

Centro Internacional de Investigaciones e Informacion Tropical

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

ACRINTED ACRIS

IICA
PM-352

**IICA/Jamaica
Miscellaneous Publication #352
Series ISSN-0534-5391**

FINAL REPORT ON
GRAIN EXPERIMENTAL WORK
IN BUNDLES
CONTRACT 11

Michigan
Miscellaneous Publication 485
Series 1854-074-2891

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

by

Claude Grand-Pierre
Grain Production Specialist
IICA/JAMAICA

May 1982

1970

1971

1972

1973

1974

1975

ACKNOWLEDGEMENTS

The writer wishes to acknowledge with thanks the assistance received from Dr. Percy Aitken-Soux (Director, IICA/Jamaica) Dr. Abdul Wahab, Mr. Vivian Chin, Dr. Irving Johnson (IICA/Ja) Mr. Ed Martin (Ministry of Agriculture), Mr. Malcolm B. Easy, Mr. Derrick Smith, Mrs. Rose Evans, Mr. Robert Stephens, Mr. Lloyd Logan (BRUMDEC) and other associated personnel of IICA and BRUMDEC. Their collaboration and assistance have been very important for the development of this short-term programme of work.

Claude Grand-Pierre
Grain Production Specialist

REFERENCE

1. Adaptive Research for Grain Production (BRUMDEC). A Short-term Programme. C. Grand-Pierre, June 1981
2. Experimental Procedure for Grain Crops Production Research. C. Grand-Pierre, June 1981.
3. First Quarterly Progress Report of the Grain Crops Research Programme. C. Grand-Pierre, July 1981
4. Second Quarterly Progress Report of the Grain Crops Research Programme. C. Grand-Pierre, October 1981
5. Third Quarterly Progress Report of the Grain Crops Research Programme. C. Grand-Pierre. January 1981

12-11-1964
The following information was obtained from the file of the
Department of the Interior, Bureau of Land Management, regarding
the land owned by the State of California, in the County of
San Diego, California, and is being furnished to you for
your information.



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

by

**Claude Grand-Pierre
Grain Production Specialist**

IICA/Jamaica

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2.

3. The second part of the document outlines the specific procedures and protocols that must be followed to ensure that all records are properly maintained and updated. It details the roles and responsibilities of various staff members involved in this process.

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 m² and the harvested plot was 8 m² 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

... of the ...

... of the ...

... of the ...

... of the ...

recommendation. The experimental design was a randomized complete block with 3 varieties and 4 replicates. The plot size was 50 m² with a harvested plot of 16 m² 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

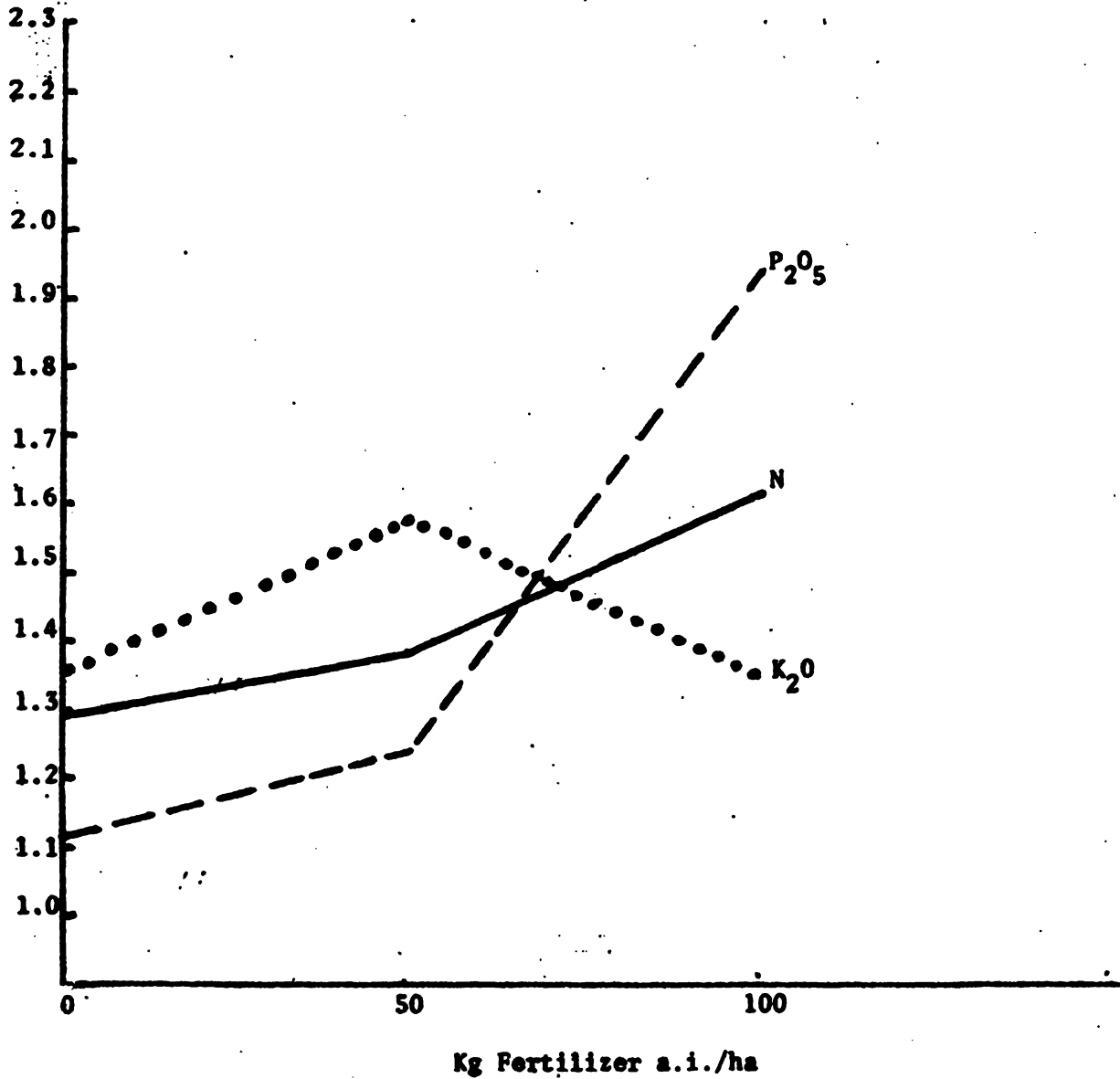
It appears from these results that the most limiting production factors: Phosphorus and Nitrogen.

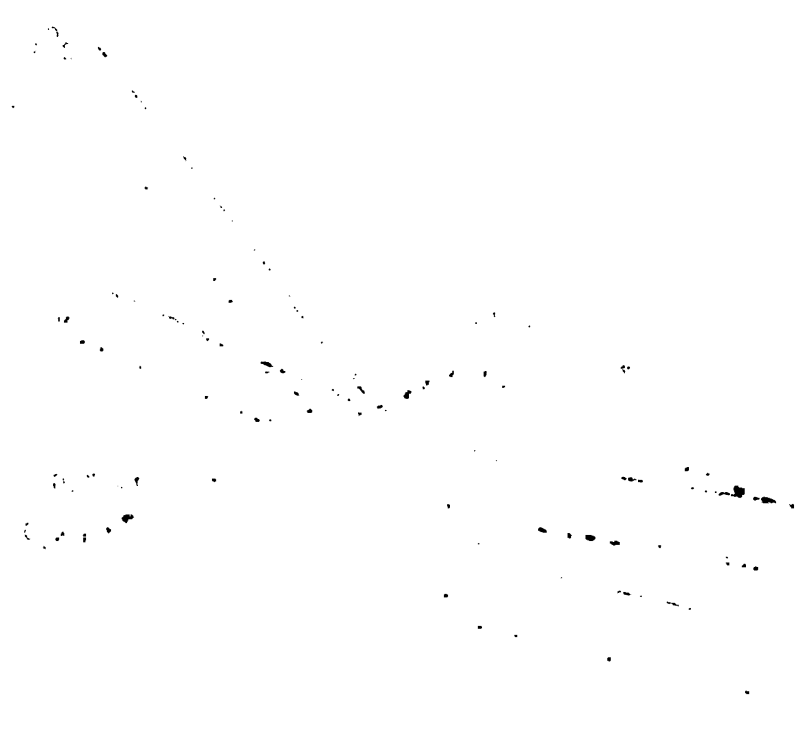
3.2 Basic Fertilizer Experiment

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





1992
10 10

1992 10 10

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, P₂O₅ and K₂O 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

<u>Kg/Ha</u>	<u>Kg/Ha</u>	<u>Yield Kg/Ha</u>
<u>1st 50 Kg/Ha</u>	1 N	2.75
	1 P ₂ O ₅	3.50
	1 K ₂ O	6.25
<u>2nd 50 Kg/Ha</u>	1 N	6.00
	1 P ₂ O ₅	20.00
<u>Total Average</u>	1 N	4.62
	1 P ₂ O ₅	11.75

1948

1949

1950

1951

1952

1953

1954

1955

1956

1957

1958

1959

1960

1961

1962

1963

1964

1965

1966

1967

1968

1969

1970

1971

1972

1973

1974

1975

1976

1977

1978

1979

1980

1981

1982

1983

1984

1985

1986

1987

1988

1989

1990

1991

1992

1993

1994

1995

1996

1997

1998

1999

2000

2001

2002

2003

2004

2005

2006

2007

2008

2009

2010

2011

2012

2013

2014

2015

2016

2017

2018

2019

2020

2021

2022

2023

2024

2025

2026

2027

2028

2029

2030

2031

2032

2033

2034

2035

2036

2037

2038

2039

2040

2041

2042

2043

2044

2045

2046

2047

2048

2049

2050

2051

2052

2053

2054

2055

2056

2057

2058

2059

2060

2061

2062

2063

2064

2065

2066

2067

2068

2069

2070

2071

2072

2073

2074

2075

2076

2077

2078

2079

2080

2081

2082

2083

2084

2085

2086

2087

2088

2089

2090

2091

2092

2093

2094

2095

2096

2097

2098

2099

2100

2101

2102

2103

2104

2105

2106

2107

2108

2109

2110

2111

2112

2113

2114

2115

2116

2117

2118

2119

2120

2121

2122

2123

2124

2125

2126

2127

2128

2129

2130

2131

2132

2133

2134

2135

2136

2137

2138

2139

2140

2141

2142

2143

2144

2145

2146

2147

2148

2149

2150

2151

2152

2153

2154

2155

2156

2157

2158

2159

2160

2161

2162

2163

2164

2165

2166

2167

2168

2169

2170

2171

2172

2173

2174

2175

2176

2177

2178

2179

2180

2181

2182

2183

2184

2185

2186

2187

2188

2189

2190

2191

2192

2193

2194

2195

2196

2197

2198

2199

2200

2201

2202

2203

2204

2205

2206

2207

2208

2209

2210

2211

2212

2213

2214

2215

2216

2217

2218

2219

2220

2221

2222

2223

2224

2225

2226

2227

2228

2229

2230

2231

2232

2233

2234

2235

2236

2237

2238

2239

2240

2241

2242

2243

2244

2245

2246

2247

2248

2249

2250

2251

2252

2253

2254

2255

2256

2257

2258

2259

2260

2261

2262

2263

2264

2265

2266

2267

2268

2269

2270

2271

2272

2273

2274

2275

2276

2277

2278

2279

2280

2281

2282

2283

2284

2285

2286

2287

2288

2289

2290

2291

2292

2293

2294

2295

2296

2297

2298

2299

2300

2301

2302

2303

2304

2305

2306

2307

2308

2309

2310

2311

2312

2313

2314

2315

2316

2317

2318

2319

2320

2321

2322

2323

2324

2325

2326

2327

2328

2329

2330

2331

2332

2333

2334

2335

2336

2337

2338

2339

2340

2341

2342

2343

2344

2345

2346

2347

2348

2349

2350

2351

2352

2353

2354

2355

2356

2357

2358

2359

2360

2361

2362

2363

2364

2365

2366

2367

2368

2369

2370

2371

2372

2373

2374

2375

2376

2377

2378

2379

2380

2381

2382

2383

2384

2385

2386

2387

2388

2389

2390

2391

2392

2393

2394

2395

2396

2397

2398

2399

2400

2401

2402

2403

2404

2405

2406

2407

2408

2409

2410

2411

2412

2413

2414

2415

2416

2417

2418

2419

2420

2421

2422

2423

2424

2425

2426

2427

2428

2429

2430

2431

2432

2433

2434

2435

2436

2437

2438

2439

2440

2441

2442

2443

2444

2445

2446

2447

2448

2449

2450

2451

2452

2453

2454

2455

2456

2457

2458

2459

2460

2461

2462

2463

2464

2465

2466

2467

2468

2469

2470

2471

2472

2473

2474

2475

2476

2477

2478

2479

2480

2481

2482

2483

2484

2485

2486

2487

2488

2489

2490

2491

2492

2493

2494

2495

2496

2497

2498

2499

2500

2501

2502

2503

2504

2505

2506

2507

2508

2509

2510

2511

2512

2513

2514

2515

2516

2517

2518

2519

2520

2521

2522

2523

2524

2525

2526

2527

2528

2529

2530

2531

2532

2533

2534

2535

2536

2537

2538

2539

2540

2541

2542

2543

2544

2545

2546

2547

2548

2549

2550

2551

2552

2553

2554

2555

2556

2557

2558

2559

2560

2561

2562

2563

2564

2565

2566

2567

2568

2569

2570

2571

2572

2573

2574

2575

2576

2577

2578

2579

2580

2581

2582

2583

2584

2585

2586

2587

2588

2589

2590

2591

2592

2593

2594

2595

2596

2597

2598

2599

2600

2601

2602

2603

2604

2605

2606

2607

2608

2609

2610

2611

2612

2613

2614

2615

2616

2617

2618

2619

2620

2621

2622

2623

2624

2625

2626

2627

2628

2629

2630

2631

2632

2633

2634

2635

2636

2637

2638

2639

2640

2641

2642

2643

2644

2645

2646

2647

2648

2649

2650

2651

2652

2653

2654

2655

2656

2657

2658

2659

2660

2661

2662

2663

2664

2665

2666

2667

2668

2669

2670

2671

2672

2673

2674

2675

2676

2677

2678

2679

2680

2681

2682

2683

2684

2685

2686

2687

2688

2689

2690

2691

2692

2693

2694

2695

2696

2697

2698

2699

2700

2701

2702

2703

2704

2705

2706

2707

2708

2709

2710

2711

2712

2713

2714

2715

2716

2717

2718

2719

2720

2721

2722

2723

2724

2725

2726

2727

2728

2729

2730

2731

2732

2733

2734

2735

2736

2737

2738

2739

2740

2741

2742

2743

2744

2745

2746

2747

2748

2749

2750

2751

2752

2753

2754

2755

2756

2757

2758

2759

2760

2761

2762

2763

2764

2765

2766

2767

2768

2769

2770

2771

2772

2773

2774

2775

2776

2777

2778

2779

2780

2781

2782

2783

2784

2785

2786

2787

2788

2789

2790

2791

2792

2793

2794

2795

2796

2797

2798

2799

2800

2801

2802

2803

2804

2805

2806

2807

2808

2809

2810

2811

2812

2813

2814

2815

2816

2817

2818

2819

2820

2821

2822

2823

2824

2825

2826

2827

2828

2829

2830

2831

2832

2833

2834

2835

2836

2837

2838

2839

2840

2841

2842

2843

2844

2845

2846

2847

2848

2849

2850

2851

2852

2853

2854

2855

2856

2857

2858

2859

2860

2861

2862

2863

2864

2865

2866

2867

2868

2869

2870

2871

2872

2873

2874

2875

2876

2877

2878

2879

2880

2881

2882

2883

2884

2885

2886

2887

2888

2889

2890

2891

2892

2893

2894

2895

2896

2897

2898

2899

2900

2901

2902

2903

2904

2905

2906

2907

2908

2909

2910

2911

2912

2913

2914

2915

2916

2917

2918

2919

2920

2921

2922

2923

2924

2925

2926

2927

2928

2929

2930

2931

2932

2933

2934

2935

2936

2937

2938

2939

2940

2941

2942

2943

2944

2945

2946

2947

2948

2949

2950

2951

2952

2953

2954

2955

2956

2957

2958

2959

2960

2961

2962

2963

2964

2965

2966

2967

2968

2969

2970

2971

2972

2973

2974

2975

2976

2977

2978

2979

2980

2981

2982

2983

2984

2985

2986

2987

2988

2989

2990

2991

2992

2993

2994

2995

2996

2997

2998

2999

3000

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

<u>Varieties</u>	<u>12% Moisture Yield Kg/Ha</u>
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/meter², 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.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text suggests that organizations should implement robust systems to track and document every aspect of their operations.

2. The second part of the document addresses the challenges associated with data management and security. It highlights the need for organizations to invest in secure storage solutions and implement strict access controls to protect sensitive information. The text also discusses the importance of regular data backups and disaster recovery plans to ensure business continuity in the event of a security breach or system failure.

3. The third part of the document focuses on the role of technology in streamlining operations and improving efficiency. It suggests that organizations should explore various digital tools and platforms to automate repetitive tasks and enhance communication. The text also touches upon the importance of employee training and development to ensure that staff are equipped with the necessary skills to effectively utilize these technologies.

4. The final part of the document provides a summary of the key points discussed and offers recommendations for future actions. It encourages organizations to regularly review and update their policies and procedures to stay current with industry best practices and regulatory requirements. The text concludes by emphasizing the importance of a proactive and collaborative approach to organizational management.

**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

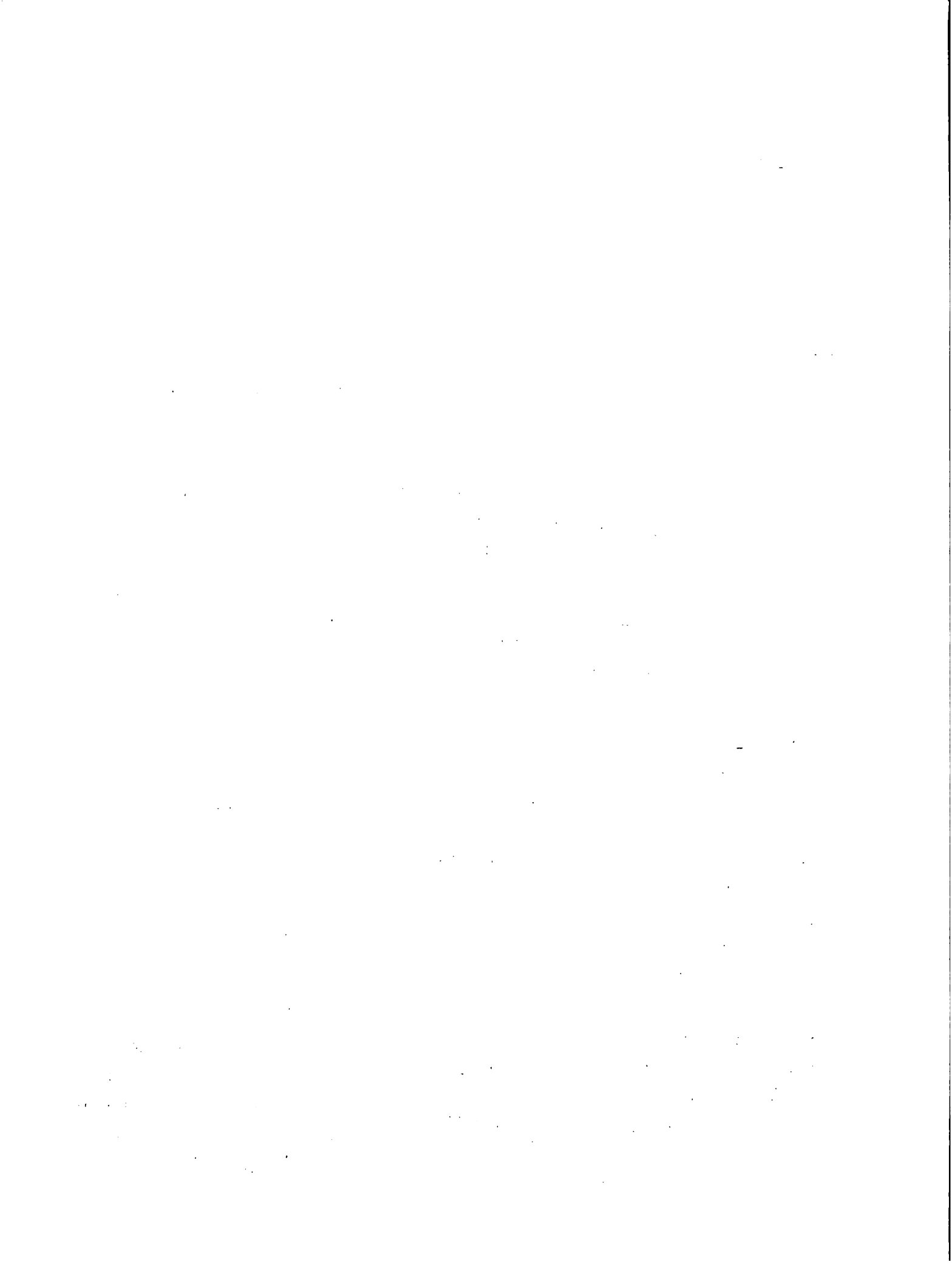
Six experiments were established during the period of August 20-27, 1981 with the objectives of identifying production constraints, and to suggest and recommend ways of removing these constraints, and for implementation of farm Grain Sorghum cultivation under the conditions of the project area of BRUMDEC. 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 $76^{\circ}15'$ to $78^{\circ}15'$ West and longitude $17^{\circ}45'$ to $18^{\circ}13'$ 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.

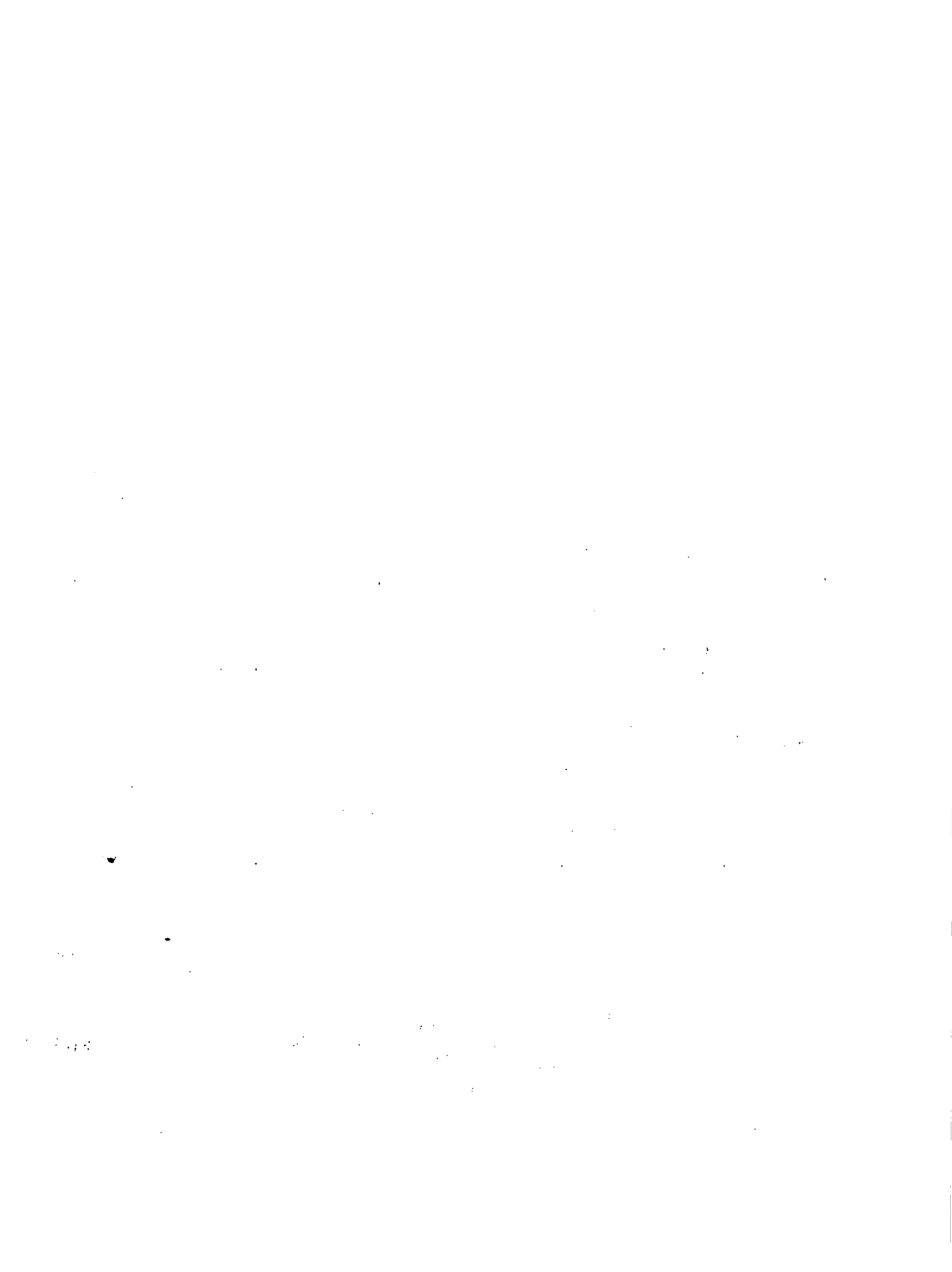
4. RELEVANCE OF PRODUCTION FACTORS EXPERIMENT

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 P₂O₅/ha + 100 kg K₂O/ha + Improved variety (Pioneer 8244) + 80,000 plants/ha + 2.5 kg/ha sevin (Carbaryl) _ 1 kg a.i./ha Gesaprim-Combi 80 (herbicide)



<u>Treatments</u>	<u>Inputs</u>
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. Notwithstanding 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.

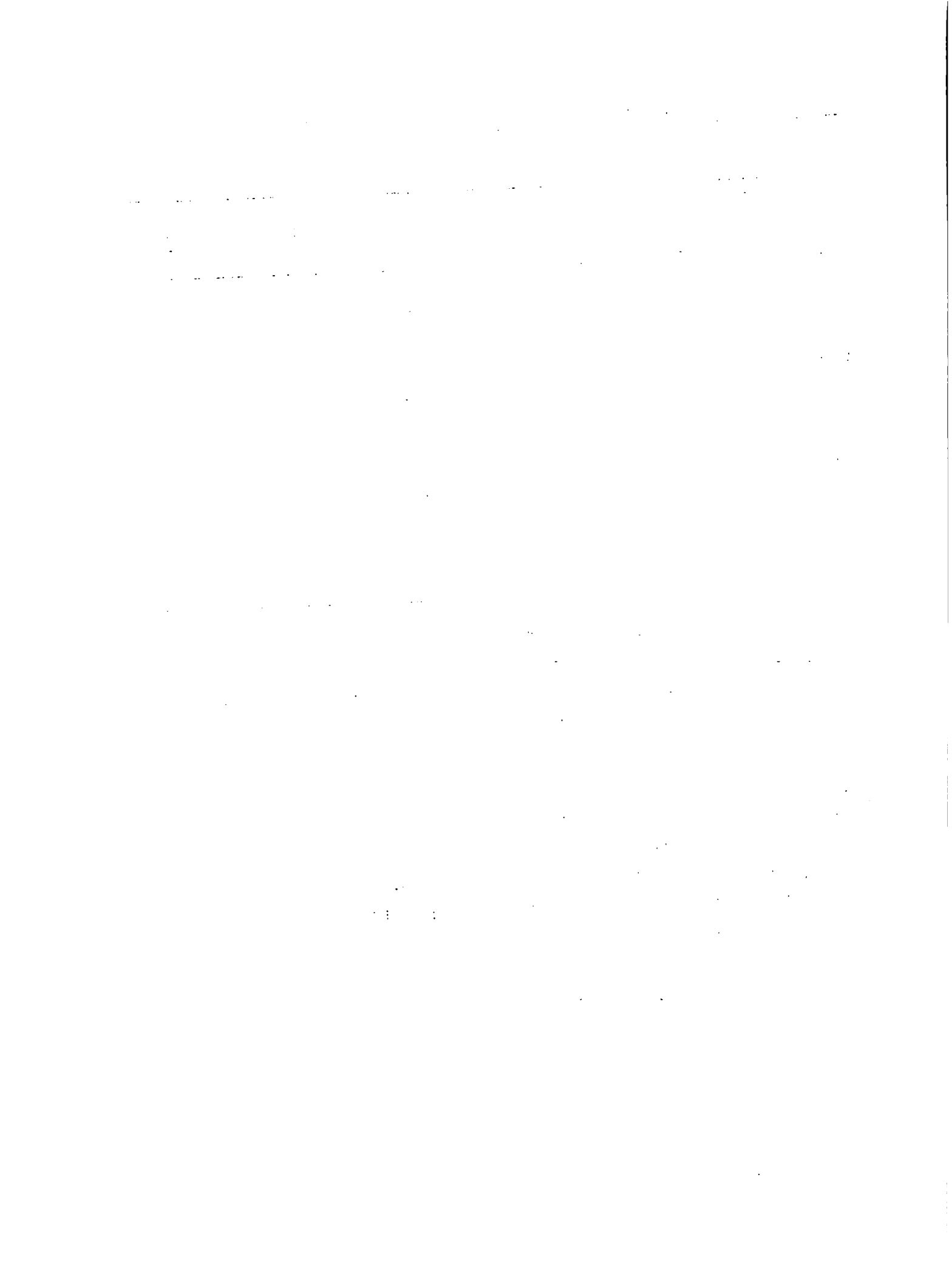
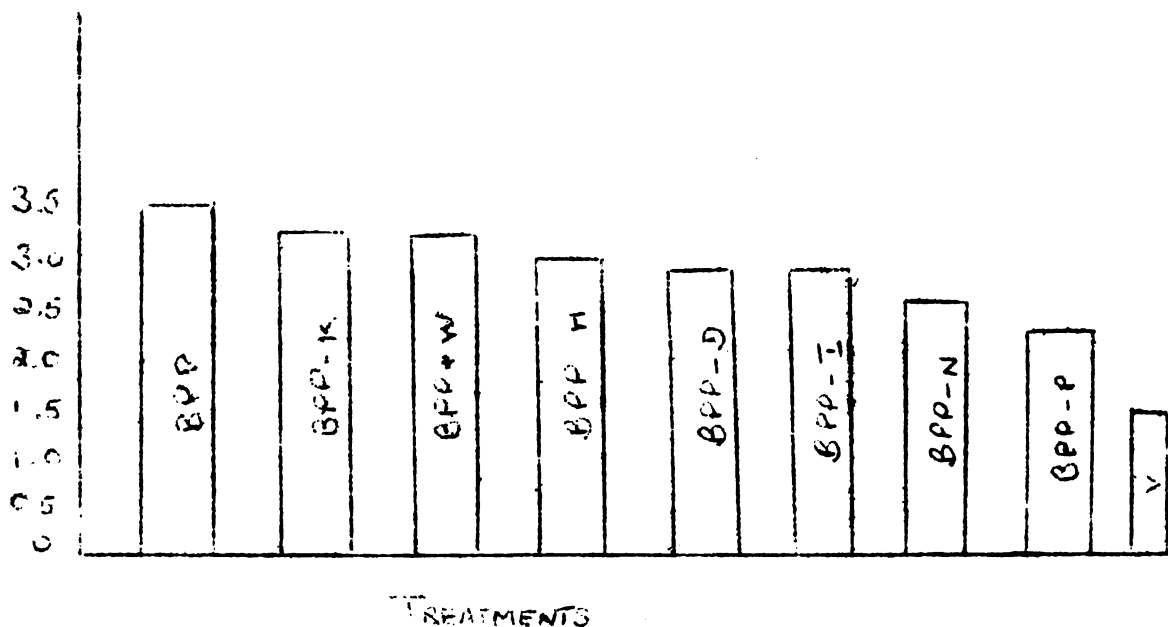


FIGURE 1 - General Response of Production Factors in Grain Sorghum at Elim, St. Elizabeth. 1981



It appears that potash at the rate applied ($100 \text{ kg K}_2\text{O/ha}$) 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 $\text{P}_2\text{O}_5/\text{ha}$ 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

N₀ no N applied

N₁ 50 kgN/ha applied

N₂ 100 kg N/kg applied

Phosphorus (P) applied as triple supershosphate

P₀ no P₂O₅/ha applied

P₁ 50 kg P₂O₅/ha applied

Potash (K) applied

K₀ no K applied

K₁ 50 kg K₂O/ha applied

K₂ 100 kg K₂O/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.

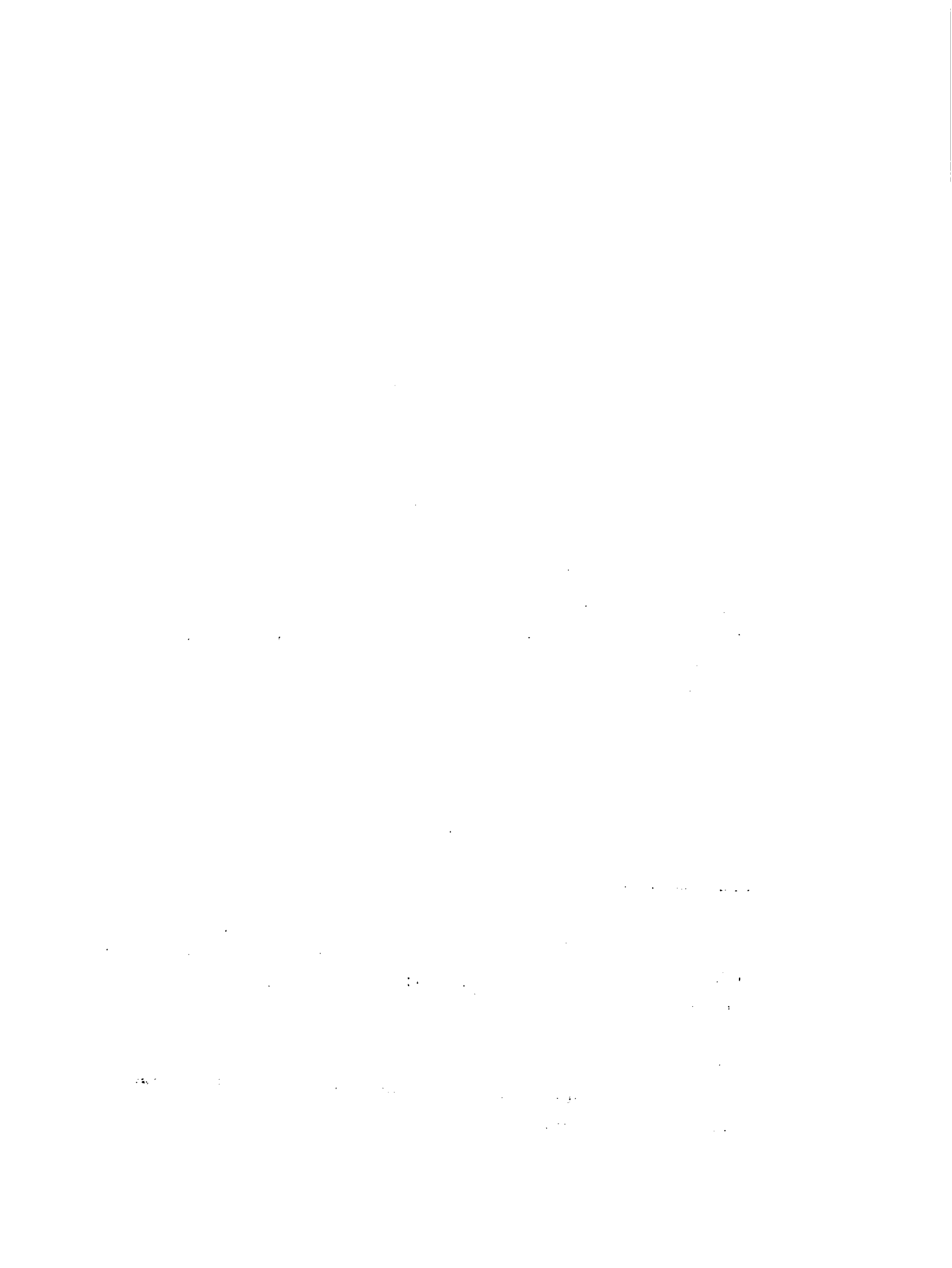
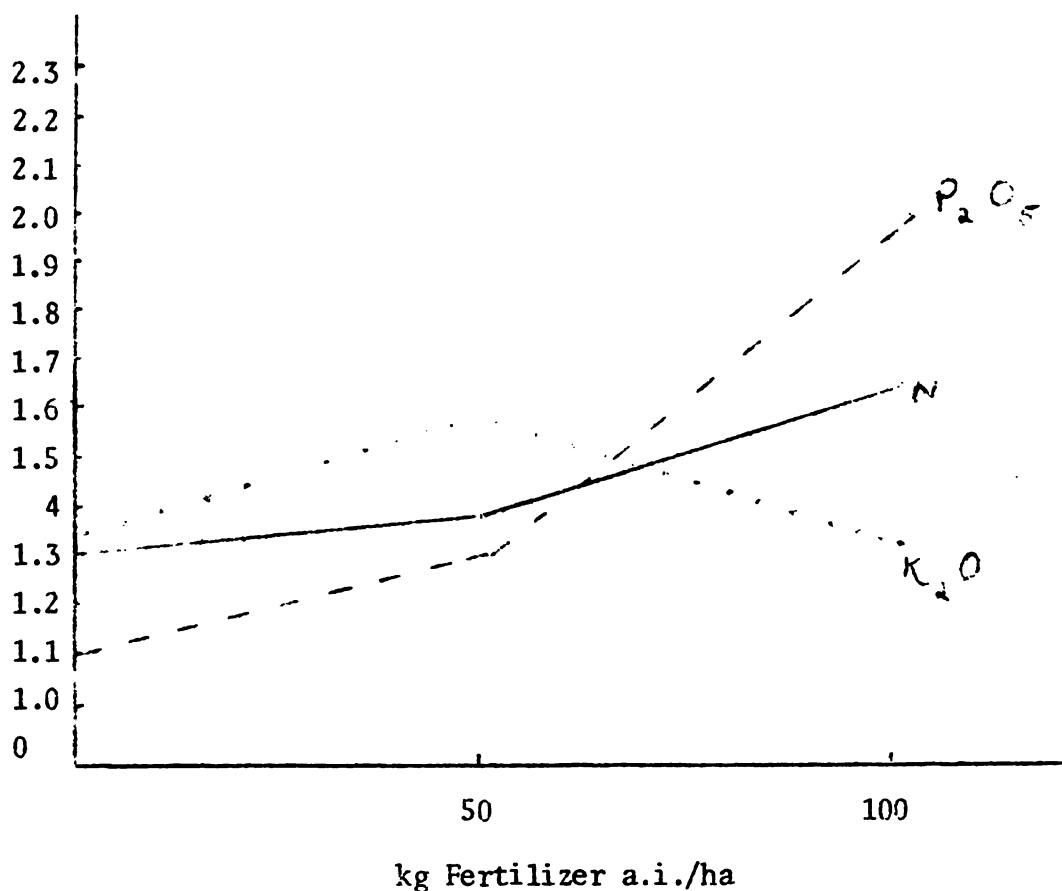


FIGURE 2. Responses of Grain Sorghum to Three Levels of Fertilizer Application of N, P, K. Elim, St. Elizabeth

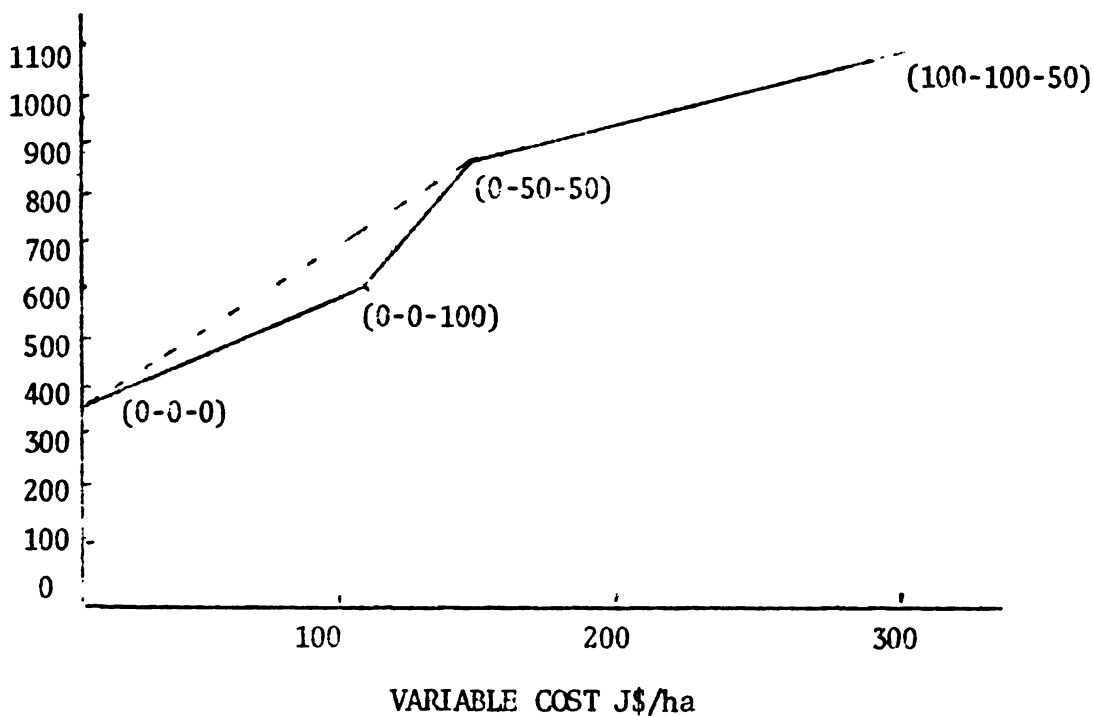


The grain yield increases as the nitrogen and phosphorus elements are rising. The yield increase starts low from 0 kg/ha to 50 kg/ha, but the increase is greater from 50 kg/ha to 100 kg/ha particularly for the phosphorus and less for the nitrogen respectively. On the other hand, potash application seems 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.

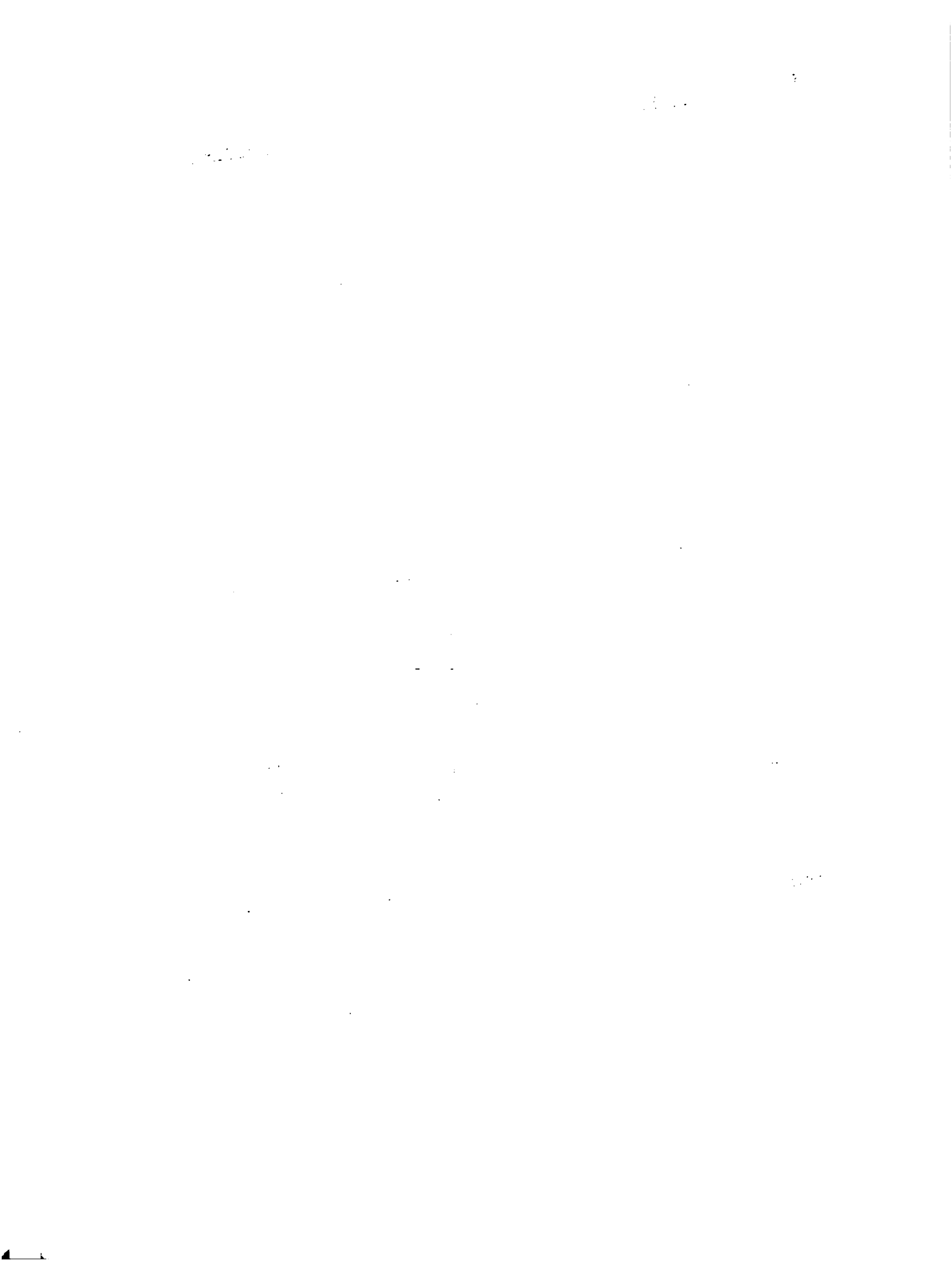
When economics is considered, the picture changes a bit. (figure 3)



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.

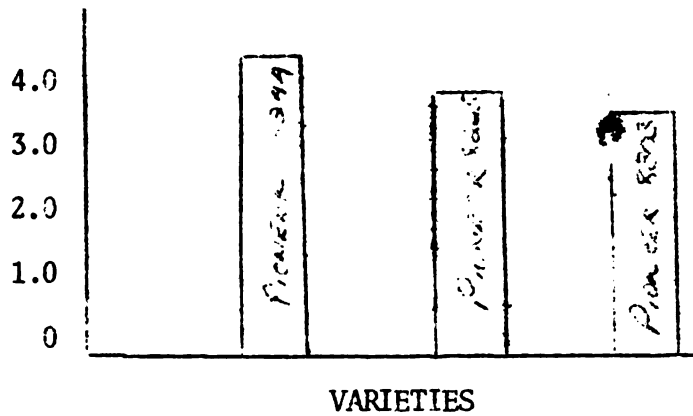
TABLE 2 - Varieties and Average Yields of Grain Sorghum at Elim, St. Elizabeth 1981

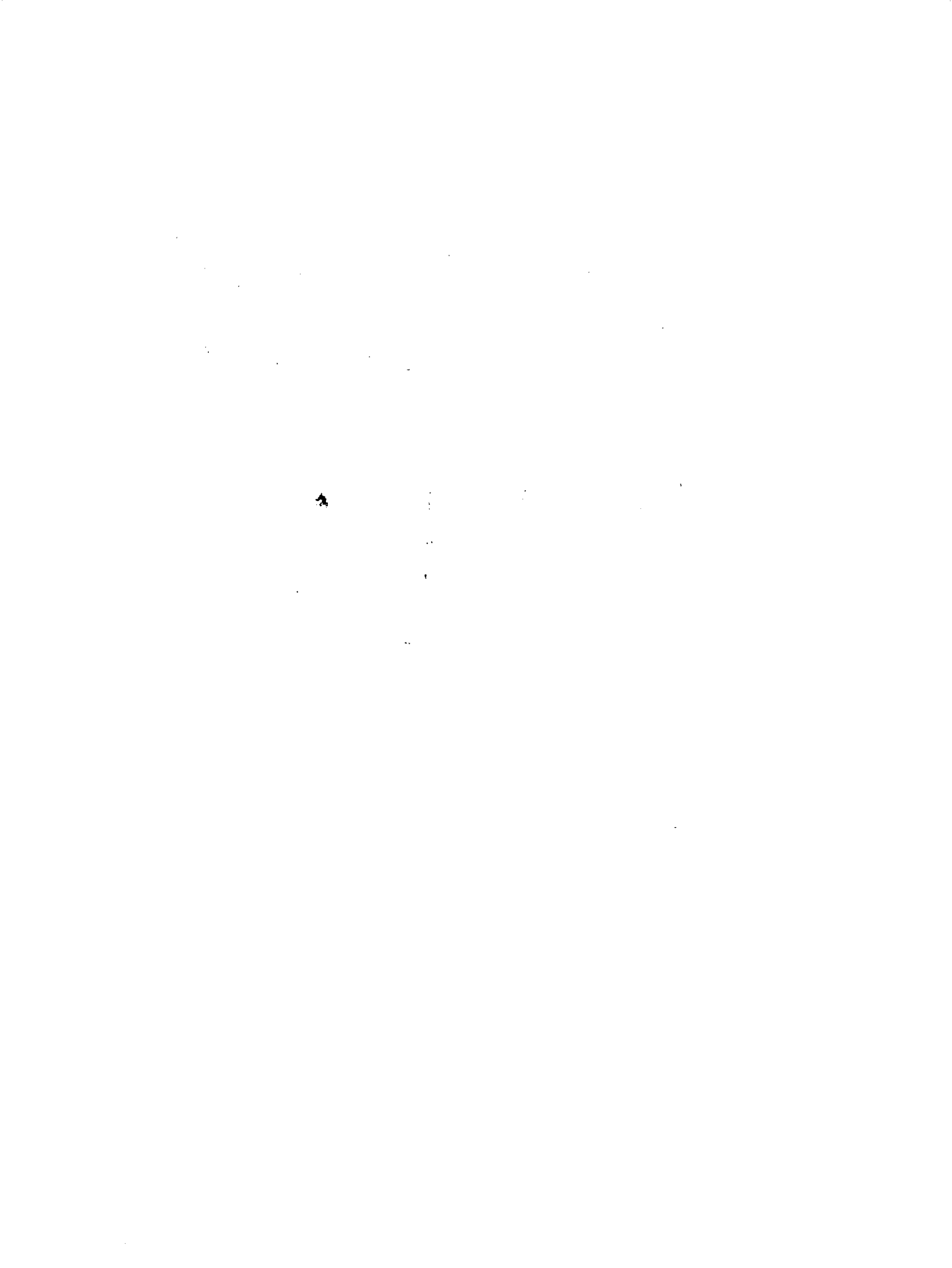
VARIETIES	DAY OF FLOWERING	PLANT HEIGHT	YIELD (kg/ha)
Pioneer 8244	55	84.1	3937
Pioneer 8225	57	84.6	3356
Pioneer 8303	57	85.1	3093



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 preferable 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.

REFERENCE

1. Adaptive Research for Grain Production. C. Grand-Pierre. IICA Grain Production Specialist. IICA/BRUMDEC. 1981
2. Black River Upper Morasses Reclamation Project. GOJ(MAL)/GRONIMIJ. 1974
3. Report on the Detailed Soil Survey of the Upper Morass. C.W. Hewitt. 1973
4. First Quarterly Report of the Grain Crop Research Programme. C.Grand-Pierre July 1981
5. Second Quarterly Report of the Grain Crop Research Programme. C.Grand-Pierre October 1981
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	197.0	104%
				206.20		
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

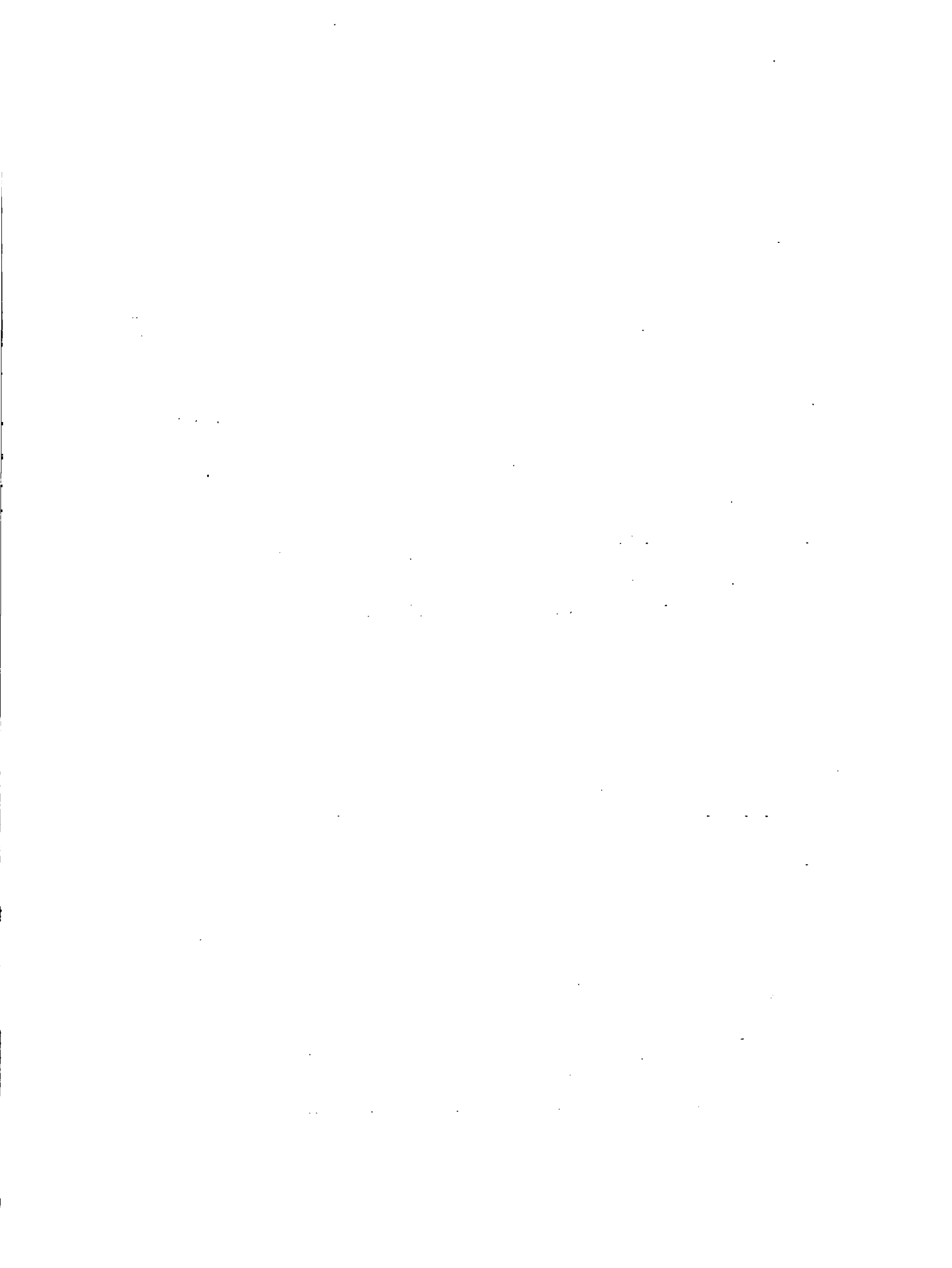
Phosphorus : J\$1.10/kg P₂O₅

Potash : J\$0.68/kg K₂O

Man/Day : J\$13.60

TABLE 8. - Analysis of variants (Variety Trial)

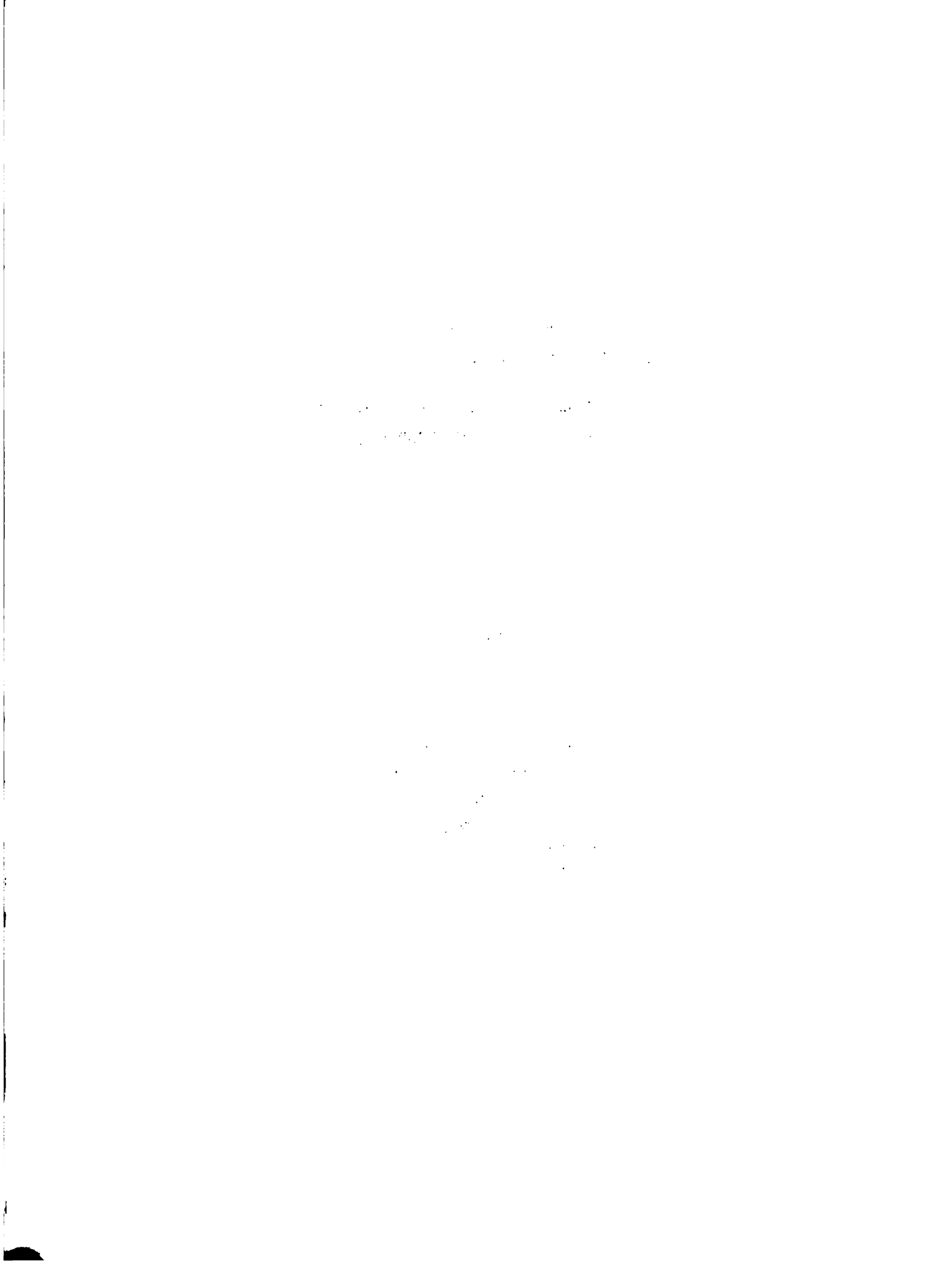
SOURCE	df	ss	MS	F
Repetitions	3	2.2425		0.51 Ns
Treatments	2	3.8117	1.9058	
Error	6	22.2150	3.7025	
Total	11	28.2692		



**SECOND QUARTERLY PROGRESS REPORT OF THE
GRAIN CROPS RESEARCH PROGRAMME**

by

**Claude Grand-Pierre
Grain Production Specialist
IICA/Jamaica**



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.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

1951

... ..
... ..
... ..

1952

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..

... ..
... ..
... ..
... ..

It consists of a randomised complete block design having 8 treatments and 4 replications. The plot size is 66m². 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 22m².

(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 55m².

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

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial reporting and compliance with regulatory requirements. The text notes that incomplete or inaccurate records can lead to significant legal and financial consequences for the organization.

2. The second section focuses on the role of internal controls in preventing fraud and errors. It outlines various control mechanisms, such as segregation of duties, authorization procedures, and regular audits, which are critical for ensuring the integrity of the organization's operations. The document stresses that a robust internal control system is not only a defensive measure but also a key component of an organization's overall risk management strategy.

3. The third part of the document addresses the challenges of data security and information protection. In an era of increasing cyber threats, it is imperative for organizations to implement strong security protocols, including encryption, access controls, and regular security updates. The text highlights that protecting sensitive data is not only a legal obligation but also a business imperative to maintain customer trust and competitive advantage.

4. The final section discusses the importance of continuous monitoring and reporting. It suggests that organizations should establish a framework for ongoing assessment of their internal controls and risk levels. Regular reporting to the board and relevant stakeholders ensures that management remains informed of any emerging risks and can take prompt action to address them. This proactive approach is essential for maintaining the long-term health and sustainability of the organization.

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.

...the ... of ...

...

...the ... of ...

...the ... of ...

...the ... of ...

...the ... of ...

...the ... of ...

...the ... of ...

...

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.

1. 1990-1991

2. 1991-1992

3. 1992-1993

4. 1993-1994

5. 1994-1995

6. 1995-1996

7. 1996-1997

8. 1997-1998

9. 1998-1999

10. 1999-2000

11. 2000-2001

**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

...the ... of ...
...the ... of ...
...the ... of ...

...the ... of ...
...the ... of ...
...the ... of ...

...the ... of ...
...the ... of ...
...the ... of ...

...the ... of ...
...the ... of ...
...the ... of ...

...the ... of ...
...the ... of ...
...the ... of ...

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

Dear Sir,

I am writing to you regarding the matter of the contract between us and your company. I have reviewed the terms and conditions and find them to be acceptable.

I have discussed this with my legal counsel and they have advised that the contract is in your favor. I am therefore pleased to accept the terms and conditions of the contract.

I have signed the contract and enclosed herewith a copy of the signed contract for your records. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory. I am sure that you will find this to be satisfactory.

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 ₂ O ₅ /Ha
68 Kg/Ha - Muriate of Potash	60% as	40 Kg K ₂ O/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

1. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

2. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

3. $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

4. $\frac{1}{2} \times \frac{1}{5} = \frac{1}{10}$

5. $\frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

6. $\frac{1}{2} \times \frac{1}{7} = \frac{1}{14}$

7. $\frac{1}{2} \times \frac{1}{8} = \frac{1}{16}$

8. $\frac{1}{2} \times \frac{1}{9} = \frac{1}{18}$

9. $\frac{1}{2} \times \frac{1}{10} = \frac{1}{20}$

10. $\frac{1}{2} \times \frac{1}{11} = \frac{1}{22}$

11. $\frac{1}{2} \times \frac{1}{12} = \frac{1}{24}$

12. $\frac{1}{2} \times \frac{1}{13} = \frac{1}{26}$

13. $\frac{1}{2} \times \frac{1}{14} = \frac{1}{28}$

14. $\frac{1}{2} \times \frac{1}{15} = \frac{1}{30}$

15. $\frac{1}{2} \times \frac{1}{16} = \frac{1}{32}$

16. $\frac{1}{2} \times \frac{1}{17} = \frac{1}{34}$

17. $\frac{1}{2} \times \frac{1}{18} = \frac{1}{36}$

18. $\frac{1}{2} \times \frac{1}{19} = \frac{1}{38}$

19. $\frac{1}{2} \times \frac{1}{20} = \frac{1}{40}$

20. $\frac{1}{2} \times \frac{1}{21} = \frac{1}{42}$

21. $\frac{1}{2} \times \frac{1}{22} = \frac{1}{44}$

22. $\frac{1}{2} \times \frac{1}{23} = \frac{1}{46}$

23. $\frac{1}{2} \times \frac{1}{24} = \frac{1}{48}$

24. $\frac{1}{2} \times \frac{1}{25} = \frac{1}{50}$

25. $\frac{1}{2} \times \frac{1}{26} = \frac{1}{52}$

26. $\frac{1}{2} \times \frac{1}{27} = \frac{1}{54}$

27. $\frac{1}{2} \times \frac{1}{28} = \frac{1}{56}$

28. $\frac{1}{2} \times \frac{1}{29} = \frac{1}{58}$

29. $\frac{1}{2} \times \frac{1}{30} = \frac{1}{60}$

30. $\frac{1}{2} \times \frac{1}{31} = \frac{1}{62}$

31. $\frac{1}{2} \times \frac{1}{32} = \frac{1}{64}$

32. $\frac{1}{2} \times \frac{1}{33} = \frac{1}{66}$

33. $\frac{1}{2} \times \frac{1}{34} = \frac{1}{68}$

34. $\frac{1}{2} \times \frac{1}{35} = \frac{1}{70}$

35. $\frac{1}{2} \times \frac{1}{36} = \frac{1}{72}$

36. $\frac{1}{2} \times \frac{1}{37} = \frac{1}{74}$

37. $\frac{1}{2} \times \frac{1}{38} = \frac{1}{76}$

38. $\frac{1}{2} \times \frac{1}{39} = \frac{1}{78}$

39. $\frac{1}{2} \times \frac{1}{40} = \frac{1}{80}$

40. $\frac{1}{2} \times \frac{1}{41} = \frac{1}{82}$

41. $\frac{1}{2} \times \frac{1}{42} = \frac{1}{84}$

42. $\frac{1}{2} \times \frac{1}{43} = \frac{1}{86}$

43. $\frac{1}{2} \times \frac{1}{44} = \frac{1}{88}$

44. $\frac{1}{2} \times \frac{1}{45} = \frac{1}{90}$

45. $\frac{1}{2} \times \frac{1}{46} = \frac{1}{92}$

46. $\frac{1}{2} \times \frac{1}{47} = \frac{1}{94}$

47. $\frac{1}{2} \times \frac{1}{48} = \frac{1}{96}$

48. $\frac{1}{2} \times \frac{1}{49} = \frac{1}{98}$

49. $\frac{1}{2} \times \frac{1}{50} = \frac{1}{100}$

50. $\frac{1}{2} \times \frac{1}{51} = \frac{1}{102}$

51. $\frac{1}{2} \times \frac{1}{52} = \frac{1}{104}$

52. $\frac{1}{2} \times \frac{1}{53} = \frac{1}{106}$

53. $\frac{1}{2} \times \frac{1}{54} = \frac{1}{108}$

54. $\frac{1}{2} \times \frac{1}{55} = \frac{1}{110}$

55. $\frac{1}{2} \times \frac{1}{56} = \frac{1}{112}$

56. $\frac{1}{2} \times \frac{1}{57} = \frac{1}{114}$

57. $\frac{1}{2} \times \frac{1}{58} = \frac{1}{116}$

58. $\frac{1}{2} \times \frac{1}{59} = \frac{1}{118}$

59. $\frac{1}{2} \times \frac{1}{60} = \frac{1}{120}$

60. $\frac{1}{2} \times \frac{1}{61} = \frac{1}{122}$

61. $\frac{1}{2} \times \frac{1}{62} = \frac{1}{124}$

62. $\frac{1}{2} \times \frac{1}{63} = \frac{1}{126}$

63. $\frac{1}{2} \times \frac{1}{64} = \frac{1}{128}$

64. $\frac{1}{2} \times \frac{1}{65} = \frac{1}{130}$

65. $\frac{1}{2} \times \frac{1}{66} = \frac{1}{132}$

66. $\frac{1}{2} \times \frac{1}{67} = \frac{1}{134}$

67. $\frac{1}{2} \times \frac{1}{68} = \frac{1}{136}$

68. $\frac{1}{2} \times \frac{1}{69} = \frac{1}{138}$

69. $\frac{1}{2} \times \frac{1}{70} = \frac{1}{140}$

70. $\frac{1}{2} \times \frac{1}{71} = \frac{1}{142}$

71. $\frac{1}{2} \times \frac{1}{72} = \frac{1}{144}$

72. $\frac{1}{2} \times \frac{1}{73} = \frac{1}{146}$

73. $\frac{1}{2} \times \frac{1}{74} = \frac{1}{148}$

74. $\frac{1}{2} \times \frac{1}{75} = \frac{1}{150}$

75. $\frac{1}{2} \times \frac{1}{76} = \frac{1}{152}$

76. $\frac{1}{2} \times \frac{1}{77} = \frac{1}{154}$

77. $\frac{1}{2} \times \frac{1}{78} = \frac{1}{156}$

78. $\frac{1}{2} \times \frac{1}{79} = \frac{1}{158}$

79. $\frac{1}{2} \times \frac{1}{80} = \frac{1}{160}$

80. $\frac{1}{2} \times \frac{1}{81} = \frac{1}{162}$

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 (Carbaryl) 80% WP in 10 lt of water. Ten (10) litres of the mixture is enough to spray one row 1,500 m long. If aphids 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.



AGRICULTURE IN JAMAICA

Collection of papers of the Office of IICA in Jamaica

1977 - 1978

- No. I - 1 Fritz Andrew Sibbles, "Basic Agricultural Information on Jamaica Internal Document of Work", January 1977
- No. I - 2 Yvonne Lake, "Agricultural Planning in Jamaica", June 1977
- No. I - 3 Aston S. Wood, Ph.D., "Agricultural Education in Jamaica", September - October 1977
- No. I - 4 Uli Locher, "The Marketing of Agricultural Produce in Jamaica", November 1977
- No. I - 5 G. Barker, A. Wahab, L. A. Bell, "Agricultural Research in Jamaica", November 1977
- No. I - 6 Irving Johnson, Marie Strachan, Joseph Johnson, "Land Settlement in Jamaica", December 1977
- No. I - 7 Government of Jamaica, "Agricultural Government Policy Papers", February 1978
- No. I - 8 Jose Emilio Araujo, "The Communal Enterprise", February 1980
- No. I - 9 IICA and MOAJ, "Hillside Farming Technology - Intensive Short Course", Vols. I and II, March 1978
- No. I - 10 Jose Emilio Araujo, "The Theory Behind the Community Enterprise - Seminar in Jamaica", March 1978
- No. I - 11 Marie Strachan, "A National Programme for the Development of Hillside Farming in Jamaica", April 1978
- No. I - 12 D. D. Henry, "Brief Overall Diagnosis of Hillside Farming in Jamaica", April 1978
- No. I - 13 Neville Farquharson, "Production and Marketing of Yams in Allsides and Christiana", May 1978

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent data collection procedures and the use of advanced analytical techniques to derive meaningful insights from the data.

3. The third part of the document focuses on the role of technology in data management and analysis. It discusses how modern software solutions can streamline data collection, storage, and processing, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data management, such as data quality, security, and privacy. It provides strategies to mitigate these risks and ensure that the data remains reliable and secure throughout its lifecycle.

5. The fifth part of the document discusses the importance of data governance and the role of various stakeholders in ensuring data integrity and compliance with regulatory requirements. It emphasizes the need for clear policies and procedures to guide data handling practices.

6. The sixth part of the document explores the future of data management and analysis, highlighting emerging trends such as artificial intelligence, machine learning, and big data. It discusses how these technologies will transform the way organizations collect, analyze, and use data.

7. The seventh part of the document provides a summary of the key findings and recommendations. It reiterates the importance of a data-driven approach and the need for continuous improvement in data management practices to stay competitive in the digital age.

8. The eighth part of the document includes a list of references and sources used in the research. It provides a comprehensive overview of the literature and resources that informed the analysis and conclusions presented in the document.

9. The ninth part of the document contains a list of appendices and supplementary materials. These include detailed data sets, charts, and tables that provide further context and support for the findings discussed in the main body of the document.

10. The tenth part of the document is a concluding statement that expresses the author's appreciation for the support and assistance provided by the organization and its staff. It also expresses a commitment to ongoing research and innovation in the field of data management and analysis.

(ii)

- No. I - 14 R. C. E. McDonald, A. H. Wahab, "Fertility Assessment of Newly Terraced Hillside Soils Using the Microplot Technique - the Allsides Case Study", 1978
- No. I - 15 IICA - IDB, "Course in Preparation and Evaluation of Agricultural Projects", Vols. I and II, November 1977
- No. I - 16 Neville Farquaharson, "Production and Marketing of Dasheen in Allsides and Christiana", June 1978

1978 - 1979

- No. II - 1 O. Arboleda-Sepulveda (IICA-CIDIA), "Agricultural Documentation and Information Network in Jamaica", September 1978
- No. II - 2 Victor Quiroga, "National Agricultural Information System", (NAIS-Jamaica) Project Profile, September 1978
- No. II - 3 Joseph Johnson, "A Review on Land Reform in Jamaica for the Period 1972 - 1978", September 1978
- No. II - 4 Neville Farquaharson, "ABC of Vegetable Farming", A Draft High School Textbook, Vols. I, II, III and IV, February 1979
- No. II - 5 Jerry La Gra, "Elements of an Agricultural Marketing Strategy for Jamaica", March 1979
- No. II - 6 D. D. Henry, I. E. Johnson, "Agricultural Extension Service in Jamaica", March 1979

1979 - 1980

- No. III - 1 H. R. Stennett, "Watersheds of Jamaica and Considerations for an Ordinal Scale of their Development", July 1979
- No. III - 2 IICA-MAJ, "Hillside Farming in Jamaica", A Training Seminar, December 1978
- No. III - 3 A. L. Wright, A. H. Wahab, H. Murray, "Performance of Six Varieties of Red Peas (Phaseolus vulgaris L.) on a Newly Terraced Ultisol in Jamaica", September 1979
- No. III - 4 IICA/Jamaica Staff, "Agro-Socio-Economic Sample Survey of Allsides - Trelawny, Jamaica", September 1979



- No. III - 5 IICA-MOAJ, "An Approach to Agricultural Settlement of Hilly Lands", October 1979
- No. III - 6 IICA-MOAJ, "Tree Crops of Economic Importance to Hillside Farms in Jamaica", October 1979
- No. III - 7 Canute McLean, "Production and Marketing of Peanuts", November 1979

1980

- No. IV - 1 Joseph Johnson, "Production and Marketing of Red Peas in the Hilly Areas of Jamaica", January 1980
- No. IV - 2 Lyn Snuffer, "Rural Women: An Annotated Caribbean Bibliography with special reference to Jamaica", January 1980
- No. IV - 3 Vincent Campbell, Abdul Wahab, Howard Murray, "Response of Peanut (Arachis hypogaea L.) on a Newly Terraced Ultisol in Jamaica", January 1980
- No. IV - 4 P. Aitken, A. Wahab, I. Johnson, A. Sahni, "Agro-Socio-Economic Survey - Pilot Hillside Agricultural Project 'PHILAGRIP' Southern Trelawny", February 1980
- No. IV - 5 Glenys H. Barker, "Bibliography of Literature relating to Research and Development in the Agricultural Sector of Jamaica 1959 - 1979", March 1980
- No. IV - 6 Milton R. Wedderburn, "Allsides Farmers' Pre-Cooperative A Socio-Economic Assessment", March 1980
- No. IV - 7 Adele J. Wint, "The Role of Women in the Development Process", April 1980
- No. IV - 8 Milton R. Wedderburn, "The Co-operative Input in the Development of the Pilot Hillside Agricultural Project (PHILAGRIP)", April 1980
- No. IV - 9 MOJ/IICA/CARDI, Fruit Trees Seminar - "Research & Development of Fruit Trees", June 1980
- No. IV - 10 Henry Lancelot, "Traditional Systems in Hillside Farming, Upper Trelawny, Jamaica", June 1980

1. The first part of the document

2. The second part of the document

3. The third part of the document

4. The fourth part of the document

5. The fifth part of the document

6. The sixth part of the document

7. The seventh part of the document

8. The eighth part of the document

9. The ninth part of the document

10. The tenth part of the document

11. The eleventh part of the document

12. The twelfth part of the document

13. The thirteenth part of the document

14. The fourteenth part of the document

15. The fifteenth part of the document

16. The sixteenth part of the document

17. The seventeenth part of the document

18. The eighteenth part of the document

19. The nineteenth part of the document

20. The twentieth part of the document

21. The twenty-first part of the document

22. The twenty-second part of the document

23. The twenty-third part of the document

24. The twenty-fourth part of the document

25. The twenty-fifth part of the document

26. The twenty-sixth part of the document

27. The twenty-seventh part of the document

28. The twenty-eighth part of the document

29. The twenty-ninth part of the document

30. The thirtieth part of the document

(iv)

- No. IV - 11 IICA/Jamaica, "Pilot Hillside Agricultural Project", (PHILAGRIP), Project Document. Vols. I, II and III, June 1980
- No. IV - 12 A. Wahab, I. Johnson, P. Aitken, H. Murray and H. Stennett, "Highlights of the Pilot Hillside Agricultural Project at Allsides", July 1980
- No. IV - 13 I. Johnson, A. Wahab, P. Aitken, H. Payne, "Benchmark for a Project Profile for Developing a Peanut Industry in Jamaica", July 1980
- No. IV - 14 P. Aitken, A. Wahab, I. Johnson, "The Allsides Post Peasant", August 1980
- No. IV - 15 Norma Munguia, Percy Aitken, Abdul Wahab, Irving Johnson, "Salt Extraction by Solar Energy", A Mini-project, September 1980
- No. IV - 16 Abdul H. Wahab, Percy Aitken-Soux, Irving E. Johnson and Howard Murray, "The Allsides Project in Jamaica - Developmental Potentials of Hillside Agriculture", September 1980
- No. IV - 17 P. Aitken, A. Wahab, I. Johnson, A. Sahney and N. Munguia, "Rural Women Survey", Vols. I, II and III, October 1980
- No. IV - 18 P. Aitken, I. E. Johnson, A. Wahab, "Assessment of Employment Among Small Hillside Farmers of Jamaica", November 1980
- No. IV - 19 IICA/Jamaica "Pilot Hillside Agricultural Project", (PHILAGRIP), Final Project Document. October 1980.
- No. IV - 20 P. Aitken, A. Wahab, I. E. Johnson, Bo-Myeong Woo, "IICA Evaluation of the First Phase FSB Allsides Project", (Internal Document of Work), November 1980
- No. IV - 21 MINAG/IICA/CARDI - "Seminar on Multiple Cropping", December 1980
- 1981
- No. V - 1 N. Munguia, P. Aitken, A. Wahab, I. Johnson, "Smoke Curing of Fish (as a household industry in Rural Jamaica)", January 1981

1. The first part of the document is a list of names and addresses.

2. The second part of the document is a list of names and addresses.

3. The third part of the document is a list of names and addresses.

4. The fourth part of the document is a list of names and addresses.

5. The fifth part of the document is a list of names and addresses.

6. The sixth part of the document is a list of names and addresses.

7. The seventh part of the document is a list of names and addresses.

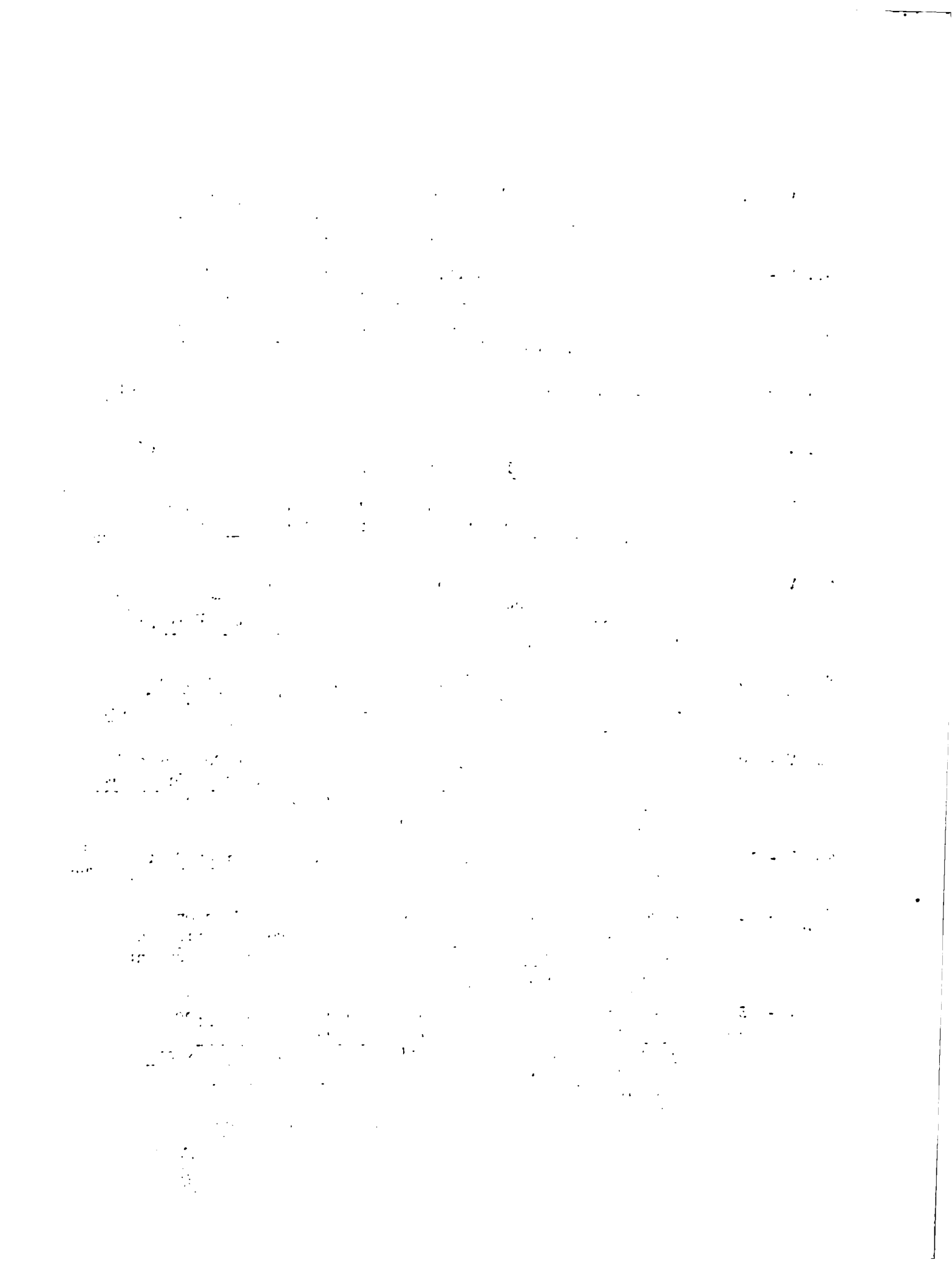
8. The eighth part of the document is a list of names and addresses.

9. The ninth part of the document is a list of names and addresses.

10. The tenth part of the document is a list of names and addresses.

(v)

- No. V - 2 P. Aitken, A. Wahab, I. Johnson, "Under-employment - It's Relation to the Agricultural Sector and Considerations for its Management", January 1981
- No. V - 3 D. D. Henry, J. R. Gayle, "The Culture of Grafted Pimento (as spice crop for Allsides, Jamaica)", January 1981
- No. V - 4 Abdul H. Wahab, Noel Singh, "Agricultural Research in Jamaica", February 1981
- No. V - 5 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Country Level Action Plan (CLAP)", May 1981
- No. V - 6 P. Aitken-Soux, A. H. Wahab, I. E. Johnson, "Overview of Agricultural Development in Jamaica", May 1981
- No. V - 7 Samuel Thompson, I. E. Johnson, P. Aitken-Soux, Abdul Wahab, "The Land Development & Utilization Act 1966", July 1981
- No. V - 8 Abdul Wahab, Percy Aitken-Soux, Irving Johnson, Bo-Myeong Woo, Howard Murray, Joseph Dehaney, "The Experiences of Jamaica in the Management of Agricultural Production on Hillsides", July 1981
- No. V - 9 Dave Hutton, Abdul Wahab, Howard Murray, "Yield Response of Yellow Yam (Dioscorea Cayenensis) After Disinfesting Planting Material of Pratylenchus Coffeae", July 1981
- No. V - 10 Elaine Montague-Gordon, Abdul H. Wahab, Joseph Dehaney and Audrey Wright, "Performance of Eleven Varieties of Dry Beans (Phaseolus vulgaris) Over Two Successive Seasons on the Hillsides of Jamaica", August 1981
- No. V - 11 Dave G. Hutton, Abdul H. Wahab, "Position Paper on Root Crops in Jamaica", August 1981
- No. V - 12 Percy Aitken-Soux, Abdul H. Wahab, Irving E. Johnson, "Technical Assistance for the English Speaking Caribbean (Considerations for an IICA Strategy)" (Internal Document of Work), September 1981
- No. V - 13 Bo-Myeong Woo, Abdul H. Wahab, Joseph Dehaney, "Crop Production on Hillsides using non-Bench Terracing Alternative Measures for Soil Conservation (first year's results of the Olive River Soil Conservation studies)", September 1981



- No. V - 14 Abdul H. Wahab, Percy Aitken-Soux, Irving E. Johnson, Bo-Myeong Woo, Howard Murray and Joseph Dehaney, "Agricultural Production on Hillsides - the Allsides Project Case Study", September 1981
- No. V - 15 D. G. Hutton, A. H. Wahab and J. Dehaney, "Investigating Critical Levels of Dry Rotting of Yellow Yam (*Dioscorea Cayenensis*) Planting Material, the Benefits of Disinfesting the Heads of *Pratylenchus Coffeae* and of After-Planting Nematicide Treatments", September 1981
- No. V - 16 D. G. Hutton, A. H. Wahab, H. Murray and J. Dehaney, "Critical Levels of Dry Rotting of Yellow Yam (*Dioscorea Cayenensis*) Planting Material and Yield Responses After Disinfesting Heads of *Pratylenchus Coffeae* and After Post-Plant Nematicide Applications", September 1981
- No. V - 17 E. Ayer and J. Reyes, "Seminar on Mediterranean Fruit Fly", September 30, 1981
- No. V - 18 Bo-Myeong Woo, "Erosion Control Works in Korea", October 1981
- No. V - 19 Irving E. Johnson and Percy Aitken-Soux, "Country Level Action Plan (CLAP)" (Third Revision - Internal Document of Work), October 1981
- No. V - 20 Humberto Pizarro, "Programme of Work to Establish Guidelines for the Effective Administration, Operation and Maintenance of the Irrigation and Drainage District in the BRUMDEC Project" November 1981
- No. V - 21 Humberto Pizarro, "The Operation of the Drainage System in the Black River Upper Morass Project", November 1981
- No. V - 22 Humberto Pizarro, "Recommendations for Land Use and Irrigation Needs in the BRUMDEC Project", November 1981
- No. V - 23 Humberto Pizarro, "Organization, Operations and Maintenance of the Irrigation System in the BRUMDEC Project", November 1981
- No. V - 24 Humberto Pizarro, "Basic Information for Planning Water Management in the BRUMDEC Project", November 1981

10

11

12

13

14

15

16

17

18

19

20

1982

- No. VI - 1 Vivian Chin, "Rice Research and Production in the BRUMDEC Project State-of-the-Art Review, Identification of Constraints and Interim Recommendations and Budget for Establishing 405 Hectares (1,000 acres) of Rice on the Clay Soils at BRUMDEC", January 1982
- No. VI - 2 Vivian Chin, "Programme of Work for the Short-Term Adaptive Production-Oriented Research on Rice in the BRUMDEC Project", January 1982
- No. VI - 3 Claude Grand-Pierre, "Adaptive Research for Grain Production (BRUMDEC) - A Short-Term Programme", January 1982
- No. VI - 4 Claude Grand-Pierre, "Experimental Procedures for Grain Crops Research in the BRUMDEC Project", January 1982
- No. VI - 5 Charles Kennard, "Summary of the Proposed Programme of Work for Adaptive Production Oriented Research (Short-Term) in Vegetable Production in the BRUMDEC Project", January 1982
- No. VI - 6 Charles Kennard, "Vegetable Production (BRUMDEC) - Review and Proposed Short-Term Adaptive Production Oriented Research Programme", January 1982
- No. VI - 7 Bo-Myeong Woo, "Olive River Run-Off Plots - Description of the Experiment", January 1982
- No. VI - 8 Vivian Chin, "Fertilizer Experiments in BRUMDEC (Second Quarterly Report)", January 1982
- No. VI - 9 Claude Grand-Pierre, "Third Quarterly Report of the Short Term Production Oriented Sorghum Research Programme", January 1982
- No. VI - 10 Bo-Myeong Woo, Ministry of Agriculture, "Crop Production on Hillsides Using Non-Bench Terracing Alternative Measures for Soil Conservation", February 1982
- No. VI - 11 Philemon Hoilett, Ina Pyne, Calvin Gray, Renford Baker, and Michel Eldin, "Workshop on Agroclimatic Zoning - case study Kingston, Jamaica", April 1982
- No. VI - 12 Charles Kennard "Vegetable Production Programme - BRUMDEC Second Quarterly Report" Period December 19, 1981 to March 18, 1982, April 1982
- No. VI - 13 Claude Grand-Pierre, "Final Report on Grain Experimental Work in BRUMDEC" (Contract I), May 1982

DOCUMENTO
MICROFILMADO

Fecha: 23 DIC 1982