"FINAL REPORT ON GRAIN EXPERIMENTAL WORK IN BRUMDEC" (CONTRACT I)

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FINAL REPORT ON

GRAIN EXPERIMENTAL WORK IN BRUMDEC

(CONTRACT I)

by

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GRAIN SORGHUM EXPERIMENTS AT BRUMDEC
AUGUST 1981 - DECEMBER 1981
PRELIMINARY RESULTS

by

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GRAIN SORGHUM EXPERIMENTS AT BRUMDEC

AUGUST 1981 - DECEMBER 1981

PRELIMINARY RESULTS

1. INTRODUCTION

In order to identify production constraints and to suggest and recommend ways of removing these constraints for implementing on-farm grain cultivation under the conditions of the Project Area, three trials were established during the period August 1981 - December 1981. Emphasis was placed on experiments which would identify critical management factors and detect factors of production which have the highest impact on lowering cost/benefit ratio.

These trials were a part of a short-term agronomic research and testing programme, proposed and aimed at developing in the shortest possible time, improved practices for increasing yields and net income of different cereal crops.

The economical analysis of these experiments will be submitted as soon as the complete statistical analysis and interpretation of the results are completed.

2. TRIALS AND EXPERIMENTAL PROCEDURE

2.1 Relevance of Production Factors

The objectives of this experiment are to identify the most critical production factors and to detect factors of production which have the highest impact on lowering cost/benefit ratio.

The design of the experiment was a randomized complete block having 9 treatments and 4 replications. The plot size was 60 m^2 with 6 rows. Distance between rows was 1 m and row length was 10 m. The data was collected in the two central rows.

The treatments consisted of withholding a different production factor from a complete set of the basic production

package (BPP). The BPP consists of : 100 Kg/Ha N + 80 Kg/Ha P_2O_5 + 100 Kg/Ha K_2O + Improved Variety (Pioneer 8225) + 90.000 plants/Ha + 3.5 Kg/Ha Sevin (Carbaryl) + Herbicide (Gesaprim Combi - 80) 1 Kg/Ha a.i.

The treatments were:

1. BPP (all factors applied)
2. BPP-N (no N applied)
3. BPP-P (no P applied)
4. BPP-K (no K applied
5. BPP + 2 weeding (no herbicide applied)
6. BPP-I (no insecticide applied)
7. BPP-H (no herbicide applied)
8. BPP-D (80.00 plants/Ha)
9. V (variety only)

2.2 Basic Fertilizer Experiment

The objectives of this experiment are to compare the yield response due to three fertilizers at three levels of application, and to identify significant interactions between fertilizer nutrients. It is a 3 x 3 x 3 factorial set out in a randomized complete block design with two replications. There are a total of 27 treatments per replicate. The plot size was 20 m^2 and the harvested plot was 8 m^2 consisting of 2 central rows with 1 m between rows and 4 m long. The Pioneer 8244 variety was used.

The three levels of fertilizer were:

N : 0, 50, 100 Kg N/Ha
P : 0, 50, 100 Kg P_2O_5/Ha
K : 0, 50, 100 Kg K_2O/Ha

2.3 Variety Trial

The objectives are to compare the performance of three commercially available hybrids for adaptation and further

recommendation. The experimental design was a randomized complete block with 3 varieties and 4 replicates. The plot size was 50 m^2 with a harvested plot of 16 m^2 consisting of 4 central rows with 1 m between rows and 4 m long. The varieties were:

Pioneer 8225, Pioneer 8244 and Pioneer 8303

3. Results

3.1 Relevance of Production Factors

The factors studied and the range of yields for the period grown at Elim, St. Elizabeth (Project Area of BRUMDEC) are shown in Table 1.

TABLE 1. - Grain Sorghum Yields at Elim, St. Elizabeth August - December 1981

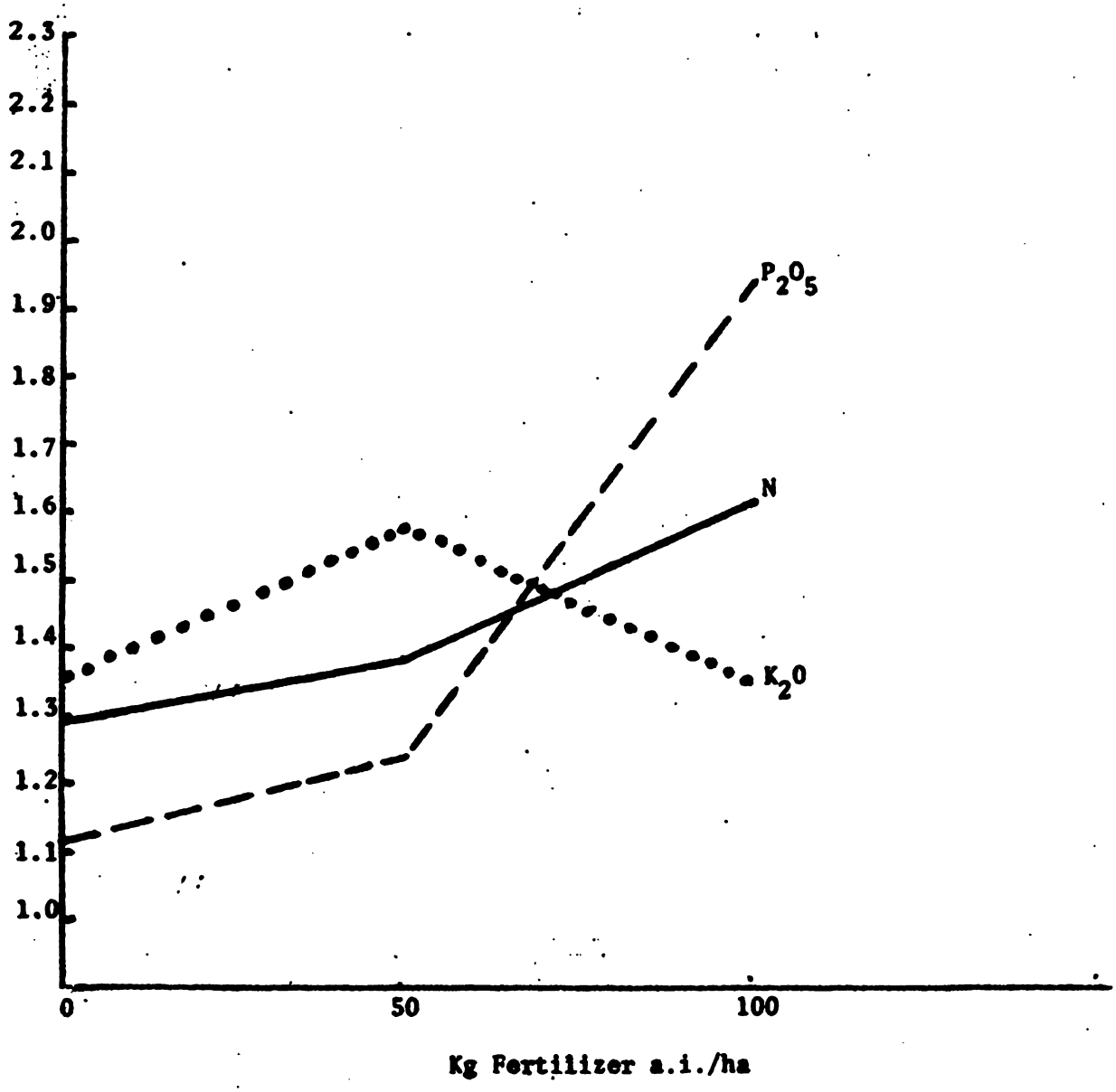
Treatments	12% Moisture Average Yield Kg/Ha	Significant Difference
BPP	3375	a
BPP-K	3293	ab
BPP + 2 weeding	3218	abc
BPP-H	3093	abcd
BPP-D	2856	abcde
BPP-I	2854	abcdef
BPP-N	1906	fg
BPP-P	1687	gh
V	937	h

It appears from these results that the most limiting production factors: Phosphorus and Nitrogen.

3.2 Basic Fertilizer Experiment

The response curves of grain sorghum at three different levels of application are shown in Figure 1. The grain yield increases as the Nitrogen and Phosphorus elements are rising from 0 to 100 Kg/Ha. The yield increase starts low from 0 to 50 Kg/Ha but the increase is greater from 50 Kg/Ha to 100 Kg/Ha

Figure 1. Response Curves of Grain Sorghum to Three Levels of Fertilizer Application - BRUMDEC August - December 1981



particularly for the Phosphorus and less for the Nitrogen. It means that Phosphorus and Nitrogen are the most limiting production factors under the conditions of the BRUMDEC Project Area for this soil type. On the other hand, Potash application seems to improve yield between 0 Kg/Ha and 50 Kg/Ha, but the yield then decreases between 50 Kg/Ha and 100 Kg/Ha suggesting an interaction effect with the other two elements as shown in Figure 1. Further exploration has to consider fertilization rates between 50 Kg/Ha and 150 Kg/Ha for Nitrogen and Phosphorus and no more than 50 Kg/Ha for Potash.

In Table 2, the average production of dry grain for each Kg/Ha of each fertilizer nutrient is shown. With the first 50 Kg/Ha of N, P_2O_5 and K_2O the responses are: 2.75 Kg/Ha, 3.5 Kg/Ha and 6.25 Kg/Ha respectively.

With the second 50 Kg/Ha, the responses are 6 Kg/Ha and 20 Kg/Ha of grain for Nitrogen and Phosphorus respectively. The average response from 0 Kg/Ha to 100 Kg/Ha of Nitrogen and Phosphorus are respectively 4.6 Kg/Ha and 11.7 Kg/Ha of grain.

TABLE 2. - Average Grain for Each Kg/Ha of Fertilizer Nutrient

Kg/Ha	Kg/Ha	Yield Kg/Ha
1st 50 Kg/Ha	1 N	2.75
	1 P_2O_5	3.50
	1 K_2O	6.25
2nd 50 Kg/Ha	1 N	6.00
	1 P_2O_5	20.00
Total Average	1 N	4.62
	1 P_2O_5	11.75

3.3 Variety Trial

The varieties and the average yields for the period under study at Elim, St. Elizabeth are shown in Table 3.

TABLE 3 - Grain Sorghum Varieties and Average Yields, BRUMDEC Project Area, August - December 1981

Varieties	12% Moisture Yield Kg/Ha
Pioneer 8225	3,937
Pioneer 8303	3,356
Pioneer 8244	3,093

No significant differences in yield have been found between these three varieties. The cultural practices applied to this experiment have been the same as those applied to the Basic Production Package (BPP) used in the first experiment.

4. CONCLUSIONS

After a preliminary analysis of the results submitted and before having a complete interpretation of all the parameters considered in these experiments, some preliminary conclusions can be made in order to provide guidelines for the validation of these results already attained.

4.1 The most limiting production factors for grain sorghum under the conditions of the BRUMDEC Project Area seems to be fertilizer application, particularly Nitrogen and Phosphorus.

4.2 Homogenous population density of plants/meter^2, regular insect control and good weed control with herbicide will improve the productivity of grain sorghum significantly.

4.3 Fertilizer application at rates of 100 Kg/Ha of N and P_2O_5 and 50 Kg/Ha of K_2O seems adequate for yield over 4000 Kg/Ha under reserve of further investigations on fertilization.

4.4 Yield response due to increasing application of Nitrogen and Phosphorus up to 100 Kg/Ha N and P_2O_5 have been obtained, while increasing application of Potash above 50 Kg/Ha K_2O shows a decrease in yield.

4.5 The variety to be used is Pioneer 8225 until further experiments can be run for a better selection.

GRAIN SORGHUM EXPERIMENTS AT BRUMDEC

FINAL RESULTS

1981 - 1982

Claude Grand-Pierre
Grain Production Specialist

GRAIN SORGHUM(Sorghum Vulgare Pers) EXPERIMENTS AT BRUMDEC

FINAL RESULTS

1981 - 1982

CLAUDE GRAND-PIERRE

1. INTRODUCTION

Six experiments were established during the period of August 20-27, 1981 with the objectives of identifying production constraints, and to suggest and recommend ways of removing these constraints, and for implementation of farm Grain Sorghum cultivation under the conditions of the project area of BRUMDEC. Emphasis was placed on experiments which would identify critical management factors and detect factors of production which have the highest impact on lowering cost/benefit ratio.

These trails were a part of a short-term agronomic research and testing programme, proposed and aimed at developing in the shortest possible time, improved practices for increasing yields and net income of different cereal crops. (1)

2. LOCATION OF EXPERIMENTS

All of the experiments were located in the project area of BRUMDEC at Elim, situated between Maggoty in the north and Lacovia in the South in the parish of St. Elizabeth, Jamaica. (latitude 76°15' to 78°15' West and longitude 17° 45' to 18°13' North). The general climatic classification of the area by Koppen (1936) is Am type (tropical moist climate, with the driest month with less rainfall than 60 mm, but where this drought is compensated for by the large total annual precipitations.)

The annual average precipitation varies between 1651 mm to 2413 mm and the average annual temperature varies from 16.3°C to 28.9°C in the winter and 20.7°C to 31.7°C in the summer; the relative humidity is about 80% and varies directly with the rainfall. The evaluation of the project area indicates that it lies at an altitude below 75 m above sea level (2). The soil type of the area planted was a Four Paths Sandy Loam with much concretionary material,

highly mottled and poorly drained sub-soil covered by a thin layer of sand or gravel; infertile with a pH of 5.2-5.3 (3)

3. EXPERIMENTAL CONDITIONS

Because of unfavourable site location and other problems, three of these experiments were lost and only three were harvested (4,5,6). All experiments were planted under rainfall conditions by hand after land preparation with tractor. Due to the late supply of insecticides and herbicides, insect and weed control were unsatisfactory.

The economic calculations were made using prices of materials available in the market. The yield reported is net yield after assuming a 10% harvest loss. No economic calculations were done for the variety trial and Production Factors experiment since it is assumed that the economic net benefits will be proportional to the grain yield.

All data processing was done using a small pocket calculator and the original data and calculation are available at BRUMDEC.

4. RELEVANCE OF PRODUCTION FACTORS EXPERIMENT

4.1 Objectives

(i) To identify the most critical production factors and to detect factors of production which have the highest impact on Grain Sorghum production.

(ii) To determine the effect of withholding one practice from the complete set of basic production practices.

4.2 Treatments

In each plot the basic production package (BPP) is applied or the BPP minus one factor. The BPP consists of: 100 kg N/ha + 80 kg P_2O_5/ha + 100 kg K_2O/ha + Improved variety (Pioneer 8244) + 80,000 plants/ha + 2.5 kg/ha sevin (Carbaryl) _ 1 kg a.i./ha Gesaprim-Combi 80 (herbicide)

Treatments	Inputs
1	BPP (all factors applied)
2	BPP-N (no N applied)
3	BPP-P (no P applied)
4	BPP-K (no K applied)
5	BPP+W (hand weed cont'd)
6	BPP-H (no herbicide applied)
7	BPP-I (no insecticide applied)
8	BPP-D (70,000 plants/ha)
9	V (variety only)

4.3 Experimental Design

A randomized complete block design was used with 4 replications.

4.4 Cultural Practices

The plots were thinned to give the desired plant densities in 10 m rows, 1 m apart. Fertilizers were applied before planting and herbicide applied immediately after planting. Weed control was done only for treatments No. 5,7, and 9. Insecticide was applied as needed (twice) except for treatments No. 6 and 9. The Pioneer 8225 hybrid was used.

4.5 Results

The factors studied and the range of yield for the period are shown in Table 1.

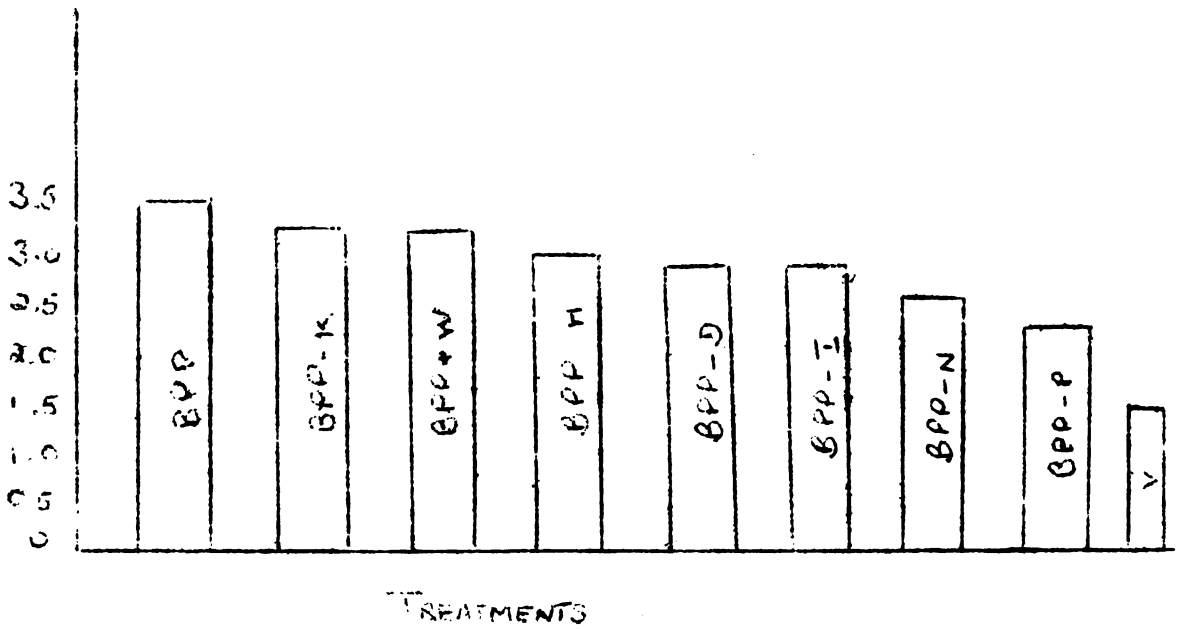
TABLE I - Grain Sorghum Yields at Elim, St. Elizabeth. 1981

TREATMENTS	AVERAGE YIELD KG/HA 12% MOISTURE
BPP	3373 a
BPP-K	3295 ab
BPP+W	3218 abc
BPP-H	3093 abcd
BPP-D	2856 abcde
BPP-I	2854 abcdef
BPP-N	1906 fg
BPP-P	1687 gh
V	937 h

In this trial no significant differences were found between the first six treatments. This at first seems rather strange but it must be remembered that this was under drought conditions. Weed control and insecticide application were done late due to unavailability of chemicals. Low population density has also contributed to this fact. Not withstanding these inconveniences the Basic Production Package where all factors were applied resulted in better yield at harvest.

On the other hand significant differences were found between the first treatments of this group and the last three treatments. It appears that the most limiting production factors are: phosphorus and nitrogen. The general response of these treatments is shown in figure 1.

FIGURE 1 - General Response of Production Factors in Grain Sorghum at Elim, St. Elizabeth. 1981



It appears that potash at the rate applied (100 kg K_2O/ha) is not needed at all and also better weed control, insect control and population density can improve plant survival and yield. Application of nitrogen and particularly phosphorus, seems definitely necessary to improve yield at application rate between those employed in the BPP treatment: 80 and 100 kg N and P_2O_5/ha respectively.

5. BASIC FERTILIZER EXPERIMENT

5.1 Objectives

(i) To compare the yield response due to nitrogen, phosphorus and potash fertilizers on Grain Sorghum grown under the conditions of the Project area of BRUMDEC.

(ii) To determine an optimum, economic fertilizer rate for Grain Sorghum under the conditions of the Project area.

5.2 Treatments

Nitrogen (N) applied as sulphate of Ammonia

N_0 no N applied

N_1 50 kgN/ha applied

N_2 100 kg N/kg applied

Phosphorus (P) applied as triple supershosphate

P_0 no P_2O_5/ha applied

P_1 50 kg P_2O_5/ha applied

Potash (K) applied

K_0 no K applied

K_1 50 kg K_2O/ha applied

K_2 100 kg K_2O/ha applied

5.3 Experimental Design

A 3 x 3 x 3 factorial set out in a randomized complete block design with two replications.

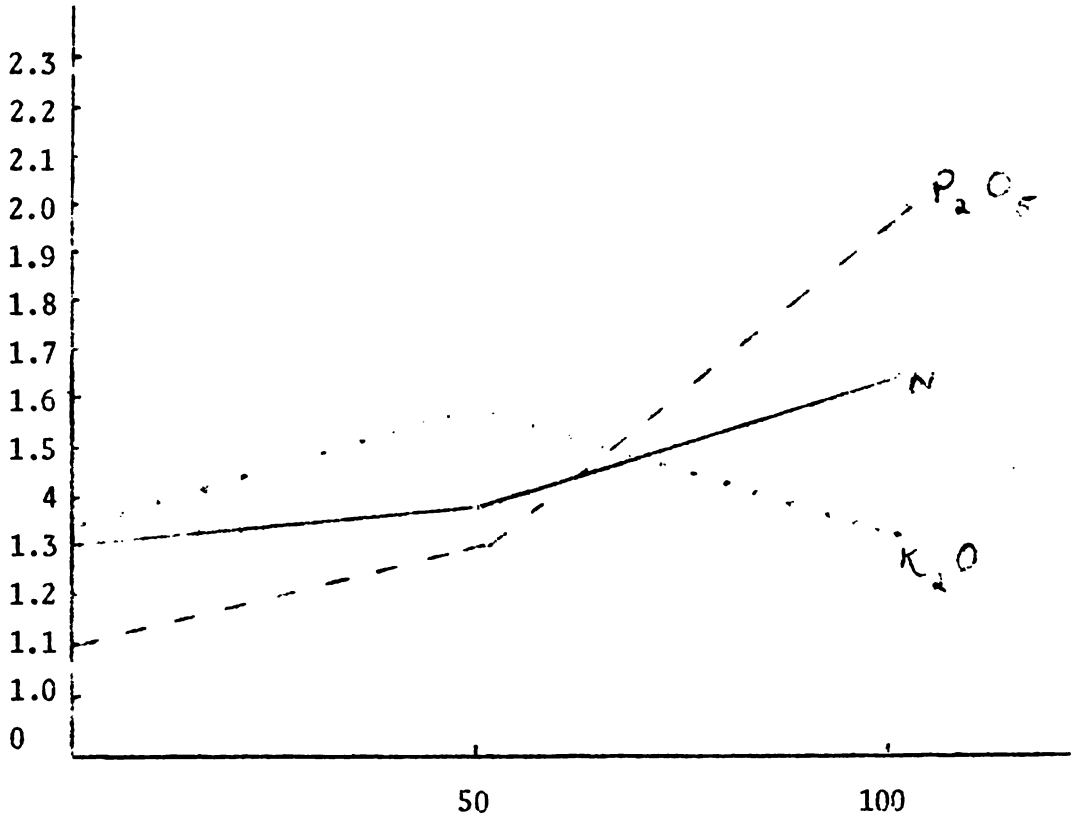
5.4 Cultural Practices

The plots were thinned to give the desired plant densities in 5 m rows, 1 m apart. Fertilizer was applied at the respective rate within the rows before planting. Weed control and insect control were done as needed. The Pioneer 8244 hybrid was used.

5.5 Results

The responses of Grain Sorghum at three different levels of application of N, P, K can be seen in figure 2.

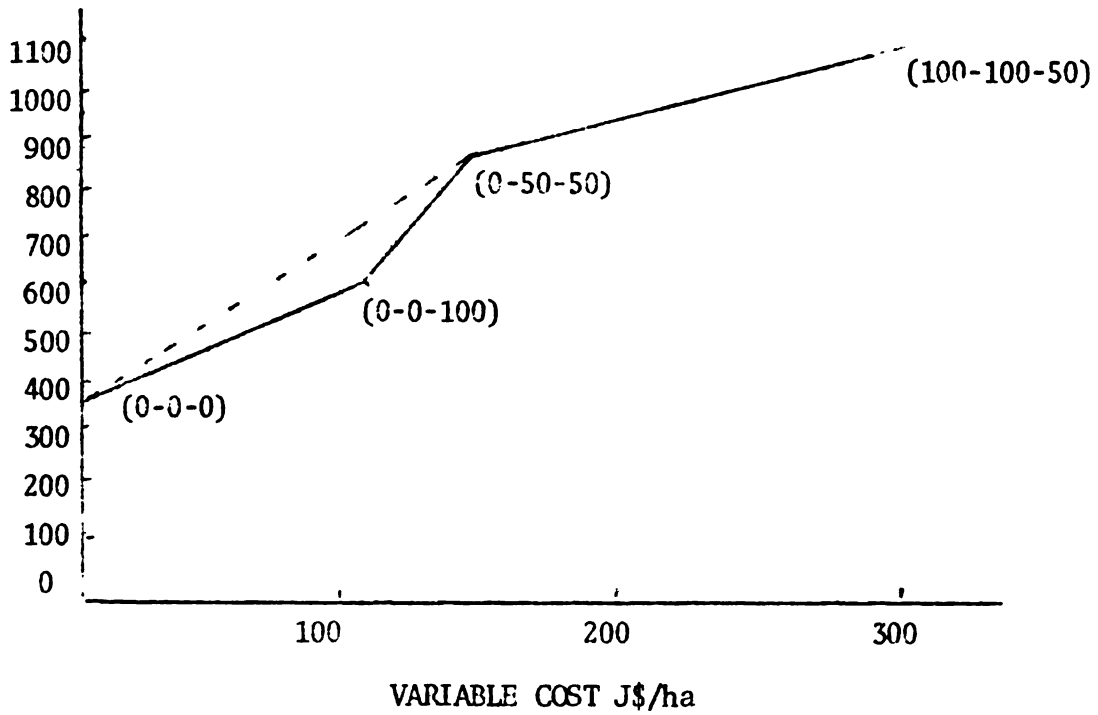
FIGURE 2. Responses of Grain Sorghum to Three Levels of Fertilizer Application of N, P, K. Elim, St. Elizabeth



The grain yield increases as the nitrogen and phosphorus elements are rising. The yield increase starts low from 0 kg/ha to 50 kg/ha, but the increase is greater from 50 kg/ha to 100 kg/ha particularly for the phosphorus and less for the nitrogen respectively. On the other hand, potash application seems to improve yield up to 50 kg/ha then a decrease in yield is observed between 50 kg/ha and 100 kg/ha. Significant differences were found between the three levels of phosphorus applications. No significant differences were found between the levels of application for the other fertilizers, nor with their interactions.

When economics is considered, the picture changes a bit. (figure 3)

FIGURE 3 - Net Return of Increased Rates of Fertilizers Applied to Grain Sorghum. Elim, St. Elizabeth



Obviously the best economical application rate of fertilizer is 0-50-50 (NPK) with a net marginal return ratio of 1408% (table 8 appendix). Although the treatment 100-100-50 (NPK) resulted in better yield, the net marginal return ratio of 104% is less than that of 0-50-50 treatment. Now BRUMDEC has to make a clear decision on what objectives are being pursued. If the decision is to improve production in order to reduce foreign exchange spending on purchasing Corn/Grain Sorghum abroad, the fertilizer rate to be used will be 100-100-50 (NPK) which guarantees better yield up to 5 ton/ha but with a high production cost and low net marginal return ratio. If the decision is to get a better return rate, obviously the treatment 0-50-50 (NPK) will be preferred until further experiments are conducted.

6. VARIETY TRIAL

6.1 Objectives

To compare the performance of three commercially available hybrids of Grain Sorghum for further recommendation.

6.2 Treatments

A Pioneer 8225

B Pioneer 8244

C Pioneer 8303

6.3 Experimental Design

A randomized complete block design having 4 replications.

6.4 Cultural Practices

All plots were thinned to give the desired plant densities in 5 m rows, 1 m apart. Fertilizers were applied before planting. Weed control and insect control were done as needed.

6.5 Results

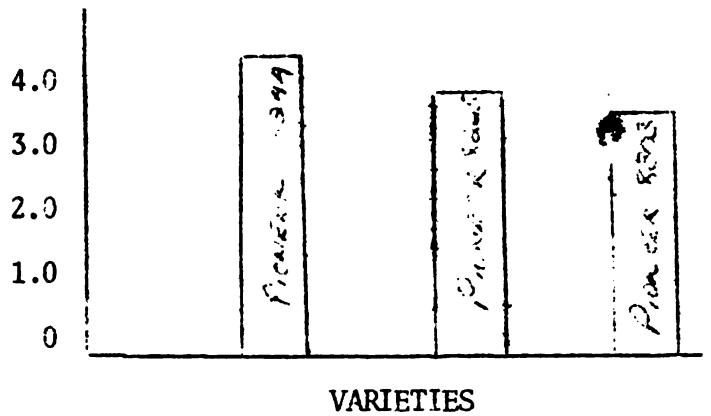
The varieties and average yields for the period under study at Elim, St. Elizabeth are shown in Table 2.

TABLE 2 - Varieties and Average Yields of Grain Sorghum at Elim, St. Elizabeth 1981

VARIETIES	DAY OF FLOWERING	PLANT HEIGHT	YIELD (kg/ha)
Pioneer 8244	55	84.1	3937
Pioneer 8225	57	84.6	3356
Pioneer 8303	57	85.1	3093

No significant differences in yield, days to flowering and plant height were found between these three varieties. Anyone of them can be recommended for the short-term, but it appears prefferable to use Pioneer 8244 because it is less readily affected by molds' during the ripening period.

FIGURE 4 - Yield Response of Three Varieties of Grain Sorghum at Elim, St. Elizabeth. 1981



7. CONCLUSIONS

7.1 The most limiting production factor for Grain Sorghum production under the conditions of the BRUMDEC project area is fertilizer application rates particularly phosphorus and nitrogen. Soil potash availability seems adequate.

7.2 Yield response to increasing application of nitrogen and phosphorus have been obtained, while increasing application of potash shows a decrease in yield.

7.3 Fertilizer application at the rate of 100-100-50 kg a.i. NPK respectively gave the best yield (3.9 ton/ha).

7.4 The best economical fertilizer application rate appears to be 0-50-50 kg a.i. NPK respectively with a net marginal return rate of 1408%.

7.5 It is indicated that further experiments will consider the following factors: population density, weed diseases and insect control, fertilizer application rates of 20, 40, 60 kg a.i. of nitrogen and potash and 50, 70, 90 a.i. of phosphorus.

7.6 The three hybrids tested produced comparable yields, but Pioneer 8244, because of its superior plant type should be used until further experiments are conducted.

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6. Third Quarterly Report of the Grain Crop Research Programme. C.Grand-Pierre January 1982.

APPENDIX

TABLE 4. - Analysis of variants (Relevance of Production Factors experiment)

SOURCE	df	ss	Ms	F
Replications	3	13.6090		
Treatments	8	59.7550	7.46	10.50**
Error	24	17.0628	0.71	
Total	35	90.4275		

C.V. = 20.6%

TABLE 5 - Analysis of Variants (Basic Fertilizer Experiment)

SOURCE	df	ss	Ms	F
Replications	1	0.2674	0.2674	0.51 Ns
Blocks	4	1.7259	0.4314	0.83 Ns
N	2	1.3248	0.6624	1.27 Ns
P	2	9.2454	4.6227	8.93**
K	2	0.8193	0.4096	0.79 Ns
NP	4	1.3757	0.3493	0.66 Ns
NK	4	2.1685	0.5421	1.04 Ns
PK	4	0.9521	0.2380	0.45 Ns
(confounded)	4'	0.3392	0.0848	0.14 Ns
NPK (unconfounded)	4'	0.4862	0.1215	0.20 Ns
Error	22	13.0748	0.5943	
Total	53	31.7793		

TABLE 6. - Average yield (Basic Fertilizer Experiment)

Treatments	Yield (kg/ha)
N P K	14% moisture
100-100-50	3812 a
100-100-0	3312 ab
50-100-100	3064 abc
0-50-50	2688 abcd
100-50-50	2688 abcd
100-100-100	2500 abcd
0-100-50	2438 abcd
50-100-0	2188 abcd
0-100-100	2187 abcd
50-0-50	2125 abcd
50-50-100	2000 abcd
0-0-100	1813 abcd
50-0-0	1750 abcd
50-100-50	1688 abcd
100-0-0	1688 abcd
100-0-50	1500 bcd
100-50-0	1375 bcd
50-50-0	1313 bcd
100-50-100	1313 bcd
50-0-100	1063 cd
50-50-50	1063 cd
0-0-0	937 cd
0-0-50	875 cd
0-50-100	813 d

TABLE 7. - Marginal Analysis of Non-Dominated Treatments (Basic Fertilizer Treatment)

Average Yield (ton/ha)	Gross Return $J/ha	Treatments N P K	Variable Costs	Marginal Gross Returns	Marginal Variable Costs	Marginal Return Rate
3.81	1032.80	100-100-50	338.80	206.20		
				206.20	197.0	104%
2.69	826.60	0-50-50	141.80			
				295.80	21.0	1408%
1.81	530.80	0-0-100	120.80			
				192.40	120.80	153%
0.94	333.40	0-0-0	0.00			

Nitrogen : J$42/kg N

Phosphorus : J$1.10/kg P_2O_5

Potash : J$0.68/kg K_2O

Man/Day : J$13.60

TABLE 8. - Analysis of variants (Variety Trial)

SOURCE	df	ss	MS	F
Repetitions	3	2.2425		
Treatments	2	3.8117	1.9058	0.51 Ns
Error	6	22.2150	3.7025	
Total	11	28.2692		

SECOND QUARTERLY PROGRESS REPORT OF THE GRAIN CROPS RESEARCH PROGRAMME

by

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SECOND QUARTERLY PROGRESS REPORT OF THE GRAIN CROPS RESEARCH PROGRAMME

1. INTRODUCTION

This report is prepared as part of the Agreement on Consulting Services for Agricultural Technical Assistance between BRUMDEC and IICA. The period covered by this report is July 15 to October 14, 1981.

2. PRINCIPAL ACTIVITIES

2.1 Establishment of Experiments on Sandy Clay Loam

2.1.1 Land Preparation

This activity was completed behind schedule from July 27 to August 7. The client (BRUMDEC) experienced difficulties in finding machines and equipment to provide land preparation services at an earlier date.

2.1.2 Preparation of Experimental plots and materials

Unavailability of a field office and adequate equipment have been the main constraints. Ten (10) days were used for this activity from August 10 to August 20.

2.1.3 Planting of Experiments

Three experiments with each of the crops (corn and sorghum) have been planted from August 21 to September 1.

i) Relevance of Production Factors

The objectives of this experiment are to identify the most critical production factors and detect factors of production which have the highest impact on cost/benefits.

It consists of a randomised complete block design having 8 treatments and 4 replications. The plot size is $66m^2$. The treatments consist of withholding a different production factor from a complete set of basic production packages (BPP). The BPP consist of N,P,K, application + Improved variety + Optimum population density + use of insecticide/fungicide + Use of herbicide.

(ii) Basic Fertilizer Experiment

The objectives of this experiment is to compare the yield response due to three (3) different fertilizer at three (3) levels of application rate and to identify significant interactions between fertilizer nutrients. It is 3 x 3 x 3 factorial arranged in blocks of nine (9) treatments with two (2) replications. There is a total of 27 treatments per replicate. The plot size is $22m^2$.

(iii) Variety Trial

The objectives are to compare the performance of commercially available hybrids and open pollinated varieties for adaptation and further recommendation. The experimental design is a randomised complete block design with 3 and 4 varieties of sorghum and corn respectively having 4 replicates. The plot size is $55m^2$.

2.1.4 Cultural Practices

One weeding and an early insect control application have been done during September 20 - 30.

2.2 Establishment of Experiments on Linstead Clay Loam

The same type of experiments have been planted in this soil type. Land preparation was completed during the period from September 18 - 21. The preparation of experimental

plots and materials and the planting of experiments were completed between September 21 - 24.

3. GENERAL

3.1 On the first site (Sandy Clay Loam), the experiments are progressing satisfactorily and there are indications of positive responses to nitrogen, phosphorus, herbicide rates and insect control. In all cases, the Basic Production Package (BPP) seems to be superior.

3.2 On the second site (Linstead Clay Loam) the plants are only three (3) weeks old and the germination is good except on some small areas where some supplying have been done.

3.3 The total rainfall during the month of August has been 104.50 mm with a 3 day frequency averaging 8.7 mm per rainfall.

3.4 Five (5) varieties of Corn: M-D-II, Pioneer 7426, Pioneer 7536, Jamaican Yellow (local variety), X-304-A and three (3) varieties of Sorghum: Pioneer 8244, Pioneer 8225, Pioneer 8303, have been used on the 12 experiments established.

3.5 The Agricultural Assistants requested have not yet been appointed since the departure of one technician after two (2) weeks of service (August 17 - 31).

3.6 Weekly meeting with the participation of IICA Director from Kingston Office and BRUMDEC's technical staff and Consultants have been held with the purpose of reviewing the work progress and problems during the period covered by this report.

4. RECOMMENDATION

In order to achieve with success the objectives of the Grain Research Programme, I wish to bring to the attention of BRUMDEC the following:-

4.1 Research work needs to be very accurate in order to obtain valid results. An adequate field office and workshop where the experimental materials and equipment have to be identified, classified, protected and maintained have to be available for the preparation of the experimental materials and equipment as requested in my plan of work submitted to BRUMDEC on May 28, 1981. Without these facilities many errors can be made in preparing the experimental materials in the field as we have had to do.

4.2 The workers employed on the field work have to be used during the time needed for conducting the experiments in order to be sure and confident in the training process and the management of the experiments. These trained workers cannot be laid off every week or two weeks as is done presently. I will suggest the following personnel on a full time basis for the monitoring of the experiments:

(i) Two (2) Agricultural Assistants
(ii) Two (2) Headmen
(iii) Four (4) workers

4.3 Given the difficulties experienced in the past six months, the plan of work is behind schedule for six (6) weeks. As a consequence the following decisions have to be taken:

4.3.1 In regard to the establishment of the legume experiments (Beans and Peas) in December.

(i) Irrigation facilities on the first site (Sandy Clay Loam).

(ii) Adequate equipment for land preparation in Mid-November.

(iii) Availability of experimental materials as requested on the list of materials submitted on May 28, 1981.

4.3.2 In relation to the verification of Commercial Technological Packages on Grain Crops (corn and sorghum) next March 1982, I wish to remind that in accordance with my terms of reference I will be at this time preparing my final report and this step cannot be concluded satisfactorily as a result of the delayed initiation of the programme due to the late supply of services for land preparation, experimental materials and equipment requested.

THIRD QUARTERLY REPORT OF THE SHORT TERM PRODUCTION ORIENTED SORGHUM RESEARCH PROGRAMME

OCTOBER 15, 1981 - JANUARY 14, 1982

by

Claude Grand-Pierre
Grain Production Specialist

IICA/JAMAICA

1. Introduction

This report is prepared as part of the Agreement on Consulting Services for Agricultural Technical Assistance between the Black River Upper Morass Development Company Limited (BRUMDEC) and the Inter-American Institute for Co-operation on Agriculture (IICA). The period covered by this report is October 15, 1981 to January 14, 1982.

2. Principal Activities

2.1 Corn Experiments

2.1.1 Six (6) experiments were established on two (2) different soil types (Four Paths Sandy Loam No. 204 and Newel Loam No. 67) in order to determine the limiting factors to corn production in the project area, with emphasis placed on experiments identifying critical management factors, and simultaneously detecting factors of production which have the highest impact on lowering the cost/benefit ratio.

2.1.2 On the first site (Four Paths Sandy Loam No. 204) all cultural practices have been executed and data collected. All three experiments have been harvested from December 18 to December 22. Due to planning problems, weeding and insect control were delayed one or two weeks contrary to the specifications and recommendations. On the other hand, these experiments were subject to praedial larceny which obligated an early reaping at about 38% moisture content. More than 380 ears were stolen throughout the experiments, modifying quite significantly the data collected. These data will not be analysed statistically, but will be used as

indications for further experiments in the final report.

2.1.3 On the second site (Newel Loam No. 67) germinating was very low. Supplying was done twice in two weeks. After investigations, we identified the problem as herbicide toxicity. The fact is that this land site, chosen by the counter-part, was planted previously in sugar cane and during the last three years (1977-1979) KARMEX (Diuron) herbicide which is highly soluble and with limited leaching, had been applied. The young seedlings which emerged were abnormal with narrow leaves, chlorosis and apical burning. The roots were apparently in good condition. The three experiments on this site were lost. No data have been collected.

2.2 Sorghum Experiments

2.2.1 Like the corn, six (6) experiments were established, three of them on the Four Paths Sandy Loam Site and three on the Newel Loam Site. For the same reason as stated above, the sorghum experiments on the Newel Loam Site were lost. On the Sandy Loam, the three sorghum experiments were executed without major problems, except for plant density, insect control and weeding which were inadequate, contrary to the specifications and recommendations.

2.3 Corn Shelling and Sorghum Threshing

These operations were started on December 19, with a lot of problems with adjustments which had to be made to the thresher to avoid cracking and to obtain clean grains. With the Christmas period, work was suspended until January 4. This constraint added to the fact that we

were more than six (6) weeks behind schedule as mentioned in our Second Quarterly Report, and has obliged us to present at this time, only preliminary results of the experiments. The complete results will be submitted in our final report on April 14, 1982.

3. Legume Experiments

3.1 Establishment of Beans and Peas Experiments on Four Paths Sandy Loam Soil Type

3.1.1 Three beans experiments and two cow peas observation plots were established from January 11 to January 14. The objectives of these experiments are:

(i) to identify the most critical production factors and to detect factors which have the highest favourable impact on lowering the cost/benefit ratio. It consists of a randomized complete block design having 8 treatments and 4 replications.

(ii) To compare yield response due to four (4) different sources of fertilizer at two (2) levels of application rate, and to identify significant interactions between fertilizer nutrients. It is a 2^4 factorial with 16 treatments and four (4) replicates.

(iii) To compare the performance of three (3) commercially available varieties for adaptation. The experimental design is a randomized complete block with 3 varieties and 4 replicates.

3.1.2 It had been planned to establish the same type of experiments on the organic soil (peat) in order to study the potential of these varieties in organic soil.

4. General

4.1 In relation to our recommendations submitted in our Second Quarterly Report on October 15, 1981, not much has been done to improve the facilities requested:

(i) A space to be used as Field Office has been provided, but storage and work shop facilities are still inadequate. Rat damage has caused loss in the experimental materials.

(ii) No worker has been appointed on a full-time basis as recommended in order to minimize human errors in the management of the experiments using trained workers.

4.2 Implementation and execution of the chronogram of activities have been delayed due to other activities assigned to my counter-part who is not under my control.

4.3 Supervision of the amount of work to be done on a basis is inadequate, occasioning constant lateness and cost over-runs on the field work.

4.4 Due to the late supply of services for land preparation, experimental materials and lack of implementation of the field work, the legume experiments will not be completed on time and the final report due to be submitted on April 10, 1982 will be incomplete.

4.5 The request made on September 9, 1981 by memorandum to my counter-part asking for monthly information on average rainfall and frequency, no. of workers/day/experiment,

quantity of materials used per experiment and cost etc. has not been complied with, except for August and September.

4.6 Due to the delay in the implementation and execution of the field work, the establishment of the legume experiments is 6 weeks behind schedule.

5. Technical Package of Practices for Grain/Sorghum Production

In accordance with our terms of reference requiring the Grain Consultant to develop a technical package of practices for implementing on-farm grain cultivation under the conditions of the Project Area, I wish to recommend to BRUMDEC the following production patterns for sorghum, based on the preliminary results presented in the Annex.

5.1 Soil Preparation

Do not over work the soil with tillage operations. Ploughing and one harrowing should be sufficient if properly done. The harrowing should be done across the direction of the rows.

5.2 Fertilizer Application

380 Kg/Ha - sulphate of ammonia	21% as 80	Kg N/Ha
217 Kg/Ha - triple superphosphate	46% as 100	Kg P_2O_5/Ha
68 Kg/Ha - Muriate of Potash	60% as 40	Kg K_2O/Ha

If the compound fertilizer 12-24-12 is available, the fertilizer rate should be 12-24-12 - 378 Kg/Ha + sulphate of ammonia 140 Kg/Ha in side dressing when the plants reach a height of 40-50 cm.

5.3 Planting

Distance between rows	:	0.80 m
Number of plants per meter	:	7
Seed per hectare	:	15 - 17 Kg/Ha

5.4 Weed Control

Apply 2.5 Kg/Ha Gesaprin Combi - 80 (equivalent to 1.0 Kg Atrazine) in 400 lt water/ha immediately after planting.

5.5 Early Stage Insect Control

Insects attacking sorghum at early stages can be controlled by spraying a solution of 20 gm Servin (Carbarryl) 80% WP in 10 lt of water. Ten (10) litres of the mixture is enough to spray one row 1,500 m long. If amphids are present, add 15 ml Folidol to the solution. One or occasionally two applications of Sevin 80% WP at 3.5 Kg/Ha may be needed for control of Diabrotica sp, Spodoptera sp. The first one, as soon as the attack is noticed (perhaps 10 - 15 days after the emergence). The second application, if needed, should be made 2 or 3 weeks later.

5.6 Harvesting

Before harvest, make sure that the average moisture content is about 14%.

6. Further Area of Investigation

Based on the preliminary results for this period, areas for future grain/sorghum research-needs of the project should be:

6.1 Fertilization: Fertilization rates, method of application

6.2 Variety: Comparison trials, screening observation and variety X cultural practices

6.3 Population Density: Inter-row spacing

6.4 Weed Control: Herbicide Trials

6.5 Insect Control: Insecticide Trials

These experiments should be established in mid-March, 1982.

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Autor

Título

Fecha Devolución	Nombre del solicitante