Sauermann

Ngonini Co-op

J.M. Shirindzi
M.S. Baloyi
B.M. Ngomane

Hoxane Tribal Authorities

S.A. Manzini
P.M. Mabuza

Eksteen, Van der Walt & Nissen

A.O. Eksteen
A. Myburgh

2. PURPOSE OF MEETING

To discuss the information presented by the study consultants Messrs. Eksteen, Van der Walt and Nissen in their second report on Phase I tabled in July, 1989.

3. Mr Eksteen presented the meeting with a general description of the work that was done to date and explained the extent of the proposed scheme. A number of questions were raised:

a) Mr J.W. Sauermann: whether off-channel storage will be considered as an additional source of water. Mr Eksteen replied that this matter would be investigated during Phase II.

b) On a question by Mr. Matukane, Mr Eksteen replied that the sophistication of the proposed scheme would be limited to proper management and control, but that normal simplified infield practices would be applied so that existing farmers could be accommodated.

c) Mr Sauermann raise the question if the proposed extension of the existing scheme by approximately 200ha is acceptable to the Tribal Authority in which Mr Manzini (representing the Tribal Authority at the meeting) replied that it has already been accepted and that the development proposals of the scheme in this regard must proceed as such. He also stated that the use of sprinkler irrigation systems may be accepted as a design parameter and that those farmers that still favours flood irrigation will be coaxed into the use thereof in time to come. This need not affect the present studies. The tribal authority will be approached in time to determine the allocation of new lands and this aspect will be dealt with as a separate issue.

4. The project leader, mr G. Mashile thereupon made the following comments and recommendations which were all accepted by the meeting:

a) The report on Phase I is accepted and work on Phase II can now commence in accordance with the Terms of Reference.

b) The following should be included in the further studies:

		Attention
i)	Clear proposal in respect of improving (training) the literacy of the existing farmers	GAZDAF
ii)	Definition of constraints of soils on irrigation system and crop types	EVN
iii)	Constraints in the use of sewage effluent in respect of the following:	
	. Soils	EVN
	. Types of crops that can be cultivated	a) GAZDAF b) DBSA (J. Swart)
iv)	More clarification and information including financial analysis is needed on the Ngonini Co-operative	GAZDAF (A Matukane)
v)	A planning statement must be sought in which the proposed development extent of the Mkhuhlu industrial area is defined.	GAZDAF/ EVN
vi)	The possible linkage of the industrial area to the irrigation scheme must be evaluated.	EVN/ (SJ de Swardt)
vii)	The marketing potential of the scheme must be investigated.	EVN/ (SJ de Swardt)

Notes originally prepared by A.O. Eksteen; altered on request by the S.C. on their meeting of 89-09-27.

2. PURPOSE OF MEETING

To discuss the information presented by the study consultants on their first interim report on Phase 2 of August 1989.

3. PREVIOUS MEETING

The representation of matters that were discussed during the S.C. meeting of 89-07-11, as represented in Annexure 1.1 of the first interim report, was altered by the meeting in so far as omitment of par. 5a) dealing with discussions between GAZDAF and farmers.

4. INTERIM MEETINGS

Since the last S.C. meeting two interim meetings were held namely:

a) A meeting between GAZDAF and the local farmers on 89-08-10 (see annexure 2.4 for minutes, as revised , of this meeting)

: Mr v.d. Merwe explained that the purpose of this meeting was to inform the local farmers on the general progress of this study as well as to discuss general policy matters that may have an influence on the farmers once the scheme is upgraded. Mr Manzini concurred that the meeting dealt with general principles only and that no commitments by GAZDAF or DBSA were determined.

b) An informal meeting in the form of a site orientation visit by the project leader and new technical members of the DBSA project team was undertaken on 89-09-07. This visit was also attended by Messrs. v.d. Merwe and de Witt of GAZDAF and EVN's mr Myburgh. Various alternative water supply scenarios were discussed between the various parties but without any firm proposals being made; the visit having been of a reconnaissance nature only.

5. PRESENTATION OF FIRST INTERIM REPORT

a) The project team informed the meeting that the water supply proposals contained in the report are unacceptable if alternatives are not presented as called for in note 3.3.2 of the project description whereupon mr Eksteen explained that alternatives were evaluated but were not detailed. The meeting decided that a discussion meeting between the technical members of each party should be held (89-10-13) and that EVN should prepare a more detailed presentation of various possible alternatives of water supply. After agreement is reached the proposals will be included in the next interim report for presentation to the S.C.

b) Mr Jooste informed the consultants of revised financial parameters to be used.

c) Mr Meyer described training requirements.

d) Mr Oosthuizen indicated that the marketing study may not cover the requirements sufficiently whereupon mr de Swardt explained that the extent of the study was determined by available funding thereof.

e) DBSA requested GAZDAF to provide a written statement that the Ngonini Coop could remain at Mkhuhlu.

f) DBSA informed the meeting that a schedule of outstanding issues would be presented at the next S.C. meeting.

6. NEXT MEETING

89-11-15 at 10:00 at Mkhuhlu training centre.

Minuted by A. Myburgh

2. IRRIGATION COMPLEXES : A PROPOSED DEVELOPMENT PLAN

2.1 General

The proposed improved Hoxani irrigation development is a run-of-the-river scheme in which the following alternatives do not feature:

a) Impounding works in the river being either large storage or seasonal or sub-seasonal balancing storage in the form of barrages or otherwise.

b) Off-channel storage.

Water supply to the riparian lands on the 22km river reach between Calcutta and Cork could therefore be by direct abstraction in one of the following ways:

a) River canal with abstraction site on Mangwazi, 1,35km upstream of the Hazyview-Mkhuhlu road bridge. The canal route is critical in respect of vertical as well as horizontal alignment in order to surpass major topographical and physical obstacles such as the railway line and residential settlement.

Alternatives to river abstraction sites are limited due to the above mentioned critical alignment. Pumping from the river into the canal is likewise not recommended.

Advantages of such a scheme are:

- little infringement on riverine vegetation and access particularly i.r.o. the Kruger National Park.
- Limited energy requirements to supply water from the source to the farming lands.
- Simplified water control and management within an inherent feature of water saving.
- Each farmer can abstract directly from the canal on an individual basis.

b) Individual pumping from the river to each farmplot

This alternative would comprise more than sixty individual pumping installations with the feature of giving each farmer the choice of his own i.r.o. water supply. In a FSP such a choice could be ideal were it not for the following disadvantages:

. Encroachment into the Kruger National Park.
. Multiplication of abstraction problems such as damages by wild animals, water control and management (inherent feature of water wastage), utilization of unsuitable abstraction sites to the detriment of good engineering etc.
. High energy requirements.

Such a pumping abstraction scheme can either be with diesel or electric prime movers and each of these sub-alternative is considered further herein.

c) Pumping abstraction at limited sites in order to achieve the most optimum relationship in respect of energy requirements and limited entrance into the riverine environment and K.N.P. Such a scheme comprises of communal abstraction and distribution and has the following advantages:

. Good control of water with limited management and inherent feature of water saving.
. Pressurized water supply to most of the farmplots allowing farmers to abstract water at his own requirement i.r.o. either sprinkler or flood irrigation.

d) A further option of water supply wherein water is to be pumped directly into five communal systems, have, on the request of the DBSA technical team, been included in this report. Discussions on this optimisation of the above three-pump system is contained in paragraph 2.4 herefollowing.

e) No further alternatives are considered to be feasible for the Hoxani irrigation scheme. Optimisation of any of the proposals are however possible, but which aspect would normally be done during subsequent study or design phases.

2.2 Cost Comparison

Details of each of three alternatives (defined in par. 1.1) are contained in the Annexures 2.1 to 2.5. The same assumptions and parameters apply to each alternative so that comparisons have the same basis. In Annexure 2.6 a comparison is made of the cost of each alternative, summarized as follows:

	Three pump	Individual Pumps		Canal
		Diesel	Electric	
Project cost	R5,120M	R4,407M	R4,775M	R10,120M
Energy requirements	690kW	940kW	840kW	320kW
Annual costs				
: Maintenance	R 73 600	R116 600	R105 900	R 97 400
: Energy	R162 500	R338 400	R197 800	R 91 700
: Water control	R 24 000	R 16 000	R 16 000	R 16 000
Subtotal	**R260 100**	**R471 000**	**R319 700**	**R 205 100**
: Capital repayment	R558 000	R539 400	R560 800	R1 060 000
TOTAL	**R818 100**	**R1 010 400**	**R880 500**	**R1 265 100**
Rating : %	1,00	1,24	1,08	1,55
: Order	1	3	2	4

The annual costs of the three pump system is therefore financially the most feasible and the individual pump installation system where electricity is used the second most feasible. If the major disadvantage of a multipump river abstraction system is taken into consideration, namely encroachment into the environmental sensitive precincts of the Sabie riverine area and K.N.P., the first alternative is recommended. This alternative is therefore further described herefollowing as the proposed layout.

2.3 Proposed Development Plan

2.3.1 General

The Sabie Irrigation Scheme has been divided into three complexes based on a separate bulk water supply to each. In these systems two new river abstraction sites (one on Ten Farms and one at the present Seholokoane canal abstraction site) and the existing one at Cork feature. The three water supply complexes form natural geographic and geometric units.

These complexes have been designated as follows (referenced to locality of the river abstraction site):

a) Ten Farms Complex
b) Seholokoane Complex
c) Cork Complex

Details of the conveyor (piped and canal supplies) are given in Annexure 2.1; with details of the extents and costs given in Annexures 2.2 & 2.3. The layout of the proposed water supply mains, pump stations and pipe terminals are given on the 1:5 000 orthophoto maps referenced 8723.2.1 -.3.

2.3.2 Ten Farm Complex: Ten Farms, Big Bend and Mkhuhlu West: Bulk Water Supply (231ha; 280 l/s)

It was found in previous work that water conveyor costs are cheaper where piped supplies are used for supply to areas up to some 130ha (350 dia pipe) and a canal supply for larger areas.

The Ten Farms area and layout are such that piped supplies would be cheaper; which system has further inherent advantages.

The piped supply flow is based on an open end terminal at the highest point in the supply system (i.e. RL 456 on plot TF'A') and closed terminals at secondary branch ends.

The prominent high spot on Ten Farms (opposite Willie Mnisi's plot 7) make the placing of a river pump installation the closest thereto an obvious choice. Such a site is further in a suitable topographical command position in respect of Ten Farms, Big Bend and the nearby farm plots (no.'s 1 to 4) of Mkhuhlu.

2.3.3 Seholokoane Complex : Mkhuhlu East, Seholokoane and Upper Cork (278ha; 330 l/s)

The land area in this Complex lies opposite to the Kruger National Park with the Park fence being on the left river bank. The existing abstraction site is, also taking the above situation in consideration, deemed to be the most suitable, also in respect of the close proximity to the local highest point of possible discharge, namely the Seholokoane koppie about 1km distant. This command position is situated in the middle of the complex from where gravity feed piped systems will supply water under adequate pressure for sprinkler irrigation to all the farm plots excepting four, as shown in the tabulation 1.2, Annexure 2.1.

The available water from the future Mkhuhlu sewage treatment plant (refer to paragraph 2.8 of the July 1989 Report) has been excluded from the proposed river abstraction supply scheme because of the relative uncertainty of the volumes of available treated effluent and the growth thereof in time. Effluent can however be quite readily incorporated into the irrigation scheme by either of the following methods:

a) Substituting the river waterflow with effluent flow by simply using less water from the piped supply line (this is the advantage of a closed conveyor system).

b) Extending within the existing plot boundaries, the irrigable lands on Mkhuhlu plots 8 and 9 and Seholokoane plot 1 each with 5ha and a further 15ha on say the Hoxani Tribal Authority plot to accommodate future sewage effluent.

c) Extending the irrigable area outside of the existing irrigation scheme boundary gradually from 12ha up to 40ha as described in par. 2.8 of the July Report.

d) A combination of the above 3 options.

We propose that for the purpose of this farming support programme the sewage effluent not be taken in direct consideration when determining the viability of the project because of the uncertain and small financial influence thereof.

2.3.4 Cork Complex : Cork Scheme and Extensions thereto (133ha; 160 l/s)

The existing Cork Irrigation Scheme comprise of 18 farm plots with an average area of 6,7ha and a further 2 blocks of land some 12ha in extent that could be added; in all totalling 133ha. The layout of this irrigation block is such that pumped water supply from the existing river abstraction point could be done directly into the scheme thereby providing a pressure system for the entire layout in lieu of the existing pump scheme with open gravity supply to the various plots. A closed supply system had to be used because of a lack of a suitable highlying spot closeby which could facilitate an open supply end as for the other two complexes. We consider that the existing water distribution system comprising concrete furrows and 2 unlined leidams be abandoned because of the following:

a) A pressurised field edge water supply cannot be achieved.

b) Maintenance on these has become a major requirement.

c) The lining of the leidams in order to reduce seepage and the resulting water logging of the nearby lands, would be costly.

d) It has already been established that the soils of the area require that sprinkler irrigation should be practised which method has also the preference of the farmers.

2.3.5 Infield Development requirement

Annexure 2.3 contains a general description with estimated costs of the various items required to upgrade the existing farm plots and extensions to accommodate the proposed improved water supply thereto comprising:

a) New fences and roads or improvement to the existing where required.

b) Land deforestation and appurtenant.

c) Surface stormwater measures.

d) Infield subsurface and surface pipework.

2.3.6 Capital Estimates for a reconnaissance layout

	REFERENCE	TEN FARMS (231ha)	COMPLEX SEHOLOKOANE (278ha)	CORK (133ha)	TOTAL CAPITAL DEVELOPMENT (642ha)
MAIN INFRASTRUCTURE					
Irrigation bulk water supply					
a) Main supply piping to field edge	Annexure 2.2 par. 2.1	R 660 000	R 980 000	R 430 000	R2 070 000
b) Pump station and discharge sump	Annexure 2.2 par. 2.2	R1 180 000	R1 240 000	R 630 000	R3 050 000
					R5 120 000
Improvement of access road from existing nearby tarred road to river pump station and discharge command sump		R 240 000	R 320 000	R 50 000	R 610 000
		R2 080 000	R2 540 000	R1 110 000	R5 730 000
(Cost per ha)		(R9004)	(R9137)	(R8345)	(R8925)
INFIELD DEVELOPMENT COSTS					
Land and General improvements	Annexure 2.3 par. 3.1	R 270 000	R 230 000	R 90 000	R 590 000
Sprinkler irrigation layout	Annexure 2.3 par. 3.2	R 710 000	R 850 000	R 410 000	R1 970 000
		R 980 000	R1 080 000	R 500 000	R2 560 000
(Cost per ha)		(R4242)	(R3885)	(R3759)	(R3988)

2.3.7 Annual Irrigation costs

2.3.7.1 **Cost Evaluation**

During a recent meeting (89-03-08) at Giyani between GAZDAF and DBSA at which EVN was present, the following guidelines were determined in respect of irrigation costs to farmers; if applied to the study area giving the following:

a) Annual irrigation cost recovery from farmers (rounded off to the nearest R100)

i) Operating staff of pump houses and overall water bailiff function
@ R8000/locality x 3 : R24 000
(R37/ha)

ii) Maintenance cost on main infrastructure, weighted between the following rates
: Underground pipelines
0,75% p.a. (36%)
: Civil and electrical works
0,50% p.a. (48%)
: Pumping equipment
4,0% p.a. (16%)
: 1,15% x R5 730 000 : R65 900
(R103/ha)

iii) Maintenance costs on infield development.
: General improvement : Nil
(The farmer shall regularly maintain such improvements using farm labour)
: Subsurface piping
1,00% x R1196000 : R11 960
(R19/ha)

iv) Electricity

. Unit cost (@2400h/a and 3,2 c/kWh) for 690 kW	: R 53 000
. Demand @ 70%xR17/kVA/month @ 90% P.F.	: R109 500
	R162 500
	(R253/ha)

v) Land rental costs (to the Government in order to cover part of the infrastructural costs) were fixed at : R100/ha/a

TOTAL	R512/ha/a

At a meeting with the farmers on 89-08-10 the Department of Agriculture and Forestry intimated that the following annual charges (i.e. annual payments by farmer to the authorities) would be applicable to this project (refer item 3 of the Minutes included herein as Annexure 2.7)

. **Land Rental**		
To GAZDAF	: R60	
To tribal authority	: R40	R100
. Irrigation costs		R100
Subtotal		**R200/ha/a**

The above implies a subsidy of
R512 - R200 R312/ha/a

b) Annual irrigation farming expenses borne directly by the farmer; estimated as follows:

i) Redemption on nett costs of surface irrigation equipment (10%; 10 years; refer Mr N.J. Jooste 89-09-27)
: 16,27% x R774 000 : R125 900
(R196/ha)

ii) Maintenance on above

: 4% x R774 000	: R 31 000 (R48/ha)
	R244/ha/a

c) Affordability

The annual pumping expenses by the farmers in the sample taken during May 1989 (refer to Annexure 10 of the July 1989 Report) ranged between R114/ha to R425/ha where the higher costs were incurred by the more successful farmers. If maintenance and repayment of surface irrigation equipment is to be included (@ R244/ha), the above determined all inclusive annual cost of R756/ha/a could well prove to be affordable without subsidization; a matter which will be addressed in the farming cost benefit study.

2.3.8 Development programme and cashflow requirements in respect of irrigation layout

The following programme covers basically the construction costs to establish the primary infrastructural and infield irrigation layout as described in the preceding paragraphs. Maintenance and running costs as well as redemption costs are not included due to the recovery thereof from the farmer as irrigation payments (as described in par. 2.3.7). Construction is most likely not to commence before the second half of 1990 and as such forms the datum of the following 18 months construction and maintenance programme.

Period / Year	1990		1991		1992	
Half year	J-J	J-D	J-J	J-D	J-J	J-D
Actions						
a) Preparatory work and engineering design	0,10					
b) Construction including engineering and supervision		2,30	3,00	2,00	0,10	0,05
c) Retentions				0,30	0,30	0,14
SUBTOTALS	**0,10**	**2,30**	**3,00**	**2,30**	**0,40**	**0,19**
				TOTAL	**R8,92M**	
					======	
d) Escalation on unexpended sums	0,01	0,52	0,90	0,84	0,16	0,08
TOTALS	**0,11**	**2,82**	**3,90**	**3,14**	**0,56**	**0,27**
				TOTAL	**R10,8M**	
					======	

2.3.9 Acceptance of plan by Hoxani Farmers

The layout proposals contained in the above descriptions had been explained to the farmers of the Sabie Irrigation Scheme at a meeting held on 89-08-10 at Mkhuhlu. From the minutes of this meeting herein contained as Annexure 2.7, it can be concluded that although no preferences were stated, the general principles for the proposed infrastructural development are acceptable to all farmers.

2.4 Optimisation Options

2.4.1 Premise

The concerned technical officials of DBSA have pointed out (ref. par. 1.3.2c) that various optimisations to the layout costs can possibly be achieved if irrigation water is to be pumped directly into the communal water supply system and not to a command reservoir as proposed in the previous paragraph. The inherent benefit of ease of

water control where open storage is provided would then have to be sacrificed. The proposed alternative would comprise of the following system:

Independant pump installations for:

a) Ten Farms
b) Big Bend
c) Mkhuhlu/Seholokoane
d) Upper Cork
e) Cork

i.e. a five pump system instead of a three pump system.

2.4.2 Comparative Capital costs of a five pump system

The following cost summaries are based on the same layout and cost parameters used in the various water supply alternatives analysed in paragraphs 2.1 to 2.3.

Note: All costs include contingencies, P & G, establishment, engineering and supervision cost allowances.

	Three Pump System (Given)	Five Pump System
a) **Main supply pipelines**		
: Ten Farms		R 300 000
: Big Bend	R 660 000	R 270 000
: Mkhuhlu/Seholokoane	R 980 000	R 580 000
: Upper Cork		R 160 000
: Cork	R 430 000	R 430 000
	R2 070 000	**R1 740 000**
b) **River abstraction works, civil construction**		
: Ten Farms		R 206 000
: Big Bend	R 206 000	R 206 000
: Mkhuhlu/Seholokoane		R 206 000
: Upper Cork	R 206 000	R 206 000
: Cork	R 138 000	R 138 000
	R 550 000	**R 962 000**

c) **Pump station Mechanical/ Electrical**

: Ten Farms	(2 x 130kW)	(2 x 80kW)
		R 352 000
: Big Bend	R 572 000	(2 x 60kW)
		R 264 000
: Mkhuhlu/Seholokoane	(2 x 140kW)	(2 x 120kW)
		R 528 000
: Upper Cork	R 616 000	(2 x 50kW)
		R 220 000
: Cork	(3 x 50kW)	(3 x 50kW)
	R 330 000	R 330 000
	(690kW)	(770kW)
	R1 518 000	**R1 694 000**
d) Pump station buildings	(3no)	(5no)
	R 550 000	R 960 000
e) Power supply main	R 272 000	R 272 000
f) Discharge sumps	R 160 000	-
	R5 120 000	**R5 630 000**

2.4.3 Conclusion

From the above cursory evaluation of relative costs it seems that a five pump system is some 10% more costly to develop than a three-pump system. The energy requirements are also higher all indicating that at this preliminary evaluation stage it would be more feasible to use a three-pump system in determining the overall feasibility of the project. It remains important to note that optimisation of the three-pump system could well result in further analysis that more river pumps could well be considered especially if the sensitivity of the cost of pump stations and river abstraction works are analysed in detail for each abstraction site. More topographical, layout data as well as refinement of the design would however be needed for the latter confirmation.

Annexure 2.1

ALTERNATIVE 1 : THREE PUMP SYSTEM

BULK WATER SUPPLY CONVEYORS

1.1 TEN FARM COMPLEX (231ha; 280 l/s)

REFERENCE POINTS FROM	NETT AREA SERVED	FLOW (NOTE 1.2)	CONVEYOR DATA LENGTH	DIA.	HEAD LOSS m & (Vel.	HYDR. GRADE Hc (NOTE 1.1)	INFIELD POWER REQUIREMENT AVE. WATER HEAD H (NOTE 1.1)	POWER (NOTE 1.2)	REMARKS
	ha	l/s	m	mm	m/s)	m	m	kW	
TF'A'	51					456,0	19	16	STORAGE SUMP
- PLOTS 7/8 JUNCTION		61	700	250	5 (2,1)	461,0	N.A.		PIPE BRANCH
- PLOT 7	53	64	150	250	1,2 (1,3)	459,8	-	-	
- PLOT 6	40	48	300	200	4,2 (1,5)	455,6	-	-	
- PLOT 5	34	41	250	200	2,6 (1,3)	453,0	-	-	
- PLOT 4	26	31	250	200	1,6 (1,0)	451,4	-	-	
- PLOT 3	18	22	250	150	3,4 (1,2)	448,0	NOM.	5	
- PLOT 2	13	16	150	150	0,8 (0,7)	447,2	NOM.	5	
- PLOT 1	8	10	200	100	4,5 (1,3)	442,7	-	-	TERMINAL
PLOT 7/8 JUNCTION						461,0	N.A.		PIPE BRANCH
- PLOT 8	127	152	100	350	0,8 (1,6)	460,2			
- PLOT 9	121	145	250	350	1,7 (1,5)	458,5			
- PLOT 10	112	135	350	300	4,5 (1,9)	454,0	NOM.	5	
- BIG BEND PLOT B7	96	115	620	300	5,9 (1,6)	448,1	-	-	BRANCH
- PLOT B6	28	34	200	200	1,5 (1,1)	446,6	-	-	
- PLOT B5 B4	13	16	250	150	1,9 (0,7)	441,8	-	-	
- PLOT B3	5	6	100	100	0,9 (0,8)	440,9	-	-	

Annexure 2.1

REFERENCE POINTS FROM	NETT AREA SERVED	FLOW (NOTE 1.2)	CONVEYOR DATA LENGTH	DIA.	HEAD LOSS m & (Vel.	HYDR. GRADE Hc (NOTE 1.1)	INFIELD POWER REQUIREMENT AVE. WATER HEAD H (NOTE 1.1)	POWER (NOTE 1.2)	REMARKS
	ha	l/s	m	mm	m/s)	m	m	kW	
BIG BEND B7 JUNCTION						448,1			
- PLOTS B8 & TFB	65	78	400	250	4,2 (1,6)	443,9	- 24	- 5	
- PLOT B9	44	52	350	250	1,9 (1,1)	442,0	NOM.	5	BRANCH
- PLOT B10	10	12	300	150	1,3 (0,7)	440,7	-	-	TERMINAL
BIG BEND B9 JUNCTION						442,0			
- PLOT B11	27	32	250	200	1,6 (1,0)	440,4	-	-	
- PLOT B12 TF'C'	24	29	200	200	1,1 (0,9)	439,3			
- PLOT MKHUHLU NO. 1	16	19	1000	150	10,3 (1,1)	429,0	-	-	
- PLOT M2	12	15	250	150	1,7 (0,9)	427,3			
- PLOT M3 & M4	8	10	200	100	0,6 (0,6)	426,7	- -	- -	TERMINAL
TEN FARMS PLOTS 7/8 JUNCTION						461,0			
- RIVER PUMPSTATION	231	280	350	450	2,4 (1,8)	464,0	64m	250kW	

Annexure 2.1

NOTES:

1. POWER REQUIREMENTS AT FARM PLOT EDGE

1.1 Average water head H (m)

$$H = Hi - (Hc - (\frac{Hh + Hl}{2})$$

where Hc : Hydraulic grade level of supply conveyor.

Hh & Hl : Ground level at highest and lowest ends of plot, respectively.

Hi : Required field edge irrigation head (taken as 35m min. for a sprinkler system.

1.2 Power Requirement

kW = 14 HQ

with Pump efficiency of 70%

H : Average water head

Q : Plot flow m^3/s based on a mean unit flow of 1,2 l/s/ha.

Note:

A nominal minimum power requirement of 5kW has been accepted in cases where the residual hydraulic head on the highest point of the plot was found to be less than 20m.

1.2 SEHOLOKOANE COMPLEX (278ha; 320 l/s)

REFERENCE POINTS FROM	NETT AREA SERVED	FLOW (NOTE 1.2)	CONVEYOR DATA LENGTH	CONVEYOR DATA DIA.	CONVEYOR DATA HEAD LOSS m & (Vel.	HYDR. GRADE Hc (NOTE 1.1)	INFIELD POWER REQUIREMENT AVE. WATER HEAD H (NOTE 1.1)	INFIELD POWER REQUIREMENT POWER (NOTE 1.2)	REMARKS
	ha	l/s	m	mm	m/s)	m	m	kW	
SEHOLOKOANE KOPPIE						428,0			STORAGE SUMP
- PLOT S4	156	187	200	400	1,2 (1,5)	426,8	18	7	
- PLOT S3	135	162	200	400	0,9 (1,3)	425,9	NOM	5	
- PLOT S2	114	137	200	350	1,2 (1,4)	424,7	-	-	
- PLOT S1	104	125	200	350	1,1 (1,3)	423,6	-	-	
- PLOT 1A	88	106	200	350	0,8 (1,1)	422,8	NOM	5	
- HOXANI TA	81	97	300	350	1,0 (1,0)	421,8	21	15	
- PLOT M9	41	49	200	250	1,0 (1,0)	420,8	-	-	
- PLOT M8	33	40	300	250	1,0 (0,8)	419,8	-	-	
- PLOT M7	24	29	300	200	1,6 (0,9)	418,2	-	-	
- PLOT M6 &M5	11	14	300	150	1,8 (0,8)	416,4	-	-	TERMINAL
SEHOLOKOANE KOPPIE						428,0			STORAGE SUMP
- PLOT UC2	80	96	1900	300	13,0 (1,4)	415,0	-	-	
- PLOT UC1	27.5	22	350	200	2,5 (1,1)	412,5	-	-	
- PLOT UC1.A	14.5	18	200	150	1,9 (1,0)	410,6	-	-	
- PLOTS UC3 &UC4	7.5	9	200	100	3,7 (1,2)	406,9	-	-	TERMINAL
PLOT UC2						415,0			
- PLOT UC5	34.5	42	300	200	3,3 (1,3)	411,7	-	-	
- PLOT U6 B4	11.5	14	350	150	2,1 (0,8)	409,6	-	-	

Annexure 2.1

REFERENCE POINTS FROM	NETT AREA SERVED ha	FLOW (NOTE 1.2) l/s	CONVEYOR DATA LENGTH m	DIA. mm	HEAD LOSS m & (Vel. m/s)	HYDR. GRADE Hc (NOTE 1.1) m	INFIELD POWER REQUIREMENT AVE. WATER HEAD H (NOTE 1.1) m	POWER (NOTE 1.2) kW	REMARKS
SEHOLOKOANE KOPPIE						428,0			STORAGE SUMP
- PLOTS S5	236	284	550	450	3,8 (1,8)	431,8	-	-	BRANCH TO PLOT S6
- PLOT S6	22	27	450	200	2,2 (0,9)	429,6	-	-	
PLOT S6 JUNCTION						431,8			
- RIVER PUMPSTATION	278	330	450	450	4,2 (2,1)	436,0	61m	270kW	

1.3 CORK COMPLEX (133ha; 160 l/s)

REFERENCE POINTS FROM	NETT AREA SERVED ha	FLOW (NOTE 1.2) l/s	CONVEYOR DATA LENGTH m	DIA. mm	HEAD LOSS m & (Vel. m/s)	HYDR. GRADE Hc (NOTE 1.1) m	INFIELD HYDRAULIC DATA AT UPPER END OF PLOT NGL HEAD H (NOTE 1.1) m	AVAILABLE WATER HEAD m	REMARKS
JUNCTION C4						404,9	364	41	
&C5							377	28	
- PLOT C6	102	123	250	350	1,3 (1,3)	403,5	368	36	
- PLOTS C7	92	110	200	350	0,8	402,7	366	37	BRANCH TO CS'A'
&CS'A'		5	300	100	1,9	400,8	370	31	
- PLOT C8	75	90	500	300	3,1 (1,3)	399,6	363	37	
- PLOTS C9	63	76	250	300	1,1	398,5	360	39	BRANCH CS'B'
&CS'B'		10	350	150	1,1	397,4	361	36	
- PLOTS C10	50	60	200	250	1,4	397,3	358	39	
&C11					(1,2)		358	39	
- PLOTS C13	40	48	100	250	0,5	396,8	356	44	BRANCH TO
&C12		6	250	100	(1,0)		353	45	PLOT C12
- PLOT C14	30	36	150	250	0,4 (0,7)	396,4	353	43	
- PLOT C15	24	29	300	200	1,6 (0,9)	394,8	357	38	
- PLOT C16	20	24	300	200	1,2 (0,8)	393,6	358	36	
- PLOT C17	16	20	300	200	0,8 (0,7)	392,8	366	27	
- PLOT C18	9	11	200	150	0,8 (0,6)	392,0	367	25	TERMINAL
JUNCTION PLOTS C4/C5						404,9			
- PLOT C3	19	23	200	200	0,7 (0,7)	404,2	375	29	
- PLOT C2	13	16	200	150	1,5 (0,9)	402,7	376	27	
- PLOT C1	6	8	200	100	3,0 (1,0)	397,7	365	33	TERMINAL
JUNCTION PLOTS C4/C5						404,9			
- RIVER PUMPSTATION	133	160	300	400	1,3 (1,3)	407,0	H = 63m; 140kW	RBL 344	

Annexure 2.2

ALTERNATIVE 1 : THREE PUMP SYSTEM

IRRIGATION BULK WATER SUPPLY : INFRASTRUCTURAL REQUIREMENTS AND COSTS

2.1 Main supply piping to field edge

a) Pipeline construction costs

PIPE DIA	PRIMARY PIPE SELECTION	BUDGET UNIT COST	TEN FARMS COMPLEX (231ha)		SEHOLOKOANE COMPLEX (278ha)		CORK COMPLEX (133ha)	
			LENGTH	COST	LENGTH	COST	LENGTH	COST
mm		R/m	m	R	m	R	m	R
450	AC ID 18	R230	350	R80 500	1000	R230 000	-	-
400	AC ID 18	R190	-	-	400	R76 000	300	R57 000
350	AC ID 12	R130	350	R45 500	900	R117 000	450	R58 500
300	AC ID 12	R90	970	R87 300	1900	R171 000	750	R67 500
250	AC ID 12	R70	1600	R112 000	500	R35 000	450	R31 500
200	AC ID 12	R50	1150	R57 500	1400	R70 000	1100	R55 000
150	PVC 6	R45	2350	R105 750	850	R38 250	750	R33 750
100	PVC 6	R25	500	R12 500	200	R5 000	750	R18 750
	b) Nett Construction cost			R501 050		R742 250		R322 000
	c) Contingencies, Preliminary & General and Establishment costs (20% app.)			R99 950		R147 750		R64 000
	d) Engineering and Supervision (including disbursements) (10% app.)			R59 000		R90 000		R44 000
	TOTAL COSTS			R660 000		R980 000		R430 000
				(R2857/ha)		(R3525/ha)		(R3233/ha)

2.2 Pump Stations and Discharge Sump

DESCRIPTION	BUDGET UNIT CONSTRUCTION COST R/unit	TEN FARMS COMPLEX QUANTITY AND UNIT	TEN FARMS COMPLEX COST R	SEHOLOKOANE COMPLEX QUANTITY AND UNIT	SEHOLOKOANE COMPLEX COST R	CORK COMPLEX QUANTITY AND UNIT m	CORK COMPLEX COST R
a) River abstraction work (Civil construction)	-	sum	R150 000	sum	R150 000	sum	R100 000
b) Pump station		(280 l/s)	-	(330 l/s)	-	(160 l/s)	-
. Mechanical	R1 000	2x130 kW	R260 000	2x140 kW	R280 000	3x50kW	R150 000
. Electrical	R600	2x130 kW	R156 000	2x140 kW	R168 000		R90 000
. Building		sum	R150 000	sum	R150 000	sum	R100 000
c) Power Supply main	R30 000	3km	R90 000	3km	R90 000	0,7km	R21 000
d) Discharge sump		sum	R54 000		R62 000	-	-
e) Nett construction cost			R860 000		R900 000		R461 000
f) Contingencies, Preliminary General & Establishment cost (25% app.)			R210 000		R225 000		R114 000
d) Engineering and Supervision (including disbursements) (10% app.)			R110 000		R115 000		R55 000
TOTAL COSTS			R1 180 000		R1 240 000		R630 000

ALTERNATIVE 1 : THREE PUMP SYSTEM

INFIELD DEVELOPMENT COSTS

DESCRIPTION	BUDGET UNIT COST	TEN FARMS (231 ha)		SEHOLOKOANE (278 ha)		CORK (133 ha)	
		QUANTITY AND UNIT	AMOUNT	QUANTITY AND UNIT	AMOUNT	QUANTITY AND UNIT	AMOUNT
	R/unit		R		R	m	R
3.1 IMPROVEMENT OF EXISTING INFIELD LAYOUT							
a) Fencing	R6	8000m	R48 000	5000m	R30 000	4000m	R24 000
b) Internal roads	R6 000	10km	R60 000	12km	R72 000	km	R24 000
c) Surface stormwater control measures	R200	250ha	R50 000	280ha	R56 000	50ha	R10 000
d) Land deforestation, clearing and grubbing including ripping	R500	100ha	R50 000	50ha	R25 000	20ha	R10 000
e) Preliminary and general costs, establishment and contingencies	15-18%		R38 000		R27 000		R12 000
f) Engineering	10-13%		R24 000		R20 000		R10 000
Subtotals			R270 000		R230 000		R90 000
3.2 SPRINKLER IRRIGATION LAYOUT							
a) Subsurface piping	R1 200	231ha	R277 200	278ha	R333 600	133ha	R159 600
b) Surface Q.C. piping (80%)	R1 000	185ha	R185 000	220ha	R220 000	105ha	R105 000
c) Surface dragline sprinkler sprinkler system for orchards (20%)	R2 000	46ha	R92 000	58ha	R116 000	28ha	R56 000
d) Preliminary and general costs, establishment and contingencies	15%		R85 800		R100 400		R49 400
f) Engineering	10-11%		R70 000		R80 000		R40 000
Subtotals			R710 000		R850 000		R410 000
TOTAL COSTS			R980 000		R1 080 000		R500 000
(Cost/ha)			(R4242)		(R3885)		R3759)

ALTERNATIVE 2 **Annexure 2.4**

: **INDIVIDUAL FARM PLOT RIVER PUMP INSTALLATIONS** (Refer to notes)

2.1 WATERSIDE FARMS : SAMPLE OF 5 (43,5ha) OUT OF A TOTAL AREA OF 467ha

Sample no.		1	2	3	4	5	TOTAL
Locality		Ten Farms	Big Bend	Mkhuhlu	Upper Cork	Cork (non riverine)	
Plot no.		7	5	6	6	14	
Area		13ha	5ha	8ha	11,5ha	6,0ha	43,5ha
Supply flow (2)		15,6 l/s	6 l/s	9,6 l/s	13,8 l/s	7,2 l/s	
Levels (3)	Hr	402	399	381	354		
	Hh	440	412	397	388		
	Hl	410	409	386	361		
	Hp	64m	51m	50m	61m	35m	
Energy (4)	kWp	14	4,3	6,7	11,8	3,5	40,3kW
Costs(5) a)	Access	R 2 500	R 2 600	R 2 800	R 2 500	R 500	
b)	Corridor	R 600	R 2 500	R 2 500	R 2 500	R 600	
c)	Civil Works	R 5 000	R 6 000	R 5 500	R 5 000	R 2 000	
d)	Pump shelte	R 5 600	R 5 600	R 5 600	R 5 600	R 5 600	
e)	Mechanical	R 8 950	R 4 450	R 8 950	R 8 950	R 4 450	
f)	Pump	R 2 450	R 2 200	R 2 300	R 2 400	R 2 200	
g)	Supply	R 4 860 (90m)	R 3 630 (110m)	R 6 480 (120m)	R 6 760 120m)	R 500	
	Subtotal	R 29 960	R 26 980	R 34 130	R 33 710	R 15 850	
h)	Engine	R 20 540	R 8 860	R 16 140	R 20 490	R 5 380	
TOTAL (DIESEL)		R 50 500	R 35 840	R 50 270	R 54 200	R 21 230	R 212 040
i)	Motor	R 3 400	R 1 600	R 2 520	R 3 170	R 1 300	
	Switchgear	R 2 880	R 2 880	R 2 880	R 2 880	R 2 880	
	Transformer	R 4 030	R 4 030	R 4 030	R 4 030	R 4 030	
TOTAL (ELECTRIC)		R 40 270	R 35 490	R 43 560	R 43 790	R 18 960	R 182 070

Unit cost/ha Diesel R4 875

(For 43,5ha) Electric R4 185

Pump kW/ha : 0,93 kW/ha

2.2 FARMS DISTANT FROM WATER (SABIE RIVER OR CORK CANAL) : SAMPLE OF 4 (86ha) OUT OF A TOTAL AREA OF 175ha.

Sample no.		1	2	3	4	TOTAL
Locality		Ten Farms	Mkhuhlu	Seholo-koane	Upper Cork	
Plot no.		9	10	4	2	
Area		7ha	40ha	21ha	18ha	86ha
Supply flow		8,4 l/s	48 l/s	25,2 l/s	21,6 l/s	
Levels (3)	Hr	398	378	376	354	
	Hh	428	426	424	397	
	Hl	404	394	396	364	
	Hp	58m	74m	76m	68m	
Energy (4)	kWp	7	50	27	21	105kW
Costs(5) a)	Access	R 2 700	R 3 000	R 2 900	R 3 400	
b)	Corridor	R 2 500	R 2 500	R 2 500	R 2 500	
c)	Civil Works	R 6 000	R 9 500	R 7 000	R 8 500	
d)	Pump shelter	R 5 600	R 15 000	R 9 000	R 5 600	
e)	Mechanical	R 8 950	R 15 500	R 11 500	R 11 500	
f)	Pump	R 2 300	R 7 600	R 4 600	R 4 600	
g)	Supply	R 11 760 (280m)	R 74 000 (600m x 250 dia)	R 43 000 (430m x 200 dia)	R 24 700 (250m x 200 dia)	
	Subtotal	R 39 810	R 127 100	R 80 500	R 60 800	
h)	Engine	R 16 140	R 61 600	R 38 000	R 38 000	
TOTAL (DIESEL)		R 55 950	R 188 700	R 118 500	R 98 800	R 461 950
i)	Electrical	R 9 430	R 33 000	R 16 600	R 16 600	
TOTAL (ELECTRIC)		R 49 240	R 160 100	R 97 100	R 77 400	R 383 840

Unit cost/ha	Diesel	R5 372
(For 43,5ha)	Electric	R4 463
Pump kW/ha	: 1,22 kW/ha	

2.3 Project Costs

		Diesel	Electric
a)	Pump stations at waterside farms 467ha @ R4875/R4185	R2 276 625	R1 954 395
b)	Pump stations at distant farms 175ha @ R5372/R4463	R 940 100	R 781 024
c)	Electrification of Cork Pump station	-	R 90 000
d)	Electricity supply main along Sabie river 22km @ R30 000		R 660 000
		R3 216 725	R3 485 419
e)	Contingencies, preliminary and general and establishment costs (25% appr.)	R 804 175	R 871 351
f)	Engineering, supervision including disbursements (12% appr.)	R 386 100	R 418 230
	Total Development Cost	R4 407 000	R4 775 000

Notes:

1. The parameters used in EVN's August 1989 proposals were used for conformity in analysing alternatives.
2. Supply flow : Based on 1,2 l/s/ha at 20h/day.
3. Levels Hr : River water level (or canal level in respect of Cork)
   Hh & Hl : Ground level at highest and lowest ends of plot respectively.
   Hp : Pump head
   $= [\frac{Hh - Hl}{2}] - Hr + 35 + 10\%$
   with required field edge irrigation head taken at 35m and 10% additional head to allow for friction head in supply main.
4. Energy requirements kWp
   : pump kW with 70% efficiency.
5. Costs
   a) Access road from farm plot edge to river side (nominal R2000 + R5000/km).
   b) Fenced in corridor, game proof @ R2500; vermin proof @ R600.
   c) Civil works comprising nominal preparation of abstraction site in river bed for pump suction inlet, site preparation for pump station including debushing etc. (Nominal R5000).
   d) Pump shelter using rudimentary corrugated iron wall and roof on concrete floor screed (nominal cost R5600, based on recent experienced 3,5 x 4m construction).
   e) Mechanical comprising the following:

	150 dia	100 dia
. Foot valve and strainer	235	131
. Suction line (20m)	1440	940
. Reflux valve	1178	602
. Line valve	633	410
. Reducers (2no)	400	116
. Bends (5no)	2215	720
. Miscellaneous fittings	610	292
. Engine/motor/pump concrete base and concrete anchor block	450	350
. Installation costs (25%)	1789	889
	R8950	R4450

   f) Pump : Centrifugal pump
   g) Supply main to field edge comprising the following
   PVC sizes and costs

Flow	6 - 9 l/s	9 - 16 l/s	16 - 30 l/s
Dia	110	160	200
Cost PVC/06	R33	R54	R76
PVC/09	R42	R68	R99

   h) Prime mover : Diesel Engine
   : Air cooled being a cheaper alternative to water cooled.
   i) Prime mover : Electric motor, switchgear and transformer.
   Supply line is considered elsewhere.

6. Cork Pump station. Electrification to serve existing 120ha layout.

Supply flow 120ha x 1,5	: 180 l/s
RBL	: 344m
Leidam FSL	: 381m
Pump head Static	: 37m
Dynamic	: 44m
Pump energy	: 110kW
Electric motor	: 120 kW
Cost of improvements	
. Electrical 120 x R600	: R72 000
. Improvements to building for switchgear etc.	: R18 000
	: R90 000

ALTERNATIVE 3 : HOXANI CANAL

3.1 CANAL DETAILS

Ch / LOCALITY	LEVELS FSL (RBL)	A(ha) / Q (l/s) : NETT : 15% S : LOSSES / TOTAL	CANAL C S V / Y FB D / t A P	COST/m Clearing / Canal Bench / Training bank and fencing / Excavation	COST/m Lining / Structures (general) / Total R/m	COST FOR REACH / Special Structures / Total	DESCRIPTIONS
0	413	642ha	35 / 855 / 60				a) Abstraction weir
Sabie	(410)	770	0,0005 / 125 / 1,43	R35	R93		at CH0
		115	0,83 / 980 / 3,1	R20	R46	1,01	: R200 000
		45		R22		0,30	b) Road crossing at
		930 l/s		R36	R252/m	R1,31M	Ch1400m
							: R 60 000
							c) Major stream
							crossings
							: R 40 000
4,0km	411	507ha	35 / 720 / 60				a) Medium cutting
End Ten		608	0,0006 / 110 / 1,12	R23	R81		: R50 000
Farms		92	0,83 / 830 / 2,7	R20	R34	0,62	b) Major stream
		40		R22		0,10	crossing
		740 l/s		R28	R208/m	R0,72m	: R50 000
7,0km	409,2	427ha	30 / 670 / 50	R50	R72		a) Fill over reach
End Big		512	0,001 / 110 / 0,87	-	R18		7,0 to 8,3km
Bend		77	0,89 / 780 / 2,4	R12		0,73	max. 11m
		31		R21	R173/m	0,52	: R90 000
		620 l/s				R1,25M	b) Fill over reach
							8,3 - 11,2km
							max. 16m
							: R250 000
							c) Major stream
							crossings (3no)
							: R180 000
11,2km	405,0	369ha	30 / 560 / 50	R22	R64		a) Special precau-
At Mkhuhlu		442	0,0012 / 100 / 0,68	R20	R26		tions at sewage
		68	0,99 / 660 / 2,2	R22		0,66	works
		25		R20	R174/m	0,15	: R50 000
		535 l/s				R0,81M	b) Major stream
							crossings (2no)
							: R100 000
15km	400,4	213ha	25 / 470 / 45	R20	R51		a) Terminal balan-
End		256	0,0015 / 90 / 0,44	R16	R21		cing dam
Seholokoane		44	0,95 / 560 / 1,7	R22		0,19	(see 3.2a)
		20		R14	R144/m	0,20	: R200 000
		320 l/s				R0,39M	
16,3km	398,5	CANAL TERMINAL AT UPPER CORK					

3.2 Terminal development

a) Canal ends in tailwater balancing dam with capacity equal to shutoff time in canal or 4h (being diffrerence of 24h day and 20h irrigation day), the biggest being 4,04h use 5h : 5760m^3.

b) Terminal flow from leidam for Cork supply:

133h @ 1,2 l/s	= 160 l/s
+ surcharge 5%	8
+ losses 5%	8
- simultaneous demand factor 15%	24
	168 l/s

c) Terminal pipeline ending in existing Cork balancing dam.

Hydraulic grade level at dam	RL 397
Pipeline 3450m; 400AC/ID/06&12; V=134;	Hl 16
i.e. terminal hydraulic level	381m
Cost of pipeline	**R800 000**

3.3 Pumping requirements

Pumping from canal or terminal leidam at Upper Cork or from existing Cork scheme is evaluated herein using the parameters of Alternative 2 as basis but adopting electricity supply (being the cheaper subalternative of Alternative 2).

SAMPLE FARMERS

Locality	Ten Farms	Big Bend	Mkhuhlu	Seholo-koane	Upper Cork	Cork
Plot no.	7	5	6	4	6	14
Area	13ha	5ha	8ha	21ha	11,5ha	6,0ha
Representing	149ha	66ha	97ha	117ha	80ha	133ha
Supply flow	15,6 l/s	6 l/s	9,6 l/s	25,2 l/s	13,8 l/s	7,2 l/s
Pump head Hp	55m	39m	24m	48m	10m	35m
Energy kWp	12kW	3,3kW	3,2kW	17kW	Nominal	3,5kW
Costs c) Civil	R 3 100	R 3 100	R 2 600	R 3 100		R 3 100
d) Pump shelter	R 5 600	R 5 600	R 5 600	R 5 600		R 5 600
e) Mechanical	R 4 450	R 4 450	R 4 450	R 8 950		R 4 450
f) Pump	R 2 200	R 2 200	R 2 200	R 2 450		R 2 200
g) Supply	R 1 500	R 1 000	R 500	R 500		R 500
h) Electrical	R 10 080	R 8 210	R 8 210	R 10 080		R 8 210
TOTAL FOR SAMPLE	R 26 930	R 24 560	R 24 060	R 30 680		R 24 060
TOTAL ESTERPOLATED FOR AREA ; ROUNDED OFF	R 300 000	R 290 000	R 250 000	R 180 000	R 20 000	R 530 000
TOTAL FOR SCHEME	R1 570 000					
TOTAL ENERGY EXTERPOLATED FOR AREA	130 kW	40 kW	30 kW	40 kW	10 kW	70 kW
TOTAL kW FOR SCHEME	320kW					

3.4 Project Costs

a)	Main canal with river abstraction and terminal structures as per tabulation 3.1	R 4 480 000
b)	Gravity supply main from tailwater balancing dam at Upper Cork to Cork Scheme command site	R 800 000
c)	Pump systems for individual farms (electricity system) per par. 3.3	R 1 570 000
d)	Electricity supply main 18km @ R30 000	R 540 000
		R 7 390 000
e)	Contingencies, preliminary and general and establishment costs (25% appr.)	R 1 845 000
f)	Engineering, supervision including disbursements (12% appr.)	R 885 000
	Total development cost	**R10 120 000**

BULK WATER SUPPLY ALTERNATIVES
COMPARATIVE RESULTS

Annexure 2.6

	THREE PUMPS	INDIVIDUAL PUMPS		CANAL
		DIESEL	ELECTRIC	
	ALT. 1	ALT. 2.1	ALT. 2.2	ALT. 3
1. PROJECT COST of irrigation bulk water supply i.r.o.				
a) Civil works non riverine including power lines	2,941	0,881	1,504	8,347
b) Civil works riverine	0,520	0,485	0,552	-
c) Buildings	0,510	0,573	0,637	0,573
d) Mechanical & Electrical	1,149	2,468	2,082	1,200
	R5,120M	R4,407M	R4,775M	R10,120M
2. ENERGY REQUIREMENTS of prime movers				
a) New	690	800	720	320
b) Existing re-used	-	140	120	-
	690kW	940kW	840kW	320kW
3. ANNUAL COSTS (R1000)				
3.1 Maintenance				
a) Civil non riverine and power lines @ 0,5%	14,7	4,4	7,5	41,7
b) Civil riverine @ 1,0%	5,2	4,9	5,5	-
c) Pump station buildings @ 1,5%	7,7	8,6	9,6	7,7
d) Mechanical and Electrical @ 4,0%	46,0	98,7	83,3	48,0
	73,6	116,6	105,9	97,4
3.2 Energy				
a) Unit cost for 2400 h/a @ 15c/kWh for diesel & 3,2c/kWh for electricity	53,0	338,4	64,5	29,9
b) Demand @ 70% x R17/kVA per month @ 90% P.F.	109,5	-	133,3	61,8
	162,5	338,4	197,8	91,7
3.3 Water Control Pump operator and water bailiff functions @ R8000/unit	24 (3no)	16 (2no)	16 (2no)	16 (2no)
Subtotal	R 260 100	R 471 000	R 319 700	R 205 100
3.4 Financing cost taken at 14% p.a. for mechanical and 10% for civil	R 558 000	R 539 400	R 560 800	R1 060 000
COMPARATIVE ANNUAL COSTS	R 818 100	R 1 010 400	R 880 500	R1 265 100
Rating	1,00	1,24	1,08	1,55

Annexure 2.7

HOXANI BOERDERYONDERSTEUNINGSPROGRAM

Samesprekings met boere gehou op 89/08/10 by Ngonini Koöperasie.

VOORSITTER SERGEANT MANZINI
Teenwoordig: Sien lys hierby.

Die doel van die samesprekings word verduidelik, naamlik om die boere in te lig oor 'n voorgestelde uitlegbeplanning asook om die vordering wat reeds gemaak is deur die verskillende betrokkenes nl.GAZDAF, OBSA en EVN.

1. Mnr. P. v.d. Merwe verduidelik die betrokkenheid van die verskillende partye.

2. Mnr Myburgh verduidelik die volgende sake aan die boere:
   - Pyplynskema wat beoog word. (Mnr. v.d. Merwe voeg by dat 'n kanaal nie prakties en ekonomies sal wees nie).
   - Dat waar die pyplyn in lande gelê word, dit diep genoeg sal wees sodat daar bo-oor geploeg kan word.
   - Elke boer genoegsame druk sal hê vir sprinkelbesproeiing.
   - Aanjaerpompe sal op eie keuse deur boere op eie koste gebruik kan word waar drukke te laag mag wees. Dit sal egter normaalweg nie nodig wees nie.
   - Bestaande leidamme te 'Cork' nie benut kan word nie.
   - 'Ten Farms' en 'Seholokoane' oop reservoirs sal hê met geslote pyplyntoevoer.
   - By 'Cork' direk in die skema gepomp sal word.
   - Energie koste laer sal wees as wat die geval tans is.
   - Regte hoeveelheid water vir die area wat hulle besproei.

3. Mnr v.d. Merwe verduidelik die volgende punte na aanleiding van vrae van die boere:
   a) Land huur per hektaar per jaar:
      : R60 aan Regering; R40 aan stam, totaal R100
      : R100 oorhoofse besproeiingskoste
      Totaal : R200/ha wat die boere direk aan die Owerhede sal moet betaal. Die regering subsidieer dan

verdere koste t.o.v. die infrastruktuurontwikkeling.

b) Nuwe lande verkieslik in eenhede van 5ha beplan sal word.

c) Die boere wat nie die hele area gaan benut nie dit kan afstaan aan ander.

d) Boere wel vir die hele area sal moet betaal ongeag of dit benut word of nie.

e) Indien boere nie behoorlik die grond benut nie ander boere op die grond geplaas kan word.

f) Vloed besproeiing slegs vir 'n beperkte tydperk nog aanvaarbaar sal wees, maar dat daar mettertyd oorgeskakel moet word na die meer doeltreffende sprinkelbesproeiing.

g) Korrekte besproeiingstoerusting sal by die Koöperasie beskikbaar wees.

h) Bestaande toerusting sal gebruik kan word slegs as dit voldoen aan die vereistes soos deur die Ingenieurs neergelê.

4. **BESLUIT***

Die boere aanvaar die verduideliking t.o.v. 'n moontlike skema.

GENOTULEER DEUR A. MYBURGH

*Amended at SC meeting of 89-09-27

Annexure 2.4

ATTENDENCE LIST.

NAME	AFFILIATION	SIGNITURE
PWA vd. Merwe	GAZDAF.	
P.T. DE WITT	GAZDAF	
Z.B. MOHLABA	G Agric Mhala	
A MASUKU	FARMER (Cork)	
E. MOHLALA	FARMER (Culcatta)	
M. S. HLUNGWANE	GAZDAF	
T W MN. S.	~~MN. S.~~ FARMER (Culcatta)	T W MN. S.
J. MAHOLE	FARMER (CORK)	
S. MHLONGO	FARMER (Culcatta)	
S.C. Magayula	farmer Culcatta	
P masinga	Farmer CORK	
[illegible]	Farmer Mkhuhlu	
[illegible] Mlonga	Belfast	
M.Z Thejedi	Farmer Culcutta	
E maseko	Farmer (calcutta E maseko	
B- JON Maluka	Farmer (calcutta) B-JON	
Themba mhlanga	farmer Cork	
W. Nxumayo	Nyanini Co-op c	
J mahole	CORK	
July Bulunga	CORK	
Dickson MS.	Calcutt	
MEK [illegible]	CALKATT	
CAVE mashaba	CALKATT	
Phineas maimbela	CALKATA	
D A Mamgwa	balcutta-	
M.D MASUKU	CALCUTTA	
F. SILUBANE	FARMER (CORK)	
P. TERWIN	GAZDAF.	
A.M. MATUKANE	GAZDAF	
Chabalala	GAZDAF	

Interpreter

Ik m.

3. MISCELLANEOUS OUTSTANDING ISSUES

3.1 General and Scope

This Section covers a number of outstanding issues raised during the Steering Committee meeting of 89-07-11 (as described in Annexure 1 paragraph 4b). The descriptions herefollowing were prepared for this Report by delegated officials of the Steering Committee and by the Consultants.

3.2 Improvement to the literacy of existing farmers

Annexure 3.2 contains generalised proposals for an extension programme of the Hoxani Irrigation project, as prepared by E.M. Zwane of GAZDAF. These proposals *inter alia* cover recommendations to improve the literacy. During Phase 3 of the investigations, more specific recommendations will be made.

3.3 Constraints of soils on irrigation systems and crop types

The pedologists have advised in their findings that overhead irrigation would be the preferred method for the soils found in the study area. The following tabulation gives a generalized crop and irrigation system selection proposal:

Soil Class	Typical Crops	Irrigation system	Irrigation Volume
1	Any	Q.C. Sprinkler	As required for optimum production
2&3	Maize/Vegetable Mango	Q.C. Sprinkler Dragline hose	Limited
3	Mango/Quava Pastures Garden plots (1ha max. per farm plot)	Dragline hose Q.C. Sprinkler Dragline Sprinkler	Very limited Very limited Very limited

3.4 Constraints in the use of treated sewage effluent

Purified sewage effluent has been used for irrigation in South Africa for many years without any obviously harmful effect on crops and the soil. When evaluating the quality of water for agricultural reuse, the health aspects and the interaction of the purified effluent with the soil and the crops in question must be considered. The health aspects relate to the direct contact of humans or animals with purified effluent and to the consumption of irrigated fruit and vegetables.

Pathogens, whether viruses or bacteria, are able to survive for several days in most agricultural crops and hence present serious health risks. Health authorities therefore restrict the type of crop that can be irrigated with effluent of different standards of purity. Irrigation with effluent from an oxidation pond system i.e. not complying with the "general standard" is permitted for industrial crops, seed crops, tree nurseries and vegetation not destined for human consumption in the raw state.

The application rate of effluent must be regularly (annually say) monitored so that any deterioration in the structural and textural characteristics of the soil are early detected and the necessary adjustments to particularly the volume of irrigation be made. In general it can be stated that the particular precautions (see tabulation par. 3.3) required for the irrigation with river water, needs stricter control when irrigating on marginal soils (which is the case of the lands adjacent to the sewage works) with treated sewage effluent.

The treated Mkhuhlu effluent (initially to comprise primary and secondary stabilization ponds together with grass beds for the removal of algae), would be acceptable for use on dry fodder crops without restriction. (Refer Guide to Permissible utilization and disposal of treated sewage effluent - Department of Health, Pretoria.) If strict control and prescribed precautionary measures on the handling of crops and water are exercised, it is of

interest to note that this effluent may also be used for the irrigation of cut flowers, fruit trees, pasturage (except for cows), parks and sport fields.

The above principles were accepted in general terms by the Gazankulu Government and the Hoxani Tribal Authority during the meeting at Mkhuhlu on 89-07-11 and in particular that use of sewage effluent be made in the most acceptable conditions i.e. for the production only of dry fodder. It was further decided it would be preferable that such farming should be limited to the Tribal Authority plot.

The following additional precautionary measures will have to be applied on the proposed irrigation system:

a) In order to prevent persons from unwillingly drinking effluent water or washing with it, the taps, valves and sprayers of the irrigation system must be so designed that only authorised persons can open them or bring them into operation.

b) Every water point where uninformed persons could possibly drink effluent water must be provided with a notice indicating that it is potentially dangerous to drink the water.

c) Sprinkler irrigation shall be permitted only if no spray is blown over to areas where such irrigation is forbidden. In this connection the quality of the effluent, the use of such adjoining area and its distance from the irrigation area must be taken into consideration before sprinkler irrigation is permitted.

Annexure 3.4 contains a statement by the animal husbandry consultant to the DBSA, mr J.P. Swart, in respect of cultivating *cencrus ciliaris* hay with the treated sewage effluent.

3.5 The Financial situation of the Ngonini Cooperative

Annexure 3.5 contains an evaluation by mr A.M. Matukane of GAZDAF of the reasons why the financial position of the Cooperative has deteriorated. From the reasoning it can be seen that in general the existing poor infrastructural

development and resulting poor crop production contributed to the gradual decline in the confidence of the farmers in the Cooperative resulting in the poor present condition. All farmers, however, support the principle of having a sound Cooperative system once an improved irrigation scheme has been established.

3.6 Future extensions to the Mkhuhlu Industrial area

The Mkhuhlu Industrial area is presently located on the Calcutta side of the railway line near the Mkhuhlu station, occupying approximately 40% of the available space between the main road and the railway line. The latter space seems geographically the most suitable for future industrial development due to the existing good road and rail access. Long term extensions to the industrial area are most likely to be towards the west and southwest i.e. away from the irrigation development. It can safely be stated that future industrial development would not affect the irrigation development as contemplated in this farmer support study. This matter was discussed with mr A.A. Human of the Gazankulu Planning Secretariat on 89-08-15 in which the above was generally agreed upon. Mr Human stated that no fixed policy has been laid down by Gazankulu in respect of future industrial development in the absence of a structure plan for this part of Hoxani. The need for a structure plan, however, exists and the matter would most probably have to receive attention in the near future.

3.7 Linkage of Industrial area with irrigation scheme

The industrial area of Mkhuhlu is very centralized to the irrigation scheme in that Ten Farms and Big Bend areas are adjoining on the south western side within 7km and Seholokoane and Cork areas are adjoining on the eastern side within 10km.

The industrial area at present is serving as an important market for some of the fresh produce of the scheme. This importance will increase as the industrial area develops further by creating job opportunities and increasing the purchase power of the local population.

At present the industrial area provides the following limited services to the farming community: Mechanical workshop and furniture repair shop. Extension of services may be possible in terms of general engineering workshops, building contractors and medical services.

Consumer orientated shops adjoining the industrial area are at present supplying to a limited extent in the needs of the farming community. This may be increased with the development of the industrialized base and consequently the establishment of more and/or bigger shops to cater for the population at large.

In terms of farm requisites, the majority of purchases are done through Ngonini Co-operative which will in future most probably be relocated outside the industrialarea.

There is a pallet manufacturing factory in the industrial area and if future agricultural production warrants palletization, pallets can be supplied locally but this factor is undefinable at present.

Educational, health and community services between the farming community and the local population resident in the Mkhuhlu area are inter-linked and development of the industrial area will be to the benefit of the farming community.

3.8 <u>Marketing potential of the proposed irrigation development</u>

Messrs. Measured Farming undertook a marketing study of the proposed F.S.P. and numerous data (tabulations and graphical presentations) are given in this regard in Annexure 3.8.

From the information obtained from the farmers' sample they cultivate 101,14% of their nett land area per annum. Refer Table 1 of Annexure 3.8. The total nett area for the scheme is 642ha, thus potentially an area of 649,34ha will be under marketable crops.

Table 2 (Annexure 3.8) represents the different crops and potential area per crop for the total scheme assuming the present land use pattern.

In Tables 3, 4 and 5 of the Annexure, the market prices and quantities for potential selected crops on the Johannesburg and Pretoria markets for the years 1986, 1987 and 1988 are reproduced per month.

The weighted average prices over the 3 year period for the two markets are represented in Table 6. The price data for the different crops and different markets are reproduced in the accompanying graphs.

The price trends on the two markets warrant the following comments:

Potatoes: From May to October the markets are the highest, with peaks in May, September and October. The two markets are very similar, except for May where Pretoria indicates a better price.

Tomatoes: The best prices achieved for tomatoes on the two markets under investigation are from May to November. Even December can be considered. June and September are the peak months. Johannesburg shows a constant higher return.

Pumpkin: From September to November the prices are the best, again with Johannesburg being the higher, especially during October.

Cabbage: The period June to August indicates the best returns, with a lower peak in March. Prices achieved on the Pretoria market proved to be consistantly higher than Johannesburg.

Onions: The best time to market onions are May to June according to the graph representing average onion prices. Prices are very similar at Johannesburg and Pretoria, with Pretoria a little higher during May.

Green Beans: July, August and October are the ideal times to market green beans on the Johannesubrg market. Although there is a trough in September, the Johannesburg market during this month is still better than Pretoria in both August and October. Johannesburg prices are considerably better than that obtained on the Pretoria market.

Sweet Potatoes: Sweet potatoes are best marketed from October to December, and best prices are once again achieved on the Johannesburg market.

Beetroot: Marketing of beetroot should be considered during March, July and August. The months in between shows a drop of up to 44% in prices achieved. Prices at the two markets are much the same with Johannesburg better during August.

Spinach: Spinach should be marketed at two times during the year at February-March and July-August when prices are the most favourable. The February-March production should be considered for Pretoria market while July-August should be sent to Johannesburg due to better prices.

Table 7 reflects 10% of the average quantity sold on the Johannesburg and Pretoria markets per month.

Table 8 reflects the population distribution within 10km radius for 1985 and projected population growth up to 1990. Table 9 reflects the additional population distribution within 50km road distance excluding the 10km radius.

Table 10 represents the per capita usage and total population and area requirements for selected crops within 10km radius. The same potential yields were assumed as for Dumfries Irrigation Scheme. In Table 11 the additional data within a 50km road distance are reproduced. No per capita usage for onions, green beans, beetroot and spinach could be obtained. It must be remembered that the per capita figures for potatoes and sweet potatoes are for the total R.S.A. and the rest for Bophuthatswana.

From Table 12 it can be seen that all the cabbage should be marketed within a 10km radius and all the green mealies within an additional 50km road distance.

The surplus tomatoes (3075 tons) can be absorbed on the Johannesburg market during the months of May to November within the 10% volume limit. The estimated volume of Hoxani tomatoes will comprise 6,64% of total volume on the Johannesburg market during the marketing period.

The marketing of sweet potatoes is more problematic. Due to the low per capita usage, the local area (up to 50km road distance) will only be able to absorb 58% of the production.

The surplus will have to be marketed on both the Johannesburg and Pretoria markets. The average prices on the Pretoria market are less than those obtained on the Johannesburg market and this fact may limit the production area of sweet potatoes. This problem will be addressed in the viability study.

No potatoes or pumpkin are at present grown on the subject area but the local area (up to 50km road distance) should be able to absorb the production of 171,6ha of potatoes and 84,2ha of pumpkin.

Annexure 3.2

1989-08-14

A PROPOSED EXTENSION TRAINING PROGRAMME FOR HOXANE IRRIGATION SCHEME

By: E.M. Zwane
Extension Division
Department of Agriculture and Forestry

1. OVERVIEW OF THE EXTENSION TRAINING

Extension training is an educational programme for the adults or farmers. It employs teaching and learning principles that affect changes in the life of farmers. Extension training is not formal, as such it is not compulsory but is based on voluntary participation. Its classrooms are the fields of farmers.

In the extension programme, useful knowledge is conveyed from the source of discovery by knowledgeable professionalist, who could be either an extensionist or anybody who represents a particular company or an institution which deals with agricultural products.

Extension training is an education for action. In order to have a desirable impact it must be problem oriented. Farmers should realize the benefits before partaking in such a programme. Extension training should therefore not only be seen as conveying knowledge but increasing the acceptance and application of the knowledge in practical terms.

The objective of the training programme should be to improve the efficiency of the farmers by persuading them to be self reliants, moving away from ignorance and therefore becoming self responsible in their farming activities. The ultimate goal of an extension training programme is to increase the farmers quality of life through increased production and higher income.

Annexure 3.2

5. PROPOSED APPROACH OF THE TRAINING PROGRAMME

5.1 It is proposed that the local extensioners should coordinate the training as well as executing the intended programme.

5.2 Each crop should have a detailed works programme. Example of one crop namely, tomato could be like this: The officer should know the exact date of soil preparation, exact date of planting, exact date of transplanting, date of starting the spraying etc. These dates should be marked in the training calendar and be executed.

5.3 Each production step of the crop should be preceded by a lecture conducted by the officer. This can be in a group or personal visit (preferably group method which is cheaper).

5.4 A production programme should also take fertilization, and seeds into account at the early stages so that the cooperative should be knowing how much to order for each farmer.

5.5 The budget for each crop should be drawn. The budget will cover the cost of ploughing, seeds, maintenance (labour), spraying, fertilizers and the cost of harvesting in case of wheat or rice, as well as an average return of cost per hectare or profit per hectare.

The assistance of an economist will be sought out in order to determine a much more realistic picture of production of each crop.

5.6 The officers should be provided with the training calendar with clearly marked variables such as: subject, date, group, presenter, venue and time. This will facilitate programming of the training.

5.7 Each extension officer should have a resource file or (data bank) for each crop planted in the scheme. This will enable the officer to have a readily available reference in time of need.

Annexure 3.2

TYPICAL TRAINING CALENDAR

NAME OF CROP: *TOMATOE*

MONTH: .....

DATE	ACTIVITY	WARD	PRESENTER	VENUE	TIME
1					
2					
3					
4					
5					
etc.					
30					
31					

PRODUCTION BUDGETS FOR MLIP - SUMMER CROP 1988

GROUNDNUTS:

DESCRIPTION	UNIT	COST/U	QUANTITY	COST/HA
ALLOCATED COSTS				
PREHARVEST				
Seeds	50 kg	1,60	100,00	160,00
Fertilizer:				
LAN (28)	50kg bag	20,80	2,00	41,60
Supers (10,5%)	50kg bag	17,50	12,00	210,00
Labour:				
Cultivate and irg.	hour	0,45	512,00	230,40
(0,8lab x 80 days)				
Spraying cost (insecticides)	Season	120,00	1,00	250,00
Machine cost:				
Ploughing	ha	55,00	1,00	55,00
Fertilizer spreading	ha	4,00	1,00	4,00
Disc	ha	20,00	1,00	20,00
Seedbed	ha	14,00	1,00	14,00
Planting	ha	28,00	1,00	28,00
HARVEST:				
Harvesting labour	hour	0,45	60,00	72,00
(5 lab x 4 days)				
Digger	ha	30,00	1,00	30,00
Transport	ton	29,44	3,00	88,32
TOTAL COSTS/HA				1203,32
GROSS INCOME	ton	600,00	2,20	1320,00
GROSS MARGIN/HA				116,68
BREAKEVENPOINT (1/ha)				2,01

MAIZE:

DESCRIPTION	UNIT	COST/U	QUANTITY	COST/HA
ALLOCATED COSTS				
PREHARVEST				
Seeds (PNR 6549)	50 kg	2,70	20,00	54,00
Fertilizer:				
3:2:1 (25) + 0,5% Zn	50kg bag	26,90	8,00	215,20
LAN (28)	50kg bag	20,80	5,00	104,00
Supers (10,5%)	50kg bag	17,50	14,00	245,00
Labour:				
Cultivate and irg.	hour	0,15	512,00	230,40
(0,8lab x 80 days)				
Spraying cost (insecticides)	Season	100,00	1,00	100,00
Machine cost:				
Ploughing	ha	55,00	1,00	55,00
Fertilizer spreading	ha	4,00	1,00	4,00
Disc	ha	20,00	1,00	20,00
Seedbed	ha	14,00	1,00	14,00
Planting	ha	28,00	1,00	28,00
HARVEST:				
Harvesting labour	hour	0,45	64,00	28,80
(4 lab x 2 days)				
Combine	ha	70,00	1,00	70,00
Transport (45km x 10 ton	ton	6,88	6,00	41,28
trailer)				
TOTAL COSTS/HA				1209,68
GROSS INCOME	ton	290,00	5,00	1450,00
GROSS MARGIN/HA				240,32
BREAKEVENPOINT (1/ha)				4,17

1. THIS FINANCIAL PROJECTION IS SUBJECT TO MARKET FLUCTUATIONS IN RESPECT TO INPUT COST AND MARKET REALISATIONS.
2. LAND RENTAL. WATER RATES AND INTEREST ON LOANS IS NOT INCLUDED IN THIS BUDGET.
3. THIS BUDGET MUST ONLY BE USED AS GUIDELINES.

Annexure 3.4

Pietersburg
Fax 74113

JP Swart
PO Box 95
KIEPERSOL 1241
0131242-vra-1904
31 July 1989

Attention of Mr Myburg

Eksteen, van der Walt and Nissen
PO Box 236
PIETERSBURG 7700

Dear Sir

PRODUCTION OF CENCRUS CILIARIS (BLUE BUFFALO GRASS) HAY WITH WATER FROM SEWAGE WASTE PLANT

At the meeting of the steering committee of the Hoxane Project I was asked to make a recommendation on the production of hay, using the waste water from the sewage works.

The following recommendations are put forward.

1. Establish Blue buffalo grass (Cencrus ciliaris) by using roots. Because it is a perennial grass, the cost of establishment is only incurred once.

2. Hay can be made by Ngonini Co-op or private contractor that has a tractor and a mower.

3. The hay can be sold to local farmers as a supplementary feed source in winter.

4. A production of 10-12 ton hay per hectare can be an attainable goal and if the hay is not baled a price of R30.00 per loose ton of hay seems reasonable.

5. Although the area under grass will eventually be extended to 30 ha, it will always be too small to be economically viable as an agricultural operation! Therefore, the Tribal Authority must stay in control of the grass/waste water scheme.

6. The application of the waste water in this "agricultural " scheme can definitely not be seen as a way to minimize the health risk posed by the possibility of diseases borne in the sewage water.

Your's faithfully

J P SWART Sci Nat

Copy to Mr Sauermann DBSA

3/10

Annexure 3.5
G.R. 88 (A)

GAZANKULU REGERING | GAZANKULU GOVERNMENT

MFUMO WA GAZANKULU

NDZAWULO YA VURIMI NI MIRHI
DEPARTEMENT VAN LANDBOU EN BOSBOU
DEPARTMENT OF AGRICULTURE AND FORESTRY

Xisakana xa Poso
Private Bag X577
Privaatsak
GIYANI
0826
1989/07/19

Tsalwa/Verw./Ref./	Riqingho/Tel. No.
6/8/3/2-5	3210 x 162
Swivutiso/Navrae/Enquiries:	
A M MATUKANE	

Eksteen,Nissan en Van der Walt
Posbus 236
PIETERSBURG
0700

NGONINI COOPERATIVE: REASONS FOR THE NGONINI : DEBT OF OVER R200 000,00

Attached hereto is a copy of the report on the reasons furnished by farmers and GAZDAF officials on reasons for the abovementioned Ngonini Debt of ± R200 000,00.

SECRETARY FOR AGRICULTURE AND FORESTRY

/MKM

SPECIAL GENERAL MEETING : NGONINI COOP : 13.07.1989

1. **BACKGROUND**

On the 11th July 1989 there was a meeting of Hoxane Irrigation Scheme Steering Committee to discuss phase 1 of the Consultant Report. As a result of this meeting, it was decided that I should conduct investigation into the reasons why Ngonini Co-operative got to the debt of ±R200 000 (Two hundred thousand rand). Hence a special general meeting was held on the 11th July 1989, under the chairmanship of Ngomane (chairman of the Ngonini Co-op, Officials present were Messrs.:

- Baloyi : Local Extension Officer
- Mdaka : Assistant Economist
- Slinda : Second in charge of the District
- Nxumalo : Co-op Manager

2. **REASONS FOR THE DEBT OF +R200 000-00**

2.1 **Reasons furnished by Farmers**

- Lack of water for irrigation.
- Pumps provided by the "STOK: (GDC) were unreliable; they were always found to be out of operation for some weeks.
- Poor market for their produce.
- Low price for the tomatoes and maize.
  Tomatoes and Maize were the main sources of income for the farmers.
- There was a poor follow up of the individual debts by the then "STOK" officials. In the opinion of the farmers their accounts were not properly controlled. Credit was given without prior determination of credit worthlyness of the farmer.
- In the opinion of the farmers, the addition of the interest rates on their individual accounts were not properly explained and farmers did not understand what was going on.

  They feel this was very unfair because the addition of the interest rate was added to a farmer even if the farmer had not yet sold his produce, and some farmers would not even sell their produce due to lack of markets and marketing facilities (transport).

- The provision of ploughing units by both GAZDAF and the then "STOK" (GDC) was insufficient.
- At one stage all farmers were approached by "STOK" and each farmer requested to contribute two (2) ha to be used by "STOK". The proceeds from the 2ha lands were to be used for the settlement of the debt. "STOK" has also planted beans - with the view of contributing towards the debt and farmers were not told what happened to the crop (Beans) until "STOK" officials left the project.

2.2 **Reasons as furnished by the local Agricultural Officer - Mr Masuka:**

- Difficulty was experienced in selecting a better crop which could be sold at higher price.
- Insufficient ploughing Units : Some tractors used by both GAZDAF and the then "STOK" were too small for the type of soil at Sabie Irrigation project.
- Wild animals like baboons were a problem to farmers.
- Irrigation system given by "STOK" was very poor. Broken engines and pumps could not be repaired in time.
- Some crops e.g. beans were heavily damaged by frost.

2.3 **Reasons by GAZDAF : Head Office**

- General demotivation of farmers due to the high debts.
- Lack of proper institutional framework, for example no management committee existed on which GAZDAF, Tribal Authority GDC, the Co-op and the farmers were represented.
- The only management committee that existed was that of the Co-op which was dominated by GDC and GAZDAF officials.
- Farmers were not properly consulted in the compilation of planting programmes e.g. Fertilizer and seed were ordered on their behalf and they were only presented with the account.
- At one stage one of the farmers was told that his debt had been fully paid, and soon afterwards he was informed that this was a mistake and he still owed ±R6 000-00. This lack of proper financial administration caused farmers to loose faith in the Co-operative management and it destroyed their loyalty to their Co-op.

Compiled by
A M Matukane
18/12/00

Annexure 3.8

HOXANE IRRIGATION UPGRADING
MARKETING STUDY DATA

15-Aug-89 09:45 AM MEASURED FARMING(SA)(PTY)LTD
MARKET

HOXANE IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

TABLE 1:SAMPLE FARMERS' LAND UTILIZATION

FARM NO:	FARMER	CROP	FARM NET SIZE (Ha)	Ha	YIELD /Ha	TOTAL YIELD	UNIT	% USAGE OF FARM
FARM_5	ELSON MASHABA	GREEN MEALIES	5.00	4.00	3333.34	13333	COBS	106.6
		SUGAR BEANS		0.50	420.00	210	Kg	
		SWEET POTATOES		0.50	50.44	25	Kg	
		TOMATOES		0.33	216.00	71	Kg	
FARM_7	WILLIE MNISI	TOMATOES	13.00	3.00	200.00	600	BOXES	50.0
		TOMATOES		3.00	760.00	2280	LUGS	
		GREEN MEALIES		3.00	4052.00	12156	COBS	
		MAIZE (GRAIN)		3.00	7000.00	21000	Kg	
		CABBAGE		0.25	1200.00	300	HEADS	
		BEETROOT		0.25	200.00	50	LUGS	
FARM_6	KAIZER MOLULI	GREEN MEALIES	8.00	3.00	2166.67	6500	COBS	62.5
		MAIZE (GRAIN)		3.00	840.00	2520	Kg	
		BANANA		1.00				
		SUGARCANE		1.00				
FARM_6_7	FRANK SHILUBANE	BANANAS	10.00	2.00				164.0
		TOMATOES		5.50	4500.00	24750	BOXES	
		GREEN MEALIES		6.00	4000.00	24000	COBS	
		MAIZE (GRAIN)		6.00	700.00	4200	Kg	
		CABBAGE		1.00	10000.00	10000	HEADS	
		SWEET POTATOES		0.90	10500.00	9450	Kg	
		GREEN BEANS		1.00	93100.00	93100	Kg	
FARM_14	THEMBA MHLANGA	GREEN MEALIES	6.00	6.00	7660.00	45960	COBS	154.2
		MAIZE (GRAIN)		6.00	560.00	3360	Kg	
		SUGAR BEANS		2.00	2100.00	4200	Kg	
		TOMATOES		0.50	250.00	125	LUGS	
		SPINACH		0.50	240.00	120	LUGS	
		ONIONS		0.25	1920.00	480	Kg	
			42.00	42.48	WEIGHTED AVERAGE USAGE --->			101.14

PROJECT NET (Ha) 642.00

USED FOR THIS STUDY (Ha) 649.34

15-Aug-89

MEASURED FARMING(SA)(PTY)LTD

TABLE 3:MARKET PRICES FOR SELECTED CROPS AT JOHANNESBURG & PRETORIA MARKETS,1986

YEAR:1986			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
POTATOES	JHB	PRICE	323	236	161	177	208	254	279	337	462	478	341	311
		QUANT	12416	12116	13949	15133	11898	11526	13974	11408	15011	14482	14145	13194
	PTA	PRICE	326	233	159	174	201	255	283	341	459	468	318	305
		QUANT	6803	6786	7997	8900	1818	6499	7874	6522	8574	8171	8669	8366
TOMATOES	JHB	PRICE	617	400	399	341	353	458	477	493	574	405	439	379
		QUANT	4729	5435	5709	7396	6287	5122	7242	6025	7815	7689	6929	7545
	PTA	PRICE	564	390	393	333	337	438	468	500	566	411	406	363
		QUANT	2503	2936	3192	38873	3394	2721	3696	3326	4529	4193	3797	4226
PUMPKIN	JHB	PRICE	125	126	117	108	99	129	126	155	220	236	227	120
		QUANT	796	725	839	1186	1406	1171	1868	1610	1778	940	692	906
	PTA	PRICE	130	159	129	116	115	146	155	202	269	241	227	124
		QUANT	492	389	595	873	707	654	832	783	911	629	357	684
CABBAGE	JHB	PRICE	66	59	76	63	46	39	42	50	45	54	41	60
		QUANT	4184	4734	5194	6033	4904	5176	6887	5572	8112	6206	6509	5993
	PTA	PRICE	99	84	110	86	61	50	53	62	58	76	62	79
		QUANT	2213	2575	2475	3221	2618	2766	3852	2845	3889	2847	2581	2463
ONIONS	JHB	PRICE	183	215	291	374	563	518	539	507	382	212	206	161
		QUANT	2242	2233	2118	2334	1873	2121	2914	2351	3270	2519	2414	2801
	PTA	PRICE	210	250	308	389	587	514	507	479	368	230	207	177
		QUANT	1549	1668	1655	1864	1242	1397	1804	1721	2170	1557	1533	1900
GREEN BEANS	JHB	PRICE	485	424	537	511	412	499	820	687	634	595	515	660
		QUANT	356	387	340	447	444	365	417	384	537	421	431	343
	PTA	PRICE	342	379	438	376	354	475	935	685	603	591	430	532
		QUANT	276	262	278	328	295	252	219	262	373	260	304	260
SWEET POTATOES	JHB	PRICE	269	209	194	209	189	193	210	213	237	376	300	328
		QUANT	434	456	539	623	637	646	896	781	908	466	528	418
	PTA	PRICE	280	229	194	189	164	162	180	207	262	365	314	346
		QUANT	329	363	473	570	589	595	796	664	705	433	392	371
BEETROOT	JHB	PRICE	109	112	176	134	113	110	138	187	122	93	82	143
		QUANT	699	683	719	803	736	695	860	680	1087	1886	906	1104
	PTA	PRICE	117	123	168	146	133	157	198	222	141	106	94	162
		QUANT	428	466	554	525	477	442	602	478	759	613	598	835
SPINACH	JHB	PRICE	190	246	209	166	145	166	217	228	151	135	138	159
		QUANT	186	162	219	288	271	261	304	280	449	336	321	215
	PTA	PRICE	217	235	233	200	169	179	255	296	200	172	174	246
		QUANT	58	55	73	94	88	92	113	102	179	129	115	62

Annexure 3.8

15-Aug-89

MEASURED FARMING(SA) (PTY)LTD

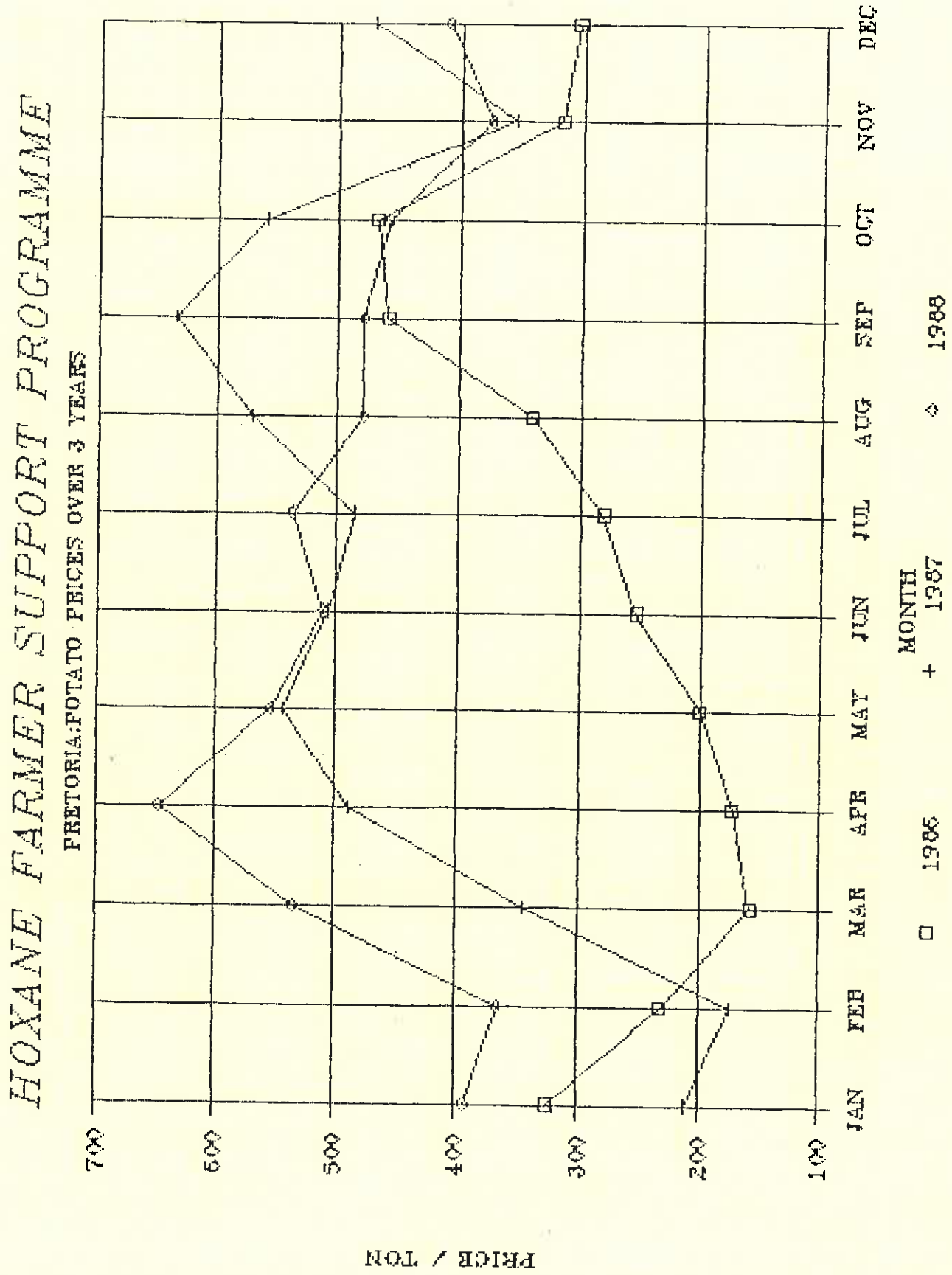
TABLE 5:MARKET PRICES FOR SELECTED CROPS AT JOHANNESBURG & PRETORIA MARKETS,1988

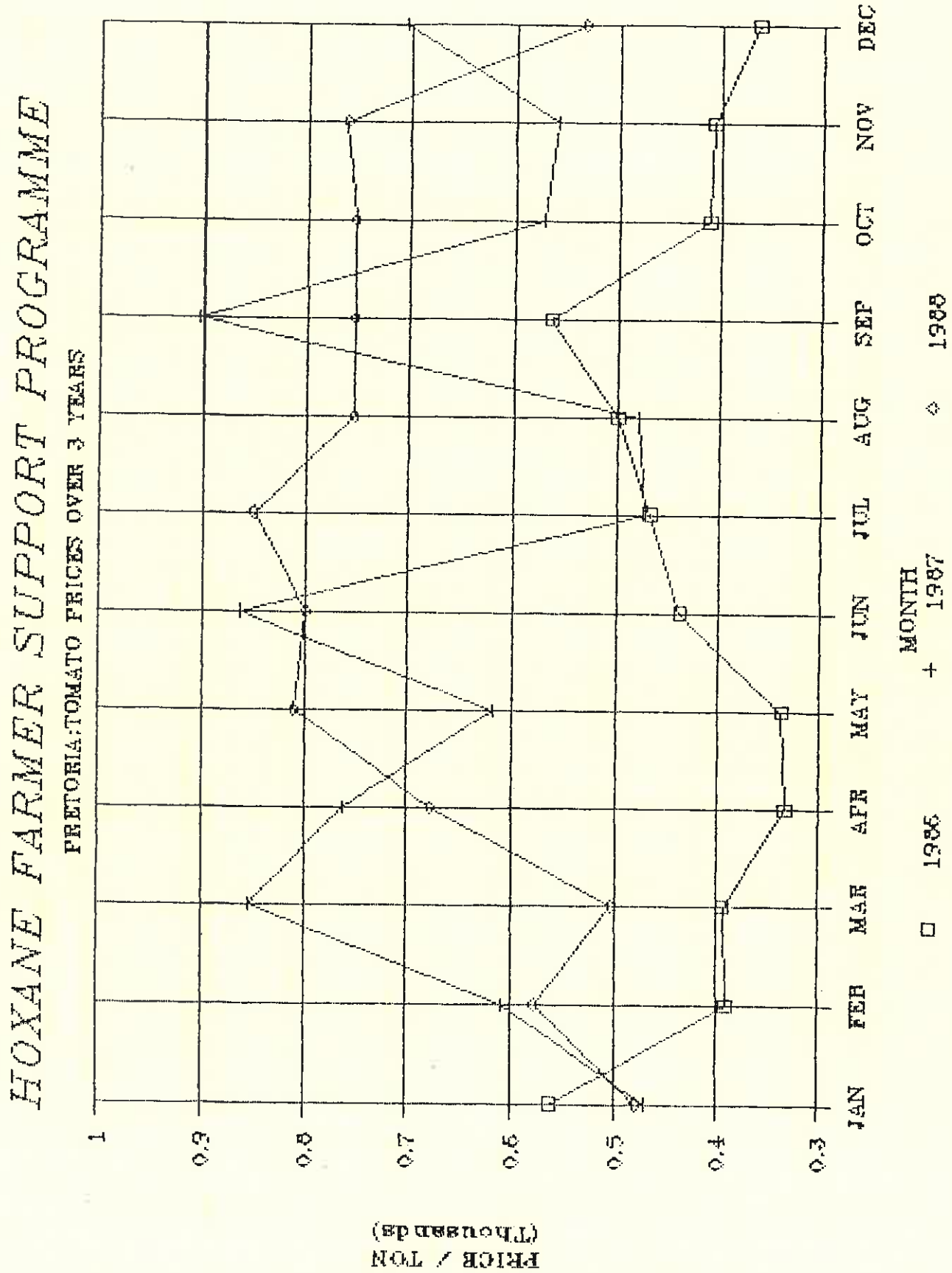
YEAR:1988			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
POTATOES	JHB	PRICE	400	370	526	643	546	525	543	483	475	481	385	435
		QUANT	11040	11609	15303	10637	15396	12228	12442	14473	15429	15747	17386	13426
	PTA	PRICE	393	366	534	648	554	510	537	479	479	458	376	411
		QUANT	5965	6642	8349	5946	8860	7309	7076	9744	9051	8653	11734	7074
TOMATOES	JHB	PRICE	493	597	535	743	865	829	831	722	775	765	837	611
		QUANT	5862	5350	7503	5286	6469	5554	5682	7310	7722	7433	7358	7500
	PTA	PRICE	479	578	504	678	811	799	851	755	755	755	763	534
		QUANT	2972	2943	4198	2716	3546	2817	2965	4271	3990	3859	4671	3434
PUMPKIN	JHB	PRICE	145	106	151	171	192	213	381	528	640	594	318	243
		QUANT	651	895	1062	884	1399	1067	1282	1084	596	478	656	659
	PTA	PRICE	108	119	134	172	152	174	349	411	523	498	279	173
		QUANT	411	476	733	480	804	605	668	610	349	264	320	358
CABBAGE	JHB	PRICE	89	113	116	107	181	328	307	210	112	140	89	76
		QUANT	3686	4159	5980	4543	3994	2698	2914	3945	4117	3698	3654	3321
	PTA	PRICE	98	128	131	114	144	242	248	182	91	105	80	76
		QUANT	1842	2002	3061	2193	2850	1889	2184	2706	2571	2348	2674	1913
ONIONS	JHB	PRICE	431	357	530	502	447	448	436	394	362	289	223	293
		QUANT	2187	2467	2776	1917	2935	2528	2606	3409	3283	3421	3218	2722
	PTA	PRICE	480	415	587	514	466	470	424	393	365	275	242	295
		QUANT	1433	1895	2232	1661	2192	1682	1771	2148	1932	1719	1959	1672
GREEN BEANS	JHB	PRICE	824	1144	961	955	1042	1210	1229	942	1091	1379	844	893
		QUANT	293	304	407	285	439	323	373	469	403	327	412	344
	PTA	PRICE	658	776	627	574	696	809	910	742	777	896	614	638
		QUANT	194	204	346	227	326	258	296	443	316	270	366	256
SWEET POTATOES	JHB	PRICE	341	244	245	234	190	194	244	215	238	424	322	358
		QUANT	451	553	822	623	1036	810	939	1197	1139	616	660	517
	PTA	PRICE	275	213	217	185	167	165	195	186	214	349	329	333
		QUANT	344	455	662	540	892	722	755	1107	744	428	462	290
BEETROOT	JHB	PRICE	365	395	385	321	278	312	430	408	185	168	167	196
		QUANT	440	451	741	499	686	538	503	670	923	877	827	1051
	PTA	PRICE	279	366	396	278	231	373	399	358	165	168	139	144
		QUANT	307	328	522	352	476	310	301	472	548	523	724	792
SPINACH	JHB	PRICE	344	417	405	307	463	520	609	554	299	253	275	326
		QUANT	161	184	329	298	263	239	209	280	381	364	350	243
	PTA	PRICE	430	492	451	320	345	335	443	382	231	263	294	321
		QUANT	34	45	66	69	104	95	92	152	154	115	126	66

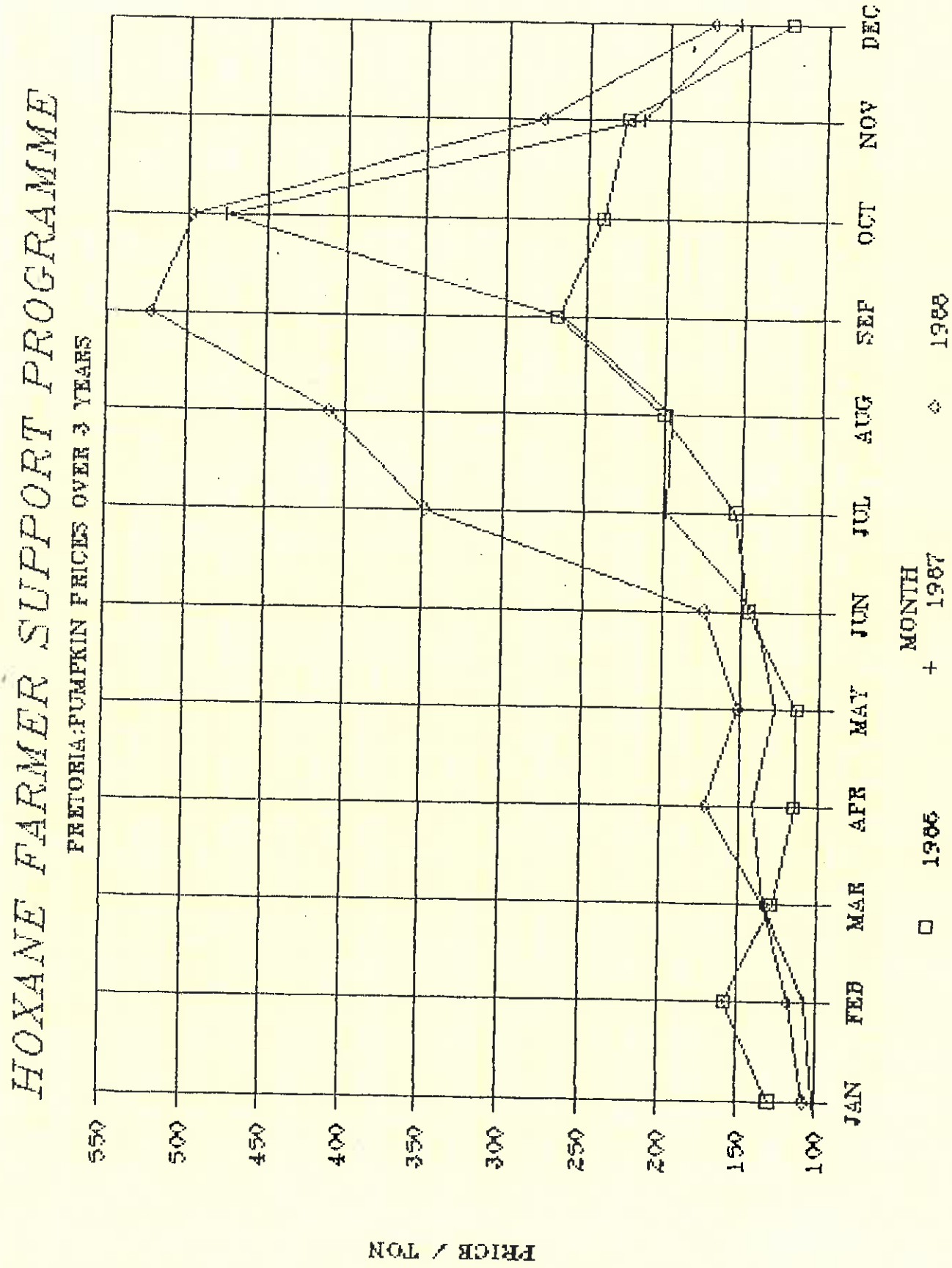
MEASURED FARMING(SA)(PTY)LTD

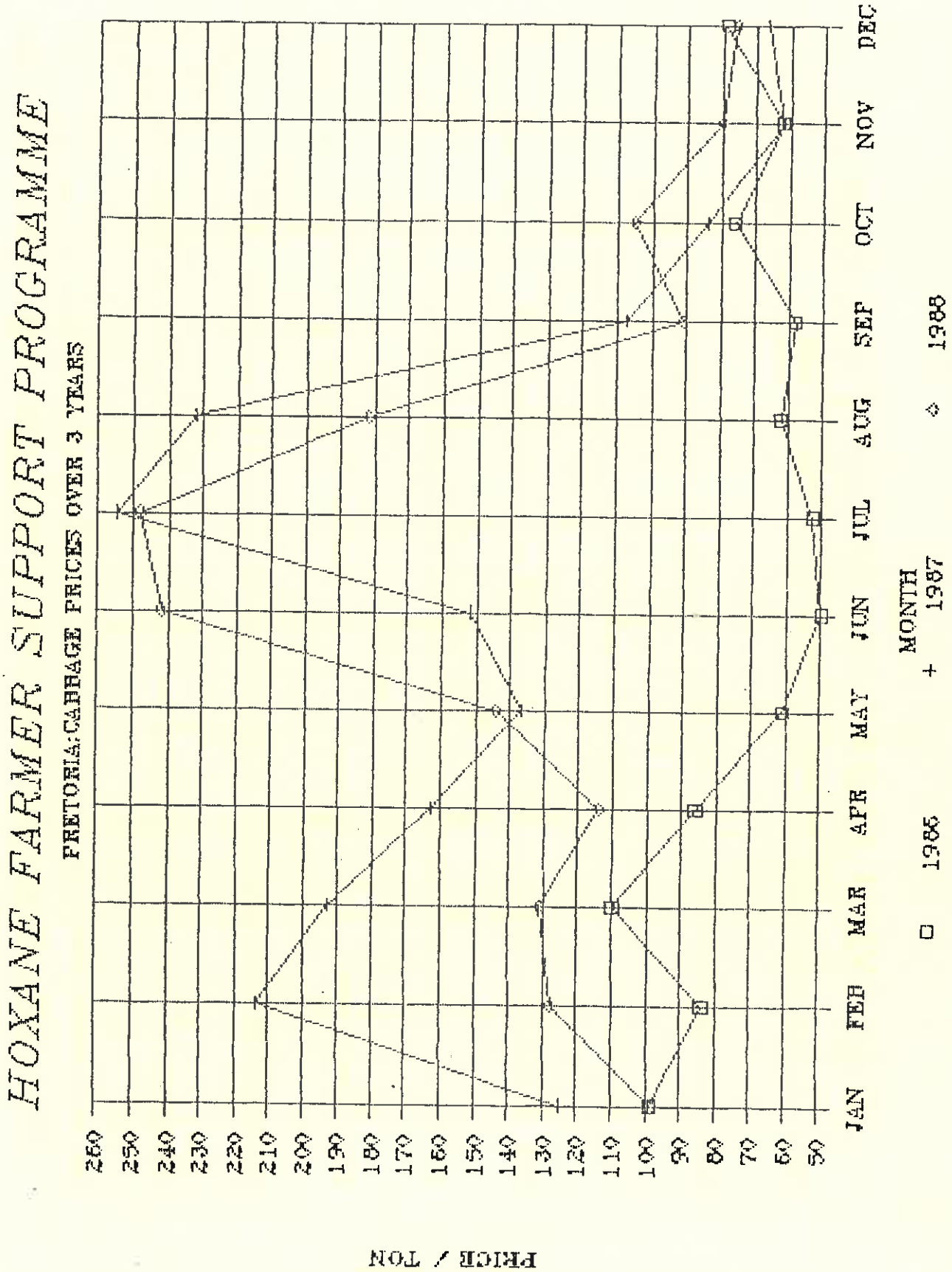
TABLE 7:MAXIMUM TONNAGE PER CROP TO BE CONSIDERED FOR MARKETS AT 10 % OF QUANTITY FOR 3 YEAR AVERAGE (1986-88)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
POTATOES	JHB	1194.03	1193.87	1459.63	1214.40	1276.60	1263.03	1282.20	1275.60	1574.23	1489.37	1537.73	1367.37
	PTA	673.73	702.87	823.20	704.10	551.93	736.60	761.83	755.10	904.70	869.57	992.37	789.77
TOMATOES	JHB	534.37	522.67	630.27	590.73	601.50	544.20	637.87	650.30	749.70	739.53	709.30	747.80
	PTA	265.63	292.83	352.53	1480.33	325.50	277.87	367.70	372.50	410.33	399.80	406.20	382.90
PUMPKIN	JHB	71.47	69.77	92.33	89.67	105.63	104.97	129.80	138.20	133.87	71.33	54.47	70.37
	PTA	52.80	50.37	71.63	66.97	67.40	62.00	72.60	76.07	74.53	42.70	34.30	52.57
CABBAGE	JHB	398.27	418.87	563.10	521.13	449.27	473.93	466.80	451.43	623.07	505.50	515.10	502.80
	PTA	204.50	204.33	263.60	252.93	258.63	260.53	281.90	250.63	335.70	265.37	249.70	226.20
ONIONS	JHB	215.70	224.17	255.07	199.37	222,20	256.43	266.57	273.80	323.70	300.30	279.83	277.30
	PTA	148.30	177.23	202.43	167.87	158.80	168.67	194.23	185.13	214.77	172.83	174.17	182.93
GREEN BEANS	JHB	29.07	31.80	39.47	38.73	44.43	42.50	39.23	43.07	49.97	36.90	40.87	37.43
	PTA	20.10	21.33	30.23	27.77	30.77	29.93	25.83	31.87	37.37	26.17	31.07	28.50
SWEET POTATOES	JHB	46.79	50.43	69.54	65.14	81.58	83.27	87.62	92.18	95.99	54.04	56.20	46.76
	PTA	36.88	42.61	59.55	58.51	72.03	73.34	80.29	82.41	74.06	43.78	41.30	33.60
BEETROOT	JHB	56.22	54.95	67.87	60.83	66.82	66.72	60.94	61.59	95.48	117.03	81.33	99.64
	PTA	37.96	35.77	50.26	40.89	46.28	44.69	46.22	46.48	68.33	57.00	61.10	79.47
SPINACH	JHB	16.97	17.98	28.03	27.67	27.10	29.77	25.28	28.19	47.29	37.69	43.57	23.09
	PTA	4.82	4.87	7.41	7.67	9.87	10.95	10.87	12.25	18.41	12.54	11.75	6.59

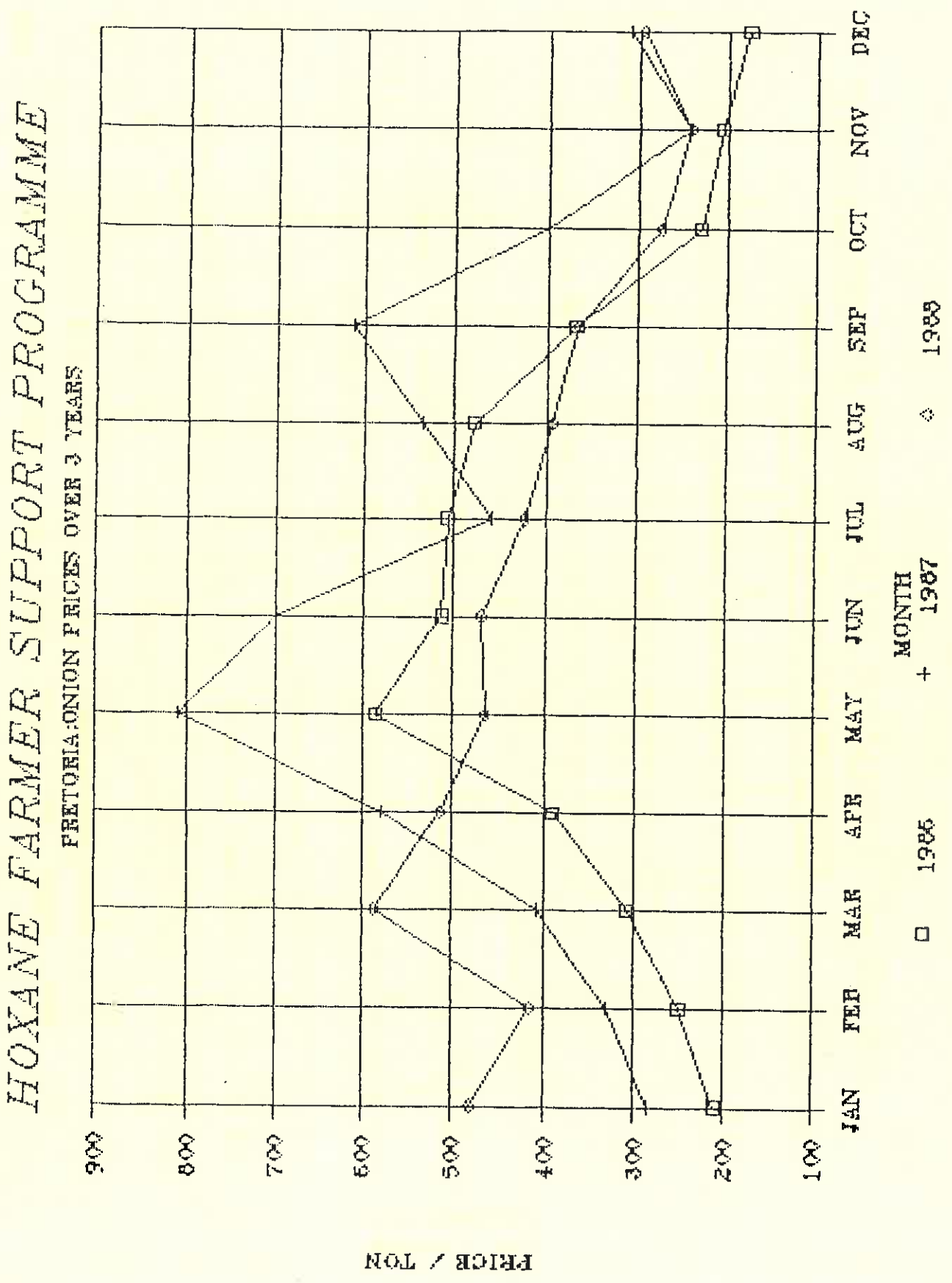

HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:POTATO PRICES OVER 3 YEARS
PRICE / TON
700
600
500
400
300
200
100
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988


HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:TOMATO PRICES OVER 3 YEARS
PRICE / TON
(Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988

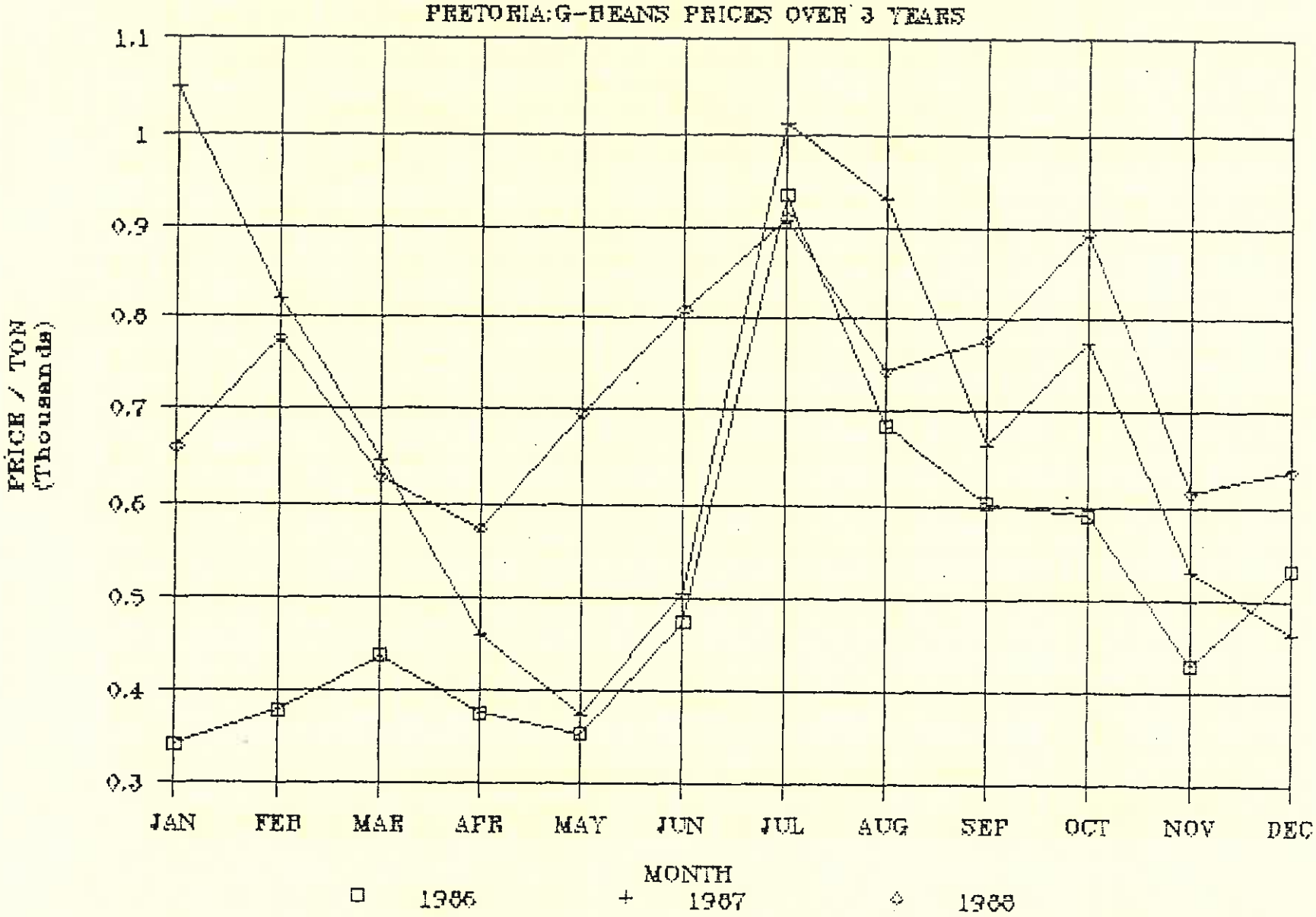

HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:PUMPKIN PRICES OVER 3 YEARS
PRICE / TON
550
500
450
400
350
300
250
200
150
100
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988

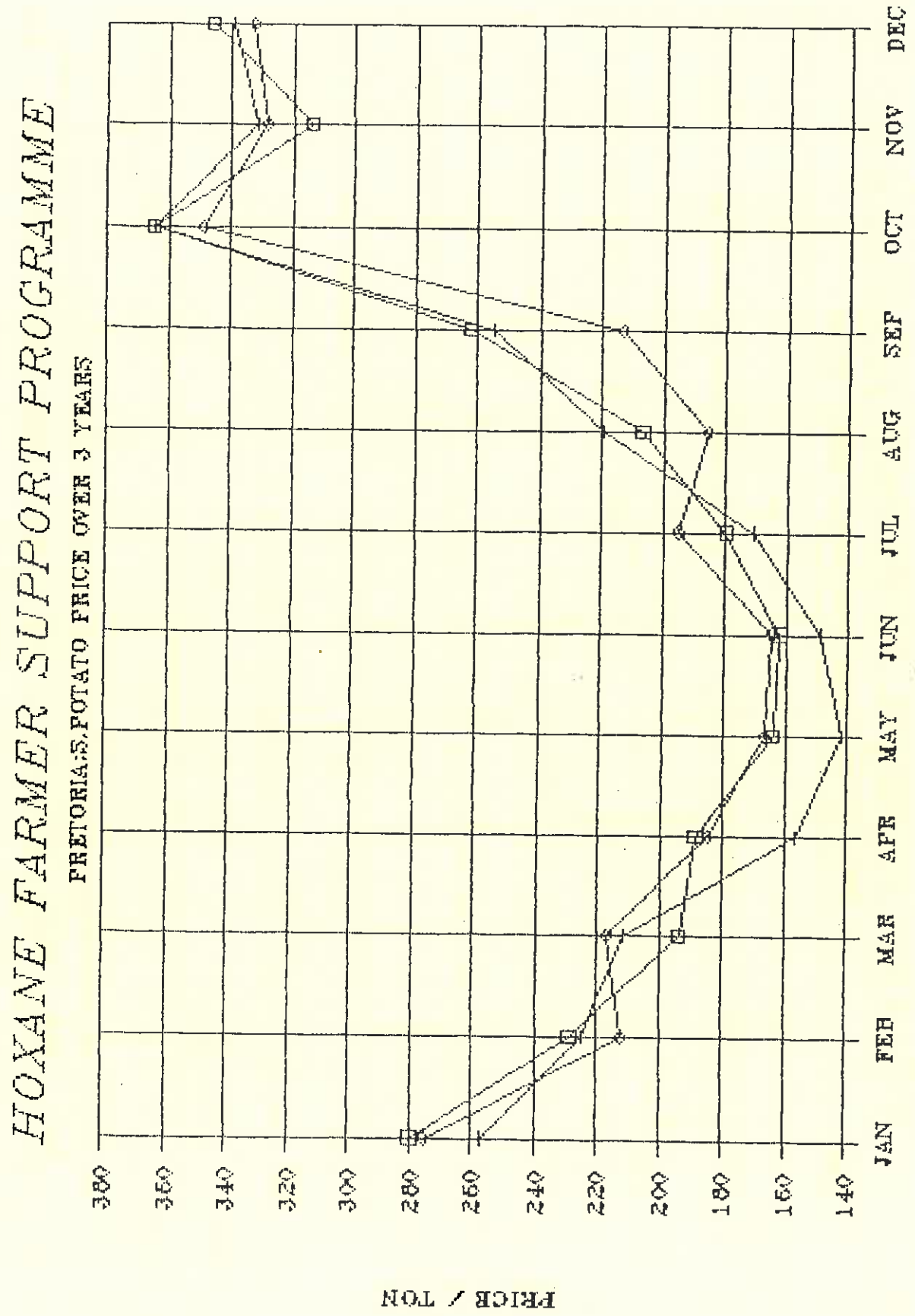

HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:CABBAGE PRICES OVER 3 YEARS
PRICE / TON
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH
□ 1986
+ 1987
◇ 1988

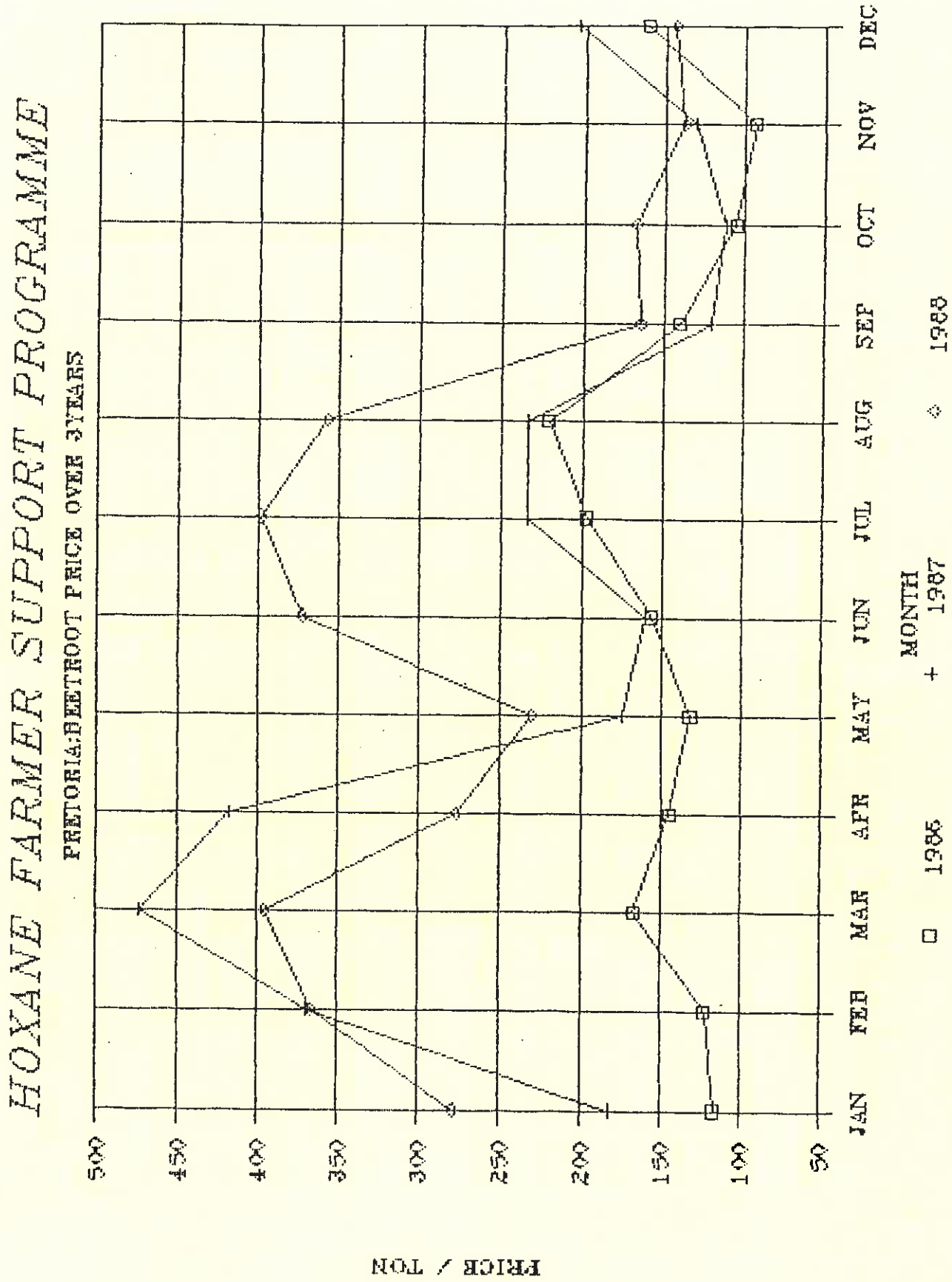
Annexure 3.8

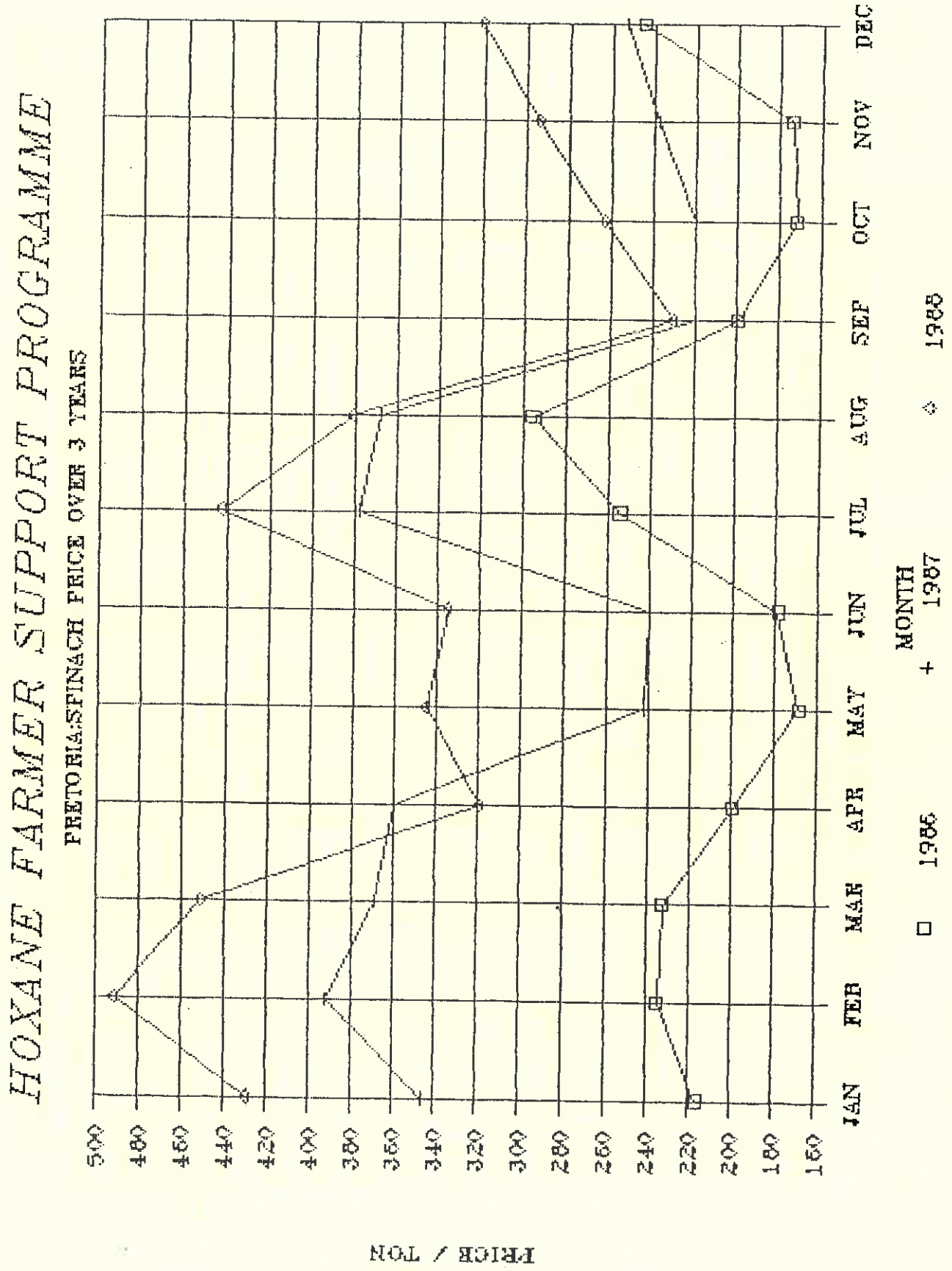

HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:ONION PRICES OVER 3 YEARS
PRICE / TON
900
800
700
600
500
400
300
200
100
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988

HOXANE FARMER SUPPORT PROGRAMME




HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:S.POTATO PRICE OVER 3 YEARS
PRICE / TON
380
360
340
320
300
280
260
240
220
200
180
160
140
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988


HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:BEETROOT PRICE OVER 3YEARS
PRICE / TON
500
450
400
350
300
250
200
150
100
50
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988


HOXANE FARMER SUPPORT PROGRAMME
PRETORIA:SPINACH PRICE OVER 3 YEARS
PRICE / TON
500
480
460
440
420
400
380
360
340
320
300
280
260
240
220
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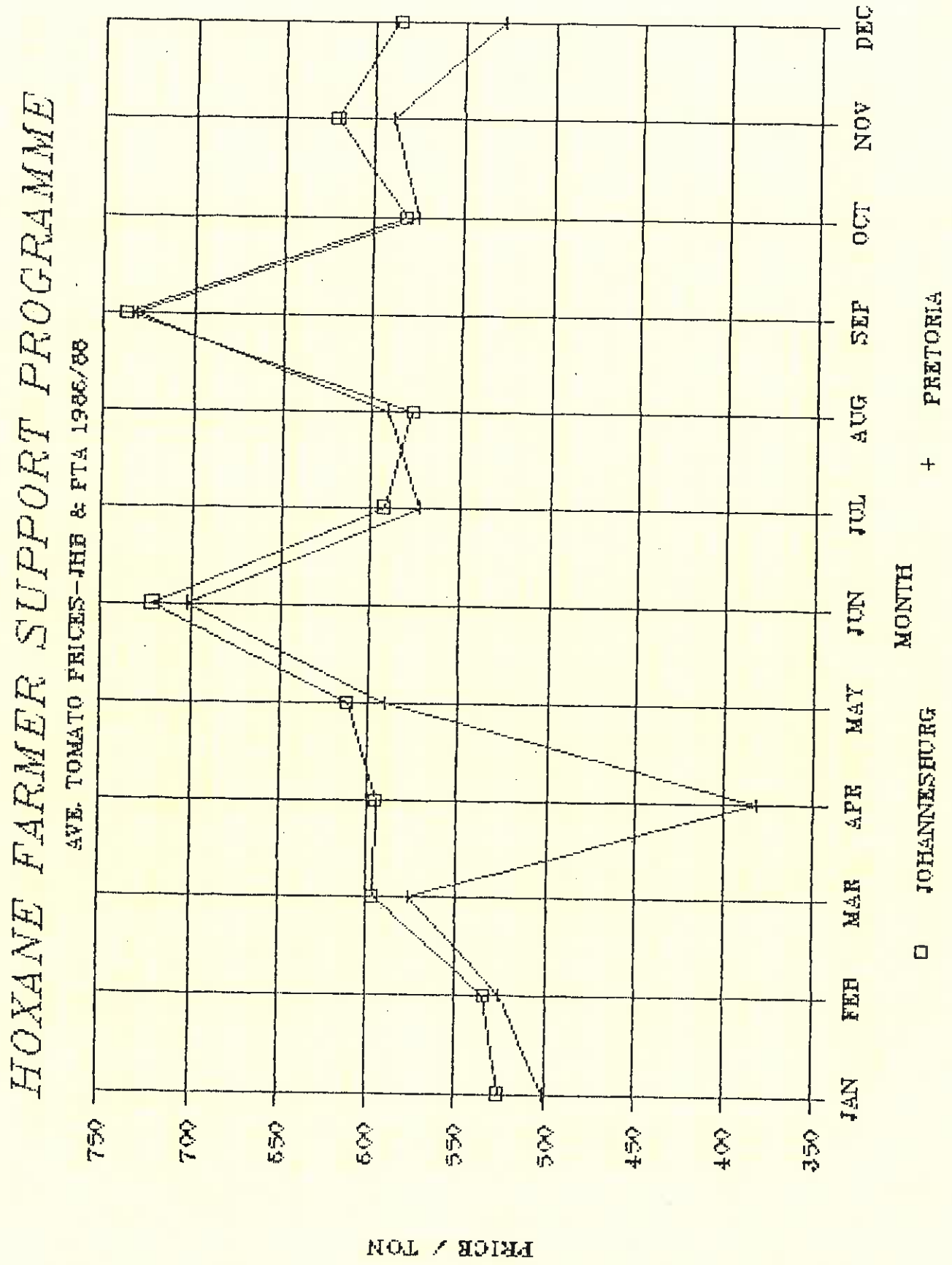
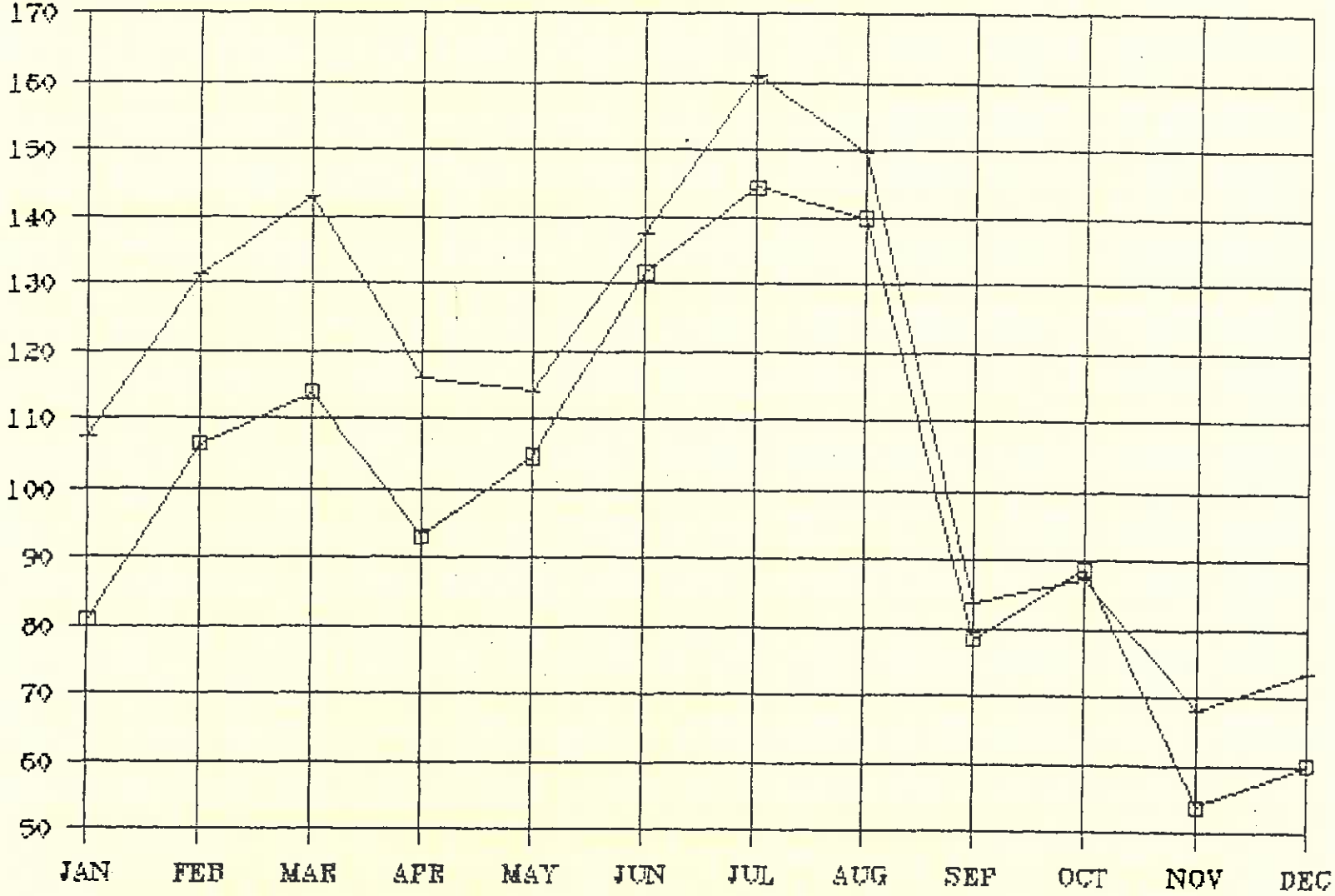
180
160
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ 1986 + 1987 ◇ 1988


HOXANE FARMER SUPPORT PROGRAMME
AVE. TOMATO PRICES-JHB & PTA 1986/88
PRICE / TON
750
700
650
600
550
500
450
400
350
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
MONTH
□ JOHANNESBURG + PRETORIA

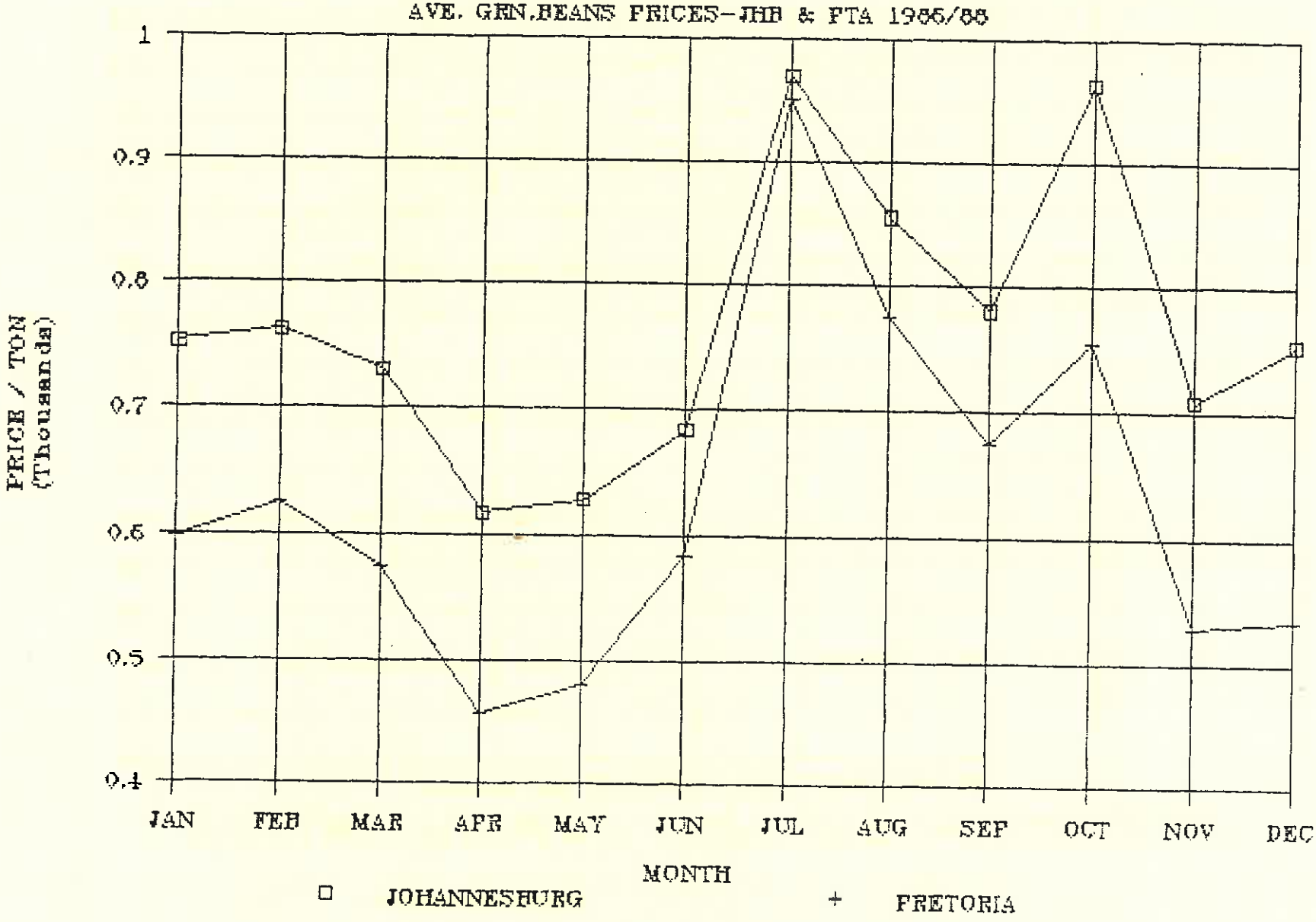
HOXANE FARMER SUPPORT PROGRAMME

AVE. CABBAGE PRICES-JHB & PTA 1986/88

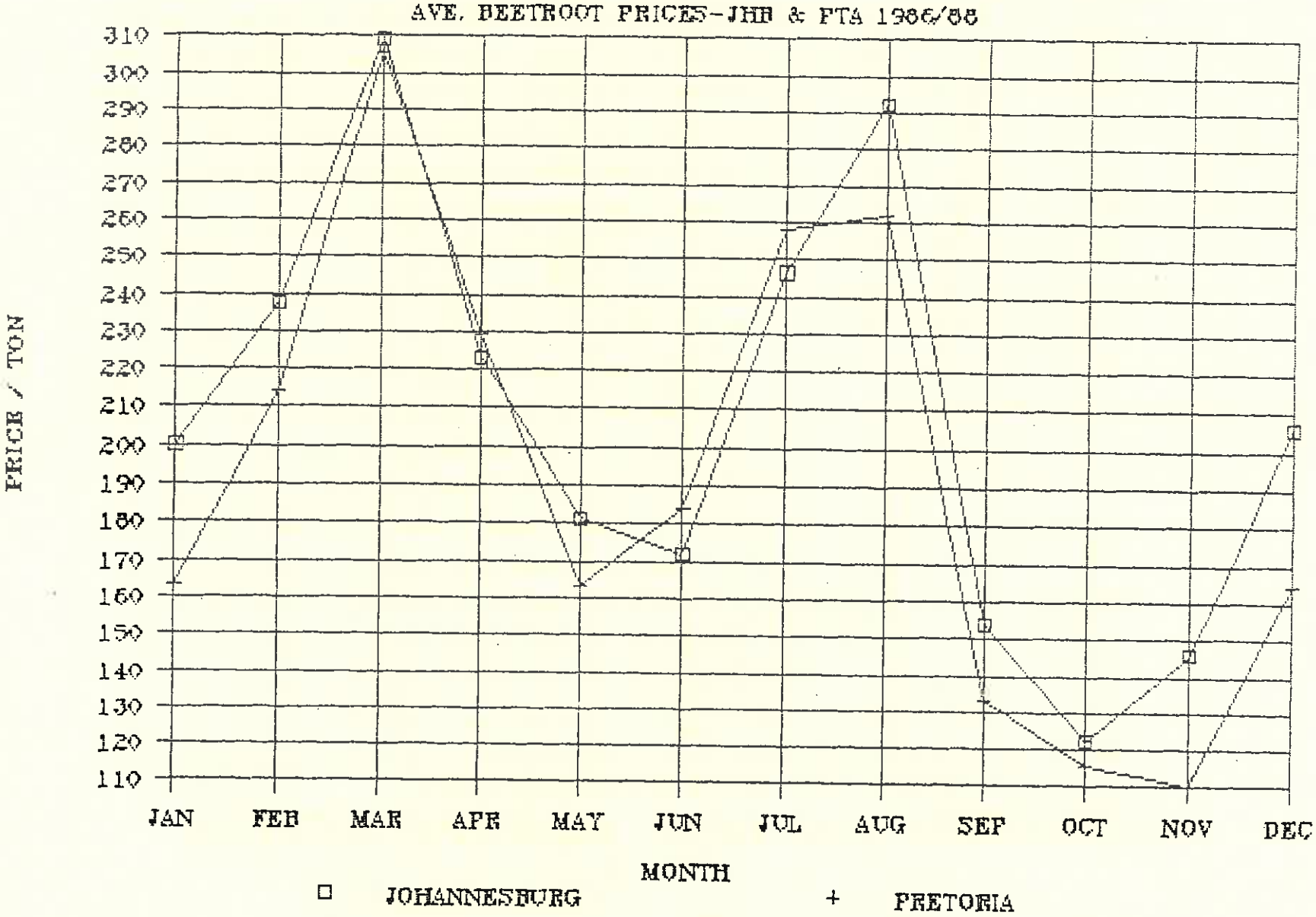


Annexure 3.8

HOXANE FARMER SUPPORT PROGRAMME



HOXANE FARMER SUPPORT PROGRAMME



Annexure 3.8

15-Aug-89

MEASURED FARMING(SA)(PTY)LTD

TABLE 8:POPULATION DISTRIBUTION: HOXANE AND SURROUNDING AREA. (10 Km Radius)

	% GROWTH	1985	1986	1987	1988	1989	1990
HOXANE VILLAGES	5.00	20775	21814	22904	24050	25252	26515
GAZANKULU	5.00	14980	15729	16515	17341	18208	19119
LEBOWA	5.00	39200	41160	43218	45379	47648	50030
KANGWANE	5.00	6170	6479	6802	7143	7500	7875
HAZYVIEW	1.00	500	505	510	515	520	526
TOTAL		81625	85686	89950	94427	99128	104064

TABLE 9:POPULATION DISTRIBUTION: HOXANE AND SURROUNDING AREA. (50 Km ROAD DISTANCE-ADDITIONAL)

	% GROWTH	1985	1986	1987	1988	1989	1990
DWARSLOOP AREA	5.00	13501	14176	14884	15629	16410	17230
RURAL AREA	5.00	40564	42592	44721	46957	49305	51771
LEBOWA AREA	5.00				23749	24936	26183
WHITE RIVER	1.00				6757	6825	6893
COMMUTATORS 30%	2.50				4050	4151	4255
TOTAL		54064	56767	59606	97142	101628	106332

15-Aug-89

MEASURED FARMING(SA)(PTY)LTD

TABLE 12:MARKET POTENTIAL FOR SELECTED CROPS

CROPS	TOTAL SCHEME AREA Ha	POTENTIAL PRODUCTION Tons	AREA REQ 10Km RADIUS Ha	SURPLUS/ DEFICIT AREA Ha	AREA REQ 50Km ROAD DISTANCE Ha	SURPLUS/ DEFICIT Ha	QUANTITY MUNICIPAL MARKETS Tons	10% JHB MUNICIPAL MARKET Tons	PERIOD TO BE MARKETED Month	PERCEN-TAGE OF MARKET %	10% PTA MUNICIPAL MARKET Tons	PERIOD TO BE MARKETED Month	PERCEN-TAGE OF MARKET %
POTATOES			84.88		86.73		0.00						
TOMATOES	142.62	5704.63	32.52	110.10	33.23	76.87	3074.68	4632.40	MAY-NOV	6.64			
PUMPKIN			41.63		42.53		0.00						
CABBAGE	19.11	477.68	83.25	-64.14	0.00	-64.14	0.00						
SWEET POTA	21.40	535.00	6.16	15.24	6.29	8.94	223.61	157.00	OCT-DEC	10.00	118.68	OCT-DEC	5.61
GREEN MEAL	336.29	211.86	289.07	47.22	295.37	-248.15	0.00						

GAZANKULU DEPARTMENT OF AGRICULTURE
AND FORESTRY
REF. 6/8/3-2-7

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II
"DEVELOPING A PROJECT CONCEPT"
REVISED COST ESTIMATE

ADDENDUM TO THIRD INTERIM
REPORT OF OCTOBER 1989

JUNE 1990

DBSA PROJECT LEADER : G. MASHILE

DEVELOPMENT BANK OF SOUTHERN AFRICA
P.O. BOX 1234
HALFWAY HOUSE 1685

EKSTEEN, VAN DER WALT AND NISSEN
CONSULTING CIVIL, STRUCTURAL AND AGRICULTURAL ENGINEERS
30 SCHOEMAN STREET - P.O. BOX 236 - TEL. (01521) 912020
PIETERSBURG 0700

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II

"DEVELOPING A PROJECT CONCEPT" REVISED COST ESTIMATE

INDEX

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II

"DEVELOPING A PROJECT CONCEPT" REVISED COST ESTIMATE

1. GENERAL AND SCOPE

1.1 Our report on "Preparatory Studies Phase II" was tabled in October 1989 (our third Interim Report on this project) and was discussed and accepted at the Steering Committee meeting held on 89-11-15 at Mkhuhlu (copy of the minutes of this meeting is included as Annexure 4).

1.2 In this Report mention was made of further optimization options to the various water supply alternatives evaluated by EVN. In par. 2.4.1 of the Report it was mentioned that "The concerned technical officials of DBSA have pointed out that various optimizations to the layout costs can possibly be achieved if irrigation water is to be pumped directly into the communal water supply system and not to a command reservoir as proposed in the previous paragraph. The inherent benefit of ease of water control where open storage is provided would then have to be sacrificed. The proposed alternative would comprise of the following system:

Independent pump installations for:

a) Ten Farms
b) Big Bend
c) Mkhuhlu/Seholokoane
d) Upper Cork
e) Cork

i.e. a five pump system instead of a three pump system"

1.3 The project leader, mr G. Mashile has consequently instructed the review engineer, mr W. du Plessis and mr A. Wallis, technical official of DBSA to prepare cost estimated of the Big Bend and Cork layouts respectively in accordance with the above principle. The presentations are included herein as Annexures 1 & 2.

1.4 Further arising out of the Steering Committee, a letter dated 89-11-21 was received from the Director-General, Department of Agriculture and Forestry, Gazankulu that the first phase development of the Sabie Scheme should be limited to the present developed area excluding the 77ha extensions proposed by Eksteen, Van der Walt and Nissen in previous reports. The latter could be added later i.e. when the Njaka Dam in the Meriti river has been completed. This letter is appended as Annexure 3. The areal extent of the scheme therefore reduces from 642ha to **565ha**.

1.5 The purpose of this report is therefore to conclude DBSA requirements for the Phase II study and we therefore have decided to present it in a form of an addendum to the October 1989 Report.

1.6 All of the above was discussed at a technical meeting held in Pietersburg on 90-05-30 where messrs. Mashile, Sauermann and Wallis of DBSA, the review engineer mr W. du Plessis, GAZ-DAF officials messrs v.d. Merwe and de Witt and our mr Eksteen were present.

1.7 The scope of this report is now

a) to evaluate the proposals of the DBSA technical team

b) to prepare a revised cost estimated of the proposed development of 565ha.

2. EVALUATION OF DBSA ALTERNATIVES

The following tabulation gives a comparison of the proposed Ten Farms and Cork alternatives presented to mr Mashile by DBSA technical officials. In order to compare similar elements with each other, it was necessary to effect minor adjustments, additions and omissions to the various cost estimates as described in the notes at the end of the tabulation.

The comparison was done using nett costs i.e. excluding contingencies etc. because in some of the DBSA estimates for Cork nett costs were used.

From the tabulation it can be concluded that using the Ten Farms exercise as an example the unit capital development costs can be reduced by a maximum of 24% (if the unit costs of R6 467/ha is compared with R5 529/ha, albeit with sacrifice of sophistication, and not including the additional cost of electricity supply to Big Bend). In the case of Cork the cost savings are not as definite as the above.

Table 2.1

Comparison of EVN proposals (Oct. 1989) with DBSA Technical Team proposals (May 1990)

		EVN	DBSA
1.	**TEN FARMS COMPLEX**		(Ref. Annexure 1)
1.1	System operation	Water pumped to a holding reservoir.	Water pumped directly into system
1.2	Area evaluated	Ten Farms complex comprising: Ten Farms : 84 Big Bend : 66 Mkhuhlu : 16 Extensions : 65 231ha	Ten Farms : 84ha
1.3	Costs (Nett i.e. excluding contingencies, preliminary and general, establishment and engineering		
	a) Underground supply mains	R 501 050 : R2169/ha	R145 572 : R1733/ha
	b) Pump station		
	i) River abstraction and civil works	R 150 000[1.1]	Not evaluated Pro rata say: R 55 000[2]
	ii) Mechanical	R 260 000	R 99 000
	iii) Electrical	R 156 000	R 15 000
	iv) Building	R 150 000 **R 716 000** : R3100/ha	R 20 000 **R189 000** : R2250/ha
	c) Above ground equipment	R 277 000 : R1199/ha	R104 664 : R1246/ha
	Total costs	**R1 494 050** : R6467/ha	**R439 236** : R5229/ha
2.	**CORK SCHEME**		(Ref. Annexure 2)
2.1	System operation	a) Existing water supply system scrapped. b) Water pumped directly into system.	a) Existing scheme retained and upgraded. b) Water pumped from new sumps along existing canals on plots 4 to 14. c) Plots 15, 16, 17 & 18 to pump directly from river. d) No mention is made in the screed of blocks 1, 2 & 3. (EVN assumes it was excluded).
2.2	Area evaluated	Cork Scheme : 121 Extensions : 12 133ha	Cork Scheme Blocks 4 - 14 : 78 15 - 18 : 24 **102ha**

		EVN	DBSA
3.	**COSTS**		
3.1	Main supply system (Nett costs)		
	a) Underground piped pumped supply	R322 000	
	b) Holding dams plots 4-14	Not required	R 30 000
	c) Upgrading of canal	Canal scrapped	R 40 000[1.2]
	d) Fencing of canal	-	R 12 000
		R322 000	R 82 000
3.2	Pump station & pumping (nett costs)		
	i) River abstraction upgrading	R100 000[1.1]	excluded
	ii) Upgrading of existing pumps		R133 000[1.2]
	iii) Pump station		
	. Mechanical	R150 000	: See b(ii)
	. Electrical	R 90 000	: Omitted use R25 000[2(1.1)]
	. Building	R100 000[1.1]	: See b(ii)
	iv) Power supply main		
	. To river pump station	R 21 000	R 21 000[2]
	. Electricity mains to individual farmers	Not required	
	Farms 4-14 : 2km		R 40 000
	Farms 15-18 : 1km		R 20 000[2]
	. Farmer pump installations	Not required	R133 000[1.2]
	. Power points to each farmer		
	Farms 4-14 : 11no		R 11 000[1.2&2]
	Farms 15-18 : 4no		R 4 000[1.2&2]
		R461 000	**R487 000**
3.3	Other (nett costs)		
	a) Main access road improvement	R 50 000	R 10 000[1.2]
	b) Improvement to existing infield layout	R 68 000	R 68 000[3]
	c) Sprinkler irrigation layout	R320 600	R320 600[3]
		R438 600	**R398 600**
	Subtotal	**R1 221 600**	**R992 600**
3.4	Contingencies, Preliminary and General and Establishment costs (20% appr.)	R 244 400	R 198 400
3.5	Engineering and supervision including disbursements (10% appr.)	R 144 000	R 119 000
		R1 610 000	**R1 285 000**

Notes:

1. Provisional estimates based on judgement and not by the breaking up in elements or using sample costs. Costs by EVN are referenced 1.1 and by DBSA referenced 1.2.
2. Omissions in DBSA calculations corrected.
3. Cost values adjusted to nett costs where lump sum amounts were used by DBSA.

TABLE 3.1 : SABIE (HOXANI) IRRIGATION UPGRADING : REVISED COST ESTIMATE

	TEN FARMS	BIG BEND	MKHUHLU/ SEHOLOKOANE	UPPER CORK	CORK	TOTAL
FIRST PHASE DEVELOPMENT	84	82	198	80	121	565
FUTURE DEVELOPMENT	65	-	-	-	12	77
	149ha	82ha	198ha	80ha	133ha	642ha
CAPITAL COST ESTIMATE						
1. Bulk Water Supply Conveyors						
1.1 Supply and construction	R 146 000	R 142 000	R 343 000	R 139 000	R 82 000	R 852 000
1.2 Contingencies	R 30 000	R 28 000	R 68 000	R 28 000	R 16 000	R 170 000
1.3 Engineering	R 15 000	R 14 000	R 34 000	R 14 000	R 8 000	R 85 000
	R 191 000	R 184 000	R 445 000	R 181 000	R 106 000	R 1 107 000
2. Pumpstation and Pumping						
2.1 Supply and Construction						
a) Civil works (river abstraction)	R 55 000	R 55 000	R 85 000	R 55 000	R 10 000	
b) Mechanical	R 99 000	R 97 000	R 240 000	R 95 000	R 133 000 (upgrading)	
c) Electrical	R 15 000	R 15 000	R 40 000	R 15 000	R 25 000	
d) Building	R 20 000	R 20 000	R 50 000	R 20 000	-	
e) Farmer pump installation	-	-	-	-	R 133 000	
f) Power mains	R 90 000	R 90 000	R 62 000	R 60 000	R 21 000	
	R 279 000	R 277 000	R 477 000	R 245 000	R 322 000	R 1 600 000
2.2 Contingencies	R 56 000	R 56 000	R 96 000	R 50 000	R 64 000	
2.3 Engineering	R 28 000	R 28 000	R 48 000	R 25 000	R 32 000	
	R 363 000	R 361 000	R 621 000	R 320 000	R 418 000	R 2 083 000
3. MAIN ACCESS						
3.1 Supply and construction	R 40 000	R 40 000	R 100 000	R 40 000	R 10 000	
3.2 Contingencies	R 8 000	R 8 000	R 20 000	R 8 000	R 2 000	
3.3 Engineering	R 4 000	R 4 000	R 10 000	R 4 000	R 1 000	
	R 52 000	R 52 000	R 130 000	R 52 000	R 13 000	R 299 000
			TOTAL MAIN INFRASTRUCTURE			R 3 489 000
4. INFIELD DEVELOPMENT						
4.1 Supply and Construction						
a) Fencing	R 17 000	R 17 000	R 41 000	R 17 000	R 24 000	
b) Internal roads	R 22 000	R 21 000	R 51 000	R 21 000	R 24 000	
c) Surface stormwater control	R 18 000	R 18 000	R 43 000	R 17 000	R 10 000	
d) Land deforestation etc.	R 15 000	R 15 000	R 30 000	R 15 000	R 10 000	
e) Electrical supply to field edge and power points	-	-	-	-	R 208 000	
f) Sprinkler irrigation layout	R 105 000	R 102 000	R 247 000	R 100 000	R 321 000	
Subtotal	R 177 000	R 173 000	R 412 000	R 170 000	R 597 000	
4.2 Contingencies	R 36 000	R 34 000	R 82 000	R 34 000	R 120 000	
4.3 Engineering	R 18 000	R 17 000	R 41 000	R 17 000	R 60 000	
	R 231 000	R 224 000	R 535 000	R 221 000	R 777 000	R 1 988 000

3. REVISED COSTS

3.1 General

A new cost estimate has been made for the proposed farmer support development on a nett area of 565ha. The following assumptions and parameters apply:

a) Proposals by the DBSA technical officials (described in the preceeding paragraphs) and their cost estimates were used directly or by exterpolation from the Ten Farms sample to Big Bend, Mkhuhlu/Seholokoane and Upper Cork. The Cork data where used directly.

b) Where the above information was inadequate, EVN's previous cost estimate (Annexure 2.2 of October 1989 Report) was used; judiciously adjusted where deemed necessary. Such inclusions of EVN's previous estimates, or adjustments thereto, are indicated by an asterix in the tabulation.

c) Contingency costs include general contingencies, preliminary and general costs as well as the establishment of contractors on site. A general markup of approximately 20% is used throughout. Engineering costs include engineering design, engineering supervision and disbursements. A general markup of approximately 10% was used throughout.

3.2. Annual Irrigation costs

3.2.1 Cost Evaluation

During a policy meeting (89-03-08) at Giyani between GAZDAF and DBSA at which EVN was present, the following guidelines were determined in respect of irrigation costs to farmers; if applied to the study area giving the following:

a) Annual irrigation cost recovery from farmers (rounded off to the nearest R100)

i) Operating staff of pump houses and overall water bailiff function @ R8000/locality x 5 : R40 000 (R71/ha)

ii) Maintenance cost on main infrastructure, weighted between the following rates

: Underground pipelines	: 0,75% p.a. (36%)	
: Civil and electrical works	: 0,50% p.a. (48%)	
: Pumping equipment	: 4,0% p.a. (16%)	
	: 1,15% x R3 489 000	: R40 100 (R71/ha)

iii) Maintenance costs on infield development.

: General improvement : Nil

(The farmer shall regularly maintain such improvements using farm labour)

: Subsurface piping 1,00% x R187000 : R 1 900

: (R3/ha)

iv) Electricity

. Unit cost (@2400h/a and 3,2 c/kWh) for 650 kW : R 49 900

. Demand @ 70% x R17/kVA/month @ 90% P.F. : R103 100

R153 000

(R271/ha)

v) Land rental costs (to the Government in order to cover part of the infrastructural costs) were fixed at : R100/ha/a

---

TOTAL **R516/ha/a**

= = = = = = = = =

At a meeting with the farmers on 89-08-10 the Department of Agriculture and Forestry intimated that the following annual charges (i.e. annual payments by farmer to the authorities) would be applicable to this project (refer item 3 of the Minutes included as Annexure 2.7 in the October 1989 Report).

. Land Rental		
To GAZDAF	: R60	
To tribal authority	: R40	R100
. Irrigation costs		R100
Subtotal		**R200/ha/a**
The above implies a subsidy of R516 - R200		R316/ha/a

b) Annual irrigation farming expenses borne directly by the farmer; estimated as follows:

i) Redemption on nett costs of surface irrigation equipment (10%; 10 years; refer Mr N.J. Jooste 89-09-27)

: 16,27% x R950 000 : R154 600

(R274/ha)

ii) Maintenance on above

: 4% x R950 000 : R 38 000

(R67/ha)

R341/ha/a

c) Affordability

The annual pumping expenses by the farmers in the sample taken during May 1989 (refer to Annexure 10 of the July 1989 Report) ranged between R114/ha to R425/ha where the higher costs were incurred by the more successful farmers. If maintenance and repayment of surface irrigation equipment is to be included (@ R341/ha), the above determined all inclusive annual cost of R857/ha/a could well prove to be affordable without subsidization; a matter which will be addressed in the farming cost benefit study.

3.3 Development programme and cashflow requirements in respect of irrigation layout

The following programme covers basically the construction costs to establish the primary infrastructural and infield irrigation layout as described in the preceding paragraphs. Maintenance and running costs as well as redemption costs are not included due to the recovery thereof from the farmer as irrigation payments (as described in par. 3.2). Construction is most likely not to commence before the second half of 1991 and as such forms the datum of the following 18 months construction programme.

Period / Year	1991		1992		1993	
Half year	J-J	J-D	J-J	J-D	J-J	J-D
Actions						
a) Preparatory work and engineering design	0,10					
b) Construction including engineering and supervision		1,00	2,00	2,00	0,10	0,01
c) Retentions					0,20	0,07
SUBTOTALS	**0,10**	**1,00**	**2,00**	**2,00**	**0,30**	**0,08**
				TOTAL R5,48M		
				= = = = = =		
d) Escalation on expended sums	0,01	0,16	0,46	0,59	0,11	0,03
TOTALS	**0,11**	**1,16**	**2,46**	**2,59**	**0,41**	**0,11**
				TOTAL R6,84M		
				= = = = =		

ANNEXURE 1

DU PLESSIS EN BURGER

Raadgewende Siviele, Strukturele en Landbou Ingenieurs
Consulting Civil, Structural and Agricultural Engineers

Ferreirastraat 18 Ferreira Street
NELSPRUIT 1200

Posbus/P.O. Box 1301
NELSPRUIT
1200
Tel: (01311) 28249
Fax: (01311) 53550

U Verw.:
Your Ref.:

Ons Verw.:
Our Ref.:

FACSIMILE TRANSACTION

DATE : 1990-05-10

REF. NO. 563

TO : DEVELOPMENT BANK OF S A

TOTAL PAGES 7
(Including fax form)

ATTENTION : MR GIDEON MASHILE
Office No. 2181
Tel Ext No. 3150

FROM : MR WILLIE DU PLESSIS

MESSAGE :

HOXANE IRRIGATION UPGRADING AND F S P

Your instructions to investigate an alternative irrigation system for the 84 ha at Ten Farm refers.

Kindly find attached our proposal for two alternative systems,

a) One pumpstation at a total cost of R510 000-00:- R6 072/ha

b) Two pumpstations serving the total area of 84 ha at a total cost of R525 000-00:- R6 250/ha.

as set out in the attached report.

Yours faithfully
DU PLESSIS and BURGER

.....
W du PLESSIS PrEng

HOXANE IRRIGATION UPGRADING AND P S P

REPORT ON TEN FARM COMPLEX - 84 ha

TEN FARM COMPLEX

INTRODUCTION

1) The system exists of a permanent underground mainline, with movable draghose and Q C piping.

2) The total irrigatable land is 84 ha.

3) The system is based on 18 x 18 m layout, with a application rate of 1,2 litre/sec/ha.

4) Two alternatives were considered, one with one pumpstation and one with two pumpstations, each farm has his own outlets and above ground equipment.

5) Pressure Protection of the mainline is necessary and is including in the system.

6) Pumpstation exists of :

Water will be pumped direct from the river into the system. The pumpstation building exists of 6 x 6 m brick wall with corrigated iron roof.

PROPOSED SYSTEM OF ONE PUMPSTATION

1) UNDERGROUND PIPING - DESCRIPTION

a) The system exists of one mainline with hydrant outlets (20 x 3) on each plot.

b) A Valve opening elbow is used to open the hydrant outlets.

c) The mainline is protected with a Hydraulic Valve at the pumpstation.

2) ABOVE GROUND EQUIPMENT - DESCRIPTION

a) The system exists of removable Q C piping and draghose on each plot.

b) 2 or 3 Hydrant Valves are fitted on each plot.

c) Each farmer has 2 or 3 Valve opening elbows to open the Hydrant Valves leading to the Q C pipes.

3. ONE PUMPSTATION

a)	6 x 6 m Brick with corrugated iron roof	- R20 000
b)	3 Pumps plus motors @ R23 000 each	- R69 000
c)	Switchgears @ R 5 000	- R15 000
d)	External electrical supply has been admitted from this estimate	- R 0
e)	Suction and delivery pipe R7 500 * 3	- R22 500
f)	Pressure Sustaining Valve	- R 7 500
	TOTAL	R134 000

4. PROPOSED SYSTEM WITH TWO PUMPSTATIONS

1) Costs for underground system
   - Plots 1 to 6 = R39 156
   - Plots 7 to 10 = R79 368

   TOTAL R118 524

2) Above ground equipment R104 701

3) 2 PUMPSTATIONS FOR PLOTS 1 TO 6 AND 7 TO 10

   a) 2 x 6 m x 5 m brick with corrugated iron roof - R17 500 = R35 000

   b) 4 Pumps and motors @ R17 500 each = R70 000

   c) Switch gear @ R5 000 each = R20 000

   d) Suction & delivery pipes R7 500 x 4 = R30 000

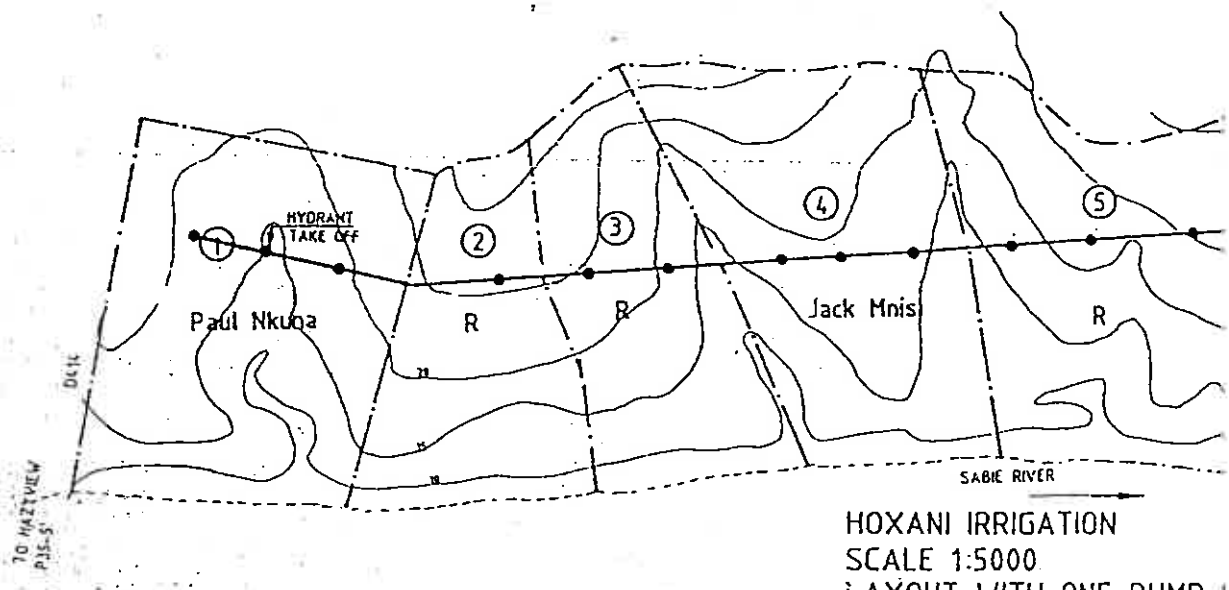
   e) Pressure sustaining valve R6 000 x 2 = R12 000

   TOTAL =R167 000

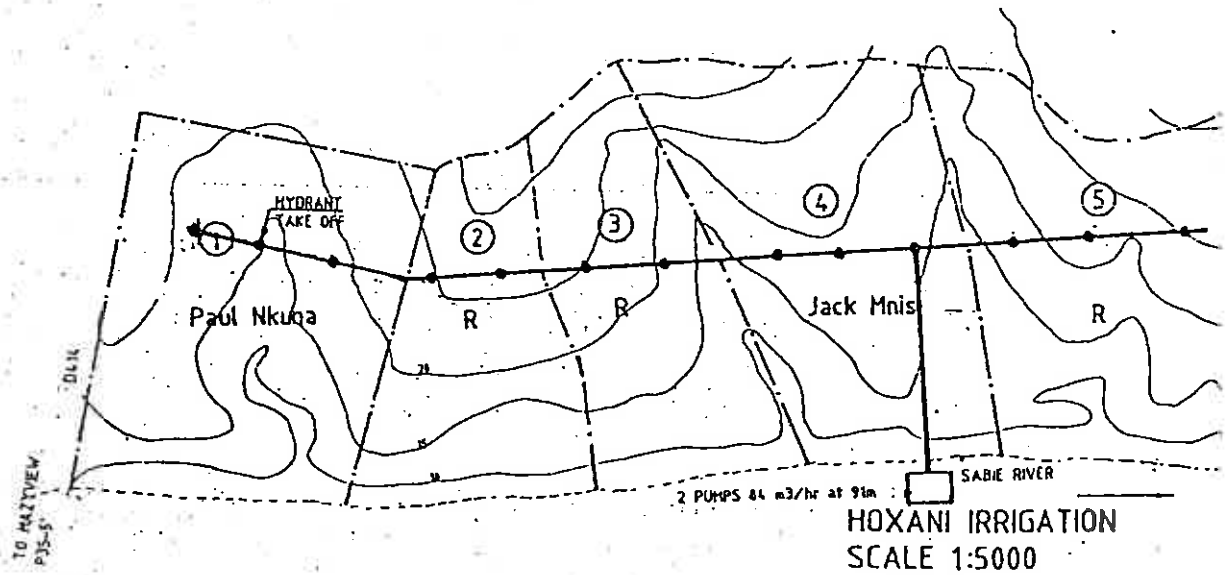
HOXANE IRRIGATION UPGRADING

S U M M A R Y

		(A) ONE PUMPSTATION			(B) TWO PUMPSTATIONS		
REFERENCE POINTS	ha AREA SERVED	UNDERGROUND PIPING R/c	ABOVE GROUND PIPING R/c	TOTAL R/c	UNDERGROUND PIPING R/c	ABOVE GROUND PIPING R/c	TOTAL R/c
PLOT 1	8	13,864.00	9,968.00	23,832.00	11,288.00	9,968.00	21,256.00
PLOT 2	5	8,665.00	6,230.00	14,895.00	7,055.00	6,230.00	13,285.00
PLOT 3	5	8,665.00	6,230.00	14,895.00	7,055.00	6,230.00	13,285.00
PLOT 4	8	13,864.00	9,968.00	23,832.00	11,288.00	9,968.00	21,256.00
PLOT 5	8	13,864.00	9,968.00	23,832.00	11,288.00	9,968.00	21,256.00
PLOT 6	6	10,398.00	7,476.00	17,874.00	8,466.00	7,476.00	15,942.00
PLOT 7	13	22,529.00	16,198.00	38,727.00	18,343.00	16,198.00	34,541.00
PLOT 8	6	10,398.00	7,476.00	17,874.00	8,466.00	7,476.00	15,942.00
PLOT 9	9	15,597.00	11,214.00	26,811.00	12,699.00	11,214.00	23,913.00
PLOT 10	16	27,728.00	19,936.00	47,664.00	22,576.00	19,936.00	42,512.00
PUMPSTATION				134,000.00			167,000.00
SUB TOTAL	84	145,572.00	104,664.00	384,236.00	118,524.00	104,664.00	390,188.00
CONTINGENCIES				65,764.00			69,812.00
PROFESSIONAL MONEYS				60,000.00			65,000.00
TOTAL				510,000.00			525,000.00



HOXANI IRRIGATION
SCALE 1:5000
LAYOUT WITH ONE PUMP



HOXANI IRRIGATION
SCALE 1:5000
LAYOUT WITH TWO PUMP

ANNEXURE 2

DEVELOPMENT BANK OF SOUTHERN AFRICA

CENTRE FOR ENVIRONMENTAL AND TECHNICAL SPECIALISTS

M E M O R A N D U M

TO:	G MASHILE	R2181	FROM:	A WALLACE
CC:	A STEYN			
	H SAUERMANN	R2177		
REF:	NA900323/7		DATE:	23 MARCH 1990

RE: HOXANE IRRIGATION PROJECT

1. PURPOSE

To inform you of the cost implications by using the existing infrastructure on the cork complex as an alternative to the proposals as presented to us by EVN.

2. CONTENT

2.1 ASSUMPTIONS

I have used the following assumption for the calculations and design of the alternative:

- Design flow : 1 l/s/ha for sprinkler irrigation
- Irrigation pump : 1kW/ha @ R1 000/ha
- Underground piping : R1 500/ha
- Above ground piping : R2 000/ha
- Electricity : Main lines @ R20 000/km
- Canal upgrading : R20 / m
- Existing irrigation dams :

  - Main dam 50 x 50 x 1,8 (4,5 mil litres)
  - Balancing dam 20 x 20 x 1,8 (720 000 litres)

- Storage dams/Farmer :

  - Holding capacity - irrigation water for 1 hour
  - Construction - R 50 / m^3
  - Lining - R 15 / m^2
  - Cost/ha - R300 / ha

- Fencing of canal : R3 000/km

- Power points for farmers : R1 000/unit

- Existing pump station : Upgrading

2.2 SYSTEM OPERATION

The water will be pumped from the river into the existing irrigation dam at farm No. 3 and the existing canal will be used as the main distribution line to the farms. Holding dams to store sufficient water for 1 hours irrigation requirement will be constructed at each farm next to the canal. Power points will be installed at these positions and could be shared by two farmers. The farmers on farms No.'s 15, 16, 17 and 18 will have to pump directly from the river and only needs to be supplied with power points. (They are presently pumping from the river with diesel pumps). The existing canal will have to be upgraded and fenced. As it is GaZankulu's policy to supply irrigation water to farm edge, the abovementioned infrastructure will be their contribution. The farmers will have to pay for their own pumps, above ground and underground piping.

2.3 CAPITAL COSTS

2.3.1 Farmers

Pumps	@	R1 000/ha
Above ground piping	@	R2 000/ha
Underground piping	@	R1 500/ha
TOTAL		R4 500/ha

2.3.2 GaZankulu Government

Holding dams (farmers)	@	R 300/ha	R 30 000
Upgrading of canal	@	R 20/m	R 40 000
Fencing of canal	@	R 3 000/km	R 12 000
Electricity Main lines	@	R20 000/line	R 40 000
Power points (farmers)	@	R 1 000/point	R 12 000
Upgrading of river pump stn.	@	R 1 000/ha	R133 000
TOTAL			R267 000

These costs are preliminary, the detail design will have to be done by the borrowers consultant, but could be used to point out the savings which is possible should the existing infrastructure be utilised.

3. CONCLUSIONS

I am convinced that the existing dams and canal could be utilised for the main distribution network and that it has sufficient capacity for sprinkler irrigation development.

I am sure that the capital cost of R1 092 000 as proposed by EVN could be cut to ±R300 000 or even less if the existing pumpstation is used as it is.

4. RECOMMENDATIONS

That we discuss this issue with the borrower and try and convince them that there are cheaper alternatives than those which have been proposed by EVN.

A WALLACE

NA900323/7

DEVELOPMENT BANK OF SOUTHERN AFRICA

CENTRE FOR ENVIRONMENTAL AND TECHNICAL SPECIALISTS

M E M O R A N D U M

TO: G MASHILE H SAUERMANN A STEYN	FROM: A WALLACE
REF:	DATE: 23 APRIL 1990

RE: HOXANE IRRIGATION PROJECT

Further information to my memo dated 23 March 1990.

1. Canal must supply water for farms 4 to farm 14 = 11 farms

Canal section AB must supply water for 78ha ✓
length 1050m for Sprinkler 1.5l/s/ha = 117l/s
slope 2% Flood 3.0l/s/ha = 234l/s

Canal section BC must supply water for 22 + 21ha = 43ha
length 450m for Sprinkler 1.5l/s/ha = 64l/s
slope 1,5% Flood 3.0l/s/ha = 129l/s

Canal section CD must supply water for 21ha
length 350m for Sprinkler 1.5l/s/ha = 32l/s
slope 2,8% Floor 3.0l/s/ha = 63l/s

Holding dam A 50m x 50m x 1,8m = 4 500 000 litres
Holding dam B 25 x 25 x 1,8m = 1 125 000 litres

TRAPEZIUM CANAL

Section AB Depth 300mm
Width Top 850m delivery 332l/s
bottom 250m

Section BC Depth 250mm
Width Top 707mm delivery 204l/s
bottom 207mm

Section CD Depth 150mm
Width Top 425mm delivery >65l/s
bottom 125mm

SEMI CIRCLE CANAL

Section AB	Depth 300m Width 600m	delivery 285l/s
Section BC	Depth 250mm Width 500m	delivery 152l/s
Section CD	Depth 150mm Width 300m	delivery >50l/s

COST COMPARISON:

MAIN INFRASTRUCTURE:	NOW: EUN	UPGRADING	
a) Main supply	R 430 000	a) Holding dams (farmers)	R 30 000
b) Pumpstation	R 630 000	b) Upgrading of canal	R 40 000
		c) Fencing of canal	R 12 000
		d) Pumps (farmers)	R 133 000
		e) Electricity	R 40 000
		f) Power points (farmers)	R 12 000
		g) Upgrading of River pump	R 133 000
Sub Total	R1 060 000		R 400 000
c) Access roads	R 50 000	h) Access roads	R 10 000
Sub Total	R 50 000		R 10 000
INFIELD DEVELOPMENT COSTS:			
d) Land and general improvements	R 90 000	i) Land and general improvements	R 90 000
e) Sprinkler Irrig. layout	R 500 000	j) Sprinkler irrigation layout	R 500 000
Sub Total	R 590 000		R 590 000
TOTAL	R1 700 000		R1 000 000

ALEX WALLACE

na900423/6

ANNEXURE 3
G.R. 88 (A)

GAZANKULU REGERING | GAZANKULU GOVERNMENT

MFUMO WA GAZANKULU

NDZAWULO YA VURIMI NI MIRHI
DEPARTEMENT VAN LANDBOU EN BOSBOU
DEPARTMENT OF AGRICULTURE AND FORESTRY

Xisakana xa Poso
Private Bag X577
Privaatsak
GIYANI
0826

21 Nov 1989

Tsalwa/Verw./Ref./	Riqingho/Tel. No.
8/7/2/11/2	3210 x 199
Swivutiso/Navrae/Enquiries:	
P.T. de Witt	

Mnre. Eksteen,Van der Walt
en Nissen
Posbus 236
Pietersburg
0700

Aandag: Mnr A O Eksteen

i.s. Sabierivier Besproeiingskema

Hiermee bevestig ons dat die beplanning van die bestaande skema plus die uitbreidings mag voortgaan. Implementering van die uitbreidings sal egter eers voortgaan nadat die Njaka dam gebou is.

U samewerking word waardeer.

Direkteur-Generaal: Landbou en Bosbou

8723

SABIE (HOXANE) IRRIGATION : MINUTES OF STEERING COMMITTEE MEETING AT MKHUHLU ON 89-11-15 AT 10:00

1. The chairman welcomes all present.

1.1 The minutes of the previous meetings, all as contained in the Phase II Report, are accepted by the meeting.

1.2 The name Hoxani has problems; use the term "Sabie Irrigation Scheme" in future.

1.3 Future agenda to be prepared by the GAZDAF for next meeting. Consultants and others are to provide inputs.

1.4 **Attendance**

A.O. Eksteen	EVN
P.T. de Witt	GAZDAF
P. Terwin	GAZDAF (Mhala)
P.W.A. v.d. Merwe	GAZDAF
I.N. Mdaka	GAZDAF
E.M. Zwane	GAZDAF
A. Wallace	DBSA
J. Swart	DBSA
M.S. Mosehana	DBSA
J. Meyer	DBSA (Training)
J.C. Oosthuizen	DBSA
G. Mashile	DBSA
S.J. de Swardt	Measured Farming
W. du Plessis	Du Plessis & Burger (Technical)
P.M. Mabuza	Hoxane Tribal Authority
S.A. Manzini	Hoxane Tribal Authority
M.S. Baloyi	Ngonini Coop.
M.B. Ngomane	Ngonini Coop. (chairman)
D.E. Shabangu	Sabie Scheme

1.5 The Chairman then thanked the Bank for

a) Arrangements for the comfortable venue

b) Duplication of reports so that each farmer has one now available.

2. REPORT ON PHASE II

2.1 Mr Eksteen presents and explains the Phase II Report.

2.2 Mr Mashile comments:

a) DBSA fully accepts the report.

b) Stresses the risks of availability of water. Proposes phasing of development.

c) Institutional arrangements should be made for farmers to cope with restrictions.

d) A regional water management authority should be encouraged.

2.3 Mr v.d. Merwe comments:

a) Training proposals will receive attention at a later stage.

b) GAZDAF has determined that the Ngonini Coop. will remain at Mkhuhlu.

c) The final limits of the Mkhuhlu industrial area have not been finalised pending studies for a structural plan for the area which has not yet started.

2.4 The Steering Committee accepts the Report.

3. REQUIREMENTS FOR PHASE III

3.1 Farmer sample models contained in Phase I. Report is accepted by Steering Committee for further studies.

3.2 Mr Mashile requests as follows:

a) The Report must comprise of two steps (sub-phases) as defined in the Terms of Reference.

Step 1 : Institutional and technical matters

Step 2 : Viability

b) Specialist matters should be discussed directly with the various particular team members.

c) Marketing studies already presented by S.J. de Swardt must be reconciled.

d) Clarification needed on

i) Subsidy issues

ii) Marketing linkages

iii) Risk of average high age of farmers

3.3 Mr J. Meyer will liaise with Mr Matukane during November 1989 and the farmers early Jan. 1990 to work out the training needs prior to discussions and finalisation with Mr de Swardt early February 1990.

3.4 Mr S.J. de Swardt will visit and discuss matters with DBSA members by the end of January, beginning February 1990.

4. **GENERAL**

4.1 A meeting of GAZDAF with the Tribal Authority will be arranged in November 1989 to discuss the possible involvement of GDC and Lisbon in the Sabie Irrigation Scheme.

4.2 The next Steering Committee meeting will be held on 89-02-28 at 10:00 at Mkhuhlu Training Centre.

.....

MINUTED BY A.O. EKSTEEN

GAZANKULU DEPARTMENT OF AGRICULTURE

AND FORESTRY

REF. 6/8/3-2-7

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II

"DEVELOPING A PROJECT CONCEPT"

REVISED COST ESTIMATE OF A

MULTIPLE PUMP RIVER ABSTRACTION SYSTEM

ADDENDUM TO THIRD INTERIM

REPORT OF OCTOBER 1989

AUGUST 1990

DBSA PROJECT LEADER : G. MASHILE

DEVELOPMENT BANK OF SOUTHERN AFRICA

P.O. BOX 1234

HALFWAY HOUSE 1685

EKSTEEN, VAN DER WALT AND NISSEN

CONSULTING CIVIL, STRUCTURAL AND AGRICULTURAL ENGINEERS

30 SCHOEMAN STREET - P.O. BOX 236 - TEL. (01521) 912020

PIETERSBURG 0700

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II
"DEVELOPING A PROJECT CONCEPT" REVISED COST ESTIMATE OF A MULTIPLE PUMP RIVER ABSTRACTION SYSTEM

INDEX

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME

PREPARATORY STUDIES PHASE II : "DEVELOPING A PROJECT CONCEPT"

REVISED COST ESTIMATE OF A MULTIPLE PUMP RIVER ABSTRACTION SYSTEM

1. GENERAL AND SCOPE

1.1 A revised cost estimate of the irrigation layout was presented in an addendum to the Third Report of October 1989, in June 1990. The proposals and costs were discussed between DBSA and GAZDAF officials in Johannesburg on 90-07-13 at which meeting it was decided that

a) EVN must "reconsider proposed models (costing and outlay) ...."

b) "Various optimal models must be outlined, compared and motivation given for the most affordable and cost effective in each of the six areas identified."

The decisions of the above meeting were explained to mr A.O. Eksteen of EVN by Messrs. P. v.d. Merwe and T. de Witt on 90-07-31 in Pietersburg.

1.2 We have accordingly undertaken the following work:

a) Identified the maximum number of suitable (practical) abstraction points on the Sabie river.

b) Evaluated the cost of various combinations of abstraction points to each irrigation block.

1.3 The following parameters are important in respect of the new evaluations:

a) Parameters as described in paragraphs 2.1.1 and 2.1.2 in respect of the irrigation layout. These parameters represent a general reduction in standards compared to the previous proposals in sofar that not only have the layout and hydraulic standards being lowered but lower cost allowances (e.g. Preliminary and General and Contingency costs) accepted.

b) The original layout proposals where the minimum number of river abstraction points form the basis resulted in major pump installations in which other criteria in respect of the civil and mechanical engineering layout are required to conform with general safety legislature. In a multiple abstraction system lower standards can be tolerated.

1.4 This study comprises now of:

a) The cost comparison of various abstraction alternatives and the recommendation based on the lowest layout costs; all as described in Section 2.

b) A revised layout cost in which other layout elements are included to form an overall cost estimate.

This study does not go into other advantages and disadvantages of multiple river abstraction systems.

2. RIVER PUMP SYSTEM ALTERNATIVES

2.1 General

2.1.1 System comprise of the following:

a) River abstraction. Refer to attached schedule (par. 2.2.2), for typical 50 l/s; 60m manometric pump head system. Inclusive cost R101 400. This layout will form the basis for cost evaluation of pump stations along the river by interpolation or extending the cost logarithmically to the required size.

b) Pressure supply main to each land from which infield distribution (surface or subsurface) would be undertaken by the farmer.

c) Power supply main to be installed to each abstraction point.

2.1.2 The following layout parameters were adopted:

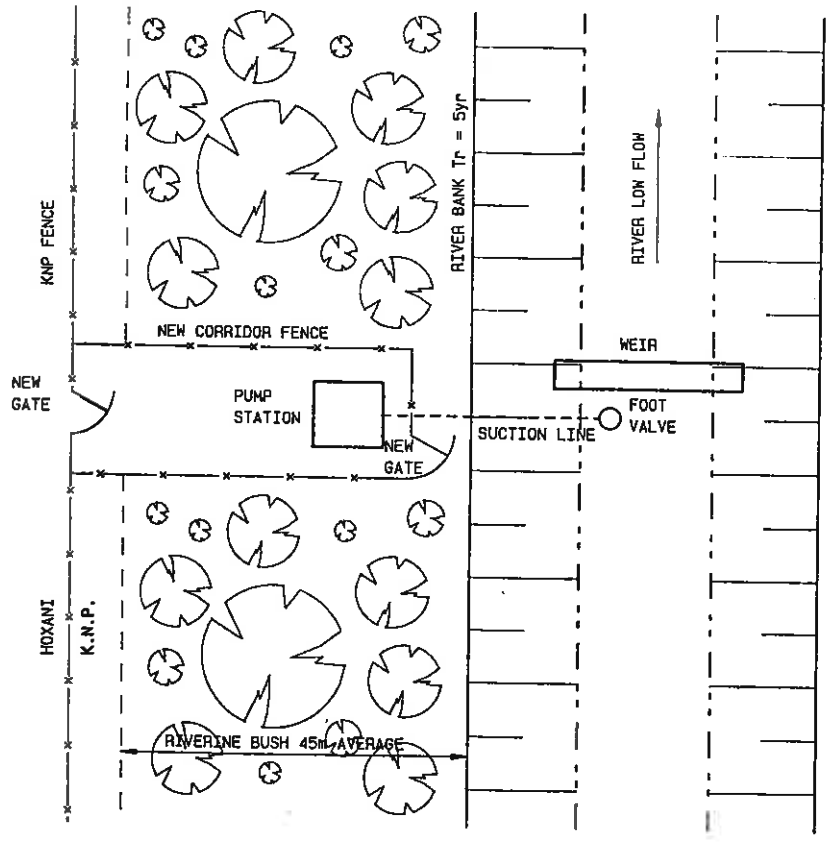
i) Unit flow : 1,1 l/s.

ii) Field edge residual pressure head (averaged to exclude local discrepancies) : 30m

2.1.3 Only elements required for comparative purposes are included in the following evaluations to determine the optimum system for each irrigation block.

2.2 Sabie River abstraction : Diagrammatic layout details and costs for nominal 50 l/s abstraction layout

2.2.1 Layout



2.2.2 Description and costs Q = 50 l/s

H = 60m

ITEM NO/NR	DESCRIPTION BESKRYWING	UNIT EENHEID	QUANT. HOEV.	RATE TARIEF	AMOUNT BEDRAG
2.2.2.1	Clearing of				
	a) Riverine bush strip	m^2	550	R2	1 100
	b) Weir site in river	m^2	50	R10	500
	c) Suction line	m	20	R2-50	50
	d) Pump house site	m^2	20	R5	100
2.2.2.2	Abstraction Weir				
	(0,5m nominal height placed on visible rock outcrop)				
	a) Concrete	m^3	5	R300	1 500
	b) Formwork	m^2	16	R30	480
2.2.2.3	Suction line				
	a) Footvalve and strainer 250 dia	no	1	R1260	1 260
	b) Suction pipe 250 steel	m	20	R221	4 420
2.2.2.4	Pump house				
	Cladded steel frame building 4m x 4m (without crawl beam); one NC8 window fitted with expanded metal; one double leaf 1524 x 2032mm pressed steel chawl door and frame.				
	Complete installation based on cost of recent (6/90) contract	sum			8 000
2.2.2.5	Game proof fencing				
	a) Fencing with standards and posts complete	m	100	R25	2 500
	b) Gates	sum			250

ITEM NO/NR	DESCRIPTION BESKRYWING	UNIT EENHEID	QUANT. HOEV.	RATE TARIEF	AMOUNT BEDRAG
2.2.2.6	Pump sets				
	a) Centrifugal pump, coupling and baseplate (50 l/s @ 60m manometric pumping head)	unit	1	14796	14 796
	b) Electric motor 45 kW	unit	1	12947	12 947
	c) Switchgear including transformer				
	i) Conventional in accordance with Factories and Machineries Act	sum	-	-	(44 000)
	ii) Rudimentary	sum	-	-	24 000
	d) Pipework and specials comprising:				
	i) 250ND Flanged 45 degree segmental bend	no	1	R390	390
	ii) 250x150ND flanged steel level overt reducer with suction gauge	set	1	R405	405
	iii) 125ND Flexible rubber coupling	no	1	R390	390
	iv) 150x125ND flanged steel concentric reducer	no	1	R175	175
	v) 150ND Pressure sustaining, non-return, hydraulic control valve	no	1	R4300	4 300
	vi) 150NDx500 long flanged steel pipe with pressure gauge	set	1	R200	200
	vii) 150ND Wafer butterfly valve	no	1	R550	550
	viii) 150NDx900 long flanged steel pipe	no	1	R237	237
	ix) 25ND by-pass priming pipework	set	1	R200	200
	Subtotal				**R78 750**
2.2.2.7	Preliminary and general costs (4%); establishment (4%) and contingencies (7%)	15%			11 800
2.2.2.8	Engineering and disbursements	12%			10 850
					R101 400
					=====

2.3 Summary of Costs

Block	System	Plots served	Area served (ha)	Development Cost			
				Abstraction works	Supply mains	Electric supply	Total
Ten Farms	One pump	1-10	84	138 000	219 000	15 000	372 000
	Two pumps						
	. Upper	1-6	40	88 000	74 000	9 000	
	. Lower	7-10	44	103 500	88 500	15 000	
			84	191 500	1 625 000	24 000	**378 000**
Big Bend	One pump	1-12	66	120 000	168 000	45 000	**333 000**
	Two pumps						
	. Upper	1-6	28	80 000	41 000	30 000	
	. Lower	7-12	38	92 000	101 000	33 000	
			66	172 000	142 000	63 000	377 000
	Three pumps						
	. Upper	1-6	28	80 000	41 000	30 000	
	. Middle	7-9	21	69 000	35 000	33 000	
	. Lower	10-12	17	62 000	20 000	15 000	
			66	211 000	96 000	78 000	385 000
Mkhuhlu West	One pump	1-4	16	62 000	25 000	58 000	**145 000**
Mkhuhlu East	One pump	5-10	81	150 000	200 000	25 000	375 000
	Two pumps						
	. West	5-7	24	65 000	50 000	20 000	
	. East	8-10	57	125 000	115 000	10 000	
			81	190 000	165 000	30 000	**385 000**
	Three pumps						
	. West	5-7	24	65 000	50 000	20 000	
	. East a)	8-9	17	60 000	40 000	10 000	
	b) T.A.	10	40	100 000	90 000	-	
			81	225 000	180 000	30 000	435 000

Block	System	Plots served	Area served (ha)	Development Cost			
				Abstraction works	Supply mains	Electric supply	Total
Seholokoane West	One pump	1-5	95	165 000	200 000	35 000	400 000
	Two pumps						
	. Upper West	1-2	33	87 000	43 000	18 000	
	. Lower West	3-5	62	135 000	96 000	12 000	
			95	222 000	139 000	30 000	**391 000**
	Four pumps						
	. Upper West	1 & 1A	23	73 000	34 000	18 000	
	. Lower West	2	10	48 000	13 000	8 000	
	. Upper East	3 & 4	42	108 000	65 000	9 000	
	. Lower East	5	20	70 000	28 000	13 000	
			95	299 000	140 000	48 000	487 000
Seholokoane East	One pump	6	22	65 000	50 000	25 000	**140 000**
Upper Cork	One pump	1-6	80	130 000	208 000	26 000	**364 000**
	Two pump						
	. Western	1-4	45,5	97 000	122 000	26 000	
	. Eastern	5 & 6	34,5	84 000	56 000	23 000	
			80	181 000	178 000	49 000	408 000
Cork Scheme	Two pumps						
	. Western existing	1-14	97	140 000[1]	260 000[2]	85 000[3]	
	. Eastern new	15-18	24	80 000	60 000	20 000	
			121	220 000	320 000	105 000	**645 000**

Notes on the upgrading of Cork Scheme

1. Abstraction works : Existing installation upgraded, also to include plots 1 to 3.
2. Supply mains : Pump main nominally upgraded : R 10 000
   : Supply canal repaired and fenced in : R 60 000
   : Holding sumps provided at plots 4 - 14 : R 30 000
   : Farmer pump installations : R133 000
   : Supply pipeline to plots 1, 2 & 3 : R 27 000
   : **R260 000**
3. Power supply : Includes electricity main to each plot (1-14) and to existing pump station.

2.4 Conclusion

Block	Comments	Recommended no. of abstraction sites with object of maximum no. of sites	Cost of abstraction, bulk water supply and electricity supply main
Ten Farms	The costs of a one or two pump system are similar.	2	R 378 000
Big Bend	One pump system is the cheapest (88%). Two- or three pump systems are of the same order. The latter costs more due to special electricity supply.	1	R 333 000
Mkhuhlu West	Only one abstraction site	1	R 145 000
Mkhuhlu East	One or two pump systems are similar in cost. Three pump systems due to parallel pump main to plot 10, is more expensive (116%).	2	R 385 000
Seholokoane West	The costs of a one or two pump system are similar and much lower than a four pump system. A three pump system has no geometric advantages and will be similar to a four pump system.	2	R 391 000
Seholokoane East	Only one abstraction site	1	R 140 000
Upper Cork	This block is of a rectangular shape in a river bend i.e. where the river fronts two sides. A one pump system is less costly because of electricity supply to one point only. Three or four abstraction sites are possible. Due, however, to high cost of electricity supply to a second or further pumpstations the one pump installation is recommended.	1	R 364 000
Cork	Only a two pump system has been evaluated because the existing flood irrigation layout (plots 1 - 14) form a unit and it has already been accepted by GAZDAF that it will be upgraded as such. The remaining Cork area lies to the east (plots 15 - 18) and would require a pump station on its own.	2	R 645 000
		12	**R2 781 000**
	Total area served **565 ha**		

3. CAPITAL COSTS

3.1 Capital Cost Estimate for proposed 565ha upgrading

3.1.1 Infrastructure

a) **River abstraction works** (12 no)

Civil & Building	: R220 500	
Mechanical/Electrical	: R980 000	R1 200 500
b) Electricity supply mains		R 343 000
c) Bulk water supply conveyors		R1 237 500
d) Main access (As per June 1990 addendum)		R 299 000
		R3 080 000

3.1.2 Infield development

As per June 1990 Addendum Table 3.1 item 4 — R1 988 000

3.2 Annual irrigation costs

The pro forma included in the June 1990 Addendum (par. 3.2) applies):

3.2.1 Cost Evaluation

During a policy meeting (89-03-08) at Giyani between GAZDAF and DBSA at which EVN was present, the following guidelines were determined in respect of irrigation costs to farmers; if applied to the study area giving the following:

a) **Annual irrigation cost recovery from farmers** (rounded off to the nearest R100)

i) Operating staff of pump houses and overall water bailiff function @ R10 000 x 6 (i.e. two pump stations per bailiff) : R 60 000 (R106/ha)

ii) Maintenance cost on main infrastructure, weighted between the following rates

: Underground pipelines : 0,75% p.a. (36%)
: Civil and electrical works : 0,50% p.a. (36%)
: Pumping equipment : 4,0% p.a. (28%)
: 1,57 x R3 080 000 : R 48 400 (R86/ha)

iii) Maintenance costs on infield development
: General improvements : Nil
(The farmer shall regularly maintain such improvements using farm labour)

iv) Electricity
. Unit cost (@ 2400h/a and 3,2 c/kWh) for 650 kW : R 49 900
. Demand @ 70% x R17/kVA/month @ 90% P.F. : R103 100
: **R153 000**
(R271/ha)

v) Land rental costs (to the Government in order to cover part of the infrastructural costs) were fixed at : R100/ha/a

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TOTAL **R563/ha/a**

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b) **Annual irrigation farming expenses borne directly by the farmer; estimated as follows:**

i) Redemption on nett costs of surface irrigation equipment (10%; 10 years; refer Mr N.J. Jooste 89-09-27)
: 16,27% x R950 000 : R154 600
(R274/ha)

ii) Maintenance on above
: 4% x R950 000 : R 38 000
(R67/ha)

R341/ha/a

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1990-11-13

The Director-General
Gazankulu Department of Agriculture
and Forestry
Private Bag X577
GIYANI 0826

Sir,

SABIE (HOXANI) IRRIGATION UPGRADING AND FARMER SUPPORT PROGRAMME
: OPTIMUM WATER SUPPLY ALTERNATIVES

Reference 6/8/3-2-7

1. Following recent discussions between your officials, the DBSA project team and our study team (Messrs. Eksteen, and de Swardt), held on 90-10-25 at Tulamahashe and 90-11-09 at Pietersburg, an economical comparison had been made between five alternative water supply systems and it was concluded that a final choice will have to be made between the following two systems:
   a) Three pump, standard design as presented to S.C. in October 1989 (3P)
   b) Multipump, substandard design as presented to SC in August 1990. The ten pump layout was elected, being the cheapest (10P).

2. At the meeting in Pietersburg EVN was requested to prepare a summary of the obvious advantages and disadvantages of these two alternatives in order to assist yourselves in making your final choice; which summary is included herewith as an annexure.

Yours faithfully

A.O. EKSTEEN

cc. G. Mashile : DBSA (fax)

COMPARISON BETWEEN 3 PUMP AND 10 PUMP WATER SUPPLY SYSTEMS

	3 PUMP	10 PUMP
1. GENERAL	a) The evaluated system proposed is of a standard design and complies with good layout and engineering principles and parameters b) The proposed communal pumped supply system is compatible with water supply under a FSP programme because of the fact that each farmer still has the choice to either pump from the pipeline traversing his land in order to reach the optimum sprinkler irrigation pumping head; to reach all extremities of its farming plot or to use gravity for in-land supply or surface gravity irrigation.	a) Maximum cost savings formed the basis of a layout in which lower standards were accepted, particularly in respect of the river pump and abstraction systems. b) A standard minimum residual water head was used in the design supply to each plot. Individual farmers will all therefore have adequate pressure to operate a sprinkler irrigation system.
2. SABIE RIVER ABSTRACTION PROBLEMS COMPRISING : . Encroachment into the Kruger National Park . Multiplication of abstraction problems such as damages by wild animals, water control and management (inherent feature of water wastage), utilization of unsuitable abstraction sites to the detriment of good engineering.	Limited to 3 localities.	Multiplication of abstraction problems.
3. WATER MANAGEMENT	a) Good control of water with limited management and inherent feature of water saving. b) Pressurized water supply to most of the farmplots allowing farmers to abstract water at his own requirement i.r.o. either sprinkler or flood irrigation. c) Irrigation by individual farmers can be by own choice due to a gravity supply to each plot.	a) Water control is more complicated because 3 to 10 farmers are grouped under one pressurised pump system in which all should participate on more or less equal irrigation practices and watering turns.
4. GENERAL ADVANTAGES AND DISADVANTAGES	. Reliable . No sharing of pumps . Gazankulu preference . More costly : R20 700/ha/a (NPV @ 4%)	. Less reliable . Pumps shared by 3 to 10 farmers. . Less costly : R19 200/ha/a (NPV @ 4%)