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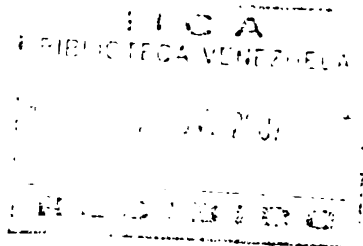


AGRINTER-AGRIS

AGRICULTURAL RESEARCH
IN JAMAICA

by

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and Noel Singh¹



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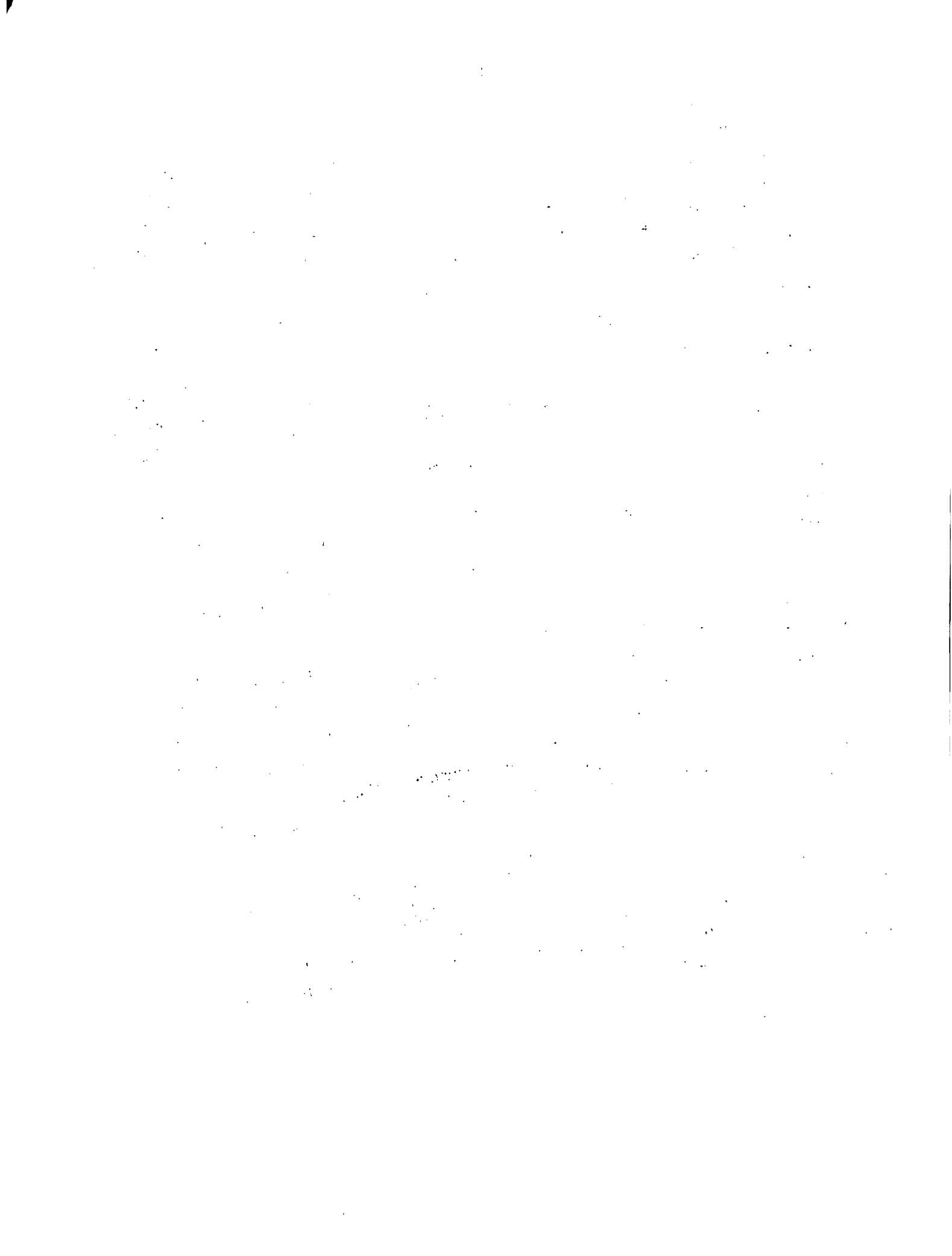
FOREWORD

Agricultural research is the most widespread form of organized research in the world. Unlike other forms of research activity such as those pertaining to the fields of medicine and chemistry, agricultural research by its very nature, has to be zonal. This is so because prior to its adoption the applicability of Agricultural research findings has to be tested and verified under the infinite number of ecological situations with which farmers are faced. In particular adaptive research is a basic requirement for improving the overall performance in Agriculture as indicated by increased productivity and production. Increased agricultural production is a sine qua non if developing countries are to raise the standard of living of rural dwellers.

To trade successfully on the world commodity market today, prices have to be competitive and the quality of produce has to satisfy certain minimum criteria. This requires both extensive and intensive production programmes which must be predicated on reliable results generated from a continuous flow of relevant research activities.

This paper is timely in that it discussed the institutional aspects of agricultural research in Jamaica and identifies the priority areas and constraints to research. The relationship between the National Research Agencies are also discussed. This is vitally important when one recognizes the absolute need to avoid unnecessary duplication of research efforts and thus derive more mileage from each dollar earmarked for Agricultural Research.

This paper has been written primarily for those responsible for formulating agricultural research policy in Jamaica, and also for the agricultural researchers themselves who should be interested in the problems of organizing and administering the research effort in which they themselves are involved.



The authors are to be commended for their contribution to a subject which features so prominently in the development of Jamaica where over 50 percent of the population derives its livelihood either directly from the farm or from activities related to the use of farm produce.

Percy Aitken-Soux

Director

13/2/81

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2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for a systematic approach to data collection and the importance of using reliable sources of information.

3. The third part of the document focuses on the analysis of the collected data. It discusses the various techniques used to identify trends, patterns, and anomalies in the data, and how these insights can be used to inform decision-making.

4. The fourth part of the document discusses the importance of communication and reporting. It emphasizes that the results of the data analysis should be clearly and concisely communicated to the relevant stakeholders, and that regular reports should be provided to keep them informed of the organization's performance.

5. The fifth part of the document discusses the importance of continuous improvement. It emphasizes that the organization should regularly review its processes and procedures to identify areas for improvement and implement changes to enhance its performance.

AGRICULTURAL RESEARCH IN JAMAICA

1.0 INTRODUCTION

1.1 Traditionally, agricultural research in Jamaica has focussed on export oriented crops such as banana and sugar and has thus been of a more applied than basic nature. However, in recent times increasing attention has been placed on food crops produced for domestic consumption. For a large part much of this research has been basic and indeed there is currently a considerable gap between available research data and the application of these results on the farms.

1.2 The GOJ recognizing the significant contribution which the small farmers of Jamaica (80% of the total farmers) make to the nation's agricultural production, continues to support research activities as one of the tools to greater productivity.

1.3 The agricultural researcher in Jamaica has operated at a distinct economic disadvantage when compared with workers in other sectors of the economy. Consequently, this situation has militated against the full realization of agricultural development potential which could have resulted from more effective application of agricultural research in the past.

1.4 Although the performance of the agricultural sector over the past decade has eroded significantly, it is still the major source of employment and income in Jamaica. For instance, while

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accounting for 9% of GDP in 1977 the sector contributed to over 35% of total employment and about 11% of export earnings. Further, despite the continuous migration from rural to urban areas about 60% of the population (1.2 million) still live in rural areas. It follows then that if the agricultural sector is to further develop on a sustained basis, importance has to be given to agricultural research which is aimed at resolving field production problems. Consequently, the GOJ has indicated a firm commitment to the support of adaptive research aimed at removing agronomic constraints to increased levels of productivity.

2.0 INSTITUTIONS THAT INTEGRATE AGRICULTURAL RESEARCH SERVICES

2.01 At present several agencies are engaged in agricultural research in Jamaica. These include:

- the Ministry of Agriculture (MINAG) through its various research divisions;
- the Commodity Boards and Associations which include (i) the Sugar Industry Research Institute (SIRI); (ii) Coconut Industry Board; (iii) Citrus Growers Association; (iv) Banana Board; (v) Cocoa Industry Board and (vi) Coffee Board;
- Public Corporations such as (i) the Agricultural Development Corporation (ADC); (ii) the Jamaica Industrial Development Corporation (JIDC); (iii) the Scientific Research Council (SRC) and (iv) the Black River Upper Morass Development Corporation (BRUMDEC); and the Bauxite Companies;

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- the regional institutions such as (i) the Faculty of Agriculture of the University of the West Indies (UWI); (ii) the Caribbean Agricultural Research and Development Institute (CARDI) and (iii) the Inter American Institute of Agricultural Sciences (IICA). Of these institutions, the MINAG, Commodity Boards for sugar, bananas and coconuts, CARDI and IICA account for almost all of the adaptive research conducted.

2.1 Research Programmes

2.1.1 Research programmes of MINAG are conducted through various divisions which have technical responsibility for specific areas of research. These divisions include:

- Crops and Soils Division;
- Plant Protection Division;
- Livestock Division;
- Forestry Division;
- Fisheries Division; and
- Veterinary Division

2.1.2 Additionally MINAG conducts trials at four main experiment field stations and five sub-stations throughout the country. Except for export oriented crops such as sugar cane and banana, and coconut research which is done by these commodity boards, the MINAG is responsible for all other research on other crops of economic importance to the country. In cases where a public corporation was created to produce a commodity on a large scale as in the case of BRUMDEC which is presently charged with producing 8,000 acres of rice, such corporations would undertake research of an adaptive type.

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

4. The fourth part of the document addresses the challenges associated with data security and privacy. It provides guidance on implementing robust security measures to protect sensitive information from unauthorized access and breaches.

5. The fifth part of the document explores the importance of data governance and compliance. It discusses the need for clear policies and procedures to ensure that data is managed in accordance with relevant laws and regulations.

6. The sixth part of the document discusses the benefits of data-driven decision-making. It explains how analyzing data can provide valuable insights into organizational performance, customer behavior, and market trends, enabling leaders to make more strategic and effective decisions.

7. The seventh part of the document concludes by summarizing the key points discussed throughout the document. It reiterates the importance of a data-centric approach and the need for continuous improvement in data management practices.

2.2 Research Priorities at the National Level

2.2.1 In order to increase efficiency and efficacy of national agricultural research the GOJ has embarked on a reorganization exercise aimed at bringing all aspects of research under one umbrella organization to be called the Research and Development Department of the Ministry of Agriculture. This reorganization exercise will inter alia provide the institutional framework and physical facilities necessary for the restructuring and conduct of agricultural research services, so that applied research, together with complementary extension programmes can be more appropriately geared to increasing agricultural food production in Jamaica. ^{1/}

2.2.2 As stated before 80% or about 150,000 farmers are classified as small producers with an average farm size of less than one hectare. Most of these farmers are located in the hilly regions of Jamaica where there is no facility for irrigation. Hence, crops are produced under rainfed conditions. The very even distribution of rainfall combined with the use of low technology, and low levels of soil fertility result in low productivity. It has been shown, however, that under a system of polyculture coupled with good farm management practices hilly lands could more than double traditional levels of productivity. ^{2/} It is against this background that the MINAG has decided as a matter of policy to emphasize intensive research, extension and training principally in the following areas:

^{1/} Wellington, K.E., a New Approach to Agricultural Research, Paper presented at MINAG Research Seminar, June 1979.

^{2/} Wahab, A.H., Aitken-Soux, P., Johnson, I.E., and Howard Murray Developmental Potentials of Cropping Systems for Hillside Agriculture Proceedings on Cropping Systems Seminar, MINAG/IICA/CARDI, December 1980.

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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 concludes by summarizing the key findings and recommendations. It stresses the importance of a data-driven approach in decision-making and the need for continuous monitoring and improvement of the data management process.

1. Crops to include: yams, cassava, legumes, cereals, permanent crops and vegetable oils, with research to include - variety screening, fertilizer requirements, spacing, incidence and control of diseases and pests, harvesting, packaging and storage methods.
2. Livestock Research to include: Comparative testing of local dairy cattle and crossbreds, and management and breed improvement of goats.
3. Other Research areas will include:
 - farming systems;
 - irrigation methods;
 - equipment and layout; and
 - agro-economic studies to facilitate new technology by farmers

2.3 Available Resources

2.3.1 Jamaica has been experiencing a severe shortage of foreign exchange over the past decade. This ipso facto and combined with the urgent need of the Central Government to curb local expenditures have resulted in insufficient budgetary allocations for agricultural research per se and the failure to recruit appropriate resource personnel to fill research vacancies.

2.3.2 However, this situation is presently being ameliorated by the current research reorganization exercise in which the IDB has agreed to provide a loan totalling US\$6.4 million or 68% of the cost of the project, the remaining US\$3.0 million to be provided by the

GOJ in local fund equivalence. ^{1/} This project was started in 1979 and has a 4-year execution period. The principal components of the project are: (i) an institutional component; (ii) infrastructure, buildings, and equipment for the experiment stations and (iii) a specific research programme. Technical consultancy for the institutional strengthening of the R & D Department of MINAG will total 54 expert-months and for the specific research programme a total of 63 expert-months has been budgeted as part of the project.

2.3.3. In terms of budgetary allocation for research conducted by MINAG on food crops other than sugar and banana the following figures have been submitted for the fiscal years 1979 - 1980, and 1980 - 1981.

<u>Division</u>	<u>1979 - 1980</u> US\$	<u>1980 - 1981</u> US\$
Plant Protection	157,166.00	234,600.00
Crops and Soils	<u>462,093.00</u>	<u>536,322.00</u>
Total (US\$)	619,259.00	770,922.00

Figures are inclusive of research staff emoluments, materials and supplies for the proposed research trials.

^{1/} Jamaica Programme for Reorganization of Agricultural Services
JA-0038, 1979.

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2.3.4 In terms of staffing at the technical level the current situation in crop related research is as follows. ^{1/}

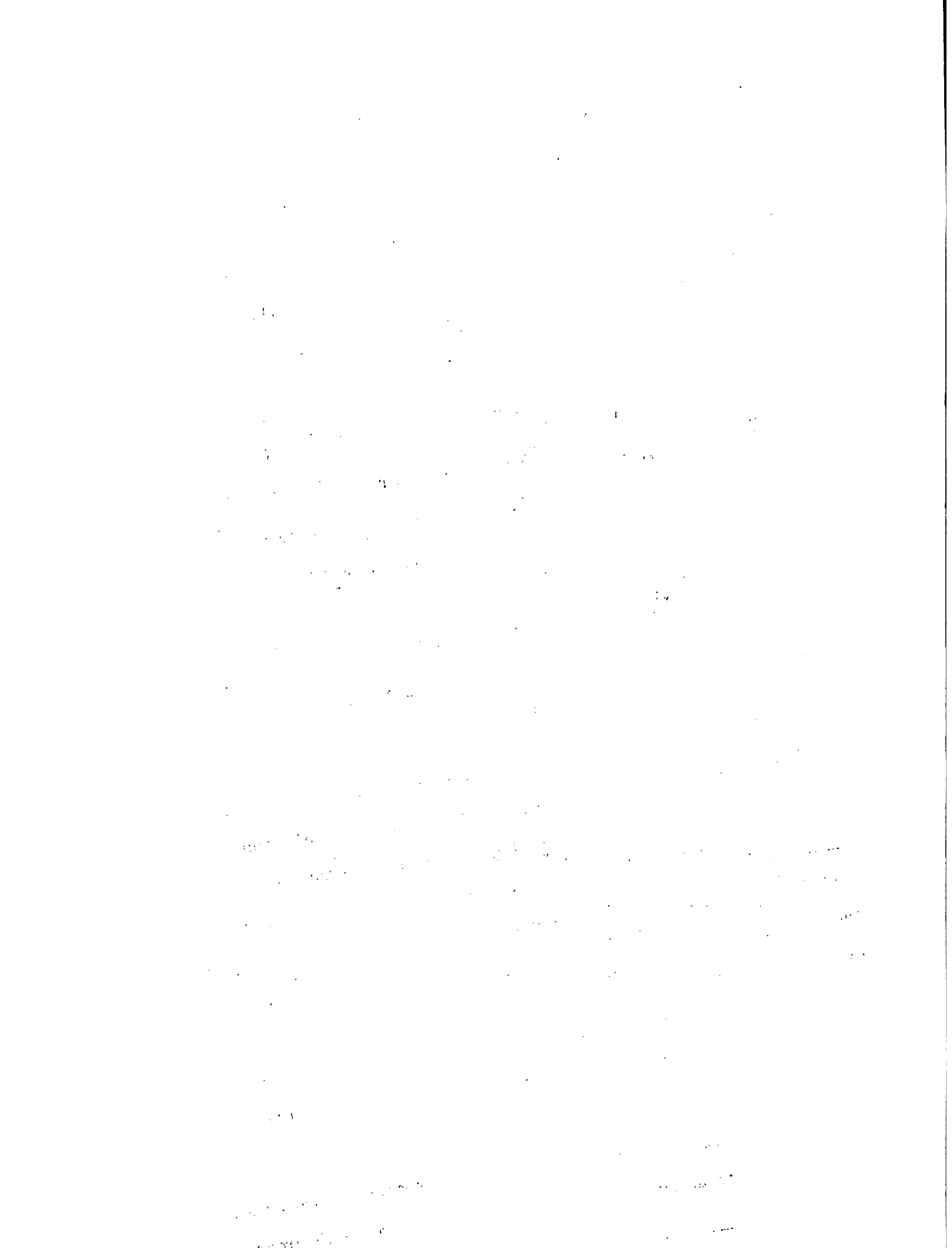
<u>Division</u>	<u>JSA</u> ^{2/}	<u>BSc.</u>	<u>MSc.</u>	<u>Ph.D.</u>
Crop Research	9	11	4	1
Soil Chemistry	7	6	2	0
Plant Protection	15	7	8	1
Total	31	24	14	2

When compared with the compliment of research personnel at MINAG in 1978 - 1979, there has been a significant decline in professionals at the graduate and post-graduate levels. This is undoubtedly due inter alia to the uncertainties accompanying the deteriorating socio-economic-political situation which the country has experienced over the past decade. Also, due to the economic stagnation and staggering rates of inflation trained personnel have had to abandon their primary vocations in search for more attractive salaries which were to be found either in other economic sectors of the country or outside of Jamaica.

2.3.5 As a consequence of the decline in the number of researchers within MINAG and to accomplish the level of specific research programme

^{1/} Staff presently deployed for the 1980 - 1981 fiscal year.

^{2/} Jamaica School of Agriculture 2 and 3 year diploma holders.



envisaged during the execution period (1979 - 1983) of the GOJ/IDB research project, it is proposed to recruit 30 additional research workers. The following table shows the additional proposed staffing, in quantity, level of academic achievement and areas of specialization:

<u>Speciality</u>	<u>Professional</u>	<u>Technician</u>
<u>Research</u>		
1. Tubers and root crops	2	2
2. Dry grain legumes	1	1
3. Dairy Cattle (herd and pasture management)	1	1
4. Dual Purpose Cattle (herd and pasture management)	2	2
5. Goat herd management	2	2
6. Goat Diseases	1	1
7. Basic Disciplines (Agronomy, entomology, phytopathology)	3	1
<u>Extension</u>		
8. "Subject Matter"		
Specialists	<u>8</u>	<u>0</u>
TOTAL	20	10

2.3.6 To strengthen the calibre of research and upgrade the research staff of MINAG, a total of 63 man-months of specialist assistance will be sought as part of the GOJ/IDB project. These specialists will work with local research staff of MINAG who are engaged in the following research disciplines:

- animal production;
- dairy cattle management;
- goat diseases;

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Furthermore, it highlights the need for regular audits and reviews to identify any discrepancies or areas for improvement. This process should be conducted in a systematic and thorough manner to ensure the integrity of the data.

In addition, the document stresses the importance of maintaining up-to-date information and ensuring that all records are properly stored and protected. This includes implementing robust security measures to prevent unauthorized access or data loss.

Overall, the document provides a comprehensive overview of the key principles and practices that should guide the organization's record-keeping efforts. By adhering to these guidelines, the organization can ensure the reliability and accuracy of its records.

The second part of the document details the specific procedures and protocols for handling records. It outlines the steps for creating, updating, and archiving records, as well as the responsibilities of the staff involved in these processes.

It also addresses the issue of record retention, providing guidance on how long records should be kept and under what circumstances they should be destroyed. This helps to manage the organization's storage resources effectively and ensure compliance with relevant regulations.

Moreover, the document discusses the importance of training and education for staff members. It emphasizes that all personnel involved in record-keeping should receive appropriate training to ensure they understand the procedures and are equipped to handle records correctly.

Finally, the document concludes by reiterating the organization's commitment to maintaining high standards of record-keeping. It expresses confidence that by following the outlined guidelines, the organization will be able to achieve its goals and maintain the trust of its stakeholders.

The document is intended to serve as a reference guide for all staff members and to provide a clear framework for the organization's record-keeping practices. It is subject to periodic review and updates as needed to reflect changes in regulations or organizational requirements.

In conclusion, the document provides a detailed and practical guide to record-keeping. It covers all aspects of the process, from the initial creation of records to their final disposal, ensuring that the organization's records are accurate, reliable, and secure.

The document is a key component of the organization's internal control system and is essential for ensuring the integrity and transparency of its operations. It is a valuable resource for all staff members and should be read and understood by everyone involved in record-keeping.

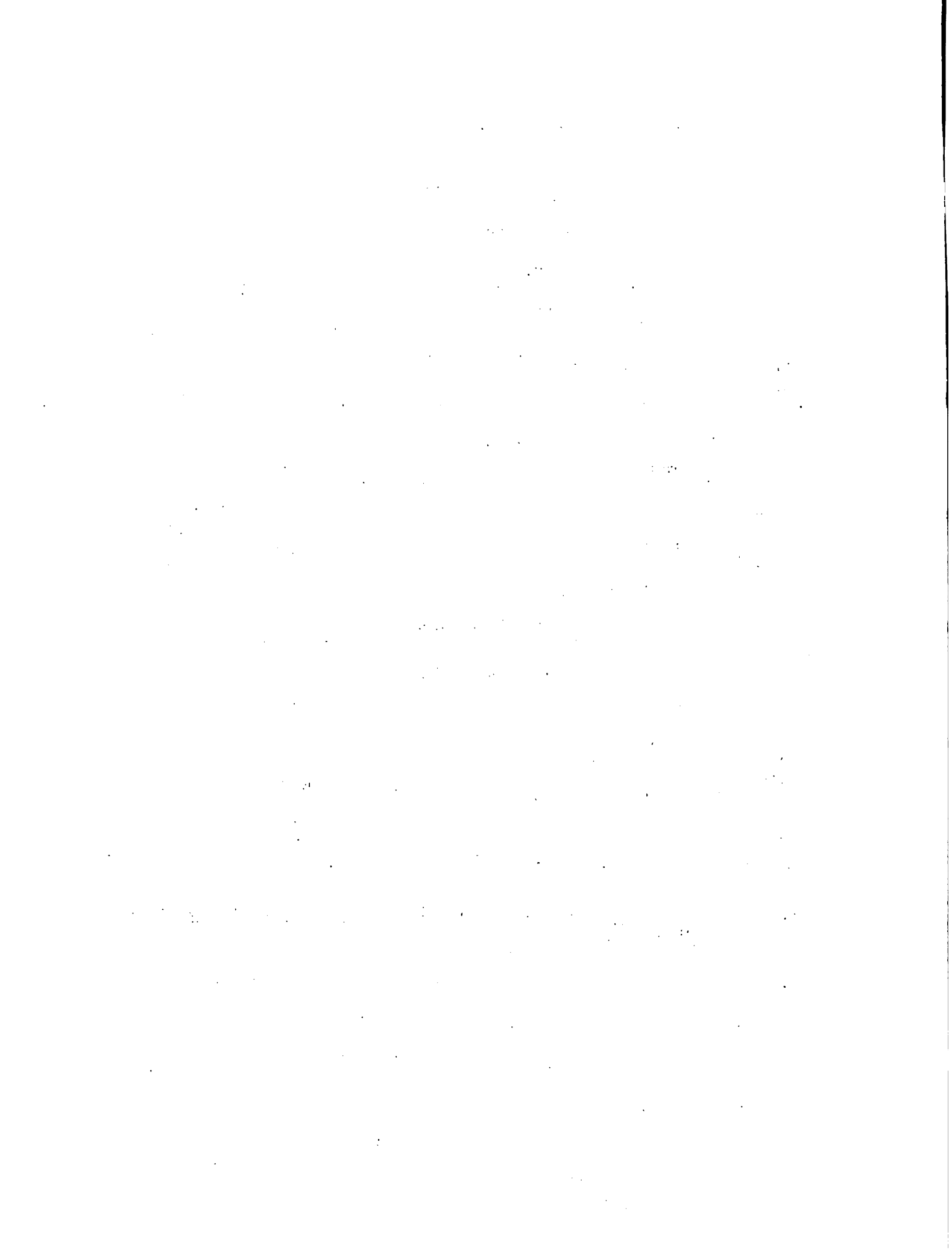
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- herd and pasture management;
- tubers and root crops;
- dry grain legumes; and
- farming systems.

2.3.7 Training constitutes an integral part of the GOJ/IDB project and will comprise two aspects: (i) recruitment of additional research personnel who will work with the research specialists in the research programme identified and specialize in specific areas of research; and (ii) overseas training of local research staff in basic agricultural research disciplines through a programme of scholarships. This overseas training programme is aimed at upgrading local skills in areas such as plant pathology, nematology, agronomy, crop production and livestock husbandry. In all, 15 scholarships will be awarded, 10 of which will be of a short-term nature and the remainder long-term enabling first degree holders to pursue graduate studies up to the Master's and Doctorate levels. The foreign exchange costs for this training are to be borne by the IDB loan component and the local costs are to be borne by the MINAG.

3.0 COOPERATIVE PROGRAMMES WITH OTHER COUNTRIES AND INTERNATIONAL AGRICULTURAL CENTERS

3.1 The MINAG continues to receive cooperative assistance from (i) Japan in developing a commercial rice programme; (ii) Canada in the area of Oyster culture; (iii) the European Economic community in efforts to combat the devastating effects of Lethal Yellow disease of coconut; (iv) the United Kingdom in the development of its fishing industry; (v) the Netherlands in the upgrading of its soils laboratory and rural physical planning; (vi) the West Indies Sugar



Breeding Station, Barbados in the screening of new varieties of sugar-cane; and (vii) the USA through the Agency for International Development in food production cum soil conservation projects.

3.2 Additionally the MINAG maintains close links with a multiplicity of national, regional and international research centers, and utilizes their outreach services and basic research materials in its research programme. Among these institutions can be cited:

- UWI;
- CARDI;
- CIMMYT;
- CIAT;
- IDRC;
- IICA; and
- IITA

3.2.1 The UWI serves principally as a teaching institution, to the Bachelors and graduate levels. The MINAG also benefits from those results of the University's agricultural research activities which have direct relevance to Jamaica. Currently, MINAG is evaluating several lines of pigeon pea (Cajanus cajan) and cow pea (Vigna sp.) which have been developed at the UWI.

3.2.2 CARDI as the regional research and development institution receives considerable financial support from the GOJ. It is currently collaborating with the MINAG in resolving production problems at the level of the small to medium sized farm.

3.2.4 CIMMYT continues to collaborate with MINAG in the search for adaptable varieties of triticale, wheat and open pollinated corn.

3.2.4 The MINAG's principal co-operative efforts with CIAT relates to screening of Phaseolus, rice and cassava germplasm material for their adaptability to Jamaican conditions.

3.2.5 IDRC has provided financial assistance to MINAG in support of its cassava research and potato (Solanum tuberosum) programmes. Also, specific training programmes have been sponsored by IDRC.

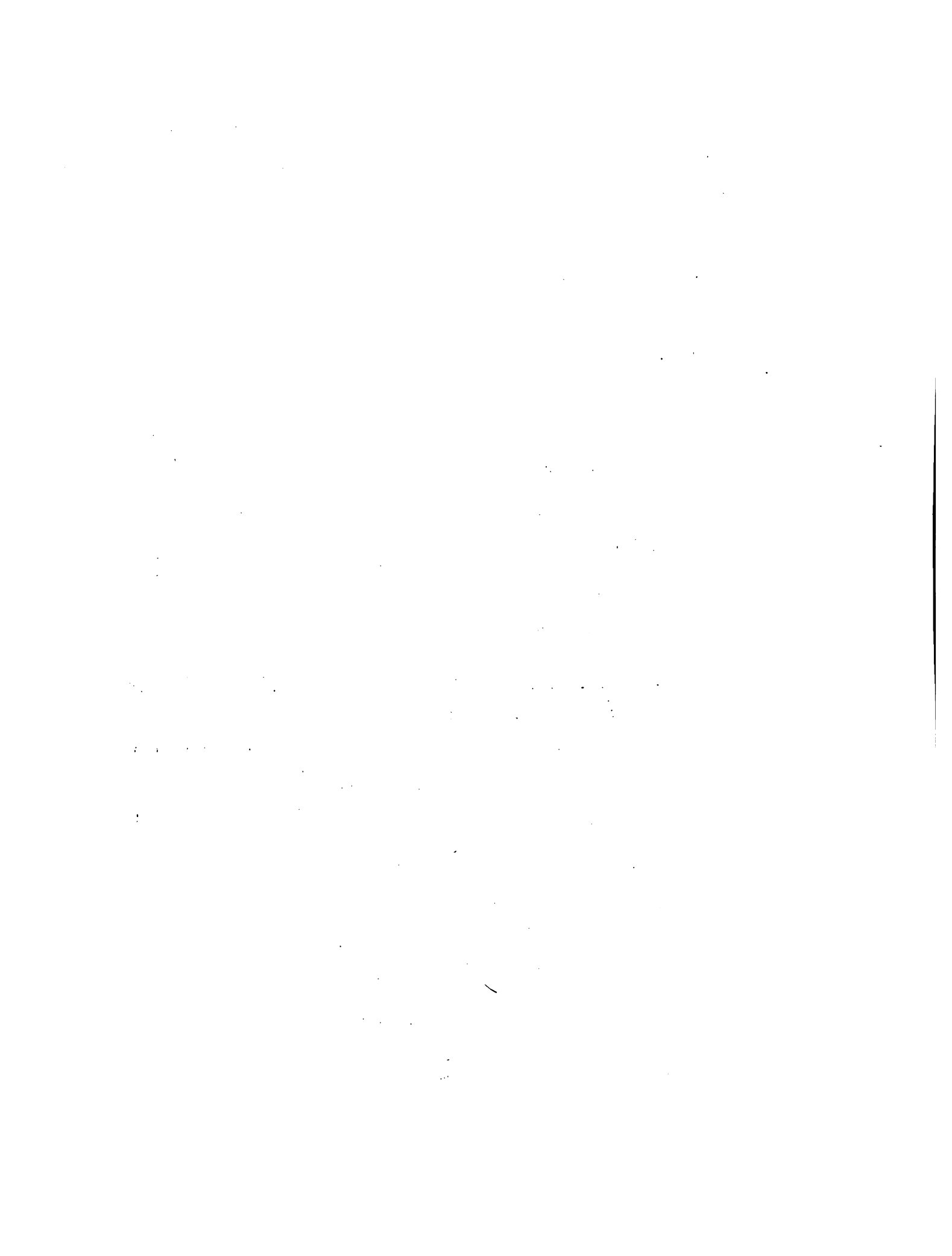
3.2.6 The MINAG has a joint programme with IICA which has as its main objectives (i) the development of appropriate farming systems for terraced hillside lands; and (ii) the development of soil conservation methods which are less costly than terraces. As an adjunct to this project basic field research is undertaken and several research technicians receive in-service and specific short-term overseas training.

4.0 EXISTING RESEARCH PROGRAMMES IN RELATION TO CORN, RICE, WHEAT, BEAN, CASSAVA AND POTATO

4.1 On initiating the joint GOJ/IDB agricultural research project in 1979, the MINAG created 12 commodity committees for Research and Development. These committees were mandated to: ^{1/}

- a) review and recommend the approval of the national programme of Agricultural Research and Development;
- b) assist in determining priority areas and lines of research and recommend the allocation of required funding to the various research programmes accordingly;

^{1/} Report of the Commodity Committee, Research and Development, MINAG, 1980.

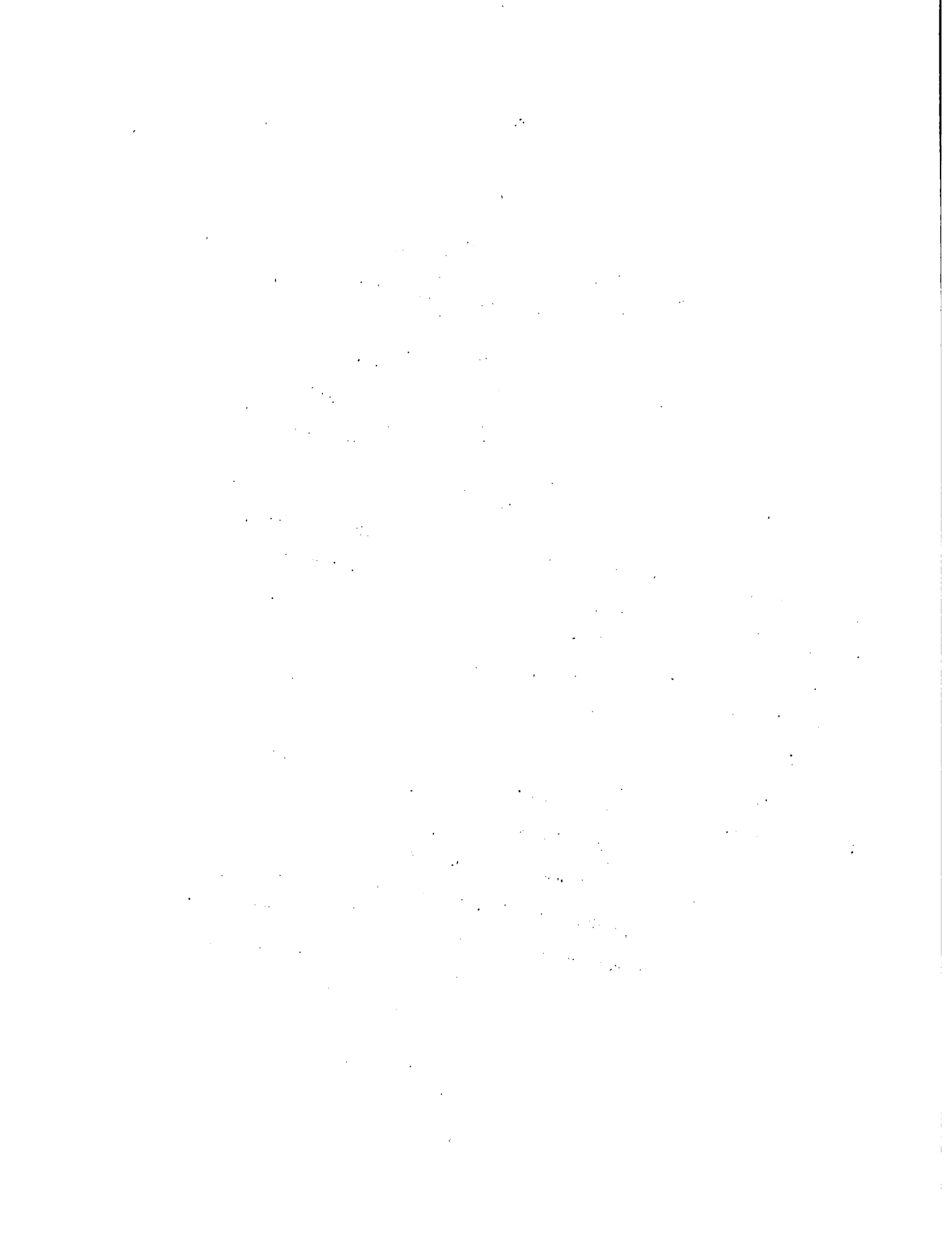


- c) ensure that relevant problems within the agricultural sector are addressed without duplication of effort; and
- d) generally oversee the implementation and co-ordination of the National Agricultural Research and Development Programmes as well as the selection and effective dissemination of research findings.

4.1.1 Following the first year of deliberations of the various commodity committee, research priorities have been identified for each of the crops listed at 4.0 with the exception of wheat which is not presently accorded priority attention. These priority areas are detailed below.

Rice

- 4.1.1.1 Jamaica presently consumes over 60,000 short tons of rice at a CIF cost of approximately US\$20 million. Although there has been a demonstrated potential for large-scale production of this cereal in the island, for various reasons this potential has not been exploited. However, there is now a renewed interest in the production of rice both by large public corporations such as the Black River Upper Morass Development Corporation (BRUMDEC) and small to medium sized farmers.
- 4.1.1.2 In this context the MINAG has accepted the recommendations of the committee charged with proposing research priorities for rice. These priorities are listed as follows:



- i) Variety testing on a continuous basis with the objective of screening for (a) high yielding potential; (b) resistance to lodging and (c) response to fertilizers.
- ii) Crop rotation trials aimed at ascertaining the advantages and feasibility of such a cropping pattern.
- iii) Investigations pertaining to soil borne diseases and pests which result in depressed yields and poor grain quality.
- iv) Studies aimed at determining the need for trace element application.
- v) Variety selection for tolerance to saline and deep water culture.
- vi) Determination of optimum seeding rates and applicability of the method of transplanting for Jamaica conditions.
- vii) Investigations aimed at determining the most efficient method of weed control.
- viii) Studies to determine the best water management system for areas where water is a limiting factor.

4.1.1.3 In order to attain the above-cited goals there is need for (a) a full-time Rice Agronomist; (b) a full complement of Research Assistants to be responsible for the day-to-day field activities and (c) adequate field equipment especially in the area of land preparation.

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2. The second part of the document addresses the challenges associated with data collection and analysis. It highlights that gathering accurate and timely data can be a complex task, often requiring significant resources and expertise. The text suggests that organizations should invest in robust data management systems and training to overcome these challenges. Additionally, it stresses the importance of ensuring the integrity and security of the data collected, as any compromise could lead to incorrect conclusions and poor decision-making.

3. The third part of the document focuses on the role of technology in improving operational efficiency. It discusses how digital tools and automation can streamline processes, reduce errors, and enhance communication. The text mentions that while technology offers many benefits, it is not a silver bullet and must be implemented thoughtfully. Organizations should carefully evaluate their needs and choose solutions that integrate well with their existing infrastructure and workflows.

4. The fourth part of the document explores the importance of collaboration and teamwork. It argues that no single individual or department can successfully manage complex tasks or projects on their own. The text encourages organizations to foster a culture of open communication and mutual support, where team members share knowledge and resources. It also suggests that regular meetings and clear roles and responsibilities are key to ensuring that everyone is working towards the same goals.

5. The fifth and final part of the document discusses the need for continuous improvement and innovation. It notes that the business and public sectors are constantly evolving, and organizations must stay ahead of the curve by embracing change and seeking out new opportunities. The text suggests that regular reviews and feedback loops can help identify areas for improvement and drive innovation. It concludes by stating that a commitment to learning and growth is essential for long-term success in any field.

- 4.1.1.4 It is expected that CIAT will continue to provide germplasm material and other out-reach services that are relevant to the rice programme. Additionally, the Japanese Government continues to provide the services of three full-time rice experts who are actively involved in field experimentation and extension work especially aimed at the small to medium sized farm (up to 5 acres).
- 4.1.1.5 Just recently, an agreement has been concluded between BRUMDEC and IICA for the provision of 16 expert-months of consultancy services in the areas of adaptive rice research and water management. It is expected that this consultancy exercise will commence no later than May 1981.

Corn

- 4.1.2.1 Jamaica has traditionally imported large quantities of grain corn for the animal feed industry and for direct human consumption. Over the years the MINAG has collaborated with CIMMYT on the screening of flints and dents, of the early and late open-pollinated varieties, as well as germplasm material that is high in protein content. Due to a multiplicity of research and production constraints the corn programme in Jamaica continues to lag considerably behind the demonstrated potential of this cereal in terms of attaining levels approaching self-sufficiency.
- 4.1.2.2 In its recommendations, the relevant commodity committee stated that most or all of the existing

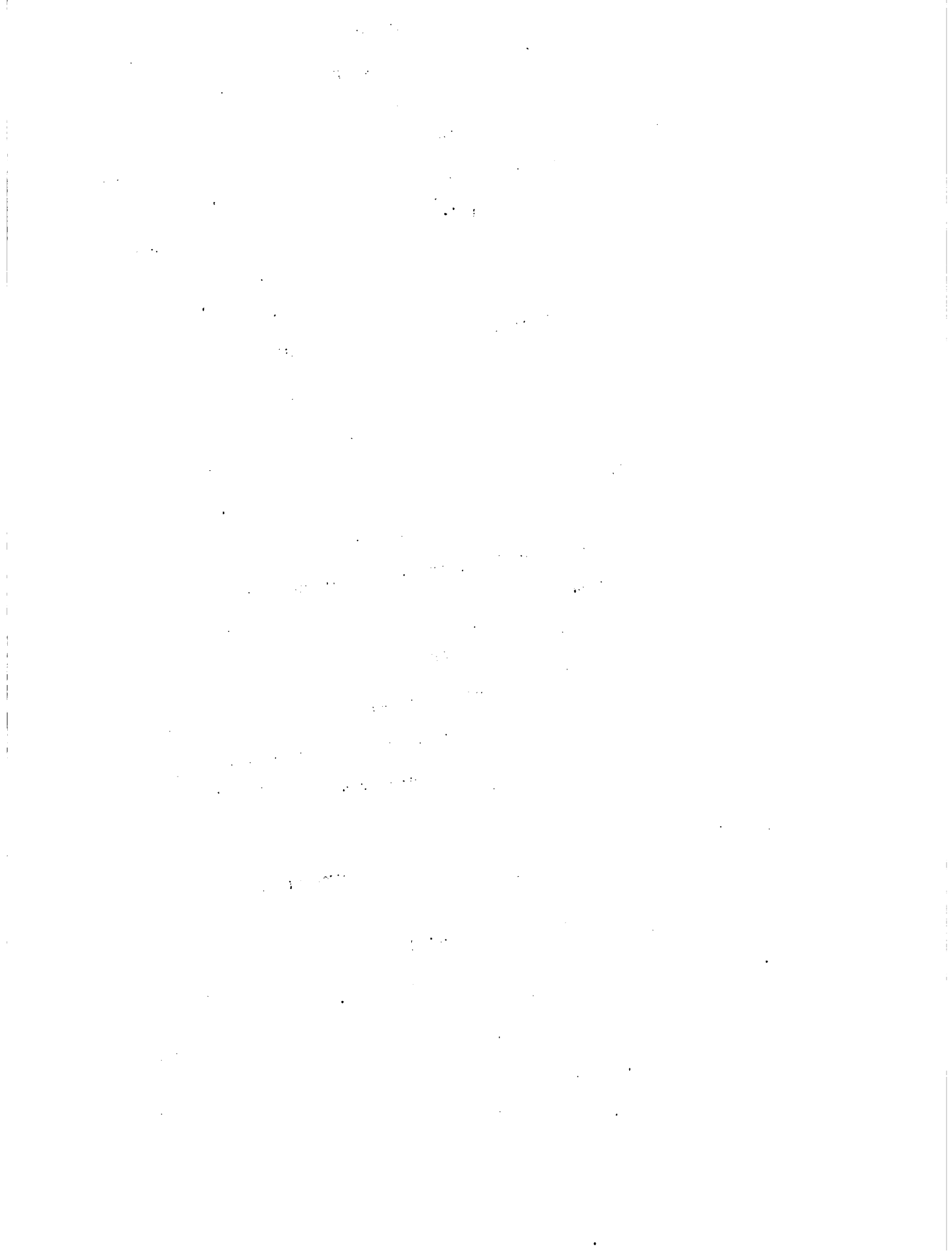
constraints to corn research and production in Jamaica can be relieved providing that MINAG takes the necessary steps to recruit additional professional and field-trained personnel to implement a research programme in the following areas:

- i) Variety trials to include entries from CIMMYT, local sources and Pioneer International hybrids.
- ii) Spacing and plant population trials in relation to irrigation and rainfed conditions.
- iii) Fertilizer trials for soil types not presently included in MINAG's fertilizer recommendation guide.
- iv) Disease and pest control.
- v) Intercropping to determine the feasibility of intercropping corn with sugar and dry grain legumes.

4.1.2.3 It is expected that CARDI, the Sugar Industry Research Institute (SIRI) and CIMMYT will make specific inputs in a joint execution of the corn research programme with MINAG over the next three years.

Dry Grain Legumes

4.1.3.1 Dry grain legumes constitute an important vegetable protein in the Jamaican diet. Local production has traditionally lagged behind demand. For example in 1978/79 a total of 9550 tons of grain legume were produced which constituted 52% of the national requirement.



Among the limiting factors to increased production and productivity as identified by the pertinent research commodity committee are the following:

- i) poor land quality and inadequate moisture supply;
- ii) low level of cultural practices;
- iii) use of inferior seed material (low yielding and uncertified seeds, compounded by low disease and pest tolerance);
- iv) sub-optimal plant population (in many cases legumes are haphazardly intercropped with other crops without attention to seeding rate).

4.1.3.2 In cognizance of the above constraints, the Commodity Research Committee for Legumes has recommended to MINAG the following lines for priority action in its research on (a) Phaseolus vulgaris; (b) Vigna unguiculata; (c) Arachis hypogaea; (d) Cajanus cajan; and (e) Phaseolus lunatus.

- i) Continued variety screening of germplasm material obtained from CIAT, IITA, ICRISAT and UWI, with emphasis to be placed in the hilly regions of Jamaica since the bulk of the edible grain legumes is produced on small hillside farms. Indicators of good performance will be tolerance to bean mosaic virus, anthracnose and powdery mildew, three of the most seriously encountered diseases in bean



- production and acceptable grain yields.
- ii) Development of intercropping systems using legumes as the intercrop - the GOJ/IICA hillside project has shown conclusively that legumes production in Jamaica can be enhanced several-fold if it is included in a mixed cropping system with yams.^{1/}
 - iii) Development of small machinery (planter, dryer, thresher) for use in small farms; and
 - iv) Development of appropriate techniques in seed multiplication.

Root Crops

4.1.4.1 The root crops to be dealt with in this submission are cassava and Irish potato.

To ensure the economic viability of the cassava mill at Goshen, St. Elizabeth it is imperative that necessary steps be taken to increase cassava production and productivity in Jamaica. At the present time, the mill is closed for most of the year due to unavailability of cassava for industrial processing. To remedy this situation the Root Crops Commodity Research Committee has recommended the following actions:

- i) investigating the control of mites, thrips and bud worm (Silba pendula) which cause severe damage to cassava growth and yield; and

^{1/} Wahab A.H., Position Paper of the Inter-American Institute of Agricultural Sciences (IICA/JA) on Legumes. Proceedings of the Seminar on Legume held under the auspices of the Research and Development Department, MINAG, Jamaica, 1980.

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

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for a systematic approach to data collection and the importance of using reliable and valid measurement tools.

3. The third part of the document describes the process of interpreting the data and drawing conclusions. It stresses the importance of considering the context of the data and the potential limitations of the study.

4. The fourth part of the document discusses the implications of the findings and the need for further research. It suggests that the results of the study have important implications for the organization and that further research is needed to explore these implications in more detail.

5. The fifth part of the document provides a summary of the key findings and conclusions. It reiterates the importance of maintaining accurate records and the need for a systematic approach to data collection and analysis.

6. The sixth part of the document discusses the limitations of the study and the need for further research. It suggests that the results of the study are based on a limited sample and that further research is needed to explore the generalizability of the findings.

7. The seventh part of the document provides a list of references and sources used in the study. It includes a variety of academic journals, books, and other sources that provide a theoretical and empirical basis for the study.

8. The eighth part of the document provides a list of appendices and supplementary materials. These materials include additional data, tables, and figures that provide more detail about the study and its findings.

9. The ninth part of the document provides a list of acknowledgments and thanks. It expresses appreciation to the individuals and organizations that provided support and assistance during the course of the study.

10. The tenth part of the document provides a list of contact information for the author and other individuals involved in the study. This information is provided so that interested parties can contact the author for more information or to request copies of the study.

- ii) through field trials on different soil types and at varying altitudes, identification of local and imported cultivars which are (a) high yielding; (b) high in dry matter content; (c) have a desirable rooting pattern for ease of harvest; and (d) of acceptable skin thickness for mechanical peeling.

4.1.1.2. It is hoped that as in the past CIAT will provide out-reach support and training of research personnel in cassava production systems. In the case of Irish potato the bulk of Jamaica's production is obtained from hilly lands. Major constraints to increased production and yields are the diseases referred to as early and late blight i.e. Fusarium and Phytophthora; and inadequacy of disease-free certified planting material. To this end the MINAG proposes to further investigate the control of these diseases while at the same time assessing the feasibility of producing locally, seed material of acceptable cultivars. It is also planned to test germplasm material developed by CIP which are suitable for lowland tropical conditions.

5.0 AGRICULTURAL EXTENSION

5.1. In the past, agricultural research findings have been passed on to farmers through Area Agricultural Officers (AAO) who worked at the field level directly with farmers. In the process of implementing Government's policy AAC's expended considerable time on regulatory functions and not enough on the promotion and implementation of improved production

methods and research findings. He had very little direct contact with the researcher and in many cases due to his limited academic background was not technically qualified to advise farmers on problems experienced on the farm.

- 5.2. In cognizance of the above the MINAG is now in the process of implementing recommendations contained in an FAO Mission report of 1979.^{1/} This report focusses on a strategy for significantly enhancing the levels of performance of the small farms which account for about 80% of the total number of farms in the country. According to this report one of the major reasons for low productivity of the small farm is the

"general neglect and poor husbandry that is being practiced. Farms are generally over-run by weeds, stands are poor with large gaps between plants. There is little or no evidence of farm planning, the plots of individual crops are scattered haphazardly over the holding, no attempt is made at a systematic crop rotation, and mixed stands are also haphazard".

- 5.3. The report further states that by properly applying known technology, production and income could be at least doubled on small farms. A doubling of yields on small farms besides its effects on the economic situation of the small farmer would have a considerable impact on economic and political developments on a national scale. Food supplies would be increased, the greater production would provide more rural employment, income would be better distributed and capital formation by the small farmer might become possible.
- 5.4. The recommendations for increasing the efficacy of the extension services of MINAG is predicated on the Extension Division operating under the Production and Extension Service of MINAG, which was created in 1977 to handle all the Ministry's field programmes for food and export crops (with the exception of sugar, banana and coconut which are still

^{1/} Arnon I., Jamaica Agricultural Research, Extension and Training, Mission Report. FAO. Rome 1979



handled by the Commodity Board but will be absorbed later by the MINAG) as well as livestock. The Directorate of the Production and Extension Services plans, directs, co-ordinates and evaluates all the extension programmes, day-to-day operations of which are the responsibility of four Regional Directors.

5.5. Included in the recommendations for improving the extension services of MINAG are:

- i) **divesting** the Area Agricultural Officer (AAO) of most regulatory functions so that he can devote more time and thus serve the farmer more effectively in resolving on-farm problems;
- ii) providing the AAO with a well-defined goal and working schedule to which he is expected to adhere strictly under proper guidance and supervision. To be successful the AAO must be provided with all the means necessary to carry out his duties. Effective communications throughout the system must be ensured so that he gets the technical and administrative support needed;
- iii) the AAO must be allowed to participate in a continuous in-service training programme so that his professional competence can be gradually built up;
- iv) effective monitoring of the activities of the AAO through a system of feedback and controls to ensure guidance, motivation and training;
- v) the implementation of appropriate agricultural training programmes and courses for Extension Workers, farmers (men, women and youth);
- vi) close cooperation between the Research and Development (R&D) and Production and Extension Divisions of MINAG in the execution of field trials at the field stations and on farmer's plots;

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. This section also touches upon the legal implications of failing to maintain such records, which can lead to severe consequences for individuals and organizations alike.

2. The second part of the document delves into the specific requirements for record-keeping, including the types of documents that must be retained and the duration for which they should be kept. It provides a detailed overview of the various categories of records, such as financial statements, contracts, and correspondence, and outlines the best practices for organizing and storing these documents to ensure they are easily accessible and secure.

3. The third part of the document addresses the challenges associated with record-keeping, particularly in the context of digital information. It discusses the risks of data loss, corruption, and unauthorized access, and offers strategies to mitigate these risks through the use of secure storage solutions and regular backups. Additionally, it highlights the importance of implementing robust access controls and security protocols to protect sensitive information.

4. The fourth part of the document provides a comprehensive guide to the legal and regulatory requirements governing record-keeping. It covers the various laws and regulations that apply to different types of records and industries, and explains how these requirements may vary across different jurisdictions. This section is particularly useful for organizations operating in multiple regions or those subject to specific industry regulations.

5. The fifth and final part of the document offers practical advice and tips for implementing an effective record-keeping system. It discusses the importance of developing clear policies and procedures, training staff on proper record-keeping practices, and regularly reviewing and updating the system to reflect changes in requirements and technology. The document concludes by emphasizing that a well-maintained record-keeping system is not only a legal requirement but also a valuable tool for improving operational efficiency and decision-making.

- vii) regularly scheduled field-days and seminars in which research results are communicated to and discussed with extension personnel;
- viii) providing opportunities and incentives for adequate financing and professional rewards to the Extension Worker to ensure vertical mobility within his field of expertise; and
- xi) the deployment of subject matter specialists (SMS) to the R&D Division of the MINAG to conduct "Pre-extension Research"^{1/} and provide specialized back-up support to the extension officers in the field. Using the approach of pre-extension research, results and methods developed at the experiment station are tested on a pilot scale on subsistence farms in order to assess their compatibility with the actual conditions under which they are to be applied. The technical, economic and social constraints to their adoption, and the modifications to ensure their acceptability are identified.

6.0. CONCLUSIONS

- 6.1. The overall performance of the agricultural sector in the past decade has been discouraging. Total output has generally tended to stagnate and even decrease. Productivity measured in value added per worker employed in agriculture is roughly one-fourth of the national average.^{2/} The stagnation in agriculture "has been a major cause of the increasing unemployment, high inflation rates, lack of foreign exchange, high rural to urban migration, lowering living standards and emerging

^{1/} This is a new approach which was pioneered in Senegal. It is predicated on the realization that the responsibility of the researcher is involved right up to the stage at which a proposal can actually be implemented by the farmer.

^{2/} Project Report Jamaica Ja-0038 - Agricultural Research Project, 1979.

nutritional problems among the poor. In 1977 the importation of foodstuffs accounted for 16% of the total merchandise imports^{1/} Nevertheless, agriculture is still the major source of employment and an important source of income in Jamaica. In 1977 it provided 35% of total employment, 9% of the G.N.P. and 11% of the total export earnings.

6.2. The Government of Jamaica has officially stated that agricultural production and development, particularly of food crops for domestic consumption, is to be accorded the highest priority in its overall strategy. To this end the agricultural research and extension services of MINAG are presently being strengthened both institutionally and technically through a joint GOJ/IDB funded Project costing US\$9.4 million which commenced in 1979 and is scheduled to continue over a 4-year period. Initially the project will address itself to:

- (i) the re-organization and strengthening of the institutional aspects of the research service of MINAG;
- (ii) the establishment and equipping of the regional research centers;
- (iii) the implementation of a research programme in priority areas as identified by select commodity research committees; and
- (iv) upgrading of local research skills through a training programme.

6.3. The GOJ having adopted a policy of promoting the agricultural sector as one of the main steps in counter-acting the deteriorating economic situation, has recognized the importance of the small farmer as a chief contributor to greater levels of production and productivity. Hence, in its deliberations the commodity research committee has recommended research priorities

^{1/} Five-Year Development Plan, 1978 - 1982, GOJ.

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The first part of the report deals with the general situation of the country. It is noted that the population is increasing rapidly, and that the government is making great efforts to improve the education and health of the people. The report also mentions the progress of the various departments of the government, and the state of the economy.

In the second part of the report, the author discusses the various problems that are facing the country. These include the problem of unemployment, the problem of poverty, and the problem of crime. The author suggests that the government should take steps to solve these problems, and that it should also encourage the people to work together to improve their lives.

The third part of the report deals with the future of the country. The author believes that the country has a bright future, and that it will continue to grow and prosper. However, it is necessary for the government to continue to work hard to improve the lives of the people, and to ensure that the country is a fair and just one for all.

The fourth part of the report is a summary of the main points of the report. It is noted that the country is making great progress, and that the government is doing a good job of governing. However, there are still many problems that need to be solved, and the government must continue to work hard to improve the lives of the people.

The fifth part of the report is a list of recommendations. The author suggests that the government should take the following steps:

- 1. To improve the education system, and to ensure that all children have access to a good education.
- 2. To improve the health system, and to ensure that all people have access to good medical care.
- 3. To create more jobs, and to reduce unemployment.
- 4. To improve the economy, and to ensure that the country is a fair and just one for all.
- 5. To improve the legal system, and to ensure that the law is enforced fairly and justly.

The author concludes the report by saying that the country has a bright future, and that it will continue to grow and prosper. However, it is necessary for the government to continue to work hard to improve the lives of the people, and to ensure that the country is a fair and just one for all.

that focus on the needs of the small farmer. Also, the Extension arm of MINAG is evolving strategies of improving the rate of transfer of research findings to farmers. Assistance is contemplated from the inter-national and regional research and agricultural developmental agencies towards the attainment of the overall goals of MINAG.

February 13, 1981.

(i)

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
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- No. I - 4 Uli Locher, "The Marketing of Agricultural Produce in Jamaica", November 1977
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- No. I - 7 Government of Jamaica, "Agricultural Government Policy Papers", February 1978
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- 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
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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential 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 establishment of clear policies and procedures. It emphasizes that effective data governance is crucial for ensuring that data is used responsibly and in compliance with relevant regulations.

6. The sixth part of the document explores the role of data in decision-making and strategic planning. It highlights how data-driven insights can help organizations identify opportunities, assess risks, and make informed decisions that drive growth and success.

7. The seventh part of the document discusses the importance of data literacy and the need for ongoing training and development. It emphasizes that all employees should have the skills and knowledge necessary to effectively use data in their work.

8. The eighth part of the document discusses the importance of data ethics and the need to consider the potential impact of data collection and analysis on individuals and society. It emphasizes that organizations should be transparent about their data practices and should strive to protect the privacy and rights of all individuals.

9. The ninth part of the document discusses the importance of data security and the need to implement robust security measures to protect data from unauthorized access, loss, or theft. It emphasizes that data security is a top priority for any organization that relies on data for its operations.

10. The tenth part of the document discusses the importance of data integration and the need to ensure that data from different systems and sources can be seamlessly combined and analyzed. It emphasizes that data integration is essential for providing a comprehensive view of the organization's data and for enabling cross-functional collaboration.

(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-CIDLA), "Agricultural Documentation and Information Network in Jamaica"
- 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

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5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and up-to-date.

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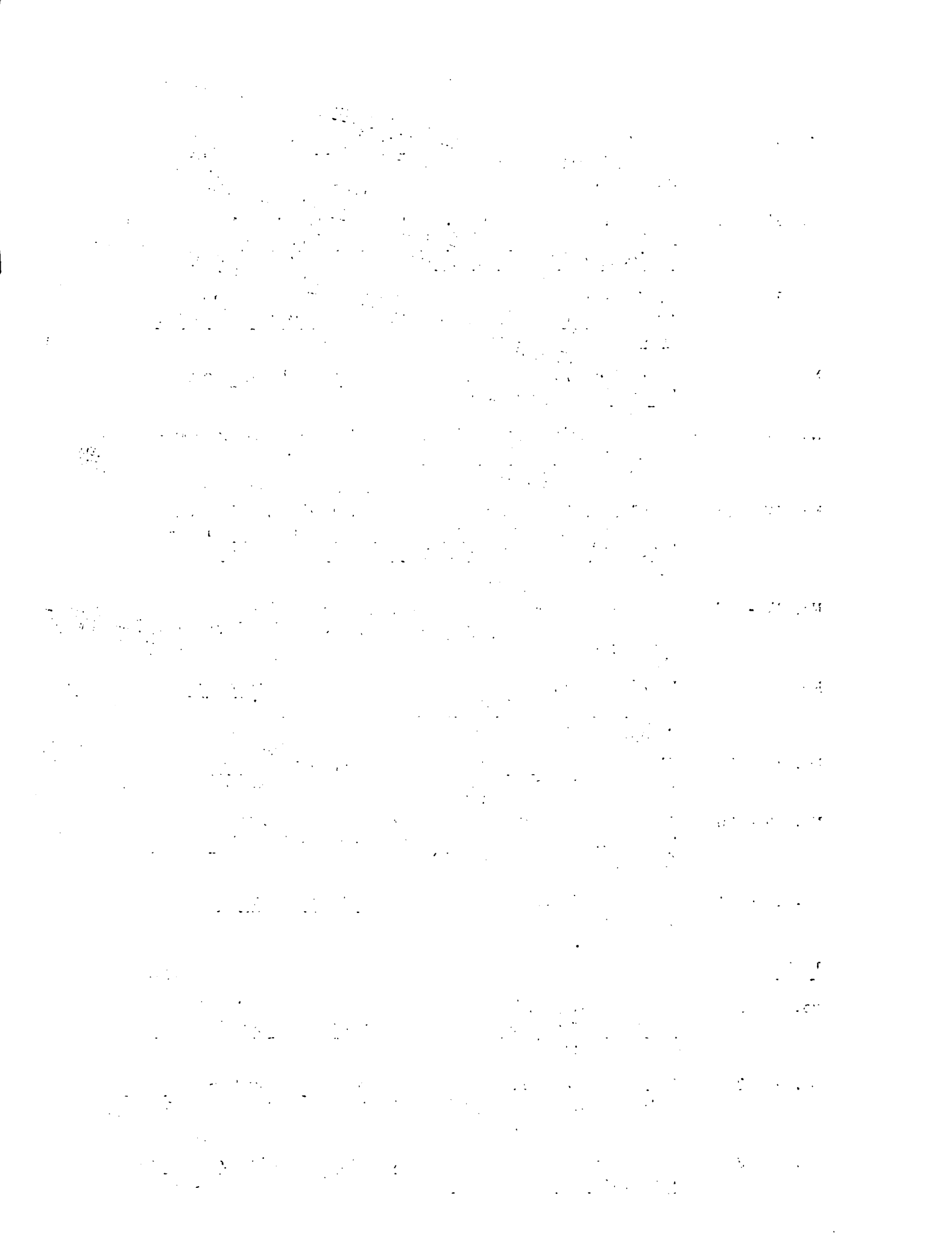
- No. III - 5 IICA-MOAJ, "An Approach to Agricultural Settlement of Hilly Lands", October 1979
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- No. III - 7 Canute McLean, "Production and Marketing of Peanuts", November 1979

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-Co-operative 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

[The page contains extremely faint and illegible text, likely bleed-through from the reverse side of the document. The text is scattered across the page and cannot be transcribed accurately.]

- 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.
- No. V - 2 P. Aitken, A. Wahab and I. Johnson "Under-employment - Its Relation to the Agricultural Sector and Considerations for its Measurement", January 1981.
- No. V - 3 D. D. Henry, J. R. Gayle, "The Culture of Grafted Pimento (as spice crop for Allsides, Jamaica)", January 1981



(v)

No. V - 4 Abdul H. Wahab, Noel Singh "Agricultural Research in Jamaica", February 1981

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