

JAMAICA - COUNTRY REPORT

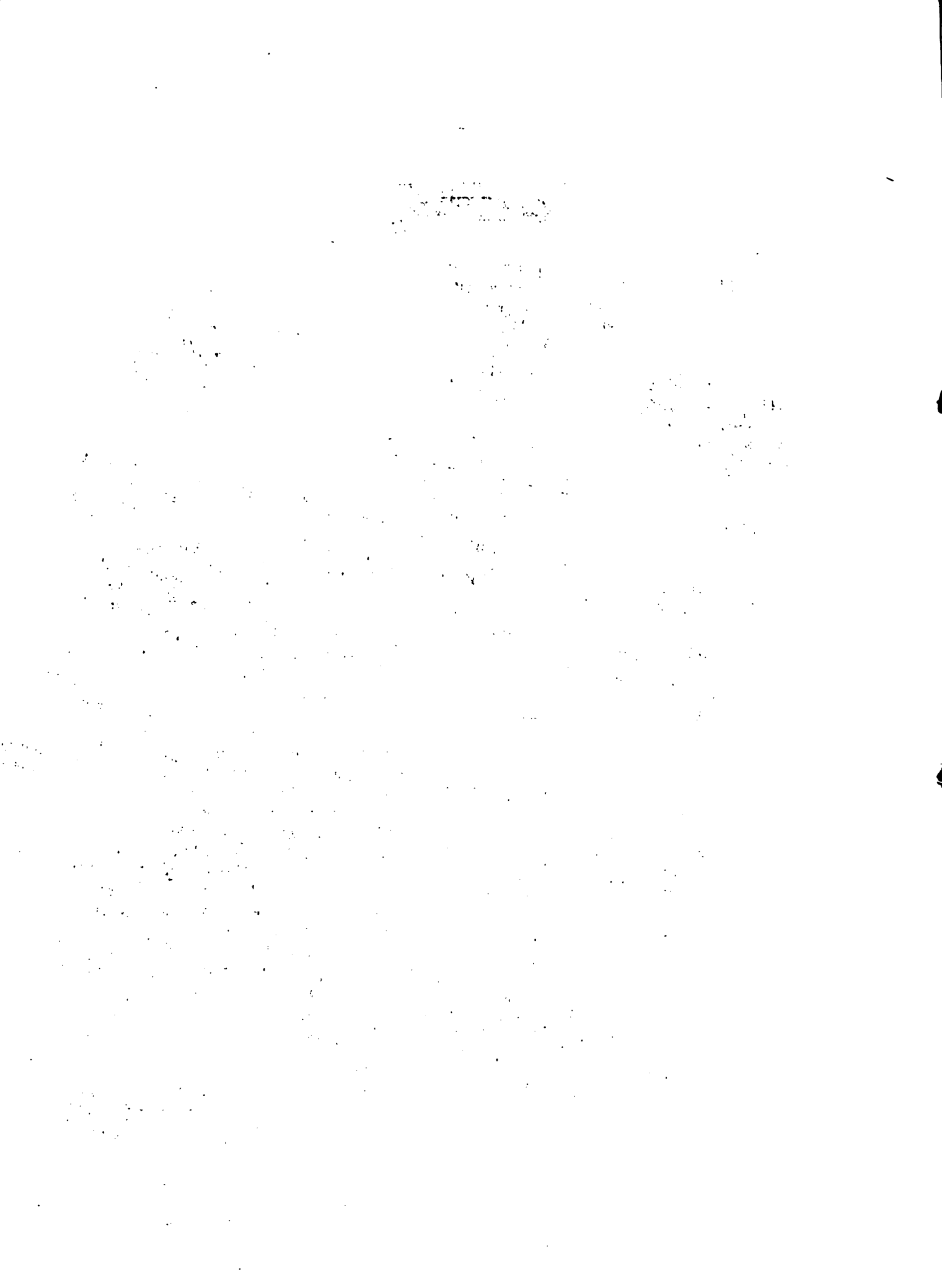
1. You will be glad to hear that I intend to condense the Country Report of Jamaica. For easy reference to the text we have combined a PAGE and CONTENT index at the beginning of the report, using the guidelines received by us from IICA. Looking at this, you will note that following the summary of Government Agricultural Policy we have identified and discussed the details of the Agricultural Research Departments within the Ministry, and supported observations made on these in Annexes. Then in Appendices we have discussed Statutory and other bodies, the University of the West Indies and the private sector agencies of research.

These last years have seen important developments within the Ministry of Agriculture in Jamaica. In 1973 a GREEN PAPER was formulated by Government with the assistance of external experts, setting out the Government Agricultural Development strategy considered within the framework of overall development of the economy. It implied that RURAL development centred on agriculture was to be accorded greater emphasis. This policy is stated on page 2, paragraph 1.1., and I quote:

"The Ministry of Agriculture (M.A.) is the principal Agricultural Research and Development Agency in Jamaica. In this respect, one of its major functions is to ensure that in developing agricultural programmes and projects due consideration is given to efficient allocation of available resources of land, labour, capital and management in such a way that optimum production will result. Of equal importance is the need to ensure that those who are engaged in agricultural activity receive adequate compensation, which will enable them to improve their general well-being and place them on a comparative level with their counterparts in other sectors of the economy. Translated into action, this means that the Ministry is charged on the one hand with ensuring the provision of basic infrastructure such as roads and water supplies, distribution of land for settlement and in some cases housing and domestic water supplies, and on the other hand with the provision of services such as extension, research, training, marketing and credit facilities. 1

1 Annual Report, Ministry of Agriculture, Jamaica, March 1975."

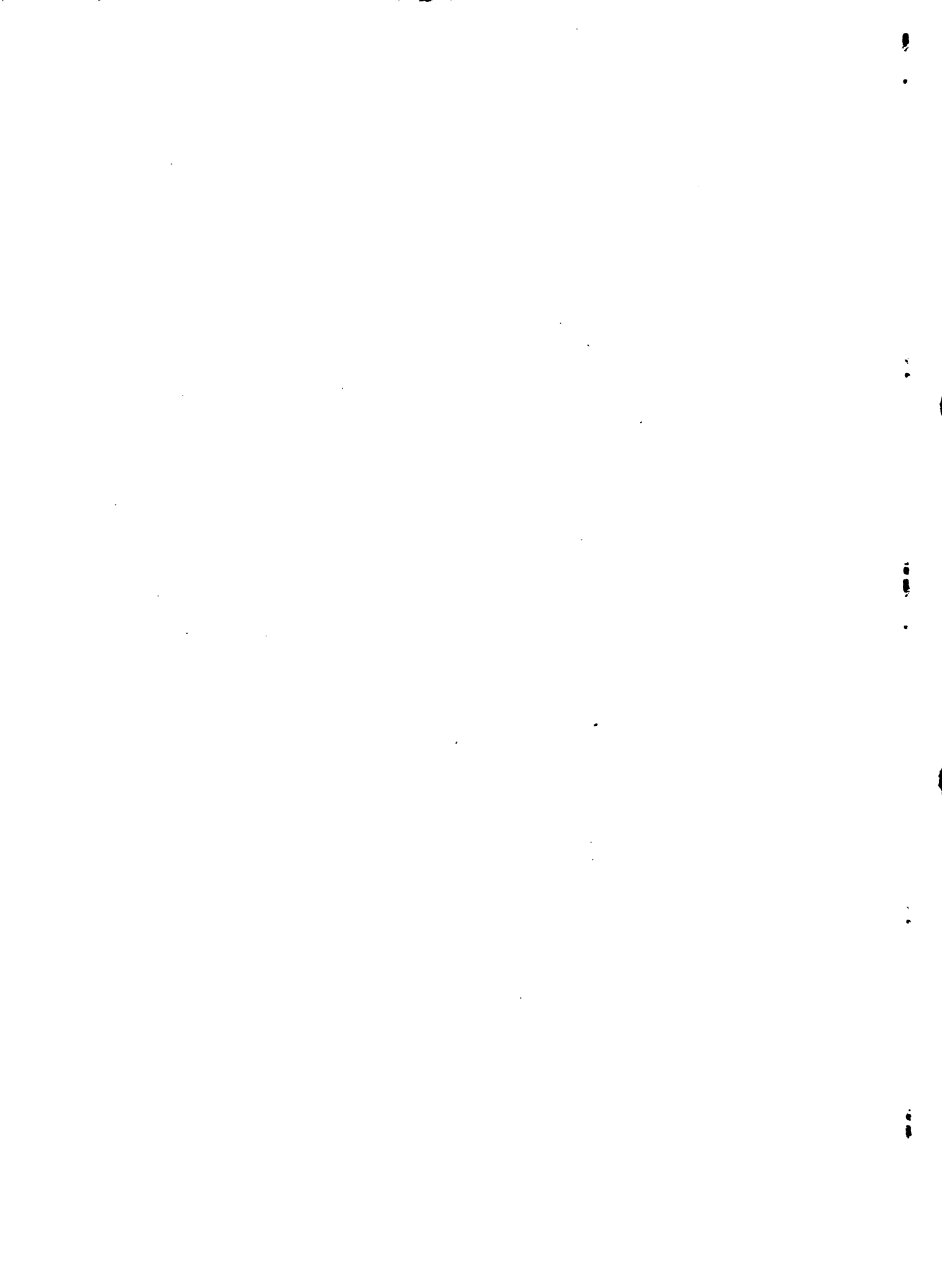
This Green Paper identified the areas needing improvement and in 1975/76 the Government of Jamaica, with the assistance of FAO/IDB, produced a detailed report on the strategy for the REORGANIZATION OF AGRICULTURAL RESEARCH within the Ministry of Agriculture,



Please turn to ANNEX 1. This sets out the organizational ~~structure of~~ Agricultural Research within the Ministry at least up to 1976. Note that the Research Departments are responsible to the P.S. via the C.T.O.

Please turn to ANNEX 2. You will note that replacing the C.T.O. is the Director of the Research Service, assisted by a Committee, and both linked to the Director of the Extension Service. Note the decentralization of Agricultural Services into Central, Western and Northern sections of the island. The Research Departments are to be centred in the Central Station (at Bodles) outside Kingston and are linked with the Extension Crop Specialist.

G. Barker



AGRICULTURAL RESEARCH

IN JAMAICA

BY

G.H. Barker, A.H. Wahab and L.A. Bell

A Report Presented at a Regional Technical Workshop on Agricultural Research Systems in the IICA-OAS Member Countries of the Antilles Zone, held in Port-au-Prince, Haiti, November 28 - December 2, 1977.

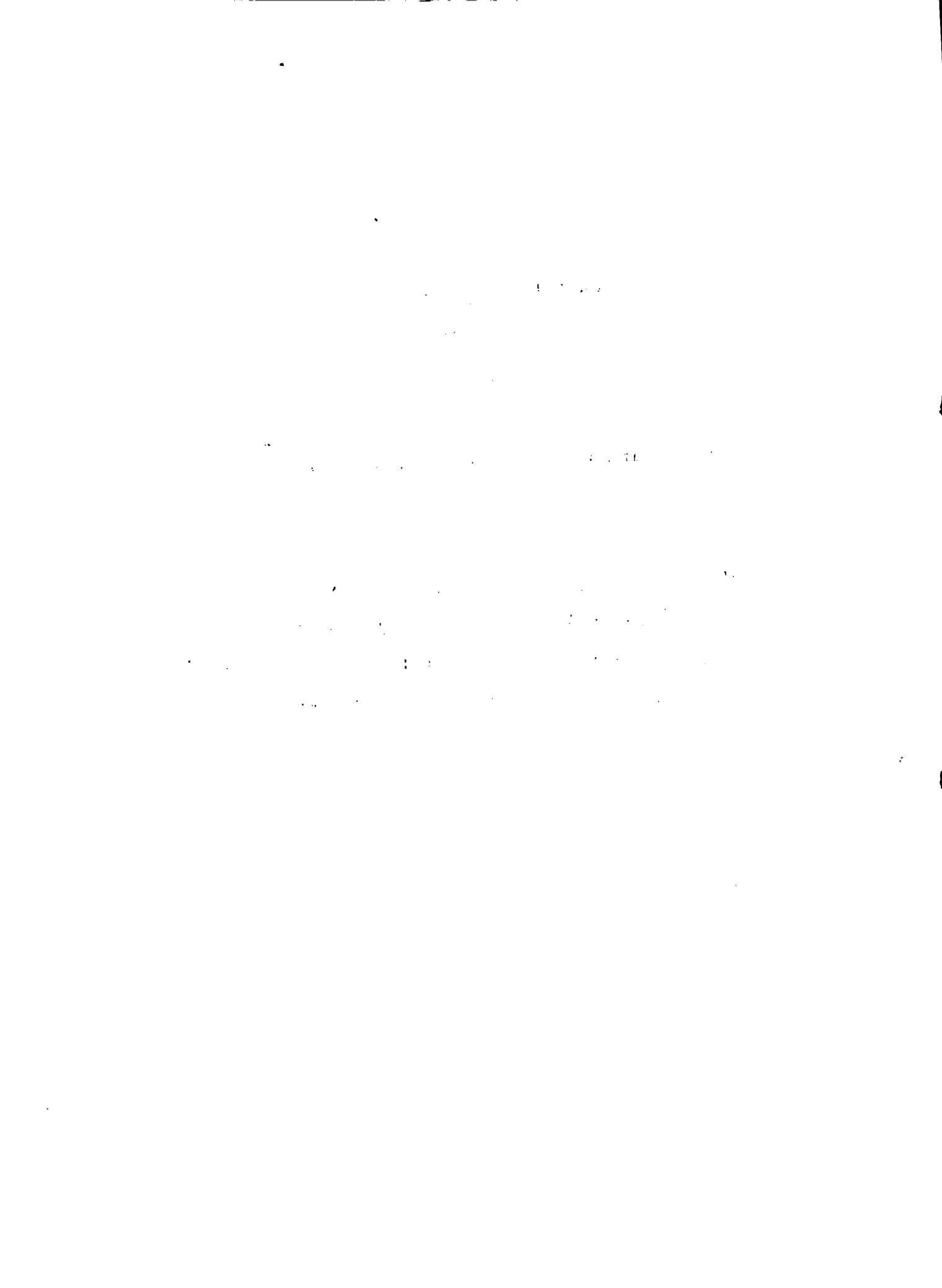


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The following table shows the results of the experiments conducted on the effect of temperature on the rate of reaction between hydrogen peroxide and potassium iodide. The reaction is catalyzed by the presence of a small amount of potassium iodide.

Temperature (°C)	Time taken for the reaction to complete (s)
10	120
20	60
30	30
40	15
50	8

From the above table, it is clear that the rate of reaction increases as the temperature increases. This is because the molecules of the reactants have more energy at higher temperatures, and therefore, they are more likely to collide with sufficient energy to overcome the activation energy barrier and undergo a chemical reaction.

The following graph shows the relationship between the rate of reaction and the temperature of the reaction mixture. The rate of reaction is measured as the reciprocal of the time taken for the reaction to complete.

The graph shows that the rate of reaction increases exponentially with temperature. This is characteristic of a chemical reaction where the rate is controlled by the activation energy. The Arrhenius equation, $k = A e^{-E_a/RT}$, describes the relationship between the rate constant k and the temperature T .

In conclusion, the rate of reaction between hydrogen peroxide and potassium iodide increases significantly as the temperature of the reaction mixture increases. This is due to the increased kinetic energy of the reactant molecules, which allows them to overcome the activation energy barrier more effectively.

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The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This ensures transparency and allows for easy verification of the data.

In addition, it is crucial to review the records regularly to identify any discrepancies or errors. This proactive approach helps in catching mistakes early and prevents them from escalating into larger issues.

Furthermore, the document highlights the need for secure storage of these records. Whether digital or physical, the information must be protected from unauthorized access and loss. Implementing robust security measures is essential for maintaining the integrity of the data.

Finally, the document concludes by stating that consistent record-keeping is a key component of effective financial management. It provides a clear framework for how to organize and maintain these records to ensure they are always available when needed.

By following these guidelines, you can ensure that your financial records are accurate, secure, and easy to manage. This will not only help you stay on top of your finances but also provide a clear audit trail for any future inquiries.

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for ensuring the integrity of the financial statements and for providing a clear audit trail. The text notes that any discrepancies or errors in the records can lead to significant complications during an audit and may result in the disallowance of certain expenses.

2. The second part of the document outlines the specific procedures for recording transactions. It details the requirements for receipts, invoices, and other supporting documents. It states that all receipts must be properly dated, itemized, and signed by the individual receiving the goods or services. Additionally, it requires that all invoices be reviewed for accuracy and that any missing or incomplete information be promptly addressed.

3. The third part of the document addresses the issue of expense reporting. It explains that employees are required to submit a detailed report of all business-related expenses incurred during the reporting period. This report should include the date, location, purpose, and amount of each expense. The text also notes that only those expenses that are directly related to the business and are reasonable in amount are eligible for reimbursement.

4. The fourth part of the document discusses the process of reviewing and approving expense reports. It states that all reports must be reviewed by the appropriate supervisor or manager to ensure that the expenses are legitimate and necessary for the business. The reviewer should verify that the receipts and other supporting documents are properly maintained and that the amounts reported are accurate. Once approved, the expense report should be submitted to the accounting department for processing.

5. The fifth part of the document provides information regarding the consequences of non-compliance with the expense reporting policy. It states that employees who fail to maintain accurate records or who submit false or inflated expense reports may be subject to disciplinary action, including suspension or termination. The text also notes that any fraudulent activity may be reported to the appropriate authorities for investigation.

Statutory Boards and other Research Agencies

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1. The first part of the report deals with the general principles of the theory of the atom. It is shown that the atom is not a solid body, but a system of particles. The particles are arranged in a regular lattice, and the forces between them are of the Coulomb type. The energy of the atom is the sum of the kinetic energy of the particles and the potential energy of the forces between them. The energy levels of the atom are determined by the boundary conditions of the wave function. The energy levels are discrete, and the transitions between them are accompanied by the emission or absorption of light. The spectrum of the atom is therefore a line spectrum. The theory of the atom is based on the principles of quantum mechanics. The wave function of the atom is a solution of the Schrödinger equation. The energy levels of the atom are the eigenvalues of the Hamiltonian operator. The wave function of the atom is a function of the coordinates of the particles. The probability of finding the particles in a certain region of space is given by the square of the absolute value of the wave function. The theory of the atom is a theory of the structure of matter. It explains the properties of matter and the behavior of atoms. The theory of the atom is a theory of the structure of matter. It explains the properties of matter and the behavior of atoms.

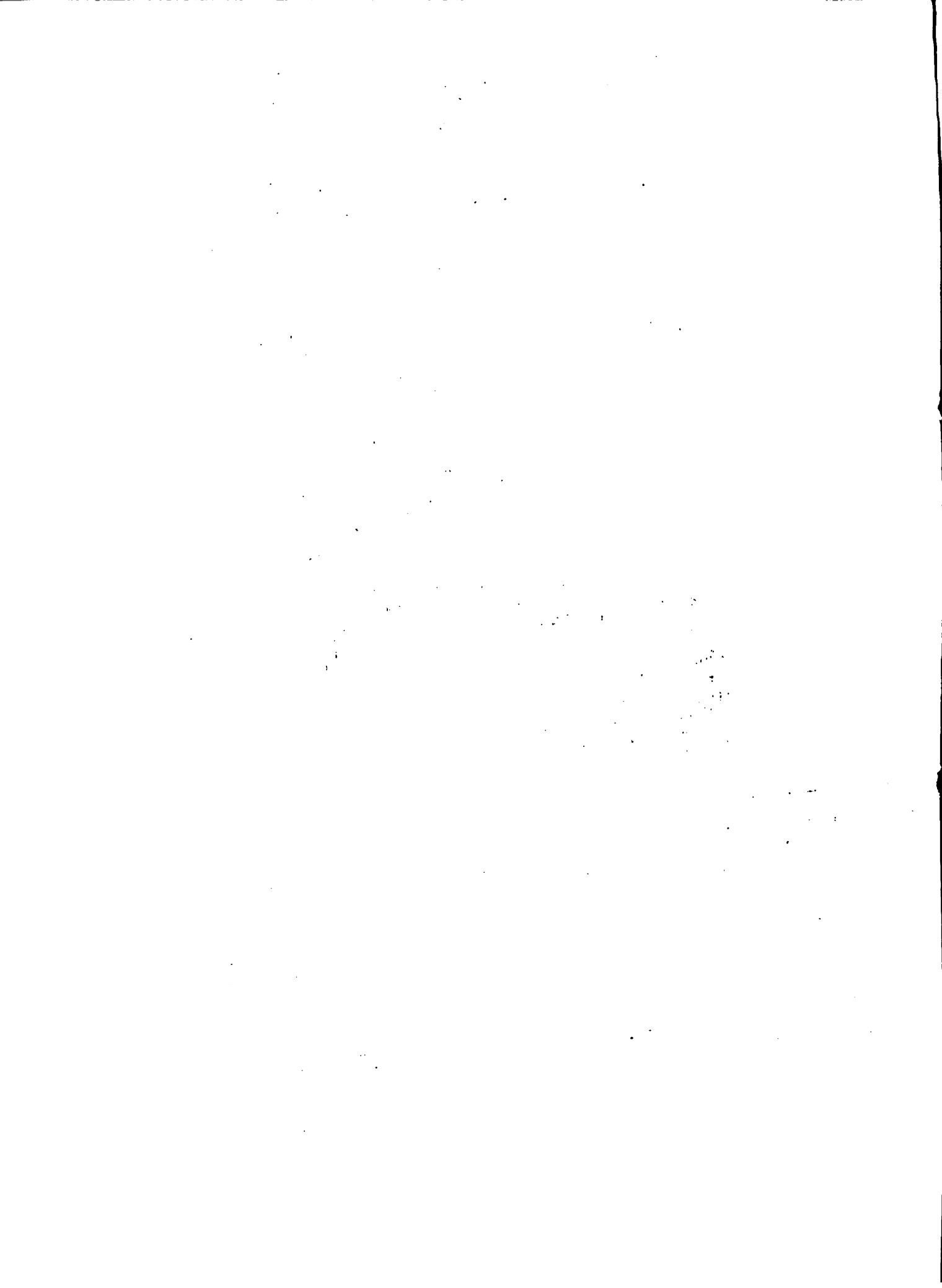
AGRICULTURAL RESEARCH
IN JAMAICA¹

G. H. Barker, A. H. Wahab and L. A. Bell²

BACKGROUND

The Inter-American Institute of Agricultural Sciences (IICA-OAS) has identified Agricultural Research as a primary function for achieving rural development objectives. Consequently, it has adopted as one line of action for its member countries within the Antilles Zone³ the identification of areas of improvement of their Research Systems. In these countries however, information on the present state of Agricultural Research is inadequately documented to guide specific programmes for institutional strengthening internally or regionally. For this reason, and in order to make recommendations for the Agricultural Research and Development of the member countries, a diagnosis of the present state and future perspectives of each country is being presented at this workshop. This should facilitate the achievement of the objective of the meeting in promoting and strengthening research and development programmes in each country, particularly as they relate to the needs of rural development.

-
- 1 Country Report prepared for presentation at a Regional Technical Workshop on Agricultural Research Systems in the IICA-OAS member countries of the Antilles Zone held in Port-au-Prince, Haiti November 28 - December 2, 1977.
 - 2 Research Coordinator, Ministry of Agriculture, Agricultural Research Specialist, IICA-OAS, and Director, Crops & Soils Department, Ministry of Agriculture.
 - 3 The IICA member countries of the Antillean Zone are viz., Barbados, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, and Trinidad and Tobago.



1. INTRODUCTION

1.1. The Ministry of Agriculture (M.A.) is the principal Agricultural Research and Development Agency in Jamaica. In this respect, one of its major functions is to ensure that in developing agricultural programmes and projects due consideration is given to efficient allocation of available resources of land, labour, capital and management in such a way that optimum production will result. Of equal importance is the need to ensure that those who are engaged in agricultural activity receive adequate compensation, which will enable them to improve their general well-being and place them on a comparative level with their counterparts in other sectors of the economy. Translated into action, this means that the Ministry is charged on the one hand with ensuring the provision of basic infrastructure such as roads and water supplies, distribution of land for settlement and in some cases housing and domestic water supplies, and on the other hand with the provision of services such as extension, research, training, marketing and credit facilities.¹

1.2. To understand the present state of Agricultural Research in Jamaica, it is important to examine the recent past insofar as Agricultural Planning and Development are concerned. Likewise, an examination of the present state of research in the island as undertaken in 1975/76 by the Ministry of Agriculture with the assistance of FAO/IDB, a major task, provided a detailed document which is to serve as a blueprint for the reorganisation of the research administration of all government funded agricultural research activities.² This proposed reorganisation of the Research Service is to be compatible and dovetail with the reorganisation of the Ministry of Agriculture as a whole. To date three regional headquarters recommended in the report have been established as a first step in this direction. These recommendations are based on four concepts:

- 1) Decentralization of services
- 2) Effective coordination of research and development, extension and production
- 3) Avoidance of duplication
- 4) Effective transfer of technology for the benefit of farmers.

1 Annual Report, Ministry of Agriculture, Jamaica, March 1975.

2 Jamaica Agricultural Research Reconnaissance Mission Report, February 1976 Washington D.C. (FAO/IDB Cooperative Programme).



2. IDENTIFICATION OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

The Ministry of Agriculture (M.A.) is the principal Agricultural Research and Development Agency in the island. Over the years several Divisions have evolved. These are identified below:

2.1. <u>Ministry of Agriculture</u>	<u>Year established</u>
- Soil & Land Use Division	1933
- Crop Research Division	1951
- Plant Protection Division	1950
- Veterinary Division	1912
- Livestock Division	1912
- Fisheries Division	1954
- Forestry Division	
- Soil Conservation Unit (Agricultural Engineering)	1975
2.2. <u>Statutory Bodies under the Ministry of Agriculture</u> [*]	
- Banana Board (Research & Development Dept.)	1955
- Coconut Industry Board (Research Department)	1959
- Coffee Industry Board	1948
- Cocoa Industry Board	1957
- Tobacco Industry Control Authority (TICA)	1967
- Sugar Research Institute (Sugar Industry Authority)	1942
- Agricultural Development Corporation (ADC)	1952
<u>Other Statutory Boards and/or Research Agencies</u>	
- Jamaica Industrial Development Corporation (JIDC)	1952
- Scientific Research Council (SRC)	1960
- Storage & Infestation Division	1958
- Caribbean Agricultural Research & Development Institute (CARDI)	1975
- University of the West Indies (Mona Campus)	
- Department of Botany	1948
- Department of Chemistry	1948
- Department of Zoology	1948
- Faculty of Agriculture	1977

* Statutory Bodies are appointed by the Minister and are responsible to the Ministry under which they fall. They are created for the organization and development of the particular industry.

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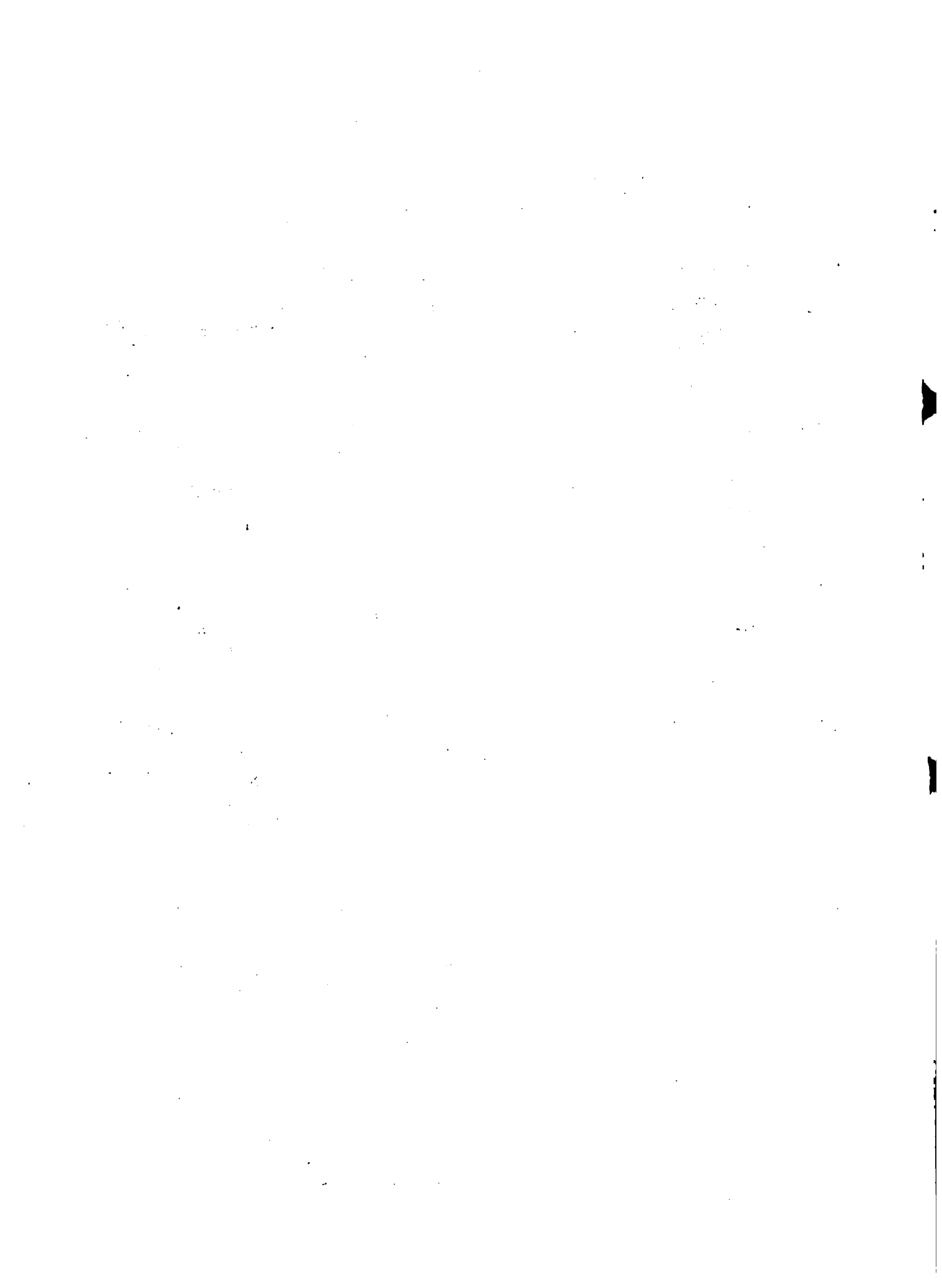
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- Pioneer Hi-Bred International Inc. (private company) 1958
- Alcan Jamaica Limited 1968

2.3. Characteristics & objectives of the research agencies

- 2.3.1. For clarity and convenience the historical development and present objectives of those Divisions within the Ministry of Agriculture are discussed collectively. Other Jamaica research agencies will be discussed individually, under separate Appendices accompanying this report.
- 2.3.2. Soil and Land Use, Crop Research, Livestock, Fisheries and Forestry Divisions of the Ministry were originally conceived as entities which would concentrate on research, plant propagation and advisory services in relation to their respective disciplines. Supporting Divisions, such as Plant Protection and Veterinary, would do research in their respective fields and collaborate in the extension work of the major Divisions.
- 2.3.3. With the rising influence of the Statutory Boards, a corresponding decline in the areas of activity and influence of the Ministry's Departments occurred. The production of planting material of the most important crops, as well as research and extension work, became increasingly the responsibility of the Boards, with little coordination between them and the Ministry.
- 2.3.4. The Division of Soil and Land Use is mainly concerned with soil and plant analyses as a basis for fertilizer recommendations and with land use recommendations. The Division of Crop Research has worked on all major crops and was originally responsible for the crop sections at various research stations. The Division became increasingly concerned with the provision of planting material to farmers and in 1974 the Crop Production Division was set up as a separate unit.
- 2.3.5. The Plant Protection Division is responsible for all aspects of research and advisory work connected with the control of pests, diseases and weeds. It consists of five sections: viz. Entomology, Nematology, Herbicides, Apiculture and Plant Quarantine. It is also responsible for regulatory and inspection work on plant quarantine, on the marketing and use of pesticides, the enforcement of the Plant Disease Law, etc. The present laboratory and other research facilities are inadequate.
- 2.3.6. All research work pertaining to Animal Husbandry is the responsibility of the Livestock Research Division, which consists of four sections, viz, Dairy Cattle Breeding and Husbandry, Beef Cattle Breeding and Husbandry, Pasture Research and Animal Nutrition. Responsibility for the development of swine and sheep production was recently transferred to the Agricultural Development Corporation.



- 2.3.7. The Veterinary Division is concerned with the survey and control of animal diseases and is carrying out research on a number of problems arising out of this work. It has a central laboratory complex consisting of four adequately equipped specialized laboratories with relevant supporting facilities.
- 2.3.8. The Forestry Department, in addition to its responsibility for the development of forests and the economic use of forestry products, has recently set up a research unit which works in project collaboration with UNDP and USAID. This unit does not yet have laboratories or specialized equipment, but hopes to obtain them in the near future. The major work of the UNDP project is concerned with problems of soil management and conservation on steep slopes. Research has also been done on the control of Spider Mite on Caribbean Pine. The USAID work in forestry is aimed at the improvement of nursery techniques and weed control.
- 2.3.9. The Fisheries Division is responsible for marine fishery and for inland fish culture. It is conducting a programme of research in each of these two fields.
- 2.3.10. Soil Conservation Unit took over the functions of the UNDP/FAO project* in 1975. The objectives of this unit are to determine the best conservation treatments and agronomic practices necessary to sustain economic levels of production, thereby increasing farmers' incomes. Since 1976 technical and financial support has been given by IICA (Inter-American Institute of Agricultural Sciences - OAS) for the development of hillside farming systems.

2.4. Organization & Performance of the Ministry of Agriculture Research Agencies

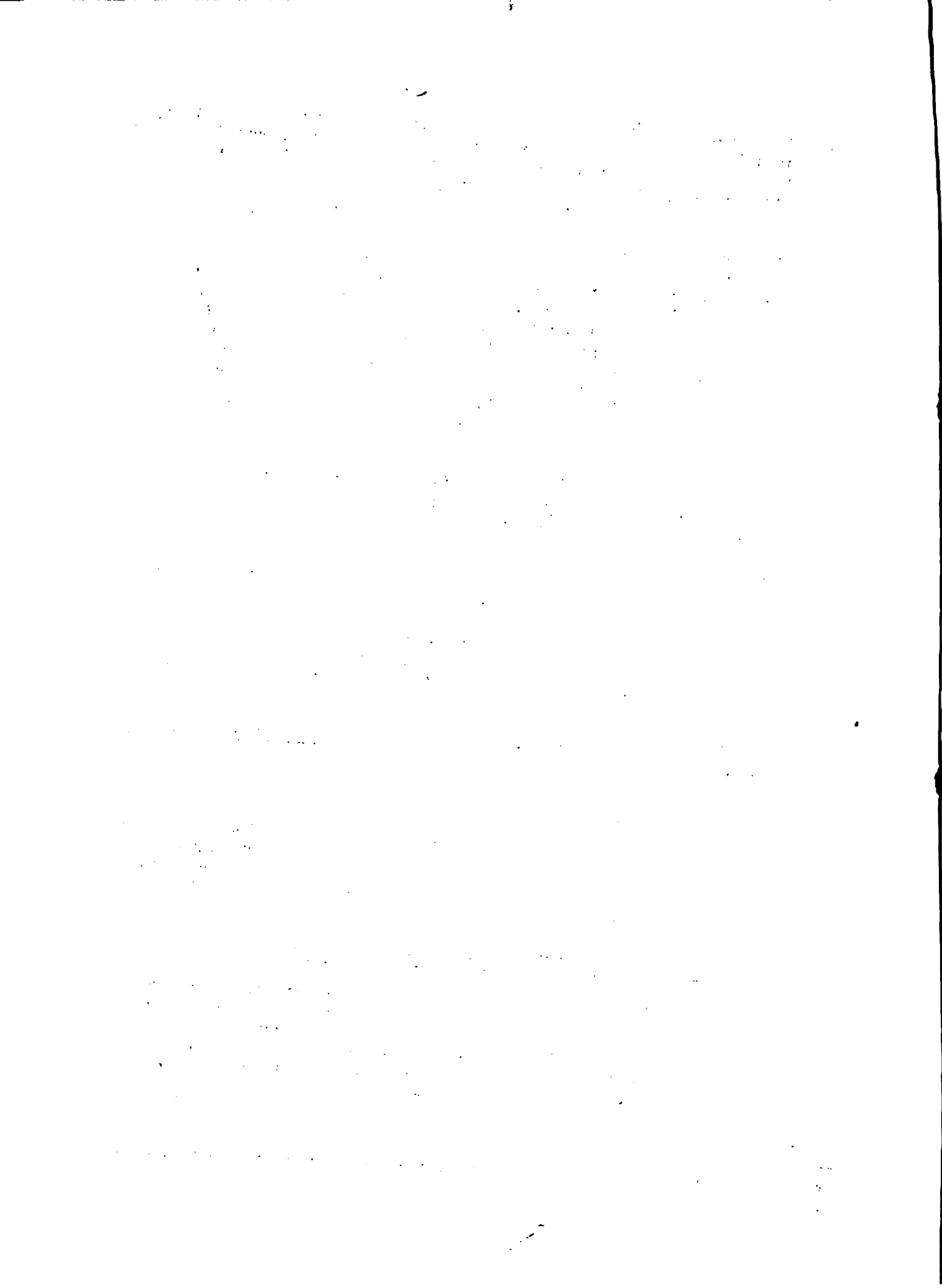
2.4.1. Internal structure

The organisation chart presented in Annex 1 shows that the Research & Resource Development Units report to the Permanent Secretary through the Chief Technical Officer, though there is considerable inter-disciplinary collaboration. The projected reorganisation is set out in Annex 2.

2.4.2. Relationship with other agencies of the sector

The Statutory Boards and other organisations engaged in research receive government grants for research purposes. Although their administrative and technical services are autonomous, they are responsible to their respective Ministries. However, when useful, various divisions within the Ministry of Agriculture will work jointly towards the fulfillment of a programme objective.

* Forestry Development & Watershed Management in the Upland regions - Project No. 67/505 - 1973.



2.4.3. Regional & international relationship

Research entities have and continue to maintain formal and informal relationships with technical and financial agencies, both regional and international, e.g.

- a) introduction, testing and evaluation of improved germplasm material from CIMMYT and CIAT.
- b) Technical and financial assistance to the Coconut Industry Board by U.K. Ministry of Overseas Development and FAO - particularly aimed at solving a specific problem: viz. Lethal Yellowing; and, by IICA on Soil Conservation and Hillside Farming. Particular assistance will be noted under the individual research agency concerned.

2.4.4. Planning and programming systems

Planning and programming fit into the Governmental Policy, and the Research Projects are rated according to the identified priorities.** However, these projects are severely constrained by:

- a) non-availability of qualified experienced personnel
- b) lack of finance
- c) limited inter-divisional integration towards the attainment of established targets.

2.5. Resources of Ministry of Agriculture Units during the last five years

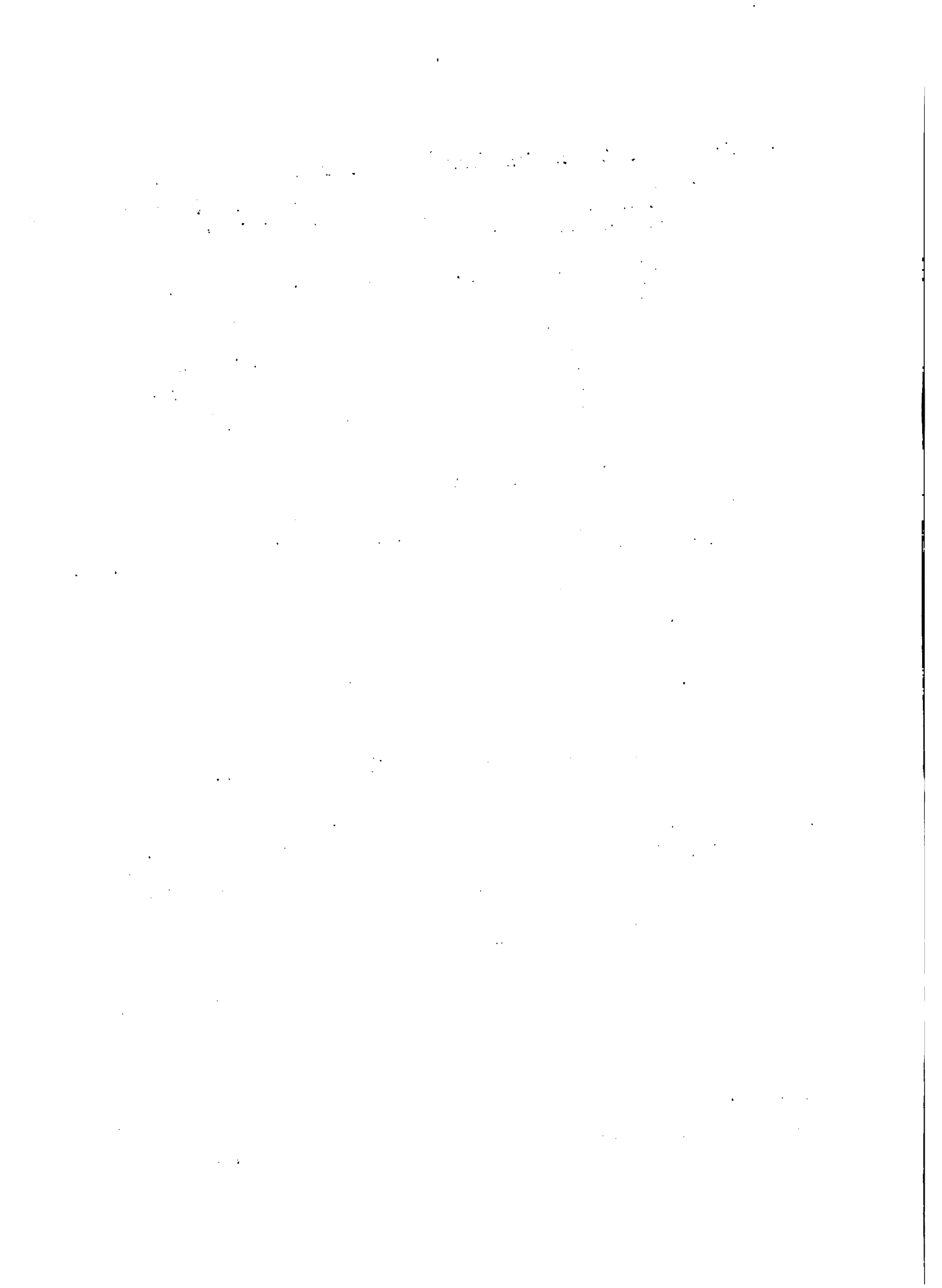
Years

2.5.1. Human - Crop Research (C.R.) Soil and Land Use (S. & L.) Plant Protection (P.P.) Veterinary Division (V.D.) Livestock Division (L.D.) Fisheries Division (Fish D.) Forestry Division (For. D.) Soil Conservation Unit (S.C.U.)

a) Number of Investigators

	<u>C.R.</u>	<u>S.& L.</u>	<u>P.O.</u>	<u>V.D.</u>	<u>L.D.</u>	<u>Fish D.</u>	<u>For.D.</u>	<u>S.C.U.</u>
1973	23	10	16	12	22	6	-	3
1977	12	9	7	12	18	8	2	17

** FAO/IDB Cooperative Programme with the Ministry of Agriculture, December 1976.



b) Academic qualification & specialization

1973

C.R.

6 M.Sc. 1 Botanist and
5 Crop Specialists

1 Ph.D. 1 Plant Breeder

14 B.Sc.

2 Jamaica School of Agriculture
(JSA) Diplomates

S. & L.

4 M.Sc. 1 Geologist and
3 Soil Chemists

6 B.Sc.

P.P.

2 Ph.D. Plant Pathologists

8 M.Sc. 4 Pathologists
1 Entomologist
2 Nematologists
1 Weed Control Specialist

V.D.

12 D.V.M.

L.D.

4 Ph.D.
4 M.Sc.
4 B.Sc.
10 JSA Diplomates

Fish D.

6 B.Sc.

For. D.

-

S.C.U.

3 B.Sc.

1977

C.R.

2 M.Sc. 1 Botanist and
1 Crop Specialist

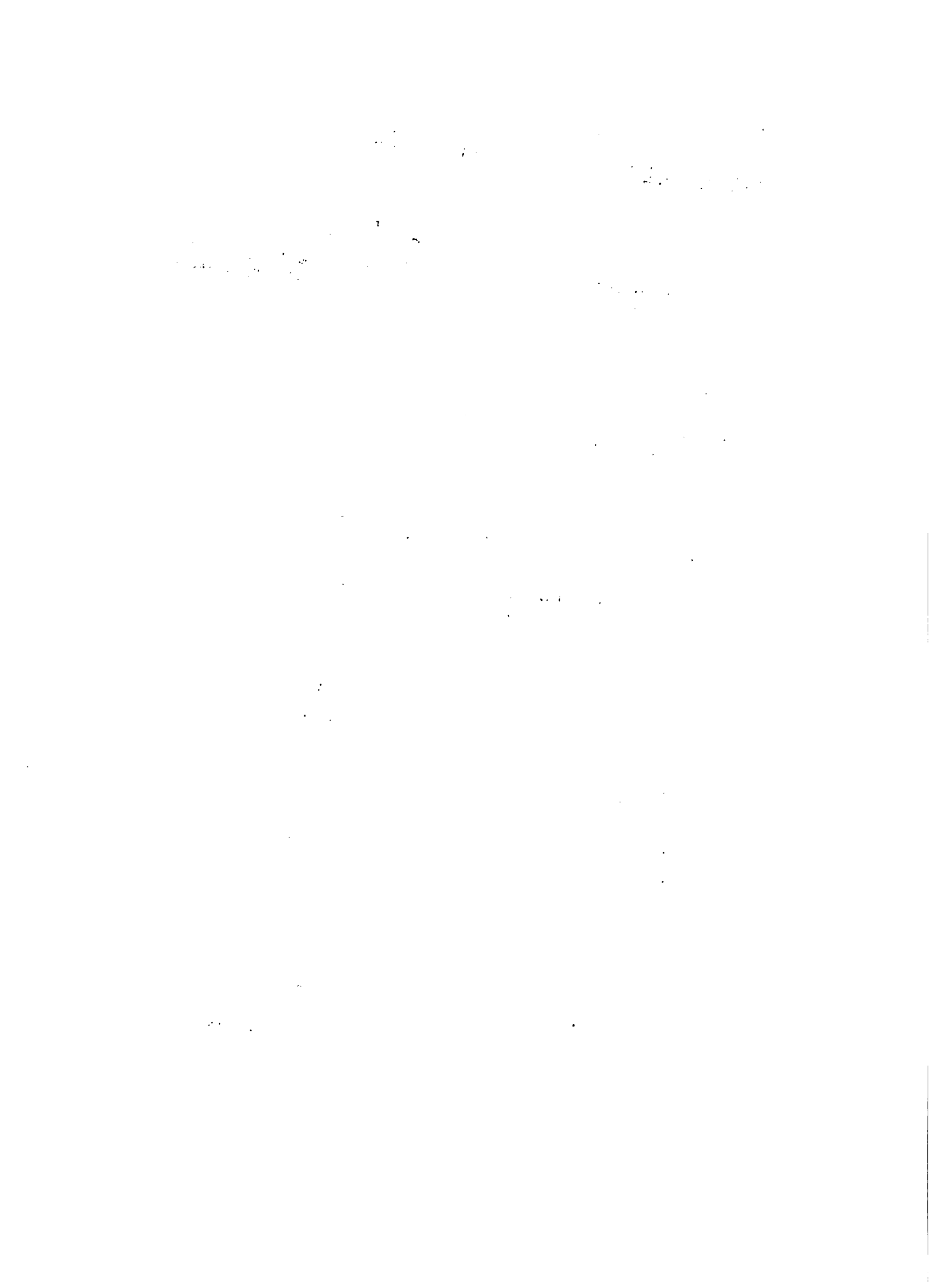
8 B.Sc.

2 JSA Diplomates

S. & L.

3 M.Sc. 1 Geologist and
3 Soil Chemists

6 B.Sc.



P.P.

1 Ph.D. Plant Pathologist
5 M.Sc. 2 Pathologists
2 Entomologists and
1 Weed Control Specialist
1 JSA Diplomate

V.D.

12 D.V.M.

L.D.

3 Ph.D.
3 M.Sc.
6 B.Sc.
6 JSA Diplomates

Fish D.

7 B.Sc.

For. D.

1 B.Sc.
1 JSA Diplomate

S.C.U.

4 B.Sc.
13 JSA Diplomates

Unless specified, all graduates received their formal training in Agriculture.

c) Experience in research (years of technical work)

	<u>1973</u>	<u>1977</u>
Crop Research: Officers with more than 5 years experience	11	7
Officers with less than 5 years experience	12	5
Soil & Land Use: Officers with more than 5 years experience	5	5
Officers with less than 5 years experience	5	4

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 and reliable data collection processes to support informed decision-making.

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 discusses the importance of data quality and integrity. It outlines strategies for identifying and addressing data errors, ensuring that the information used for analysis is accurate and reliable.

6. The sixth part of the document explores the various applications of data analysis in different industries. It provides examples of how data insights can be used to optimize performance, identify trends, and make strategic decisions.

7. The seventh part of the document discusses the ethical considerations surrounding data collection and use. It emphasizes the need for transparency, informed consent, and responsible data handling practices to protect individual privacy and rights.

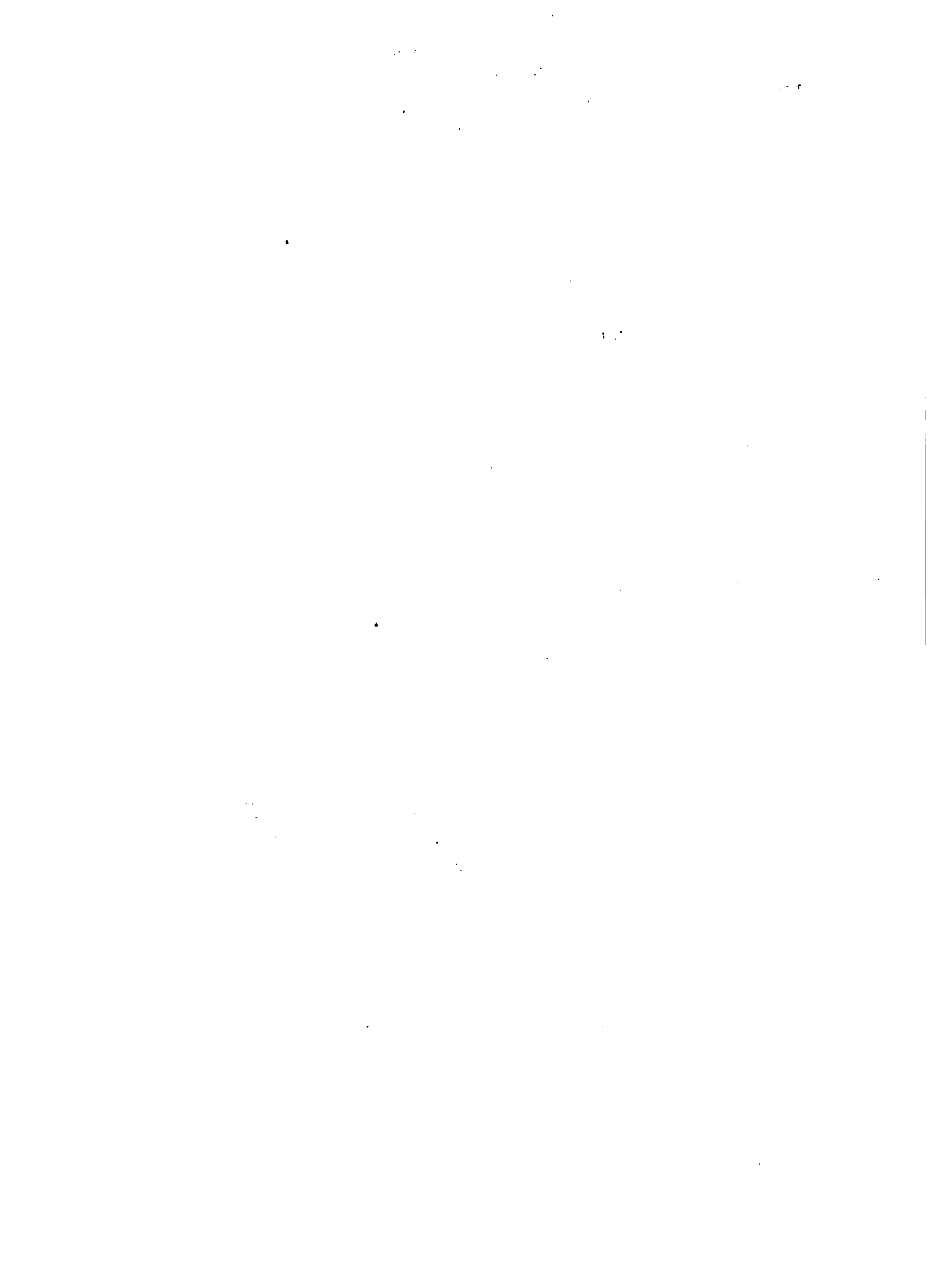
8. The eighth part of the document provides a summary of the key findings and recommendations. It reiterates the importance of a data-driven approach and offers practical advice for implementing effective data management practices.

9. The final part of the document includes a list of references and resources for further reading. It provides links to relevant articles, books, and online tools that can help readers deepen their understanding of data management and analysis.

		<u>1973</u>	<u>1974</u>
Plant Protection:	Officers with more than 5 years experience	5	6
	Officers with less than 5 years experience	11	1
Veterinary Div.	Officers with more than 5 years experience	5	6
	Officers with less than 5 years experience	7	6
Livestock Div.	Officers with more than 5 years experience	13	10
	Officers with less than 5 years experience	9	12
Fisheries Div.	Officers with more than 5 years experience	1	3
	Officers with less than 5 years experience	5	4
Forestry Div.	Officers with more than 5 years experience	0	0
	Officers with less than 5 years experience	0	2
Soil Conservation Unit:	Officers with more than 5 years experience	1	1
	Officers with less than 5 years experience	2	12

d) Position and salary

Having been classified on appointment, promotion is within the grade. However, the number of vacant posts within the grade limits the vertical movement of the employee. The salary scales presented below are to be reclassified, but temporary regrading of salaries has been instituted. Except for grade IV, which has not been altered, these revised salaries appear in brackets. All fall under the group of Natural, Physical and Social Sciences (N.P.S.).



Grade IV	J\$9,960 x 480 - 11,400 p.a.*
Grade III	J\$8,580 x 420 - 9,840 p.a. (+ J\$1,200)
Grade II	J\$7,380 x 360 - 8,460 p.a. (+ J\$1,800)
Grade I	J\$4,500 x 300 - 6,900 p.a. (+ J\$2,100)

Per capita disposable** income in Jamaica:***

<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
465	545	576	653	780	1005	1163	1185

e) Stability & job security

There is considerable stability, but for personal advancement the individual must show initiative under the 'merit' system.

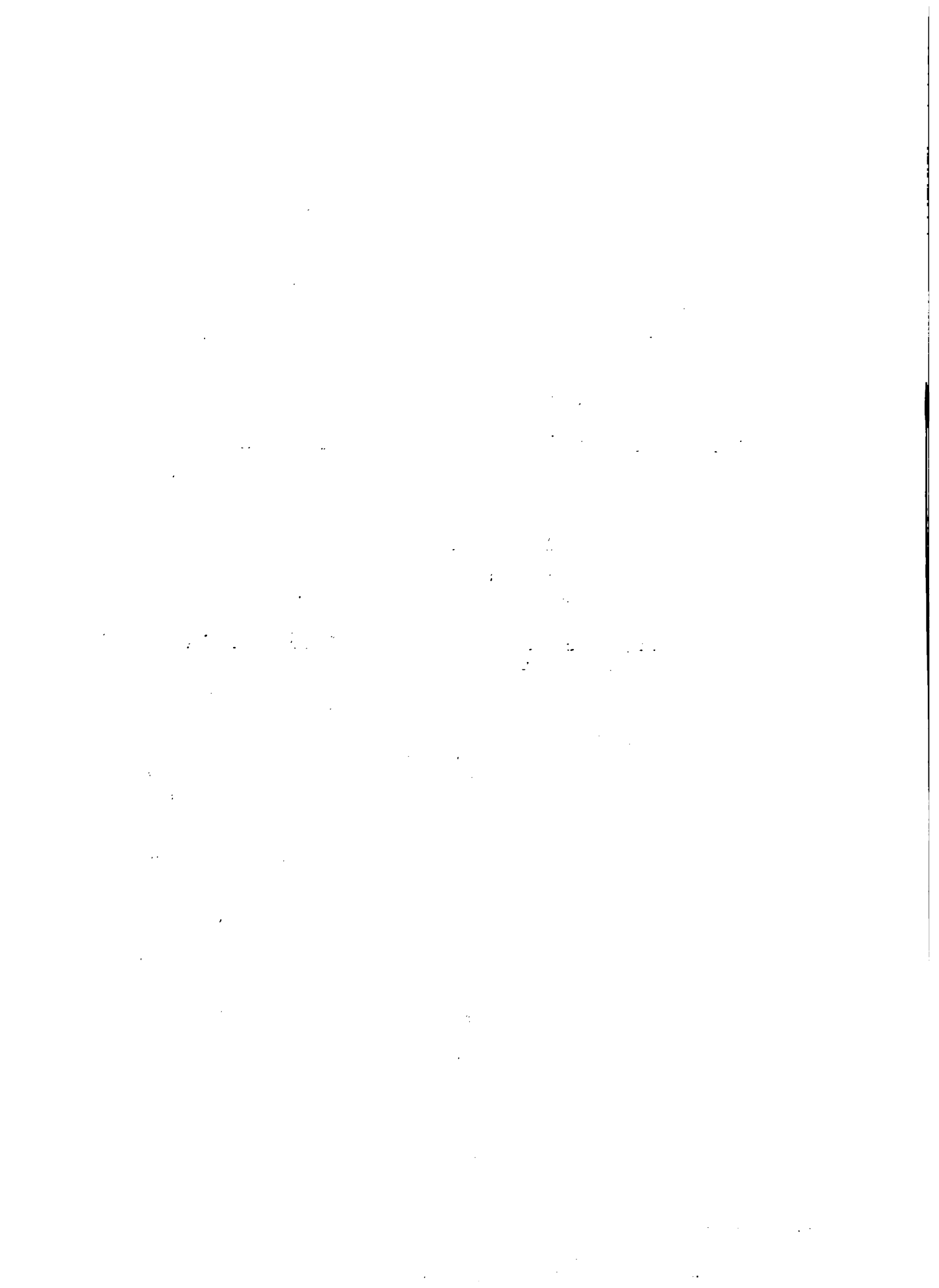
f) Number of auxiliary personnel (technical assistants & general services personnel)

	<u>Technical Assistants</u>	<u>Office</u>	
1974 to 1977	Crop Research including research assistants, headmen and drivers & artisans	Crop Research	16
		Agricultural Chemistry	6
			25
	Soil & Land Use		11
	Plant Protection	Plant Protection (some partly field staff)	12
	Veterinary Div.		15
		+ 4 Quarantine Officers	
	Veterinary Div.		11
	Livestock Div. including research assistants (non-diplomates), laboratory technicians, headmen, drivers, rangers, farm hands & artisans		71
			10

* One Jamaican dollar equals U.S.\$0.78

** Disposable income - that which remains after all compulsory income tax has been abstracted.

*** Statistics Yearbook of Jamaica, 1976.



<u>Technical Assistants</u>		<u>Office</u>
Fisheries Div.	1	2
Forestry Div. (Research)	2 sharing time and facilities with Forestry Div.	1
Soil Conservation Unit	semi- permanent 13 or tem- porary assistants	4

2.5.2. Physical

Infrastructure (buildings, land):

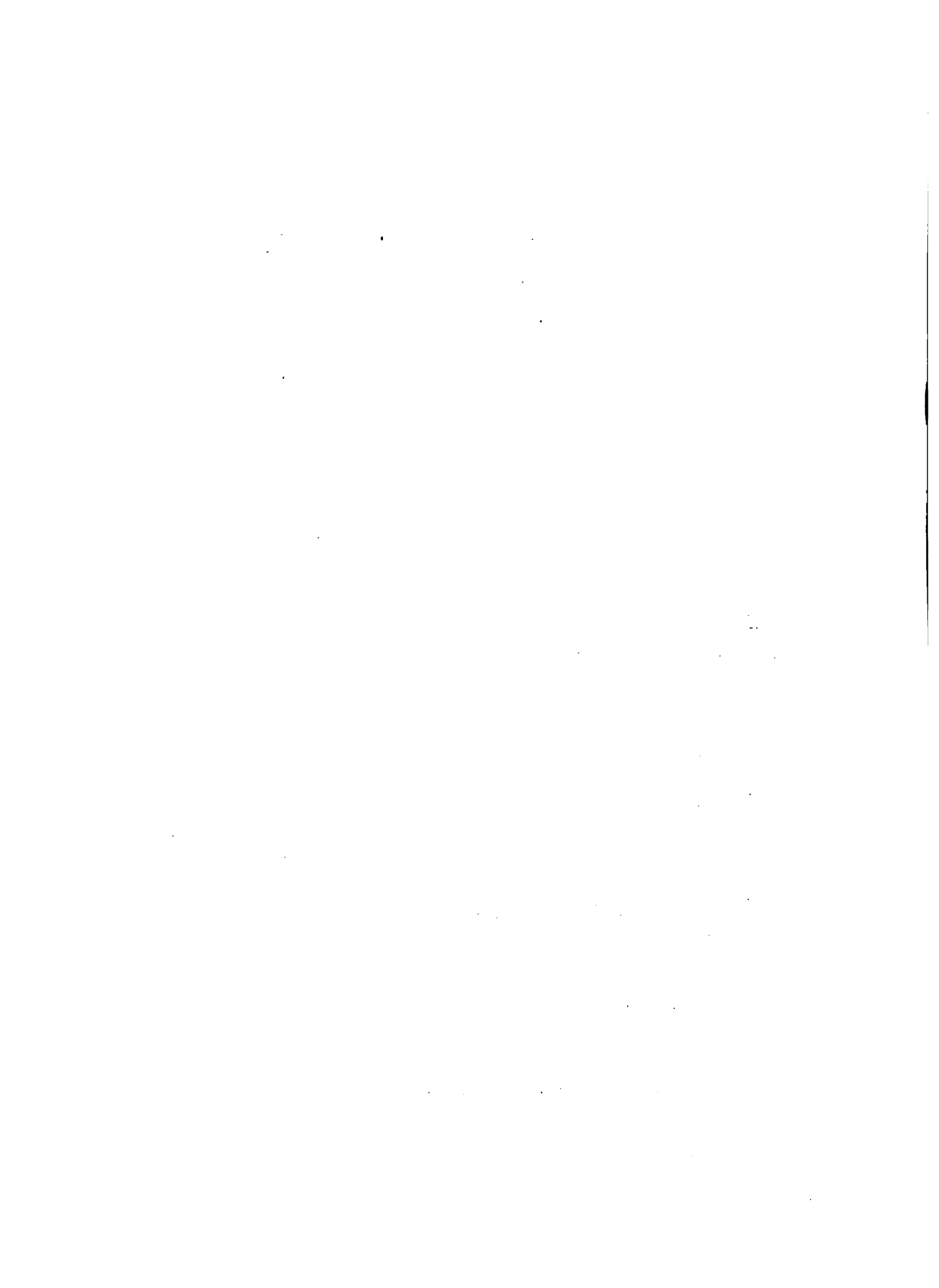
- Soil & Land Use:

2 buildings, one for 2 offices, the other housing an Analytical Laboratory and a greenhouse.

- Crop Research:

Offices at headquarters in Kingston and Research Stations at the following areas:

1. Lawrencefield: St. Catherine. Attitude 50 ft. Area: 94 acres (irrigated). Housing for 2 Agronomists & Headman.
1 Office
1 Store Room and 1 Implement shed.
2. Bodles: St. Catherine. Altitude 50 ft. Area: 2,200 acres (500 acres irrigated).
Office Buildings
Housing for 12 - 14 people, some of which are for livestock research personnel
Chemistry - analytical laboratory
Livestock Buildings
Rabbitry
Mechanical workshop
Store rooms
Implement sheds
Farm equipment



3. Grove Place: Manchester. Altitude 1,400 ft. Area: 1,200 acres (not irrigated).
Office buildings
Implement shed
Housing for 4 senior staff and 5 technical staff
4 houses for labourers.
4. Orange River: St. Mary. Altitude 500 - 1,000 ft. Area: 305 acres (not irrigated).
Office buildings
Housing for 4 senior staff and for technical & service personnel
Implement shed
Buildings for small stock
Tractors and farm equipment
Insectary.
5. Beverley Pimento Research Station: St. Ann. Altitude 300 ft. Area: 31 acres (not irrigated).
Office
1 Headman cottage
2 apartments
Storage tank 10,000 gall. for domestic use.
6. Top Mountain: St. Andrew. Altitude 3,500 ft. Area: 8 acres (5 of which are irrigated).
Simple cottage
Seed and implement room
storage tank

- Plant Protection:

Offices, laboratories and 2 greenhouses in Kingston. Other facilities at Orange River and at Regional Offices of the Ministry of Agriculture.

- Veterinary Division:

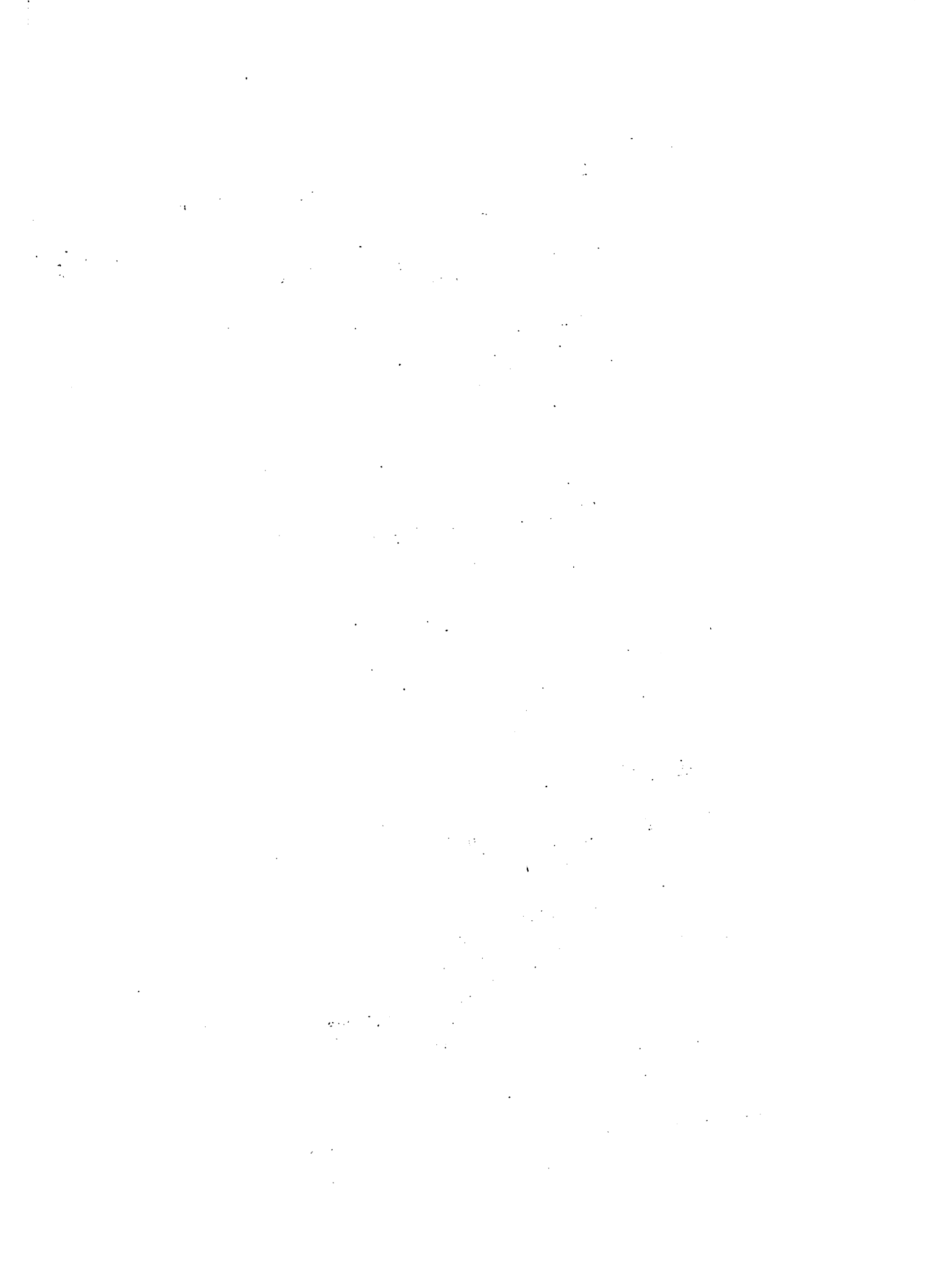
Facilities consist of a laboratory complex including Pathology, Bacteriology, Parasitology and Haematology laboratories; Poultry Pathology and Clinical Pathology Sections and auxiliary services all located in Kingston. Outlying parishes have basic office and laboratory/pharmacy facilities.

- Livestock Division:

See under Crop Research 2.5.2.2. and 2.5.2.3.

- Fisheries Division:

Modest office/laboratory/library.



- Forestry Division:

At the moment laboratory facilities and equipment are being set up (USAID Programme).

- Soil Conservation Unit:

This unit maintains research/demonstration plots at two stations viz. Smithfield, Hanover and Allsides, Trelawny, Facilities at

(a) Smithfield (600 - 900 ft. altitude) are as follows:

- 110 acres
- dormitory for 18 trainees
- classroom building
- office
- implement shed
- mechanical equipment
- meteorological station

(b) Allsides (2,000 - 2,500 ft. altitude)

- 5 acres
- offices
- mechanical equipment
- meteorological station.

- Library - located in Kingston

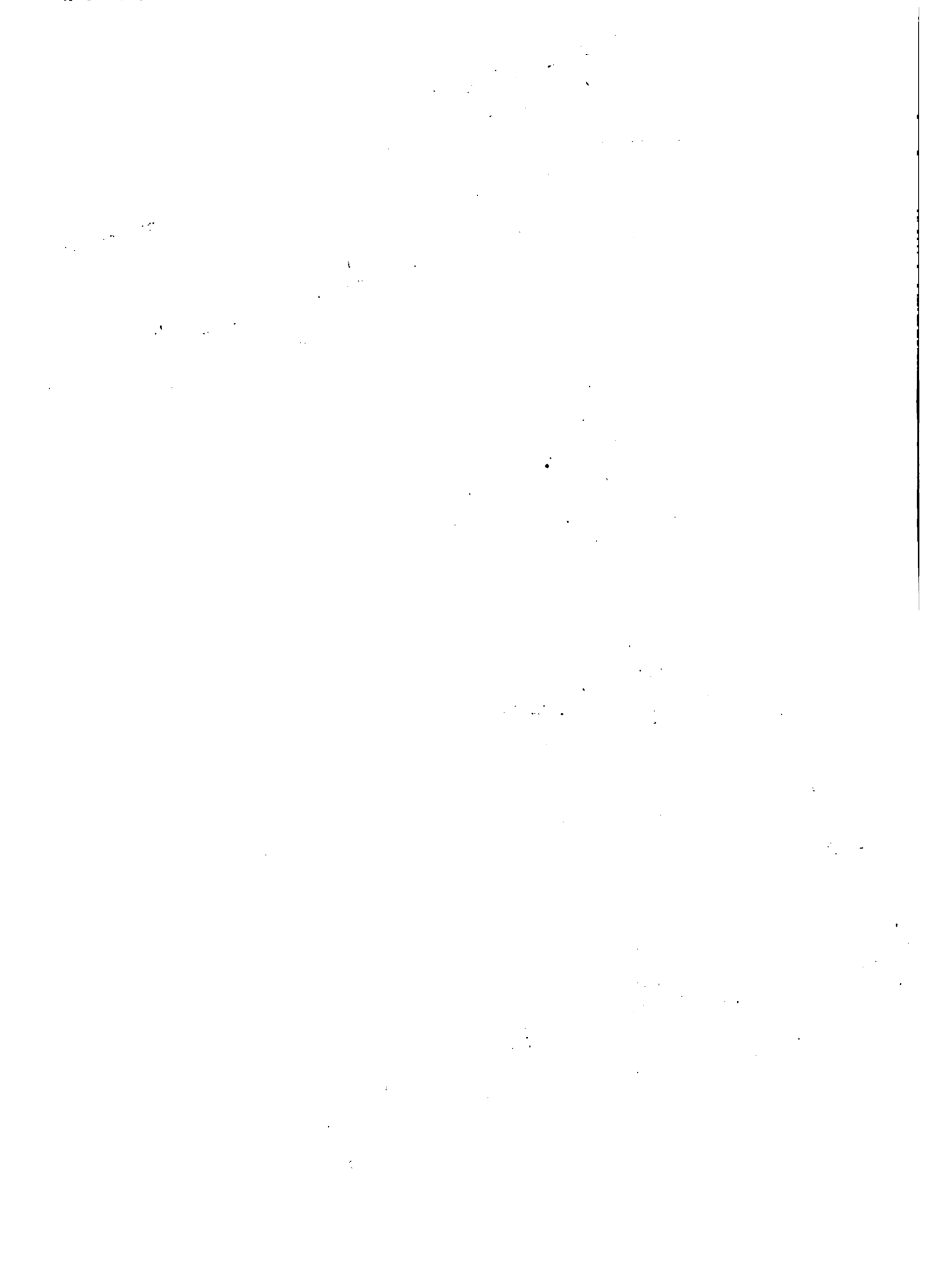
Central library for all Divisions

Books	13,000
Periodicals (titles)	1,550
Maps	85
Pamphlets	2,500

2.5.3. Financial

Source: Jamaica Government.

Annex 3 presents the Government Expenditures on Crop Research, Plant Protection and Soil and Land Use during the period 1971 - 1977. For comparative purposes, Annex 3A tabulates the budgetary expenditures of the various agricultural research units for the 1974 - 1975 period. Other funding agencies have been specified wherever appropriate.



Annual operating budget (total budget less personnel expenses)

The Personnel Budget represents over 25% of the allocated funds.

Timeliness (dates for disbursements) and proportion of budget needs covered

The budget is disbursed in April, a portion of it being retained for contingencies.

2.6. Scope of the Ministry of Agriculture's Research Divisions

2.6.1. Geographical Coverage

Number and location of operating units are identified under 2.1. and 2.5.2. Each research station is representative of an ecological/geographical area where local problems are given priority, either in livestock and/or crop research.

In Jamaica 1.4 million acres are suitable for agriculture (about 50% of total land area) all of which are subject to research and extension coverage.

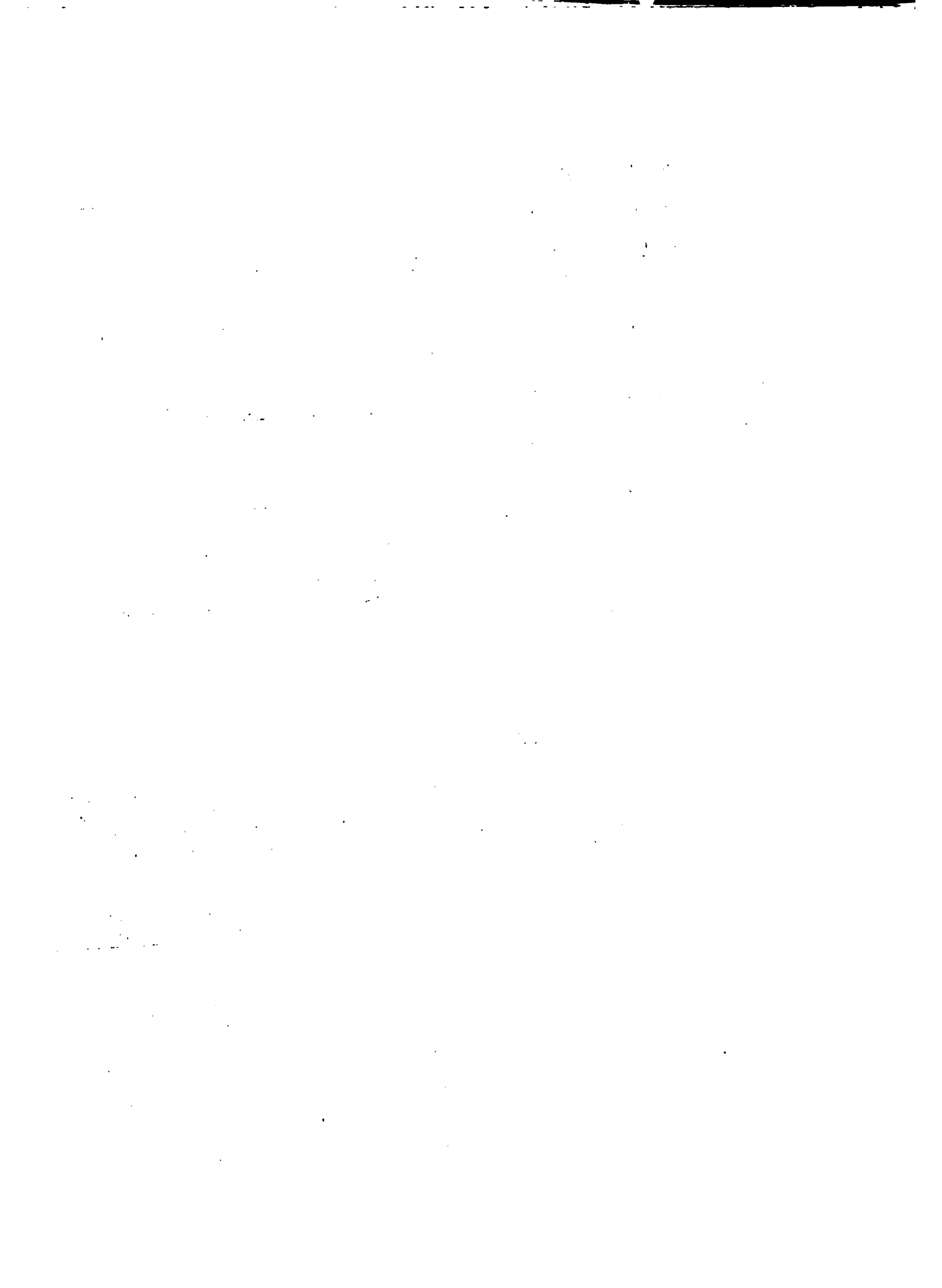
2.6.2. Clients

Number and type of agricultural clients:

2.6.2.1. Soil and Land Use Section

(a) Government is the largest client via the researcher/extension agent, who in turn serves farmers of mainly the medium sized farms (5 - 25 acres). For general information the pattern of land distribution for agriculture in Jamaica is presented below:

<u>Farm size (acres)</u>	<u>Number of Farms</u>		<u>Farm Land Acres</u>	
	<u>(000)</u>	<u>% of total</u>	<u>(000)</u>	<u>% of total</u>
0 - 5	151.7	78.4	229	15.4
5 - 25	37.6	19.5	341	22.9
25 - 100	3.1	1.6	127	8.5
100 - 500	0.7	0.4	148	9.9
over 500	<u>0.3</u>	<u>0.1</u>	<u>644</u>	<u>43.3</u>
TOTALS	193.4	100.0	1489	100.0



Government is also served by the preparation of land capability maps when new developments are undertaken, and for subdivisions for property development. The Soils and Land Use Division has to approve subdivisions prior to final ratification.

- (b) The Soil and Land Use Division provides advisory service for crop/fertilizer use for medium, small and large sized farms.
- (c) Cartographic service for government and private sector.
- (d) Coconut, Tobacco, Coffee Boards, e.g. routine analyses.
- (e) Various clients - salinity tests for irrigation water from wells and rivers.
- (f) Collaboration with chemical/ fertilizer manufacturers on research programmes to develop formulae for crop/fertilizer needs.

2.6.2.2. Crop Research Division

Government is the largest client. Research results are passed on to the Extension and Production units and often to the private progressive farmer who is prepared to collaborate by introducing new technology. Seed and chemical companies both benefit and often participate in research and extension. Bauxite companies have conducted research on mined-out lands and collaborated with government in the adoption of their findings.

2.6.2.3. Plant Protection Division

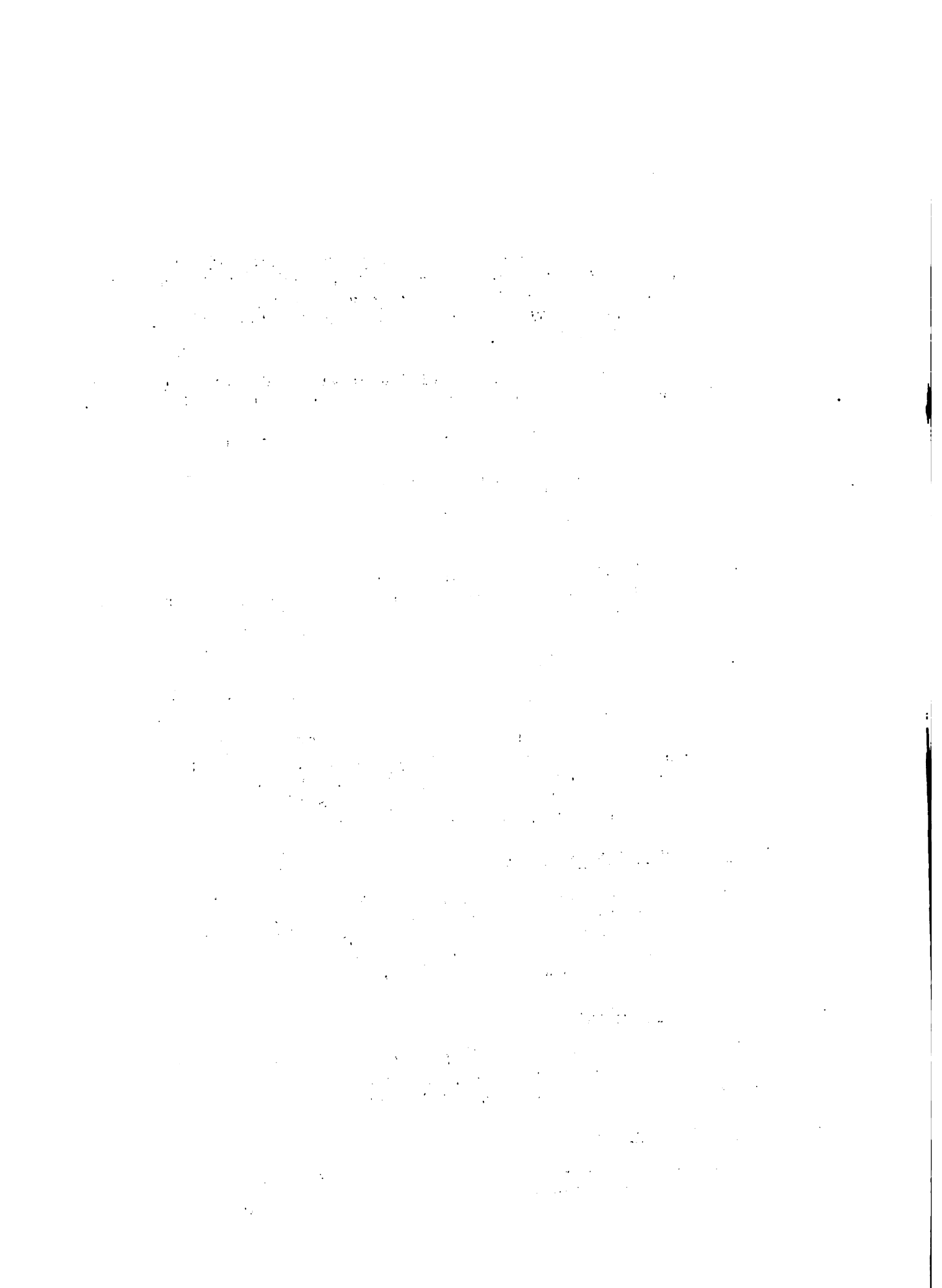
Government is the largest client. Plant Protection screens and evaluates the latest chemicals, and in collaboration with crops and soils research results, are able to give recommendations to all farmers. Results are sometimes related to specific crops, e.g. choice of Nematocides on pineapples.

2.6.2.4. Veterinary Division

Government is the largest client. Advisory and therapeutic services are carried out from the various parish offices and regulatory measures such as vaccinations are undertaken.

2.6.2.5. Livestock Division

All livestock farmers in the island benefit from advisory services based on research findings.



2.6.2.6. Fisheries Division

Inland fish farmers obtain subsistence stocks of appropriate fish spp. Sea fishermen benefit from the developmental studies on utilization of fish stocks exploited by Jamaican fishermen.

2.6.2.7. Forestry Division

Farmers, particularly those on steep lands, benefit by way of choice and management of tree crops. Also, Government benefits in the area of Water shed Management in highly eroded areas.

2.6.2.8. Soil Conservation Unit

Small hillside farmers benefit from soil conservation treatments and also ongoing research programmes on hillside farming systems aimed at improving the family income.

2.6.3. Problems taken care of:

2.6.3.1. Soil & Land Use Division

The Division is continuously involved in providing detailed land capability maps on land reform planning programmes. Increased food productivity based on new technology has been attained from the medium sized farms 5 - 25 acres. Efforts are being made by introduction of appropriate technology to accelerate the progress of the small farmer (0 - 5 acres) from subsistence level agriculture. Large farms are able to contribute to export production and are often not dependent on facilities provided by Government. Medium and small farms usually aim to meet local and/or domestic food demands.

2.6.3.2. Crop Research Division

Problems taken care of:

The biological economic value of the crop is expected to reflect the research and development inputs. Currently improved cassava varieties and onions which will give an acceptable year-round performance are high on the list of priority. Irish potato production in the last decade has considerably increased through research. Tree crops research results are more difficult to implement as they require long term investments which the small farmer is unable to sustain. The Crop Research Programme was geared to serving the two Land Reform Programmes, Food Farms (now defunct) and Land Lease, to provide high yielding plant material and other inputs for the Production Department.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud.

2. The second part of the document outlines the specific requirements for record-keeping, including the need to maintain original documents and to keep copies of all supporting documents. It also discusses the importance of ensuring that records are accessible and retrievable.

3. The third part of the document discusses the importance of regular audits and reviews of records. It emphasizes that audits are a key component of the internal control system and are essential for ensuring the accuracy and reliability of the financial statements.

4. The fourth part of the document discusses the importance of training and education for all personnel involved in the financial system. It emphasizes that ongoing training is essential for ensuring that personnel are up-to-date on the latest regulations and best practices.

5. The fifth part of the document discusses the importance of maintaining a strong internal control system. It emphasizes that a robust internal control system is essential for preventing fraud and ensuring the accuracy of the financial statements.

6. The sixth part of the document discusses the importance of transparency and disclosure. It emphasizes that providing clear and concise information to stakeholders is essential for building trust and confidence in the financial system.

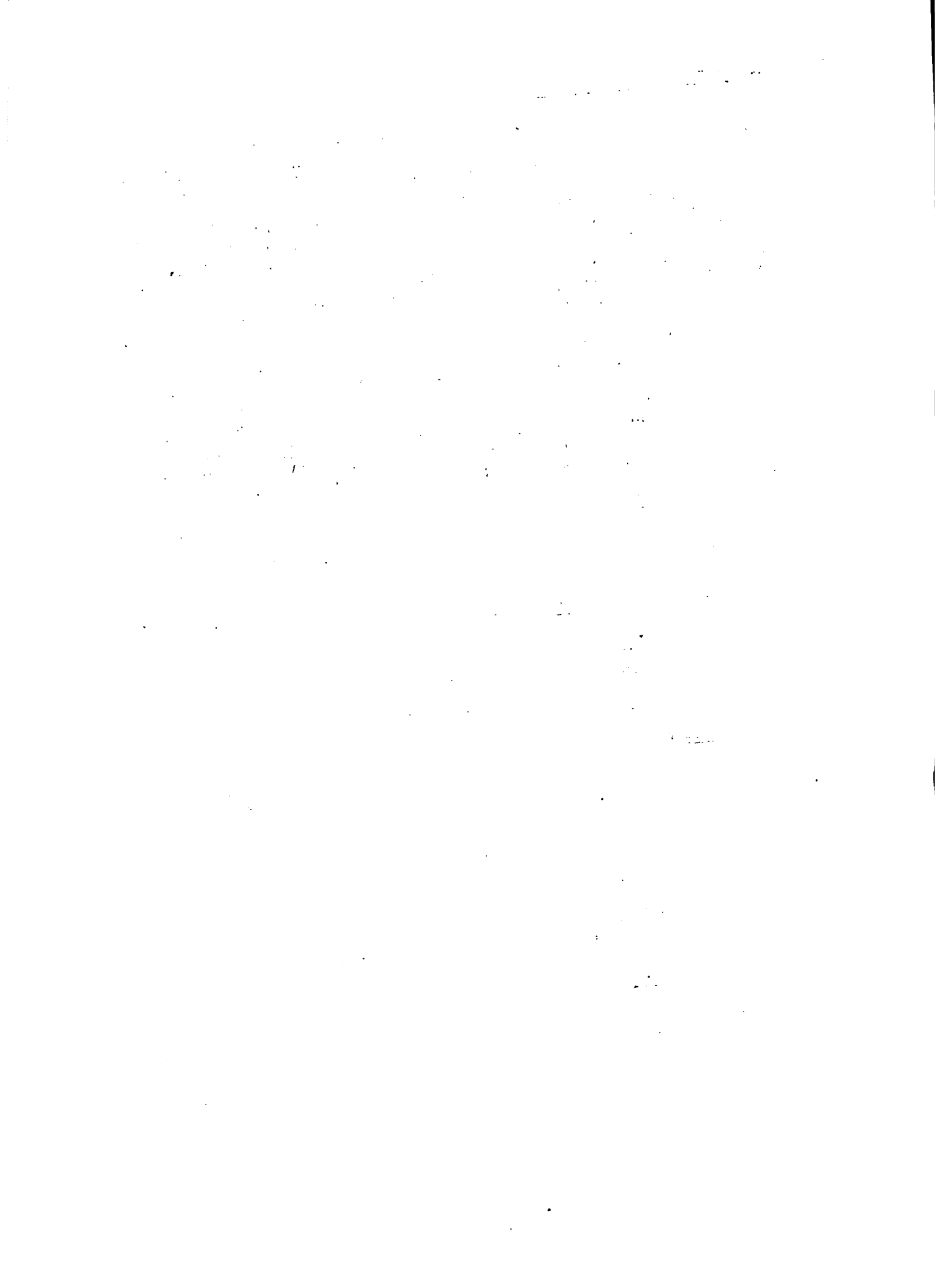
2.6.3.3. Plant Protection Division

Although the basic laboratory is at Kingston, considerable decentralization of staff and equipment has taken place in order to service the Land Reform Programme and to provide support to the Islandwide Extension Services. The scarcity and unavailability of chemicals at critical times, especially in remoter areas, is a problem. Alternative chemicals are also difficult to obtain. Clients are from all sizes of farms and the service is usually crop related. Sugar cane and banana are taken care of by their own Statutory boards. The screening of chemicals for safety is one of the regulatory functions of the Plant Protection Division. The use of fertilizer is by and large accepted by all, but farmers take a little time to be convinced of the optimum level to produce an economic return on their crops. The use of plant protection methods need more skills and will depend on supervision and technical knowledge of application at the right time and in the right quantity. The use of fertilizer and plant protection methods are related to the crops, and probably used more on the medium and large sized farms than on the small farms.

2.6.3.4. Veterinary Division

Over the last five years this Division has carried out research in the following problem areas:

1. Bacterial & Viral diseases
 - a. - Pasteurella pneumonia in pigs
 - b. - Mycoplasmosis in chickens
 - c. - Newcastle disease in poultry.
2. Helmintology
 - a. - Nematode larval counts on herbage on pastures grazed alternately by calves and cows.
3. Toxicology
 - a. - Oxalate nephrosis in horses
 - b. - Photosensitization in cattle
 - c. - Laryngeal oedema in suckling calves.
4. Miscellaneous
 - a. - a wasting disease in beef cattle in south Manchester.



2.6.3.5. Livestock Division

- a. - Animal breeding
- b. - Husbandry technology
- c. - Feed technology.

2.6.3.6. Fisheries Division

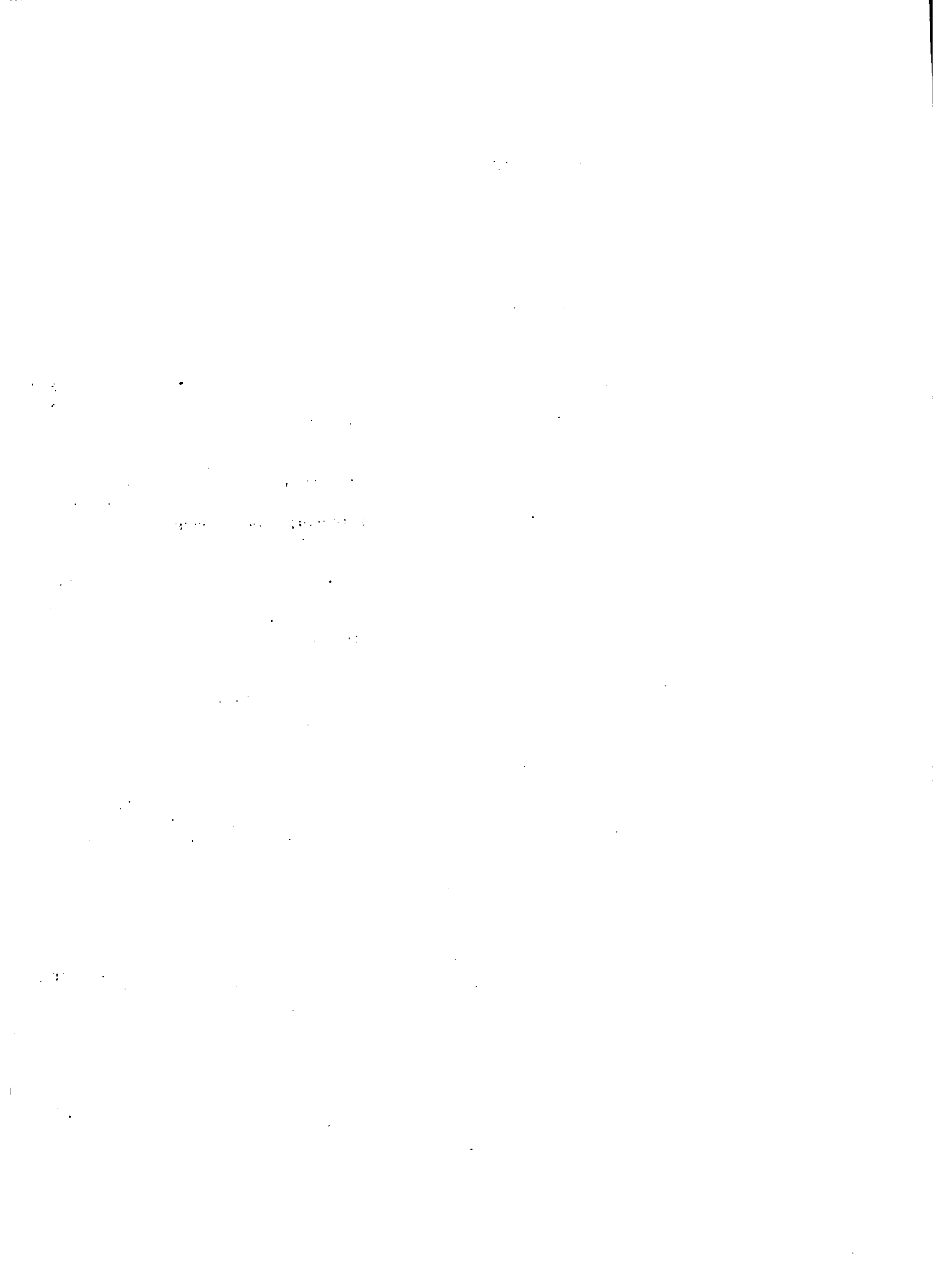
Areas of problem solving include:

- a. - Stock assessment and management studies - designed to assess the amount of fish which each species can provide without damaging the prospects for the future.
- b. - Bio-ecological studies on the Spring lobster so as now to be able to make firm recommendations with respect to minimum carapace length of lobsters to be taken under conservation regulations to **protect the stocks of** lobsters occurring along the Jamaican coast.
- c. - Biological studies on the sea mullet. These studies have progressed to the stage where it can be ascertained that the species will adapt quite readily to fresh water and grow satisfactorily with or without supplementary feeding. Studies are continuing.
- d. - Inland Fisheries. The culture of African Perch continues - and the introduction of mullets is being assessed.

2.6.3.7. Forestry Division

Within the normal Forestry Programme there is a small research unit with a full time officer and a research assistant working in cooperation with the UNDP project on Forest Development & Watershed management. The objectives currently are:

- (1) to improve the efficiency of the planting programme through
 - (a) type of planting stock
 - (b) improvement in methods of plantation establishment, specifically in the areas of site preparation, planting technique, crew organization and in weed control.
- (2) To set the stage for the
 - (a) improvement in local seed supply; and
 - (b) investigation of any genetic improvement possibilities.



- (3) Species adaptation and Provenance trials (seeds obtained from CATIE seed bank in Turrialba, Costa Rica).
- (4) Growth studies on native species.
- (5) Continued study and surveys of the incidence of mites on P. caribaea and release of exotic predators.

2.6.3.8. Soil Conservation Unit

This unit is developing a blueprint for the construction and maintenance of terraces and/or other appropriate conservation techniques. Also efforts at upgrading soil fertility hillside farms are resulting in increased productivity for the small farmer.

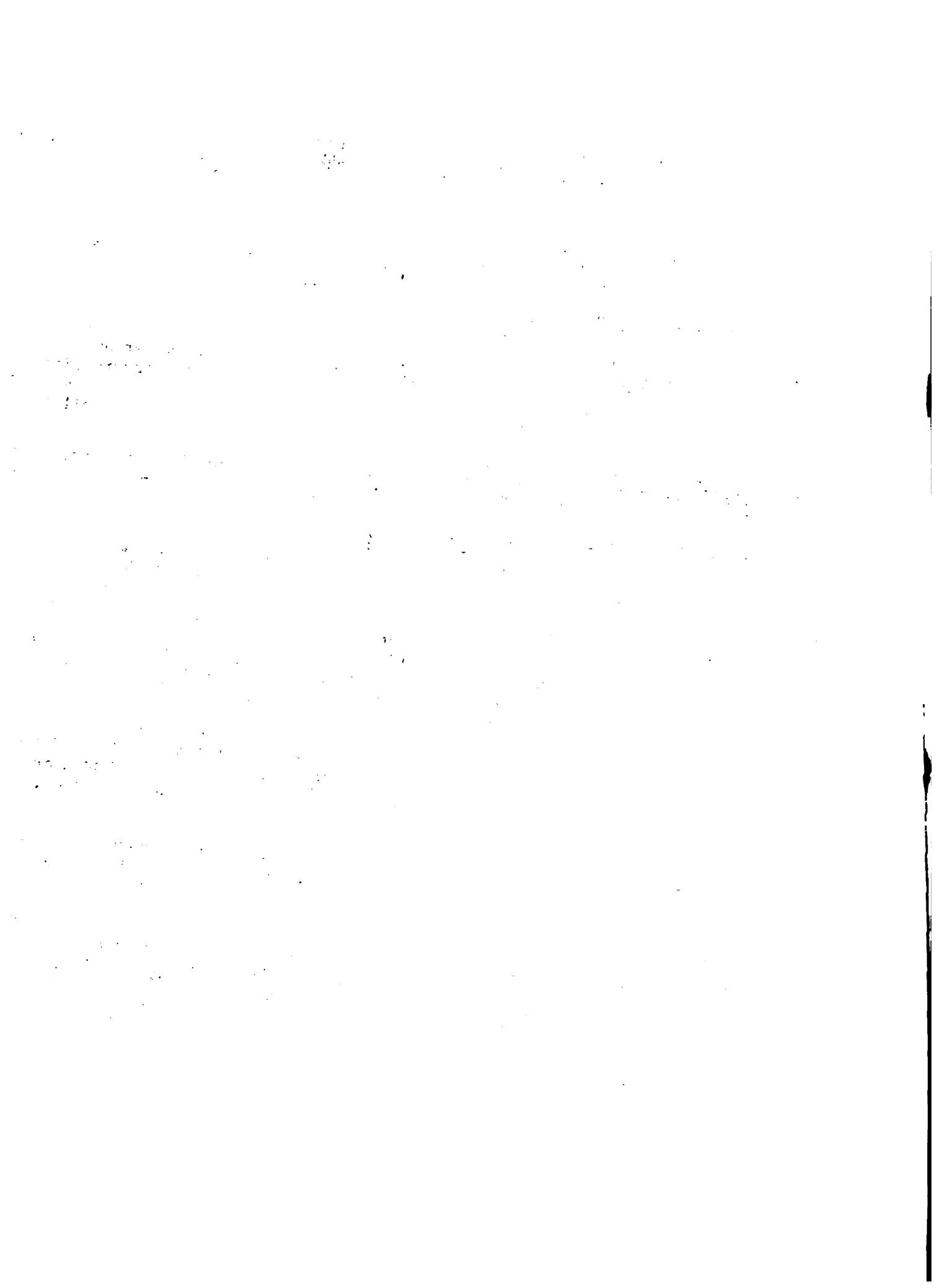
3. EFFICIENCY AND EFFECTIVENESS OF EACH MINISTRY OF AGRICULTURE RESEARCH UNIT (LAST 5 YEARS)

3.1. Relationship between project and rural sector

All projects cater to the Rural Sector Programmes. All research projects are relevant to the rural agricultural problems.

- 3.1.1. The Soil and Land Use Section plays an important part in updating the Soil Maps and preparing detailed Land Capability Maps which provide the basis for planning areas for Land Lease and Food Farm programmes, matching crops onto appropriate soils so as to give suitable recommendations.
- 3.1.2. The Crop Research Section recommends the most suitable type of planting material and ensures its rapid multiplication in order to help the Plant Production Unit to serve these programmes. Emphasis is placed on high yielding varieties, e.g. of Cassava, Corn, Rice, Irish Potato and Onion.
- 3.1.3. The Plant Protection Section has decentralized a part of its staff so as to provide on-the-spot service, particularly to the Land Reform Scheme.
- 3.1.4. All activities carried out by the Veterinary Division relate to rural sector needs, whether they pertain to small or large rearers of cattle, goats, sheep, poultry, rabbits and pigs. For example, in 1974 the following number of visits were paid to farmers:

Clinical	8,134
Disease control	7,721
Advisory	816



- 3.1.5. In the recent past activities of the Livestock Division related to: (1) breed improvement of beef and dairy herd; (2) fertility evaluation and artificial insemination; (3) pasture improvement and (4) animal nutrition.
- 3.1.6. The management and stocking of inland fisheries and improvement in marine fishing techniques have related to the needs of the industry.
- 3.1.7. The activities carried out by the Forestry Division relate directly to rural development needs and watershed management.
- 3.1.8. The rural areas of Jamaica are mainly located on hillsides, requiring soil conservation measures which will improve the productivity of the small farmer.
- 3.2. Achievements and failures of agricultural research projects

Achievements:

- 1) Introduction and testing of new varieties of onion, thereby extending the cropping season. As a result, total acreage and yield per acre have increased from 16 acres yielding 2 tons/acre in 1970 to 837 acres yielding 3.5 tons/acre in 1975. Yield figures of as high as 15 tons/acre have been reported.
- 2) Introduction and testing of new varieties of rice, e.g. CICA 4 and CICA 9 superseeding IR 8, also giving better milling quality. Additionally, better weed control resulted through herbicides trials.
- 3) Irish potato - testing of introductions under various ecological conditions, including the growing of a Fall planting on the irrigated lowlands, resulted in greater acreage and yields under production. This, together with pest and disease control and improved agronomic work, resulted in a significant overall improvement of this crop, see Table 1 below.

Table 1

<u>Year</u>	<u>Acreage harvested</u>	<u>Yield per acre (short tons)</u>
1968	2,420	3.33
1969	2,101	4.50
1970	2,216	4.60
1971	3,321	4.38
1972	4,211	4.22
1973	3,152	3.12
1974	3,420	4.71

Source: Agricultural Planning Unit, Ministry of Agriculture.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for ensuring the integrity and reliability of financial data. This section also outlines the various methods used to collect and analyze data, highlighting the need for consistency and transparency in the reporting process.

In the second section, the focus is on the challenges faced by organizations in implementing effective data management practices. It identifies key areas such as data security, privacy, and access control, and provides recommendations for addressing these issues. The text also discusses the role of technology in enhancing data management capabilities and the importance of regular audits to ensure compliance with relevant regulations.

The third section delves into the specific requirements for data retention and disposal. It details the legal and regulatory obligations that organizations must adhere to, including the need to retain data for a specified period and to securely dispose of it once the retention period has expired. This section also addresses the importance of documenting data retention policies and procedures to ensure they are consistently followed.

The fourth section discusses the importance of data quality and the impact of poor data on decision-making. It highlights the need for organizations to invest in data quality management tools and processes to identify and correct errors and inconsistencies. The text also emphasizes the role of data governance in ensuring that data is accurate, complete, and up-to-date, and provides guidance on how to establish a robust data governance framework.

The fifth section focuses on the ethical considerations surrounding data management. It discusses the importance of transparency, accountability, and fairness in the use of data, and provides guidance on how to ensure that data is used in a responsible and ethical manner. This section also addresses the need for organizations to be open and honest about their data practices and to provide clear information to individuals about how their data is being used.

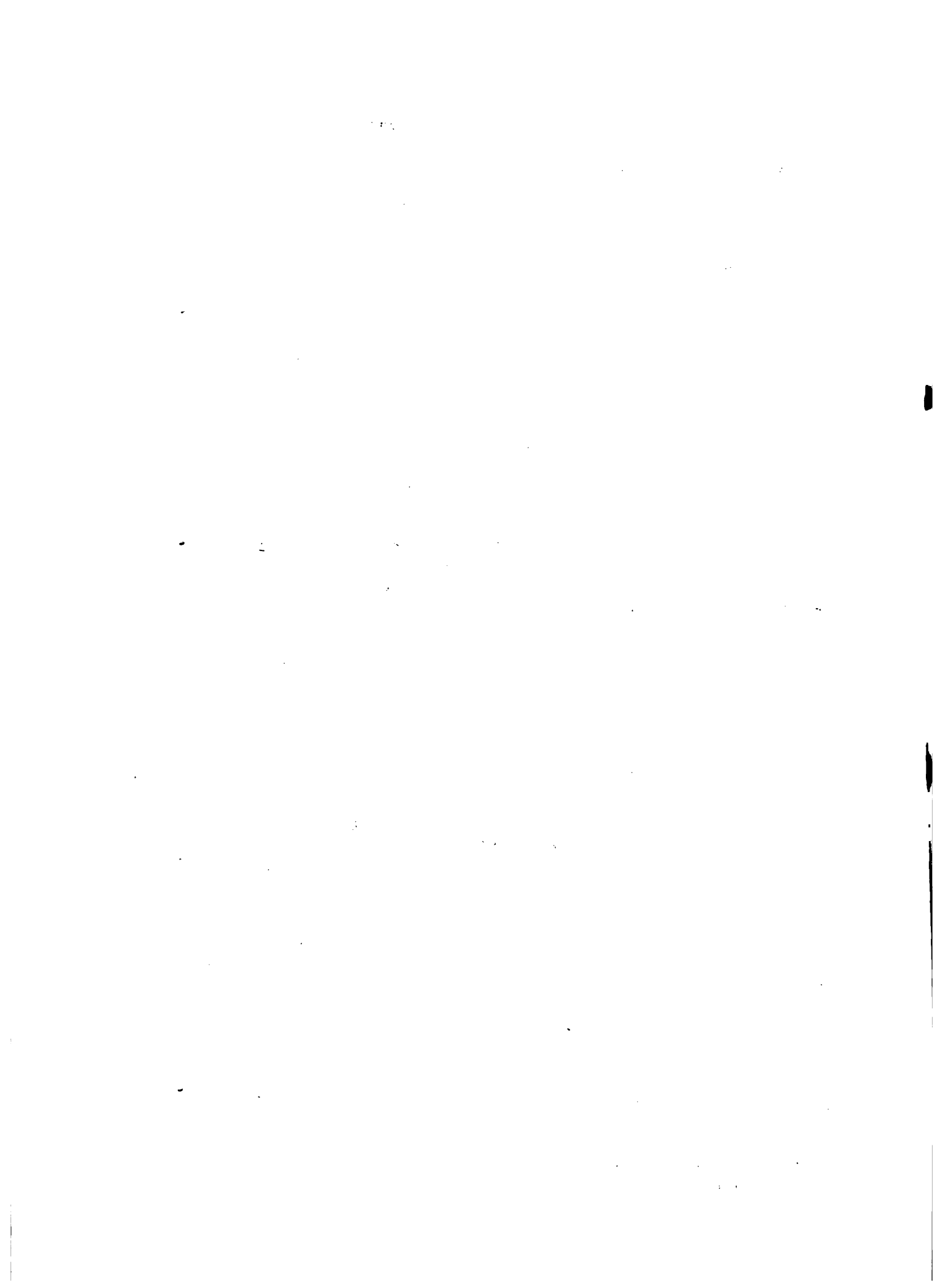
The sixth section discusses the future of data management and the emerging trends that are shaping the industry. It highlights the growing importance of artificial intelligence and machine learning in data analysis, and the need for organizations to stay up-to-date on the latest developments in data management technology. The text also discusses the impact of regulatory changes and the need for organizations to adapt their data management practices accordingly.

The final section provides a summary of the key findings and recommendations of the document. It reiterates the importance of data management in ensuring the success of an organization and provides a clear call to action for organizations to take the necessary steps to improve their data management practices. The document concludes by emphasizing the need for ongoing monitoring and evaluation to ensure that data management practices remain effective and compliant with the latest regulations and standards.

- 4) Rapid field multiplication of screened Cassava varieties has increased production, and this constitutes the basis of supply for a cassava factory.
- 5) Control of cabbage pests and selection of Black Rot resistant cabbage have now made this crop economically viable.
- 6) Control of Pinworm on tomato and screening for heat and disease resistant varieties and for the control of Pinworm have resulted in improved yields and crop performance over the standard varieties.
- 7) Nematode control on Pineapple has resulted in a four-fold yield increase.
- 8) Significant progress was made in the control and eradication of diseases of livestock previously mentioned in 2.6.3.4.
- 9) Productivity of the Jamaica Hope breed of dairy cattle markedly increased over the last five years.
- 10) Efforts by the Livestock Research Division to replace native grasses with introduced species have resulted in increasing the carrying capacity of these well managed pastures from 0.5 to 1.5 acre/head compared to 3.0 acres for natural pastures.
- 11) Achievements of the Fisheries Division are particularly outstanding in the area of population control/productivity of lobster and sea mullet as set out in 2.6.3.6.
- 12) Research by the Forestry Division has resulted in the development of improved nursery techniques.
- 13) Sound terrace complex construction methods associated with research on the locally grown crops, demonstrated the economic potential of these conservation measures.

Failures

- 1) Caused by praedial larceny - particularly in the case of onions, Avocado and Mango, so that material for assessing time to maturity, storage and other problems were not always available.
- 2) Operating finance inadequate (see Annex 3).
- 3) Equipment - poor supply atrocious maintenance and unavailability at the critical time in the preparation and cultivation schedules have hampered research activities.
- 4) Physical resources - inadequate water supply on stations at critical periods, poor station security and transportation difficulties, all impeded research.



- 5) Problems with farmers - uncertainty of obtaining yield data from experimental trials placed on farmers' land, particularly in cases where experiments are superimposed on other trials. Promises of inputs (for instance, fertilizer application at correct time and dosage) by farmers are not kept. Reluctance to try, and to adopt new technique; have been a constant problem.
- 6) Sociological problems - praedial larceny and damage caused by stray animals.
- 7) Support field staff - inadequate numbers and quality of technical field assistants and poor research project site supervision have hindered progress.

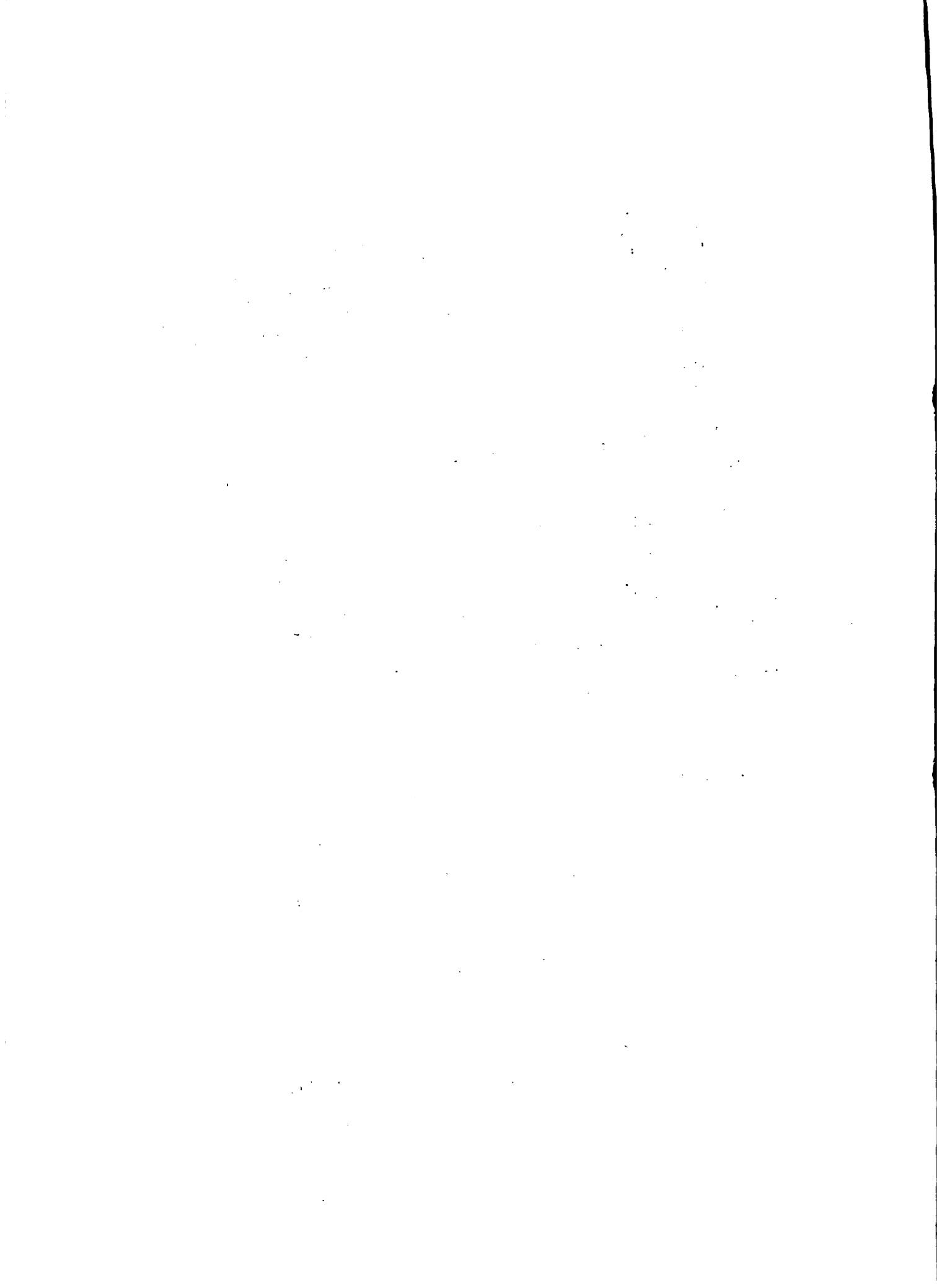
3.3 Number and Title of Publications based on the Results

Currently available are publications based on research results of various agricultural research units. These are published by the Agricultural Information Services and have been prepared by Research, Extension and Development agencies. (See Annex 4)

3.4 Transfer and process of Technology

The lines of adoption run through the agencies of:

- a) Extension Division, which serves the individual farmers through his parish or Land Authority Officers and also Land Reform Programmes. The link between Research and Extension is vested in the role of the Subject Matter Specialist, concerned with extension. The transfer process is effected by demonstration plots, advisory service, distribution of literature and via radio and television.
- b) Statutory Bodies which are crop oriented, e.g. Coffee, Cocoa, Banana, Sugar Cane, have their own extension package geared to fulfil the quality required by export demands.
- c) The Agricultural Development Corporation is responsible for testing new research technology in rice and livestock on a commercial scale prior to making such technology available to the farmers via the Extension Services.

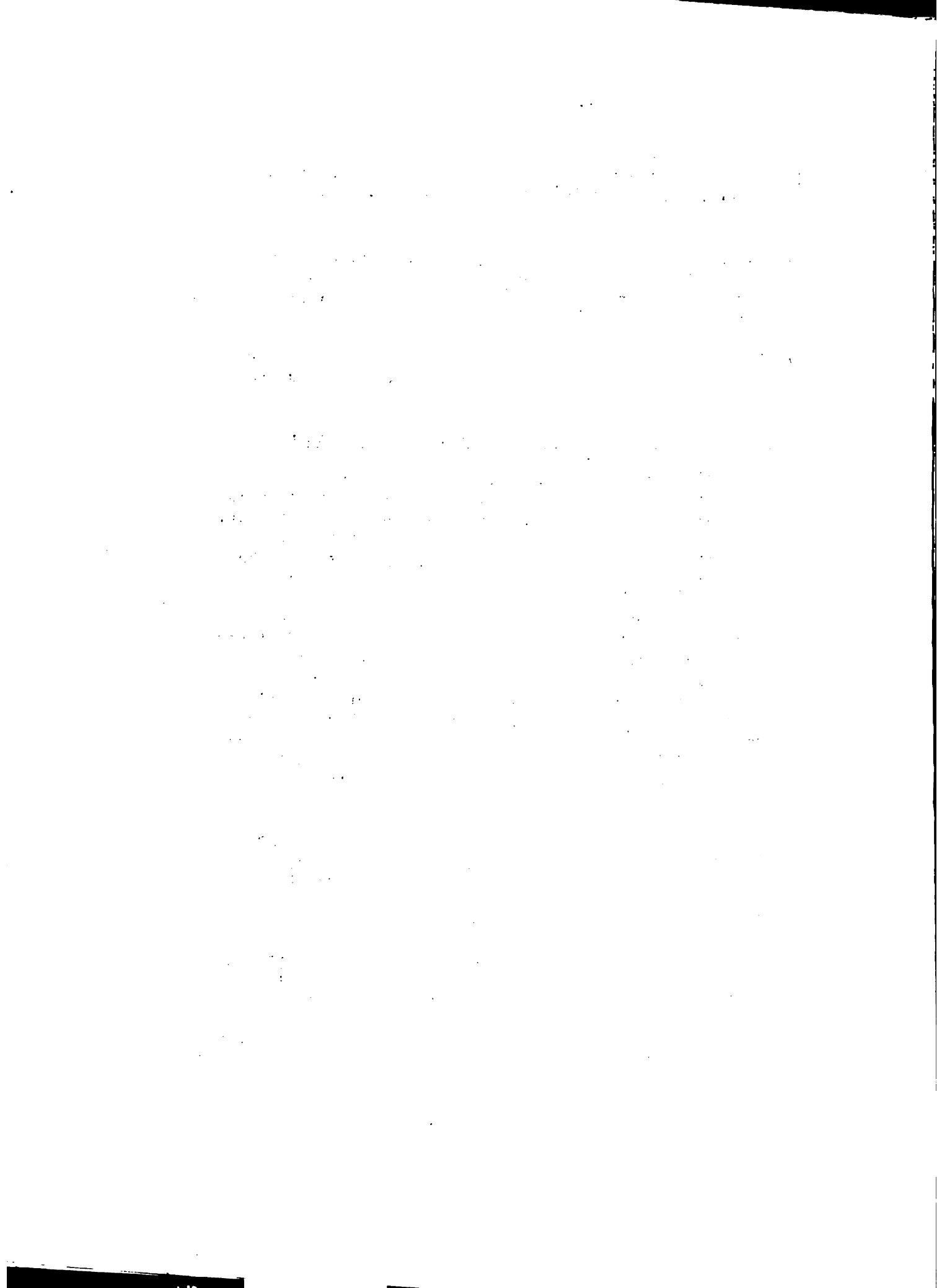


- d) The Production Unit, by disseminating high yielding planting material under the agronomic supervision of extension workers.
- e) Extension literature and other communication media produced by the above agencies under the aegis of the Agricultural Information Services of the Ministry of Agriculture.
- f) Researchers - organization of seminars and field days for Extension personnel, farmers and other interested clients.

3.5

Degree of Adoption of Technical Information by clients

- a) Referring to 3.4. a), the degree of adoption of technology by small farmers depends on access to their extension officers or contact with a successful farmer. He must also be convinced by demonstration of the benefits in terms of economics of the proferred technological input. His reluctance to depart from his traditional practices is a constraint towards the implementation of improved technology. The medium sized farmer (5 - 25 acre) will more readily adopt new technology, provided the necessary credit facility is available. The larger farmer is able to buy his own extension package if necessary, but at this point in time is wary of political changes which deter his adoption of new programmes. In all cases, the availability of inputs at the right time, e.g. chemicals, farm machinery or credit are important factors.
- b) Statutory bodies that are crop oriented are in a much better position to enforce adoption of new technology. Their research is in some cases more sophisticated and geared towards economic and high quality production.
- c) The role of the Agricultural Development Corporation includes the multiplication of clean seed material of the selected variety, for distribution and confirmation of research findings. For example the IR8 rice variety was high yielding but did not mill well. This pointed to the need for further research into other varieties having more satisfactory milling properties. Although lower yielding, CICA 4 and CICA 9 proved better in this respect.



- d) The Production Unit of the Ministry of Agriculture provides material of high yielding potential screened in Jamaica from various International Agricultural Agencies, e.g. CIAT, CIMMYT. This Unit was recently established to accelerate the production of food for domestic consumption at the same time reducing the adverse Balance of Payment situation. However, this still leaves room for neglect of cultural practices and the care of young plants. The nonavailability of fertilizers, at the right time could nullify the otherwise positive impact expected from improved planting material.
- e) Publications and mass media reach a substantial number of people. The effect of the written word is limited by degree of literacy and interpretation. The radio transistor is probably one of the most effective mass media, as TV is out of reach of most farmers, particularly in those areas lacking electricity.
- f) One of the most effective methods of transferring new technology has been the participation of farmers in residential training courses on important aspects of appropriate farming practices. Two permanent residential training centres are operated by the Extension Department of the Ministry of Agriculture. Sessions are also held for the benefit of researchers and extension personnel.

3.6

Significant changes (economic and social) observed in the agricultural sector in particular and in the country in general, as a direct or indirect result of agricultural research

The utilization of the basic soil maps^{*} and recommended practices of soil/crop management were prepared in the form of land capability maps. These have served as the basis for the development of Land Reform Programmes. The social and political considerations of the country have had varying effects in terms of labour utilization and management, yet the adoption of new technology itself was triggered by the Land Reform Programme.**

* Soil and Land Use Surveys. Regional Research Centre, UWI Trinidad 1958 - 1970.

** Annual Report, Ministry of Agriculture, 1975 pp 2-7.

The following table shows the number of people who have been convicted of crimes since 1970 and the percentage of those convicted who have been sentenced to prison. The data is broken down by crime type and by year.

Year	Crime Type	Number of Convicted	Percentage Sentenced to Prison
1970	Aggravated Assault	12,345	15%
	Armed Robbery	8,765	25%
	Carjacking	3,456	30%
	Domestic Violence	15,678	10%
1975	Aggravated Assault	13,567	18%
	Armed Robbery	9,876	28%
	Carjacking	3,890	35%
	Domestic Violence	16,789	12%
1980	Aggravated Assault	14,678	22%
	Armed Robbery	10,987	32%
	Carjacking	4,321	40%
	Domestic Violence	17,890	14%
1985	Aggravated Assault	15,789	25%
	Armed Robbery	12,098	35%
	Carjacking	4,765	45%
	Domestic Violence	18,901	16%
1990	Aggravated Assault	16,890	28%
	Armed Robbery	13,209	38%
	Carjacking	5,210	50%
	Domestic Violence	20,012	18%
1995	Aggravated Assault	18,001	32%
	Armed Robbery	14,320	42%
	Carjacking	5,651	55%
	Domestic Violence	21,123	20%
2000	Aggravated Assault	19,112	35%
	Armed Robbery	15,431	45%
	Carjacking	6,092	60%
	Domestic Violence	22,234	22%
2005	Aggravated Assault	20,223	38%
	Armed Robbery	16,542	48%
	Carjacking	6,533	65%
	Domestic Violence	23,345	24%
2010	Aggravated Assault	21,334	40%
	Armed Robbery	17,653	50%
	Carjacking	7,074	70%
	Domestic Violence	24,456	26%
2015	Aggravated Assault	22,445	42%
	Armed Robbery	18,764	52%
	Carjacking	7,515	75%
	Domestic Violence	25,567	28%
2020	Aggravated Assault	23,556	45%
	Armed Robbery	19,875	55%
	Carjacking	8,056	80%
	Domestic Violence	26,678	30%

The data shows a general upward trend in the number of people convicted of crimes over time, with a significant increase in the percentage of those convicted who are sentenced to prison. This is particularly evident for crimes such as Armed Robbery, Carjacking, and Domestic Violence. The percentage of people sentenced to prison for these crimes has increased from around 10-20% in 1970 to 30-50% in 2020. This suggests that the criminal justice system has become more punitive over time, with more people being sentenced to prison for the same crimes.

The feasibility of growing Irish potato under irrigation on the plains, giving significantly higher yields than on the uplands, as well as other considerations discussed under 3.2, resulted at times in a surplus for export. Improved storage techniques resulting from trials by the Storage and Infestation Department has further enhanced the role of this crop in contributing to the economy, (see Appendix 8).

The selection (ongoing) of onion varieties has reduced the importation of onions from 10M lbs. in 1970 to 5M in 1976. This has contributed towards remedying the adverse balance of payments experienced in food imports.

4. PERSPECTIVES OF THE GOVERNMENT OF JAMAICA RESEARCH AGENCIES.

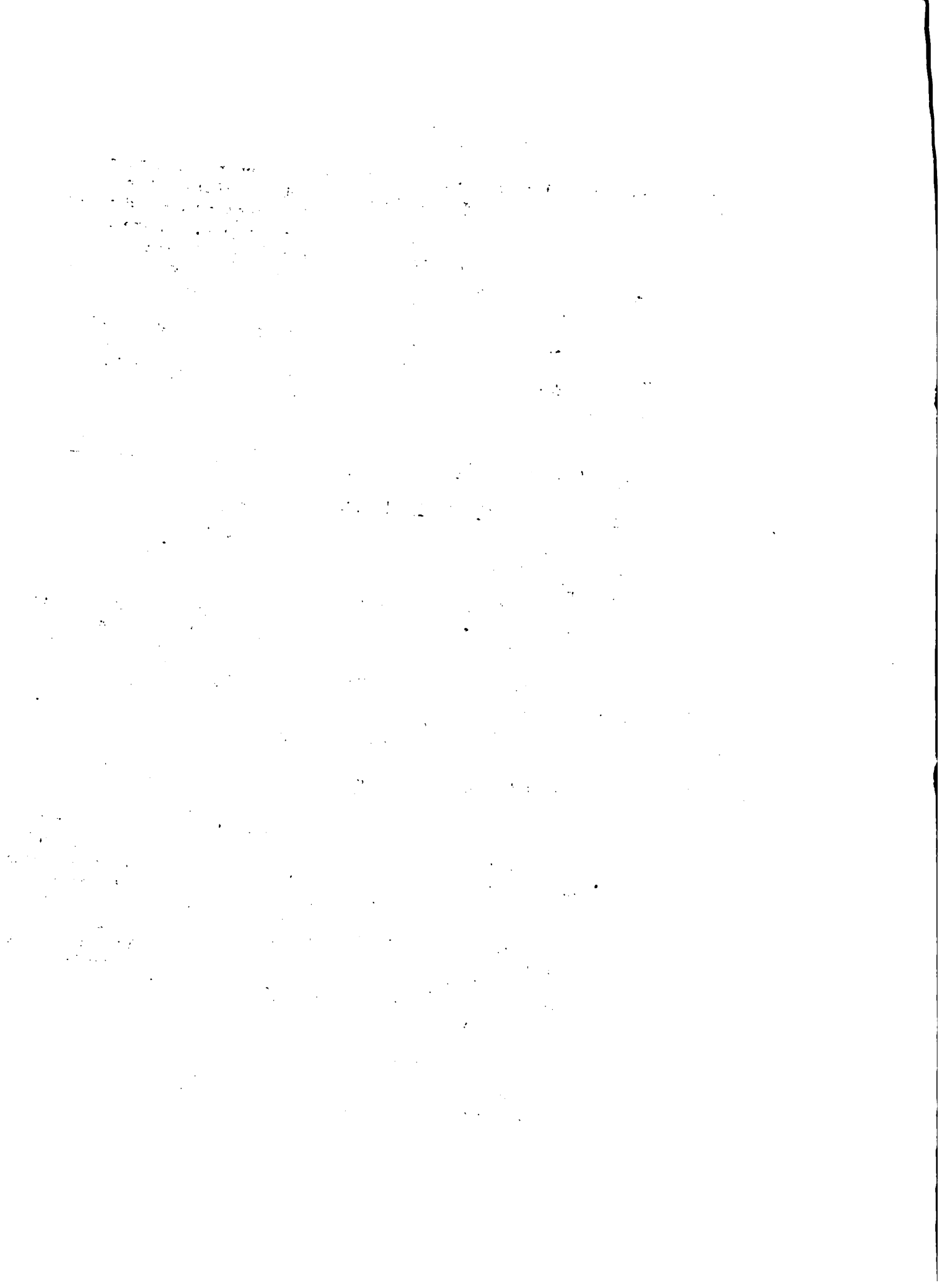
4.1 Policy objectives and goals for the next five years

- * The Government of Jamaica, desiring to accelerate the development of agriculture, has, as a first step undertaken to reorganize the Ministry of Agriculture on the basis of (a) Central planning, coordination and monitoring of all agricultural activities, and (b) decentralized implementation of Government agricultural policy through three regional directorates. Special emphasis is to be given to the problems of the small farmer, to reduce reliance on imports of food crops and to reverse the adverse trade balance in agriculture; to increase efficiency of agricultural labour whilst maintaining labour intensive production methods.

4.2 Organization, internal functions and external relations

During the next four years the Central Experiment Station (Bodles) will be fully developed while the Western Research Station (Montpelier) will be equipped to include a livestock component within its research programme. In the reorganization (Annex 2 and 6) the centralization of planning, data storage, information and control will be at Headquarters, in Kingston, while Production and Rural Development Units have already to a large extent been decentralized and implemented in three regions. The proposed infrastructure and equipment will allow for the gradual integration of the larger Commodity Boards into the new Research Organization.

* Final Draft FAO/IDR Cooperative Programme December 1976.
Project Preparation Synthesis Report.



The new Research Stations will be established to fit the decentralized regional structure of the Ministry of Agriculture, thereby facilitating coordination between research, extension and development. Cooperation would be continued with U.W.I., CARDI, CIAT, CIMMYT, IITA, CIP, ICRISAT, The Central Sugar Cane Breeding Station (Barbados), the Winban Banana Research Department and CIBC.

4.3. Human, Physical and Financial resources (in quality and quantity)

Human

It has been stated in the IDB/FAO Final Draft Report that to counter the inadequate transfer technology, human, financial and physical resources should be pooled into a single framework, viz:

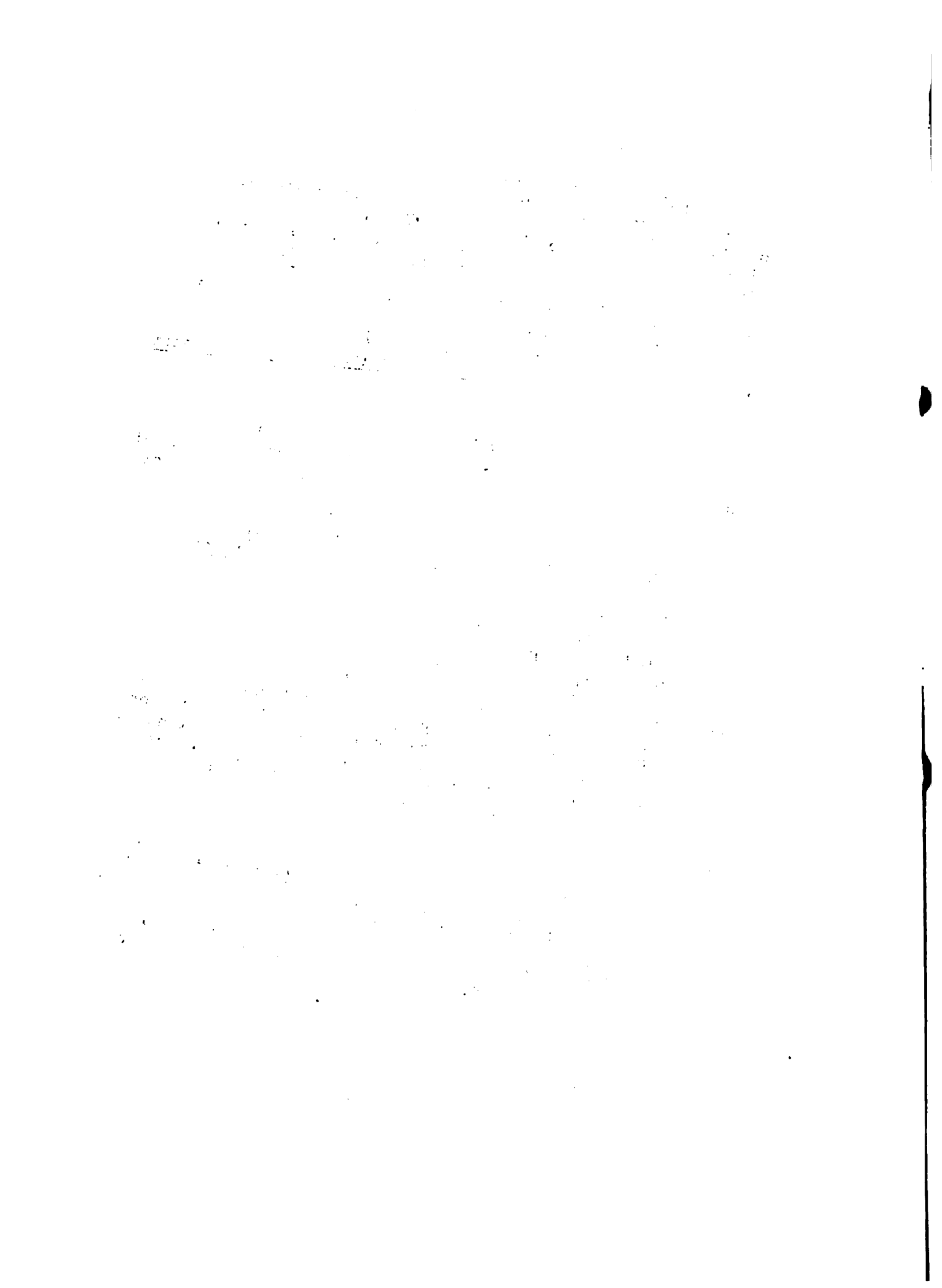
The Agricultural Research Service of Jamaica.
The Reorganized Structure (Annex 2) allows for a Director of Research supported by:

- a) Research Project Office
- b) Econometric Unit, and
- c) Minimal Administrative staff.

Coordination between Research and Extension should be assured at Director's level by a committee consisting of the Director of Special Programmes and a Director of Research and Extension. It is estimated that about 35 additional University graduates and 90 more diplomate technicians will be required for the reorganized research service (Annex 5).

Physical

- a) Establishment of Central Research Station entailing site development, construction of building, furnishing, equipment, acquisition of livestock.
- b) Development of Montpelier Research Station in the western part of the island.



Financial

It is envisaged that IDB will be financing 60 percent of the project total (US\$10.6M). * All Government agricultural research will be financed through the Ministry of Agriculture with the exception of that for sugar. Operating costs for the Crop Research Projects will be phased over a four-year period in terms of material, personnel, seasonal operations and cost of technical cooperation.

4.4.

Scope, clients and identified problems

Orientation is towards maximising farm income of small farmers whose land occupies 70% of Jamaica. Farming systems and soil conservation/hillside farming schemes, and/or labour intensive projects are intended to alleviate unemployment. The middle and larger farmer groups are not specifically catered for apart from making available the technology. The Land Lease Programme will continue. The Food Farms Programme has been absorbed into the Land Lease Programme in 1977. The distribution of land is thus intended to increase the unit from 2 to 5 acres and to avoid fragmentation.

Five Priority Research Projects have been selected for their labour intensiveness and their concern with small farmers who represent the majority of agricultural producers in Jamaica. These projects are identified as follows:

- Yam, cassava and sweet potato research - to give improved yields which would then release land available for diversified production.
- Pigeon peas and cow peas - selected for their potential as a replacement for low yielding Phaseolus as sources of protein.
- Further sources of protein will be sought through research projects on milk production (improving milk herds and developing dual purpose herds), and on management problems on small farmer goat herds.
- Facilities for the Fishery and Forestry Programme have not been provided for in the project, but research in these fields is being implemented in a joint Jamaica Government/ USAID Programme.

* FAO/IDB Cooperative Programme Report 475, Jamaica Agriculture, December 1976.

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SUGGESTIONS FOR IMPROVING EACH AGRICULTURAL RESEARCH DIVISION
(in efficiency and effectiveness)

1. Changes in the integration and coordination of agricultural research at National Level

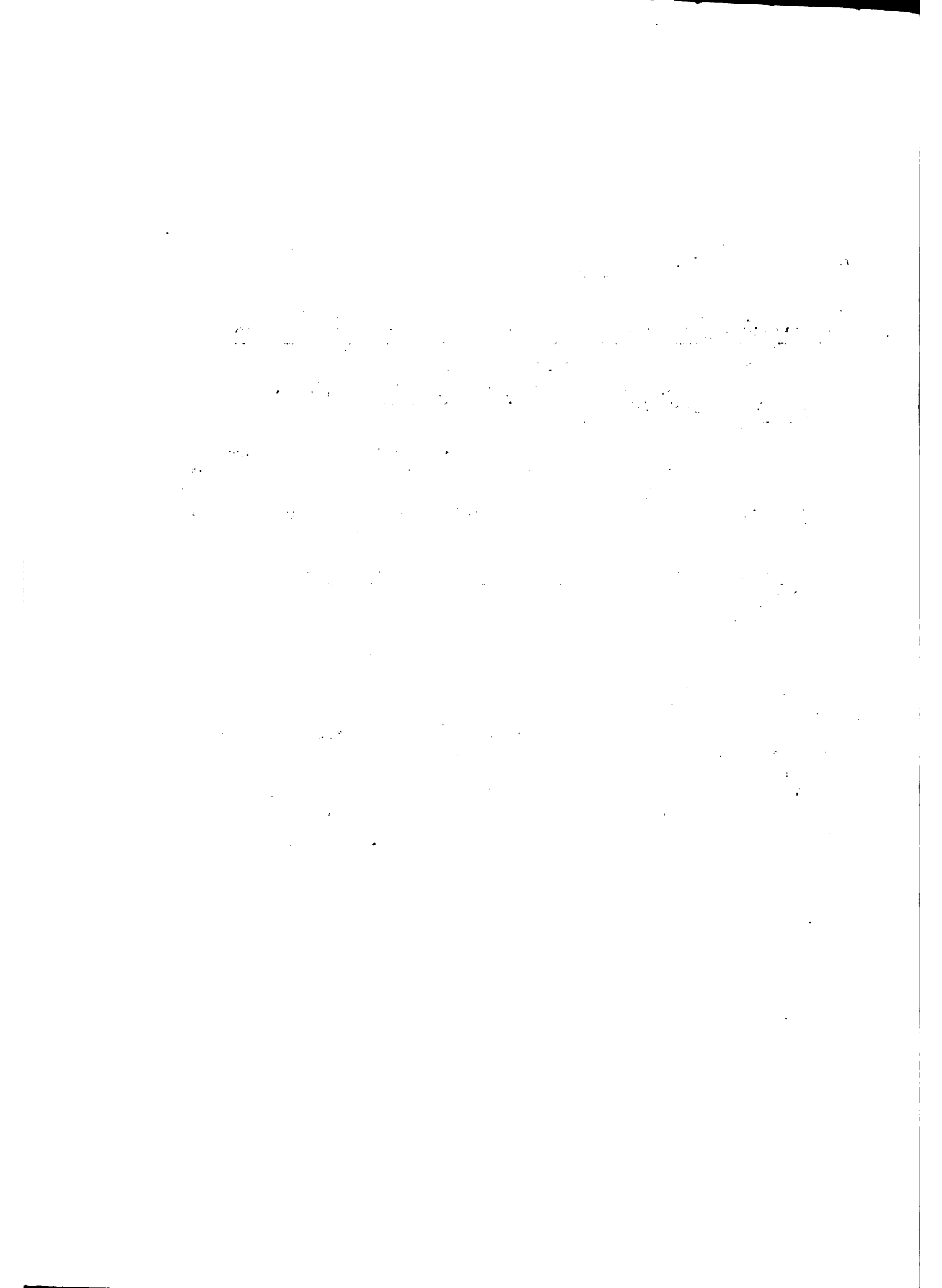
The coordination of research at national level has been discussed under 4.3 as stated in the FAO/IDR Cooperative Programme - December 1976 Final Draft. The Statutory Boards will be absorbed within the structure proposed in the reorganization programme, though the Sugar, Coconut and Banana Boards will be absorbed gradually.

2. Strengthening of intra-regional and international technical cooperation

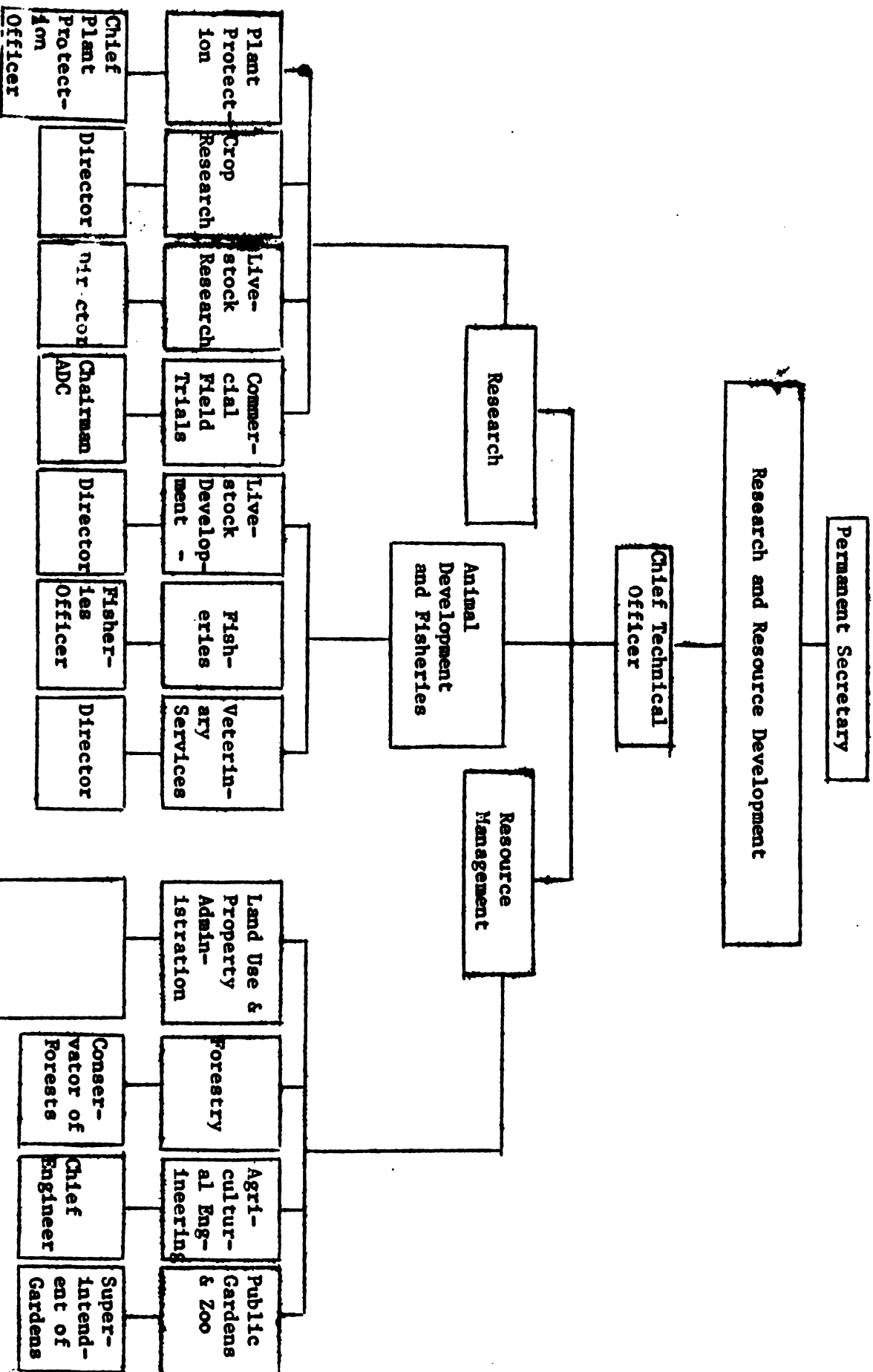
See Annex 7

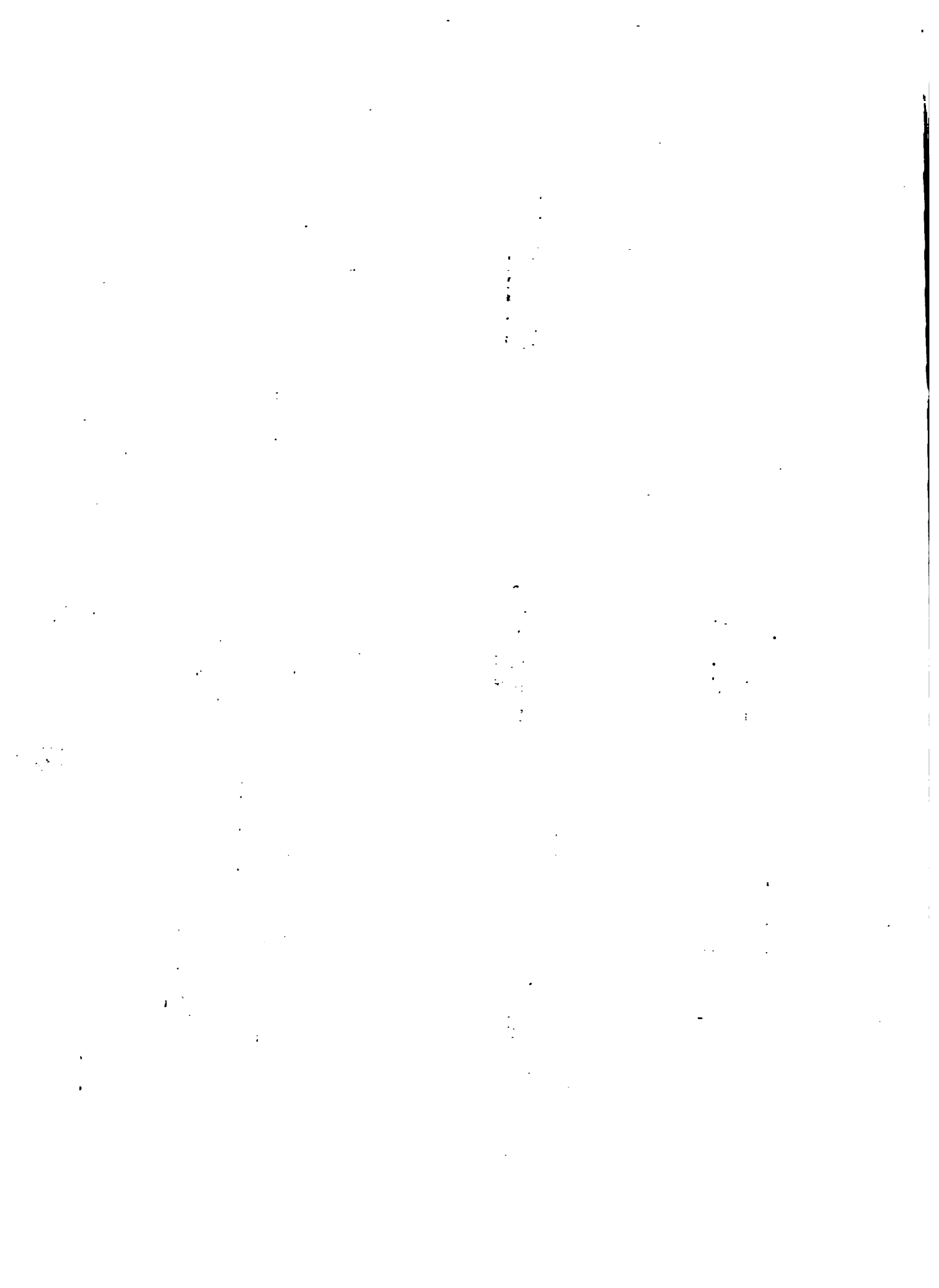
ADDITIONAL COMMENTS

It is suggested that each member country should document ongoing programmes of research and make available the results of completed investigations. If this is effected unnecessary duplication of efforts and more relevant research activities would be generated. This should result in greater benefits to the region.



PRESENT ORGANIZATIONAL STRUCTURE OF THE MINISTRY OF AGRICULTURE





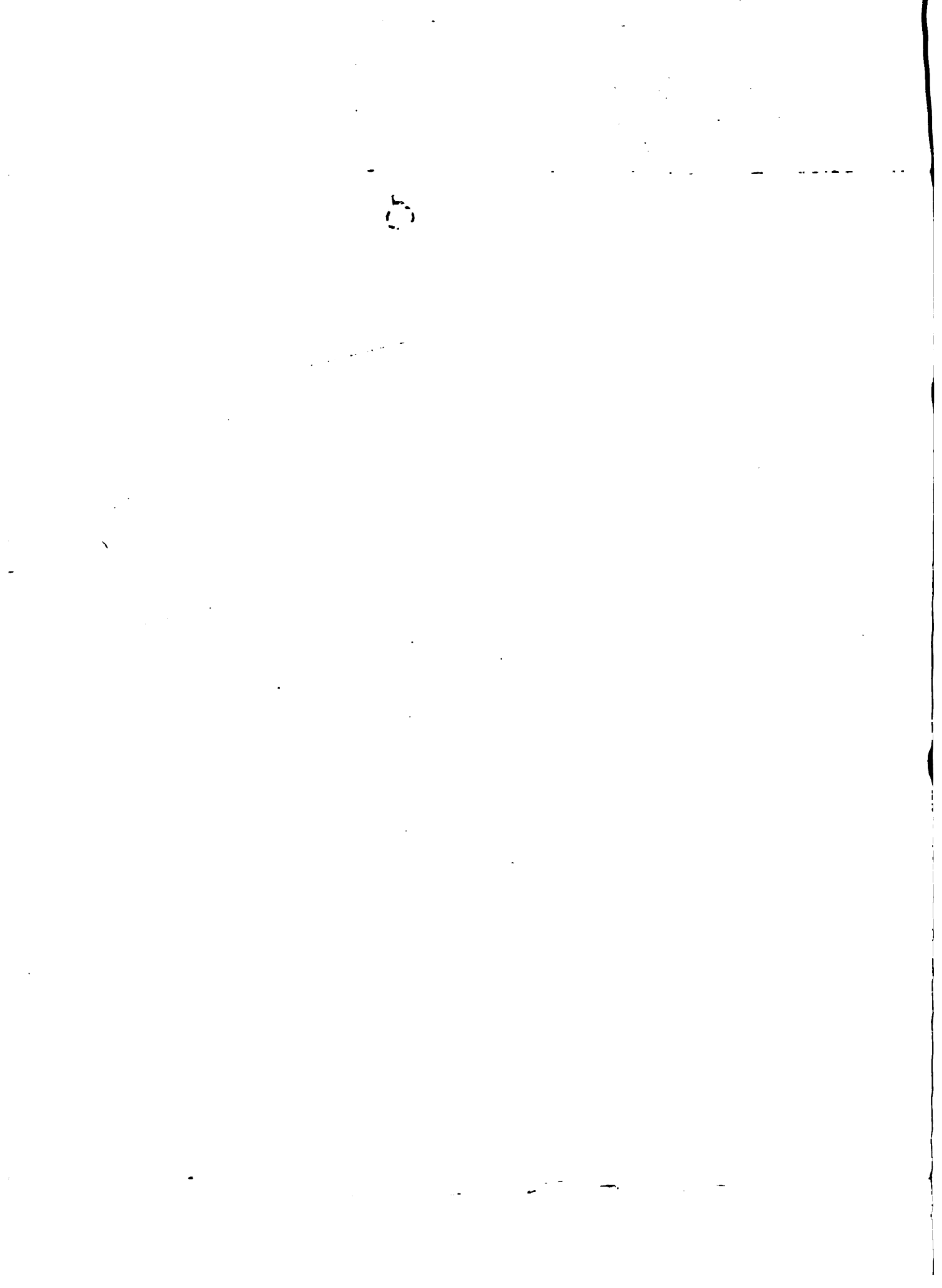
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E. 27001

YEAR	Total Govt. Exp. (TGE)
1971-1972	\$300,648,072
1972-1973	\$364,631,275
1973-1974	\$462,139,566
1974-1975	\$724,174,611
1975-1976	\$966,900,826
1976-1977	\$1,126,541,355 (Estimated)

N.B. A variable amount of mo
general revenue.

* MRLD = Ministry of Rural L

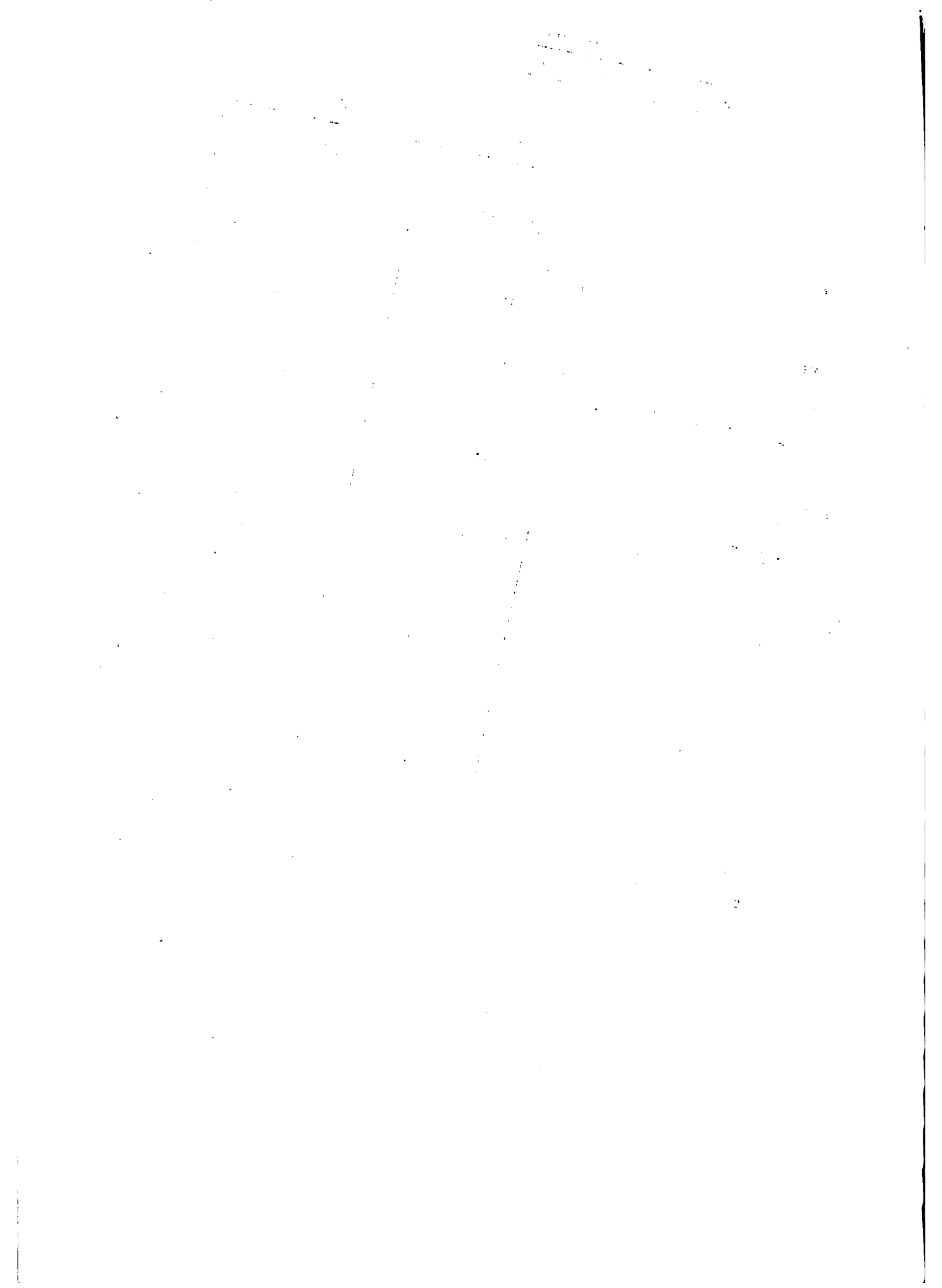


BUDGETARY EXPENDITURE
FINANCIAL YEAR 1974/75*

Expenditure in Jam.\$

	<u>Capital</u>	<u>Recurrent</u>
Project Food Farms	2,783,665	-
Project Land Lease	3,088,934	-
Fisheries Department	812,483	-
Soil Conservation Unit	233,844	-
Soil Conservation Employment Programme	678,583	-
Agricultural Engineering	980,780	1,014,771
Plant Protection Division	221,304	246,874
Veterinary Services	59,451	637,553
Livestock Development	145,213	636,565
Livestock Research	131,744	1,522,568
Forest Department	287,681	-
Plant Production	1,226,000	258,578
Crops & Soils Department	83,714	636,688

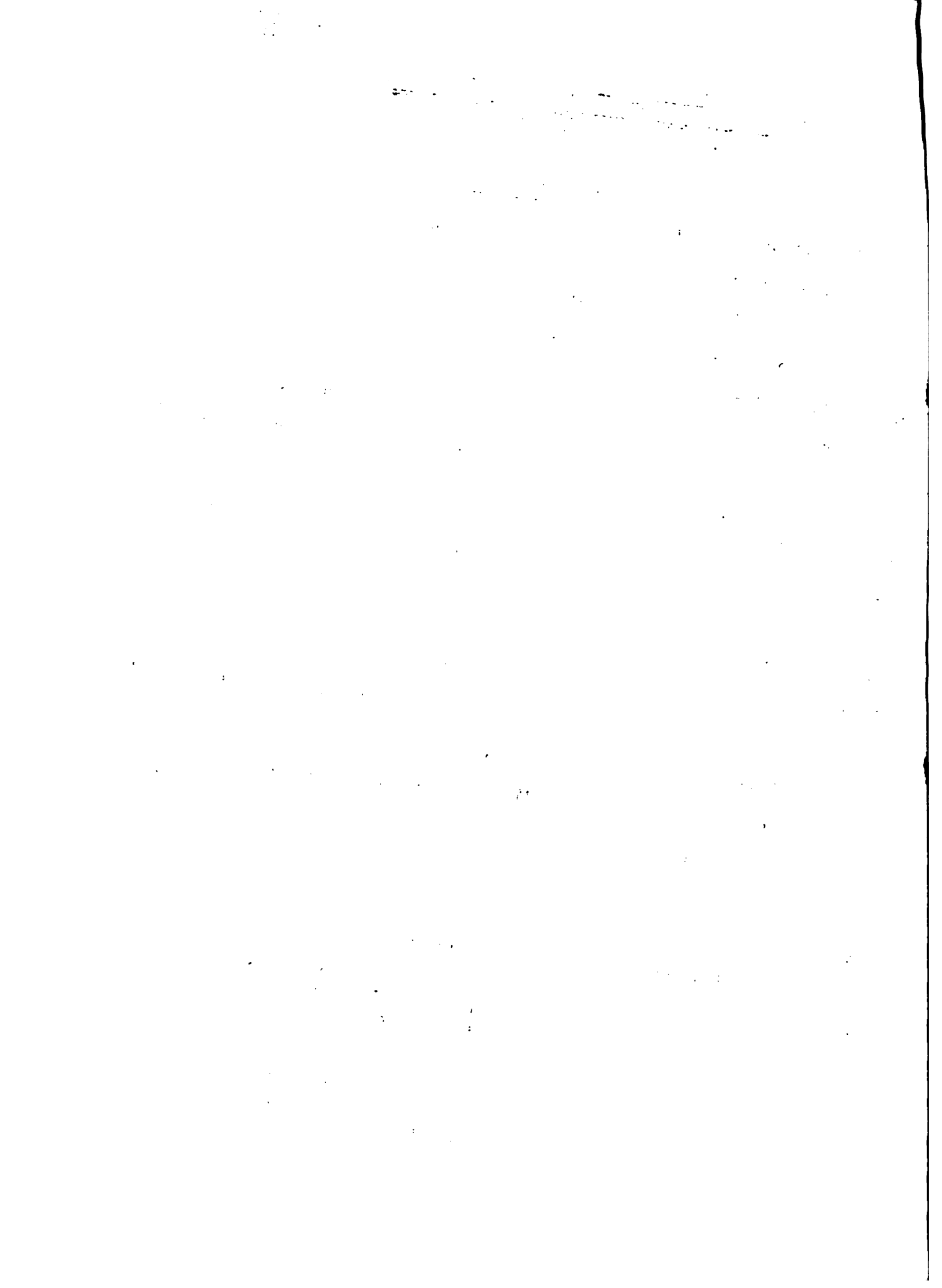
* Abstracted from Appendix 11 Annual Report, Ministry of Agriculture Jamaica 1975.



RESEARCH AND EXTENSION LITERATURE
PUBLISHED BY THE AGRICULTURAL INFORMATION SERVICE
OF THE MINISTRY OF AGRICULTURE - JAMAICA

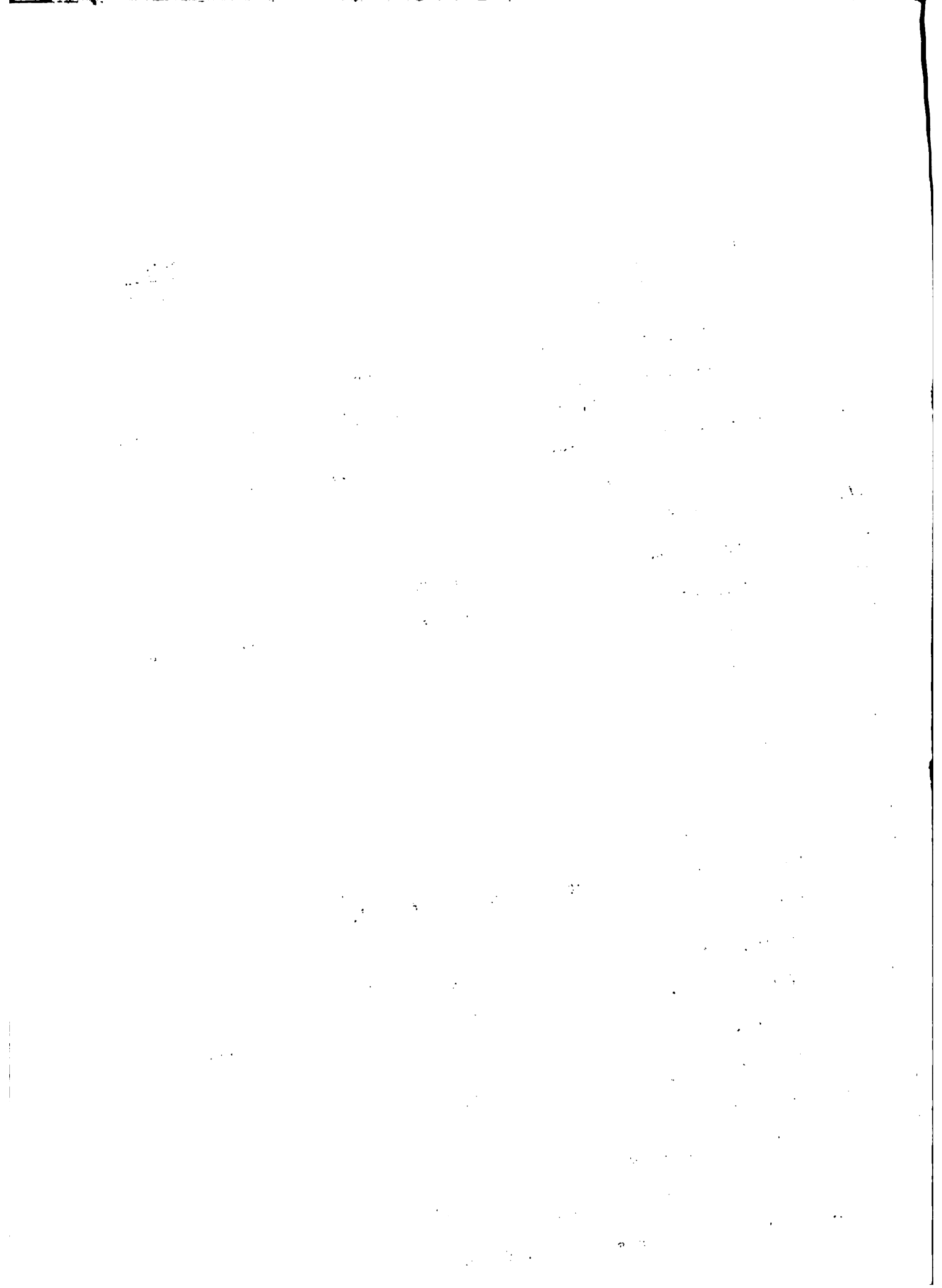
November 1977

1. Weed Control in Citrus (pamphlet).
2. Citrus Growing in Jamaica (book - \$1.00).
3. Royal Botanic Hope Gardens (brochure).
4. Managing the Laying Flock (booklet).
5. Ginger (Technical Bulletin) - booklet.
6. OPERATION G.R.O.W. (Focus Project Land Lease - brochure).
7. CORN (Maize Investigations in Jamaica - a review of research 1940 - 1969).
short supply.
8. Planting Coconuts (brochure).
9. Red Peas (Red Kidney Beans) (pamphlet).
10. The Tomato Pinworm - A New Pest to Jamaica (booklet).
11. Growing Onions in Jamaica (booklet).
12. Let's Grow Peanuts for Profit (pamphlet).
13. The Jamaica Hope Breed - Animal Husbandry Bulletin No. 2, 1972 (\$2.00).
14. Investigations - 1964 - 1970 (bulletin No. 63) \$5.00.
15. Investigations - 1970 - 1974 (bulletin No. 64) \$5.00.
16. Farm Subsidies (folder with leaflets) (1975).
17. The Growing of Avocadoes (booklet).
18. How to Grow Pumpkins.
19. Soya Bean (Technical Bulletin - 1974).
20. Proofs of Jamaica Hope Sires 1965 - 1974 reserved list
1965 - 1975 (available)
1965 - 1976.



21. Think Coconuts - Plant Malayan Dwarf Cocumuts (stickers).
22. Backyard Gardening.
23. Pig Production (Reproduced \$1.00 per copy).
24. Root Crops are Roots Food (cassava, yams, Irish potato, sweet potato and recipes). (short supply).
25. Ministry of Agriculture, Annual Report to March 1975.
26. Spraying Red Peas.
27. Soil Erosion.
28. Poultry Disease, Prevention and Control.
29. C.A.L.A. Annual Report, Year ending March 1976. (Reserved copies).
30. The Ackee.
31. Naseberry.
32. Lychee.
33. Guava.
34. Starapple.
35. Tobacco (short supply).
36. Tips on Poultry Management (Livestock Monthly Newsletter).
37. Garlic.
38. Nutrition News - Jamaica Nutrition Holdings Ltd.)
39. Sugar Cane - September & November 1975)
40. The Coconut Grower - November 1976.)
41. Jamaica Sugar Digest (Jan./April 1977).
42. Calf Rearing.
43. How to deworm Your Calves.
44. Grove Place Agricultural Station.
45. Money Management; key to success in farming.

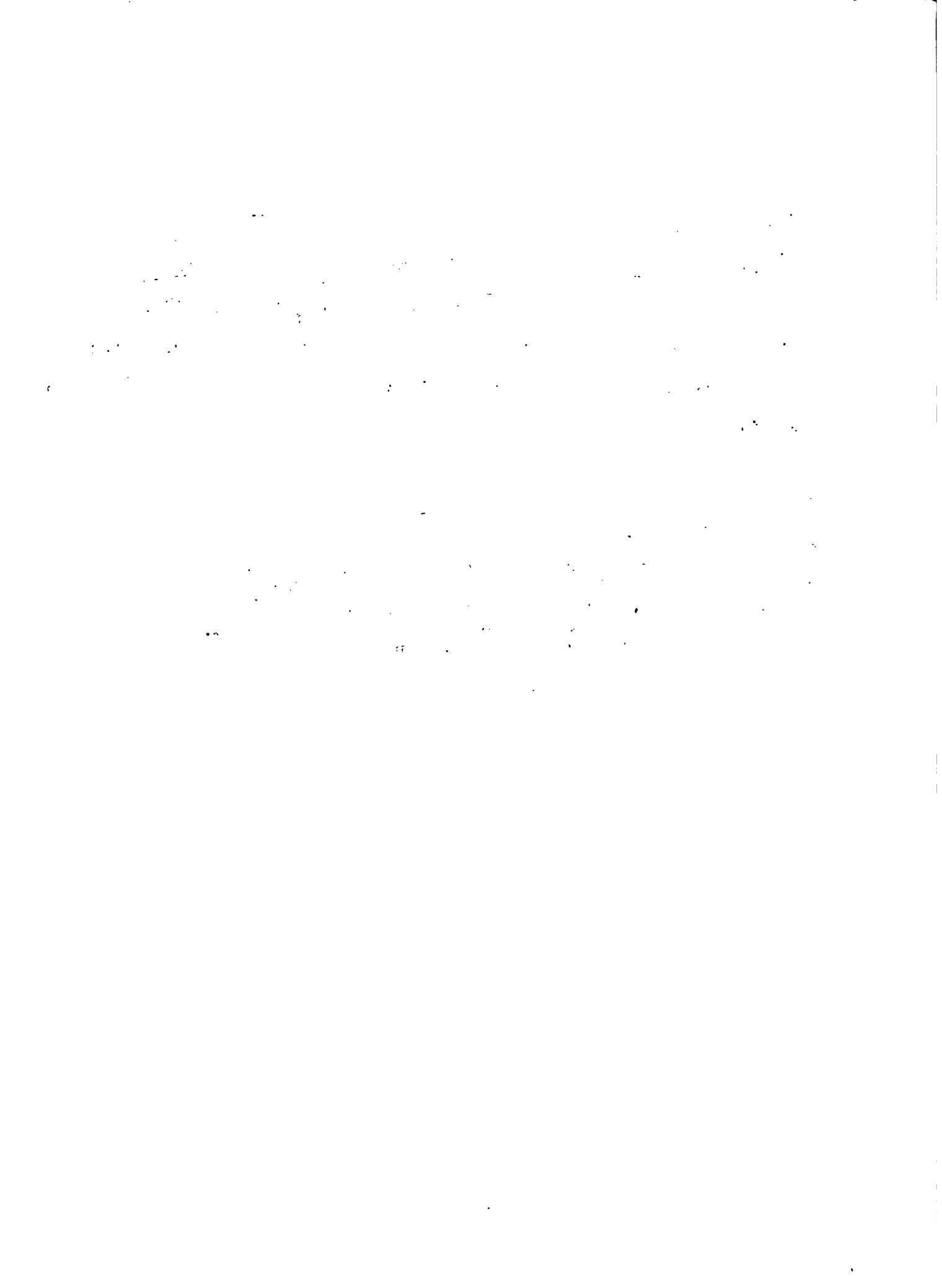
READING ROOM



46. **New Lines of Credit to the Farmer: Crop Lien Programme.**
47. **Grains are the Greatest (Denbigh Agricultural Show, August, 1977).**
48. **The Jamaica Economy; Agriculture and Industry. (Mediamix Production).**
49. **Growing Cucumbers (soon off press).**
50. **Growing Grapes (soon off press).**

Posters

51. **Lobster Poster re egg carrying undersized lobsters (A.I.S.).**
52. **Land is the Root; Industry the Fruit (Mediamix Production).**
53. **Pork: Why You Should Cook It Again.**



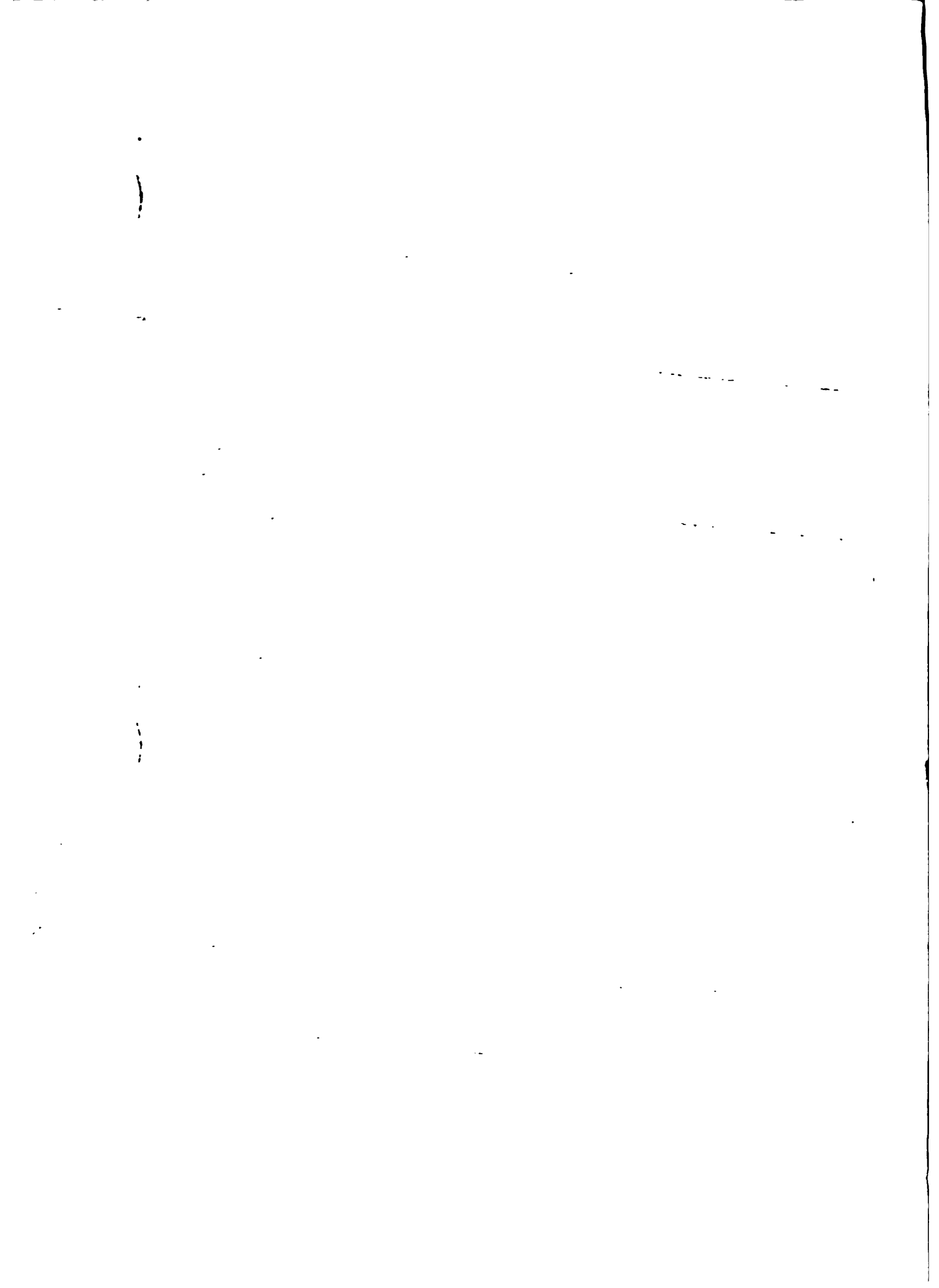
PROJECTED STAFF REQUIREMENTS
FOR THE REORGANIZATION OF THE MINISTRY OF AGRICULTURE

G = Graduates

D = Diplomates or technicians JSA

	Present Staff		Additional Requirements		Proposed location of staff									
	G	D	G	D	S.Reg.		W.Reg.		N.Reg.		Other		Totals	
					G	D	G	D	G	D	G	D	G	D
Tree Crops	1	1	4	6	3	3	-	2	2	2	-	-	5	7
Field Crops	7	3	3	17	6	7	2	7	2	6	-	-	10	20
Forestry	3	2	4	10	6	10	1	1	-	1	-	-	7	12
Fisheries	2	1	2	6	-	-	-	-	-	-	4	7	4	7
Livestock	8	12	2	5	6	8	3	5	1	4	-	-	10	17
Farming Systems	-	-	3	1	1	1	1	1	1	1	-	-	3	3
Plant Protection	10	5	2	6	9	8	3	3	-	-	-	-	12	11
Soils & Irrigation	10	11	1	11	9	18	1	2	1	2	-	-	11	22
Plant Propagation	-	-	1	1	1	1	-	-	-	-	-	-	1	1
Agro Engineering	-	-	5	13	3	8	2	5	-	-	-	-	5	13
Plant Introd. Serv.	-	-	1	1	1	1	-	-	-	-	-	-	1	1
Biometrics	-	-	1	2	1	2	-	-	-	-	-	-	1	2
Seed Testing	-	-	1	6	1	6	-	-	-	-	-	-	1	6
Library	1	-	1	-	1	-	-	-	-	-	1	-	2	-
Farm Management	1	45	3	11	2	20	1	18	1	18	-	-	4	56
TOTALS	43	80	34	88	50	93	14	44	8	34	5	37	77	168

Source: Final Draft FAO/IDB Cooperative Programme December 1976.



PROJECT COMPONENTS OF THE PROPOSED REORGANIZATION
OF GOVERNMENT AGRICULTURAL RESEARCH IN JAMAICA *

A. General Description

The Project will cover the requirements of the first phase of the re-organization of agricultural research in Jamaica. The difficulties of planning and conducting agricultural research, currently created by the multiplicity of entities involved, will be eliminated by means of the centralisation of research planning and facilities in one organization under MINAG. To this end, during the Project, a Central Research Station will be established at Bodles and the development of the Western Research Station will be initiated at Montpelier. At both sites, development work will include basic infrastructure, irrigation ^{1/} and land preparation, as well as building construction (offices, laboratories, workshops) and provision of equipment (farm machinery, laboratory and workshop equipment), animals, storage facilities and housing (at Montpelier only).

Facilities for the fishery and forestry sectors of research have not been provided for in the project. Research in these fields is already being implemented in a joint Jamaica Government/USAID program.

In addition to the general research work carried out, programmes of agricultural research will be undertaken in (1) food crops that are basic to diets of low income groups and which are suited to undershade cultivation and soil conservation, and in (2) livestock development, mainly in improved systems of management with dual purpose beef/dairy cattle and with goat herds. Required physical facilities, laboratories, machinery, workshops, storage, etc. are furnished in the Project. Since there is a deficiency of personnel specialized in the respective research fields involved, technical cooperation consisting of foreign specialists and staff training will be provided by the Project.

The following package of works, inputs and assistance is considered to be the minimum required to provide agricultural research in Jamaica with the basic framework for a significant effort.

B. Project Components

Establishment of Central Research Station

Site Development. Works to be completed during year one and early year

* Extracted from Final Draft FAO/IDB Cooperative Programme Report 475. Jamaica Agriculture 1976 pp 25 - 31.

1/ At Bodles only

two of the Project consist of the provision of basic infrastructure, irrigation layout and land preparation. The infrastructure comprises 12,000 L. ft. ^{1/} of internal road and 88,000 sq. ft. of parking and paved areas; landscaping and security fencing, together with electrical, sewage, cold water supply and telephone services. The irrigation system requires the provision of new pumping equipment to existing wells, supply lines and sprinklers for 140 acres. Land preparation involves the levelling of 140 acres of land, the removal of trees and stumps and fencing. All this work will be carried out on Government land.

Construction of Buildings. During the initial 30 months of the Project, a total of 53,000 sq. ft. of offices, laboratories, storage, greenhouses, herbariums, precision instrument rooms, preparation and other operating spaces will be constructed at the Central Research Station (Bodles) for the respective use of the following research divisions and units: Agricultural Engineering, Crops, Forestry, Plant Protection, Soils and Irrigation, Extension Subject Matter Specialists (office space), Biometrics, Experimental Station Farm and Livestock Research.

Provision of Furnishing. Office furnishings will be purchased during the latter half of year one ^{2/} of the Project, to be installed during the first month of year 2. Office furnishings will be provided for 2 directors, 38 scientists, 69 technicians, 16 clerical officers, one accountant, 2 secretaries, 8 secretary/stenographers, one telephone operator and four domestic staff. Furnishings will also be provided for 9 laboratories, a library, a balance room, a conference room and a canteen.

Equipment. The agricultural machinery, workshop, laboratory and other equipment will be installed immediately after completion of the buildings. The equipment provided to the respective research divisions and units will consist of farm machinery and workshop equipment for Agricultural Engineering, laboratory equipment for Crops, Forestry, Soils and Irrigation, Plant Protection and Livestock, cafeteria equipment and fittings for Experimental Station Farms and machinery equipment and fittings for Livestock Division milking parlour, feed store, slaughterhouse and farm.

Acquisition of Livestock. Cattle will be acquired for the livestock research programme at both Montpelier and Bodles. The comparative evaluation of Holstein and Jamaican Hope Cattle requires the acquisition of 40 imported Holstein calves and 40 imported heifers in year one and two, respectively.

^{1/} L. ft. = Linear feet.

^{2/} Year one of Project starts with the preparation of tender documents, immediately following agreement of IDB for the disbursement of the loan.

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Development of Montpelier Research Station

Site Development. Preparation of the Montpelier site consists of the provision of infrastructure and land preparation. All works will be completed during the first two years of the project. Infrastructure works comprise 4,000 L. ft. of internal roads, 1,000 sq. ft. of parking and paved areas, landscaping, security fencing, plus electrical, sewage, cold water and telephone services. Land preparation consists of the removal of trees and scrub on 250 acres and fencing.

Construction of Buildings. These facilities comprise 18,000 sq. ft. of construction for the Administration (offices, etc.), Livestock (laboratories, milking parlour, storage, etc...) and Farm Machinery (workshop/garage, changing room/toilets, kitchen/lunch room) Departments and housing for the director, a technician, a headman and the labour force.

Furnishings. Office furniture comprising desks, tables, chairs, shelves, cabinets, typewriters, etc. will be provided to accommodate a director, a technician, an accountant, 3 administrative officers, a secretary and a domestic staff. Furnishings and facilities will also be provided for the laboratories, workshop, lunch room and service facilities.

Equipment. The equipment to be provided consists of tools and farm machinery for the Livestock and Farm Machinery Divisions. The Livestock Division will be furnished with a feed hopper, complete milking and laboratory equipment, scales, a grain drier, a livestock spray-race, office equipment, etc. The Farm Machinery Division will be furnished with two tractors with tillage, hay and silage making machinery, farm trailers, a jeep and a truck, etc. This division will also be provided with complete repair and maintenance workshops and kitchen cum lunch room.

Acquisition of Animals. At Montpelier the Management and feeding programme for dual purpose cattle requires the acquisition of 160 cows and/or in-calf heifers mainly of Red Poll extraction. The goat research programme requires the purchase of 300 local females and 10 imported males.

C. Research Programme

Food Crop Research Programme

Yam Research. In year one, 4 acres of yams will be cultivated at the Central Research Station at Bodles to provide a nematode free source of planting material for future needs. From year two, additional acreages of 1.5 acres each will be cultivated at Smithfield and in Christiana. The experimental design will be determined by the responsible specialist in consultation with his research team. The experiments will determine the effect of size of planting



setts, spacings (and staking), hill versus ridge planting and better yielding varieties. Nematode research will study methods of obtaining nematode free planting material, the effects of alternative hosts and of environmental conditions on the build-up of nematodes in soil; effect of nematicides in the field (including economic evaluation) and varietal resistance ^{1/}. The required monthly sampling for tuber development, nematode investigation and plant nutrient status will necessitate the use of laboratory (agronomy and crop protection) and greenhouse facilities at Bodles, as well as of the Central Analytical Laboratory. Equipment provided will include balances, microscopes and drying ovens.

Cassava Research. In the first year, six acres will be cultivated for the production of planting material at the Central Station at Bodles (including multiplication of selected varieties by the CIAT propagation technique). From year two, 5 acres will be kept in experiments at Bodles, and two 1.5 acre sites will be added to the experiments at St. Elizabeth and St. Catherine. Land preparation will include ridges and flat land preparation treatments; pre-emergence chemical and hand weeding. Local and imported varieties will be compared at different spacing, and irrigation problems will be studied. Monthly sampling for tuber development, starch content, and plant nutrient status will be taken. Facilities provided will include crop drying units, laboratory and analytical equipment, etc.

Legume Research. The main objectives of this programme will be to develop a new system of pigeon pea production to find an acceptable substitute for phaseolus, and to develop a high yielding type of cow pea. Newly developed short season varieties of pigeon peas will be introduced from Trinidad, Puerto Rico and India (ICRISAT). Problems to be investigated include:

- a) Spacing and time of planting (May, September and January),
- b) harvesting methods,
- c) disease incidence (particularly Rust disease) and
- d) methods of podborer control. Yields, bud, flower and pod drop will be recorded.

A wide range of cow peas varieties will be introduced and tested at Bodles (2 acres), St. Elizabeth (1.5 acres) and Smithfield (1.5 acres). Problems to be investigated include: row spacing and planting dates (May, September and January). Observations will be made on disease and pest incidence.

Livestock Research Programme

This section provides the main outlines of the research topics; a detailed experimental design will have to be prepared by the expatriate experts to be contracted and their local counterparts.

^{1/} These nematode study proposals have been made to the Ministry of Agriculture by C.W.D. Braithwaite as part of the root crop research programme proposed by Wilson and Rankine.

1. Comparative trials of Jamaica Hope Dairy Cattle and Friesian-Holstein

For the purpose of economic evaluation, a comparison will be made, under various levels of management practice, between imported Friesian-Holstein cattle, the Jamaican Hope and crosses derived from Jamaica Hope cows using semen from high-grade progeny-tested bulls from abroad. It is suggested that this trial be located at Bodles, which already has many of the facilities required for this type of work.

The programme will begin in year one of the Project on existing Pangola grass pastures which will be expanded by 140 acres subsequent to installation of irrigation layouts. In year one, 40 Holstein calves (30 - 60 days) and 40 Holstein heifers (12 - 14 months) will be imported to establish the herd. All breeding heifers will be inseminated with imported semen from the best available high grade bulls. The respective herds will be submitted to experiments designed to determine: (1) physical and economic requirements for semi-intensive and intensive milk production systems and (2) requirements for an appropriate system of calf rearing and maintenance of animal health.

2. Management Trials with Dual-purpose Cattle

The research programme will consist of the following elements:

a) Livestock Rearing Investigations. An economic and technical comparison will be made between different systems of management, housing and feeding, and between various practices of calving and suckling (single, multi-suckling, etc.) and of rearing from weaning to calving.

b) Milk Production Programme. Herd management systems, critical periods for supplementary feeding, building design, as well as the effects of different systems of calving and weaning rates, will be examined. The programme will be located at Montpelier. Physical facilities to be provided include a milking parlour, open and covered yards, silos, calving pens, storage, laboratory, workshops, offices, housing for staff, machinery, etc. The investigation also requires the acquisition of 160 cows and/or in-calf-heifers and appropriate bulls predominantly of Red Poll extraction.

For the first year, 250 acres of Pangola grass, divided into an appropriate number of fenced paddocks, will be established.

3. Increased Meat Production from Goats

The research programme will investigate appropriate systems of management, feeding, animal health and breed improvement. A herd of three hundred females plus 10 imported improved males will be acquired in year 1 of the project. Additional males will be imported in years three and four. The work will be centered in Montpelier where buildings and physical facilities will be available in the Livestock Research Division, but its implementation will have to be carried out on selected typical farms, under strictly controlled conditions, under different levels of production and management practices.



D. Technical Cooperation

Technical cooperation will be provided in the form of foreign experts and training for Jamaican research personnel. For the yam and cassava project, a detailed and comprehensive research proposal has been submitted to the Ministry of Agriculture by L. A. Wilson and L. B. Rankine, as a joint project of the UWI, CARDI and the MINAG. It is proposed that Dr. Wilson of the U.W.I. be nominated leader of the research team. There possibly would be further need for one foreign specialist for this Project. The cost of Dr. Wilson to the project would be that of travelling and per diem expenses only.

For the animal husbandry research, a specialist in animal husbandry research techniques, familiar in particular with the problems of small stock under tropical conditions, should be proposed by the MINAG, preferably from among IDB member countries, to serve as leader for the goat management research project for a three-year period. A cattle research planner would also be provided for the first three months of project implementation.

Training of local research personnel should be confined to graduates already working in MINAG, but requiring special competence in specific areas of their future work. The programme would, therefore, consist mainly of short term training periods in fields such as:

- Research in farming systems (INCRISAT in India), (TRI in Nigeria).
- Farm machinery and equipment for small farms (Taiwan, Japan).
- Irrigation research techniques (Volcani Institute, Israel).
- Introduction of new varieties (the main international centres, especially in Latin America).
- Experimental techniques and analysis (Rothamstead, U.K.) and others to be decided by MINAG, within the framework of the allocation made for this purpose.

Details of the training programme would be finalized in the course of project execution. A sum of US\$719,470 has been allocated for this purpose.

Recruitment of foreign consultants will be undertaken by Government through procedures acceptable to IDB.



STRENGTHENING OF INTRA-REGIONAL AND
INTERNATIONAL TECHNICAL COOPERATION *

ANNEX 7

Page 43

A major constraint in the Agricultural Research Service, at present and for many years to come, will be a shortage of trained and experienced research workers needed to undertake the research programme that has been outlined above. It is, therefore, essential to make the fullest possible use of the contribution that other bodies engaged in research can make to the research effort. This can be done by making funds from the research budget available on a contract basis for projects of high priority, in areas in which the contracting body has special competence and/or facilities, and for scientists from other bodies joining interdisciplinary teams of the Research Service as specialists in their respective fields.

The "Proposals for investigation toward the improvement of root crop productivity and production in Jamaica" (Wilson, L.A. and Rankine, 1976) can serve as a model for such cooperative projects. In this case, the participating bodies are the Agricultural Research Service of the Ministry of Agriculture of Jamaica, CARDI, and the Faculty of Agriculture of the U.W.I. The detailed research proposal was preceded by an agro-economic survey of the crops to be investigated, in which the major constraints to improving productivity were identified. The next step was to define, by order of priority, the problems requiring study in order to eliminate these constraints, and finally, a detailed and comprehensive research project was established.

A. UNIVERSITY OF THE WEST INDIES

Cooperation between U.W.I. and the Agricultural Research Service would have the following advantages:

To the Agricultural Research Service: Leadership for joint research efforts provided by the senior faculty members; opportunities for academic advancement of researchers; planting material for breeding and varietal work; accreditation of research staff; part-time teaching assignments; strengthening of the research effort by basic research carried out at the University.

To the U.W.I.: Justification for funds solicited from international agencies for joint projects of regional significance; commissioning of contracts for research required by the Ministry of Agriculture;

* Extracted from the Final Draft FAO/IDB Cooperative Programme, December 1976.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry, no matter how small, should be recorded to ensure the integrity of the financial statements. This includes not only sales and purchases but also expenses and income.

The second part of the document provides a detailed breakdown of the accounting cycle. It outlines the ten steps involved in the process, from identifying the accounting entity to preparing financial statements. Each step is explained in detail, with examples provided to illustrate the concepts.

The third part of the document focuses on the classification of accounts. It discusses the different types of accounts, such as assets, liabilities, equity, and income, and how they are used to record transactions. It also explains the relationship between these accounts and the accounting equation.

The fourth part of the document covers the process of journalizing and posting. It describes how transactions are recorded in the journal and then posted to the ledger. It also discusses the importance of double-entry bookkeeping and how it helps to ensure that the books are balanced.

The fifth part of the document discusses the preparation of financial statements. It explains how the information from the ledger is used to prepare the balance sheet, income statement, and statement of owner's equity. It also discusses the importance of these statements for the business and its stakeholders.

The sixth part of the document covers the process of adjusting entries. It explains why adjusting entries are necessary and how they are prepared. It also discusses the different types of adjusting entries, such as accruals and deferrals.

The seventh part of the document discusses the process of closing the books. It explains how the temporary accounts are closed to the permanent accounts and how the new year's opening balances are determined. It also discusses the importance of closing the books at the end of the accounting period.

The eighth part of the document covers the process of auditing. It explains the role of the auditor and how the audit process is conducted. It also discusses the different types of audits and the importance of maintaining accurate records for the auditor.

The ninth part of the document discusses the process of reconciling the books. It explains how the balance sheet and income statement are reconciled with the bank statements and other external records. It also discusses the importance of reconciling the books to ensure that the financial statements are accurate.

The tenth part of the document covers the process of preparing the financial statements. It explains how the information from the ledger is used to prepare the balance sheet, income statement, and statement of owner's equity. It also discusses the importance of these statements for the business and its stakeholders.

- A. part-time teaching by qualified specialists from the Research Service with field experience; supervision and provision of research facilities for undergraduate, graduate and post-graduate students.

POTENTIAL OR ACTUAL COOPERATIVE PROGRAMMES

U.W.I. (Trinidad) Faculty of Agriculture:

Department of Livestock Science: Breeding of small animals; utilization of forages and by-products as livestock feed.

Departments of Crop Science and Biological Science: Grain legumes and root crops research: storage problems of roots and vegetables; supply of seeds and planting materials.

Department of Soil Science: Water requirements of crops, nitrogen fixation, nitrogen cycle.

U.W.I. (Jamaica):

Department of Botany: Plant diseases, seed biology, crop breeding, weed biology, lethal yellowing.

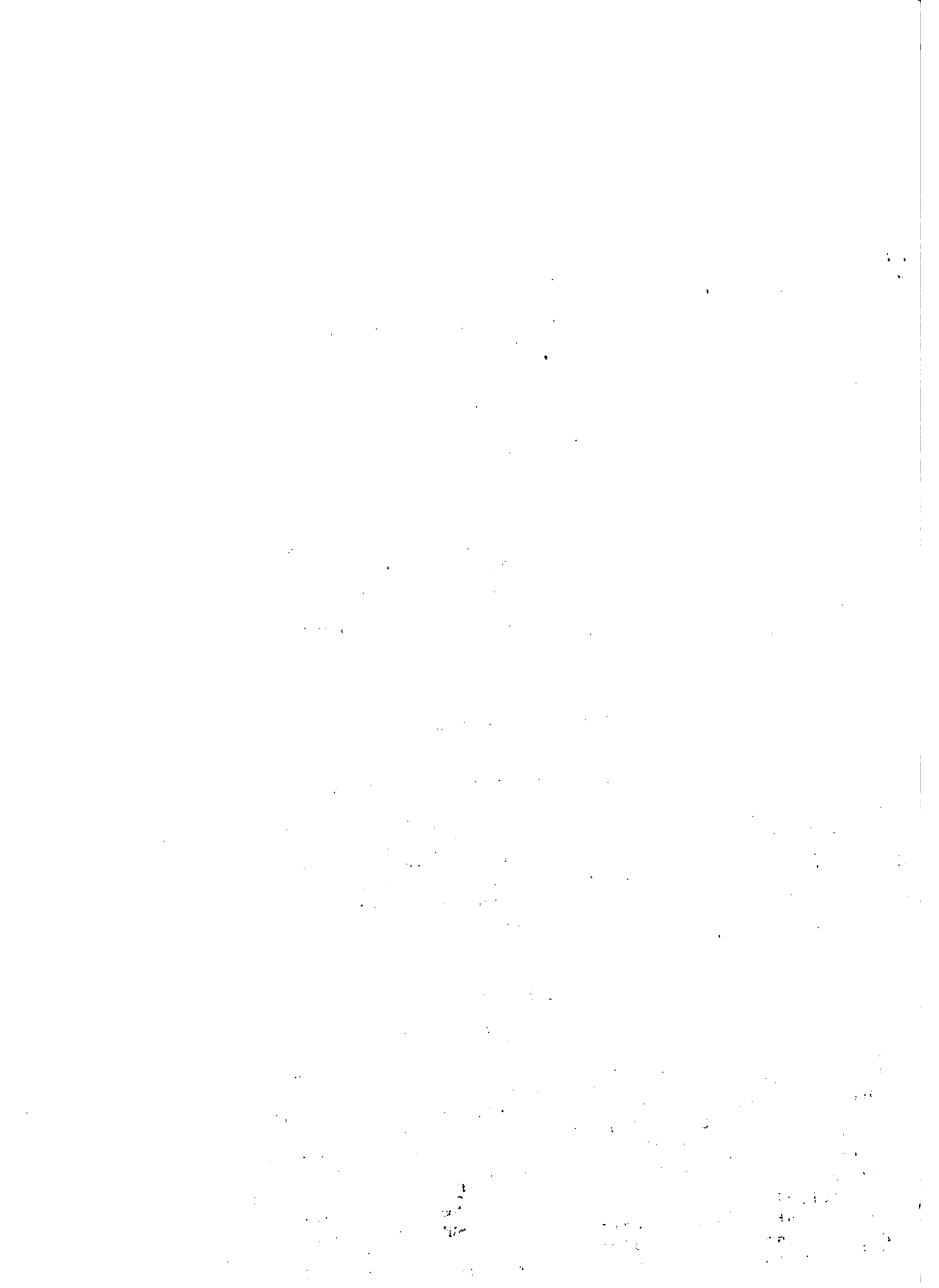
Department of Zoology: Fisheries research, entomology.

Institute of Social and Economic Studies: The Institute of Social and Economic Studies at U.W.I. is doing important sociological research on the problems of the rural sector. This Institute might be able to provide the framework for research on the sociological problems with which the modernization of agriculture in Jamaica is faced, in particular the constraints in adopting new techniques by small farmers.

B. CARIBBEAN AGRICULTURAL RESEARCH

AND DEVELOPMENT INSTITUTE (CARDI)

The Caribbean Agricultural Research and Development Institute (CARDI) is doing a limited amount of research work over which the Ministry has little or no control at present. A greater effort needs to be made to link the research activities of CARDI more closely with problems of immediate relevance to Caribbean agricultural development. This would have the following advantage to the Agricultural Research Service: Supply of planting material of important crops; information on basic and applied research on topics of weed control, vegetables and sweet potatoes; joint research projects on regional problems.



D.

The advantages to CARDI would be: contract research on topics required by the Ministry of Agriculture; provision of facilities for field research in Jamaica.

Cooperative programmes such as on nutritional problems of live-stock and on agronomy and breeding of legumes (particularly peanuts) and of tuber crops (cassava, yams) could be undertaken with CARDI.

C. INTERNATIONAL INSTITUTES

Cooperation with the appropriate international institutions would provide a source of planting material of improved cultivars and information on basic and applied research topics of common interest. The Agricultural Service would be able to collaborate in testing breeding material, farming systems and agricultural practices.

Some of the possible cooperative programmes are:

CIAT: Cassava breeding and research;

CYMMIT: Grain cereal varieties;

IITA: Sweet potatoes and farming systems;

CIP: Potato research;

ICRISAT: Farming systems and cultural practices for semiarid tropics;

Central Sugar Cane breeding Station, Barbados: Provision of breeding material;

Winban (Banana) Research Department: Nematode and weed control;

Commonwealth Institute of Biological Control (CIBC): Biological control of insects.



STATUTORY BOARDS AND OTHER RESEARCH AGENCIES

The Statutory Boards listed below are appointed by the Minister of Agriculture and are responsible to the Ministry and formalised by Law. They are designed to stimulate various aspects of the Industry concerned. A Board of Directors forms the management of each Board. Statutory Boards are self-financing, Government only giving a grant for a specific reason or purpose.

It will be seen that the organisation and/or development of research is only one of the functions exercised.

Statutory Boards falling under the Ministry of Agriculture consist of:

- Coconut Industry Board
- Coffee Industry Board
- Cocoa Industry Board
- Banana Board
- Agricultural Development Corporation
- Tobacco Industry Control Authority
- Sugar Industry Authority

Statutory Boards falling under the Ministry of Industry and Commerce:

- Jamaica Industrial Development Corporation

Statutory Board falling under the Ministry of Finance & Planning:

- Scientific Research Council.

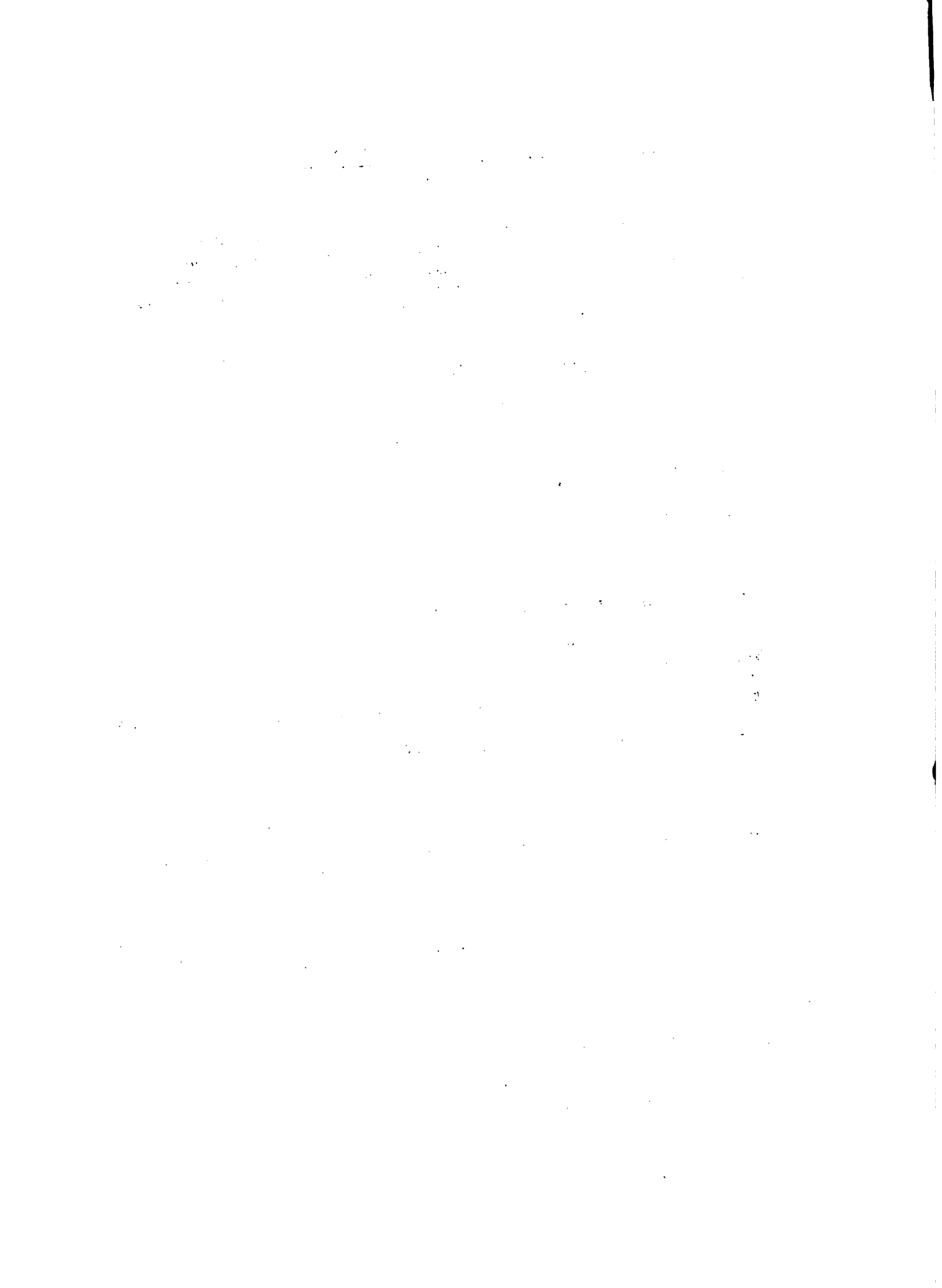
N.B. Storage and Infestation is a Department of the Ministry of Industry and Commerce.

Objectives of each Statutory Board*

Banana Board - Established in 1953

- (1) promote the development of the Industry and to secure the most favourable arrangement for the purpose, sale, exportation and marketing of bananas.

* Official Handbook of Jamaica 1971.



- (2) be responsible for research activities and experiments for improvement in the methods of cultivating bananas and control and elimination of diseases;
- (3) has power to control prices paid to growers, producers or agents for bananas. (Further details on the Banana Board are presented in Appendix 1).

Cocoa Industry Board - Established in 1957 - was charged with the responsibility for:

- (1) regulating and promoting the development of the industry;
- (2) securing arrangements for the purchase, processing, marketing, (local and export) sales import and export of cocoa;
- (3) advising the Minister on matters affecting the industry.

The Board operates 4 fermentaries through which most of the island's cocoa is processed. In 1969 a 5-year Cocoa Resuscitation Programme was put into operation in an effort to reduce shade and rat population and to increase the use of fertilizers and fungicides.

Coffee Industry Board - was established in 1948 and charged with the general duty of performing such functions as may be considered most expedient for the encouragement and development of the Coffee Industry.

The Board operates six central factories, i.e. pulperies, which process most of the island coffee. It also operates a central grading and processing factory in Kingston. A resuscitation and expansion programme was started in April, 1969.

The Board is the central agency for the marketing of coffee.

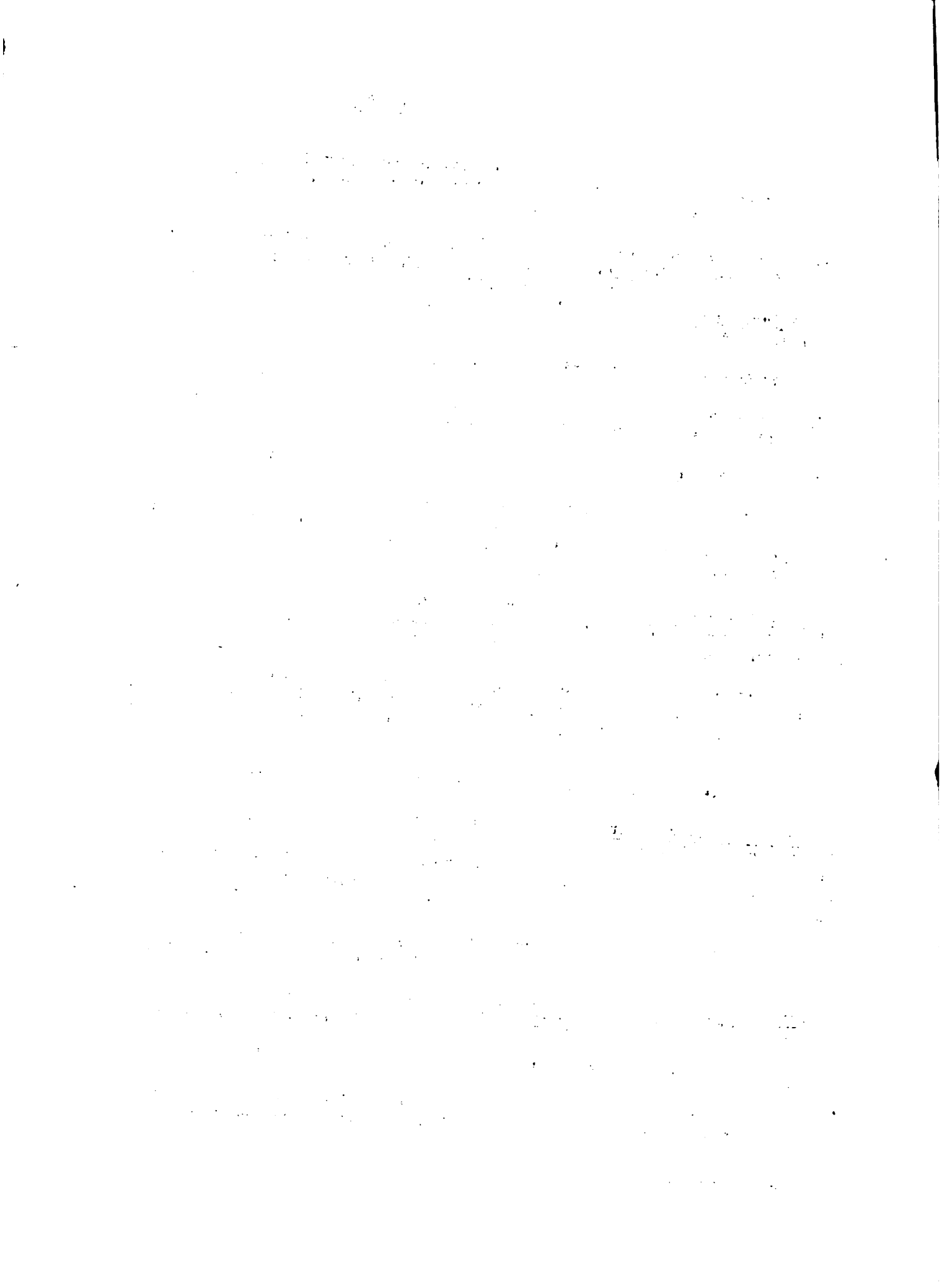
Coconut Industry Board was established in 1945, and charged with promoting the interests and efficiency of, and to control the coconut industry; to encourage the production of, and to regulate the purchase, sale and exportation of coconuts, and the processing, manufacturing, purchase, sale, distribution and exportation of coconut products, and for purposes incidental thereto and connected therewith.

The Research Programme was undertaken in 1959 with the consent of the Authority and approval of the Minister. (see appendix 2 for further details)

Agricultural Development Corporation - established in 1951, is designed to fill the role of development between research and commercial production.

Tobacco Industry Control Authority - established in 1967

- (a) to promote the interest and efficiency of the tobacco industry in Jamaica, to assist in its development and to promote the welfare
-



of persons engaged in that industry.

- (b) to secure the most favourable arrangements for the production, handling and marketing of tobacco.
- (c) to perform such other duties in relation to or in connection with the Tobacco Industry or persons engaged in that Industry as the Minister of Agriculture may require to be performed. See Appendix 3 for the Research Input.

Jamaica Industrial Development Corporation was established in 1952 to facilitate and undertake the development of industry in the island. It provides a wide range of services to industry, including market research and evaluation, feasibility studies, training, advice in selection of factory sites.

Its Food Technology Department operates a pilot plant, and is engaged in research aimed at developing new processed foods utilizing local raw materials.

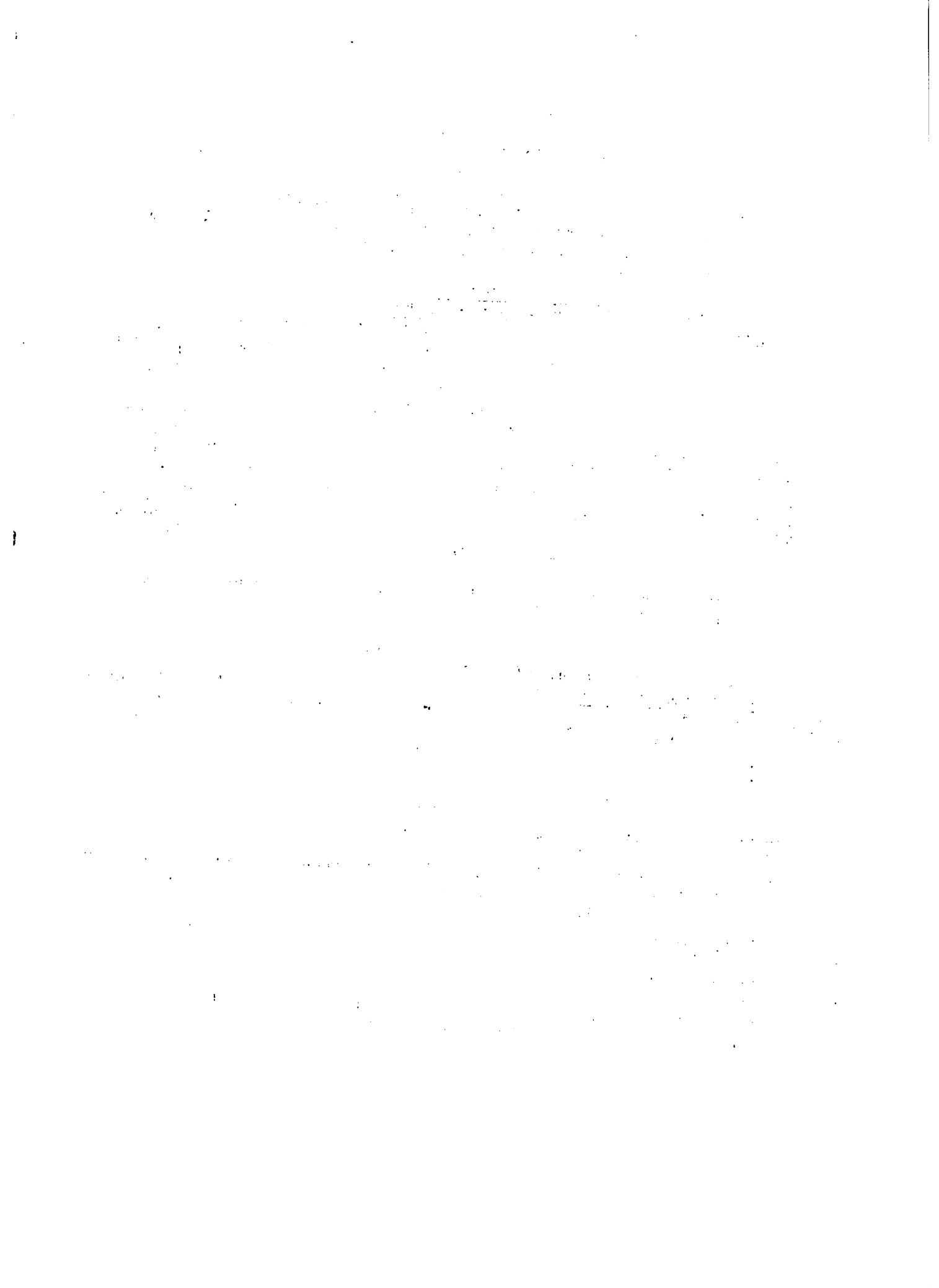
Sugar Industry Authority - established in 1970 with the functions of:

1. advising the Minister on general policy within the Industry, mechanization and economic use of parts;
2. fostering and coordination of research;
3. making arrangements for the marketing of sugar and molasses for local consumption;
4. management and control of the Sugar Authority. (refer to appendix 4 for details on research).

Scientific Research Council - established in 1960 to undertake, foster and coordinate scientific research in this island and to encourage the application of the results of such research to the exploitation and development of resources of the island.

Some of the activities are listed below:

1. Mineral resources (Clay Mineralogy and Ceramics);
2. Bioresources (Essential Oils, Sugar-derived products, Process Development for Natural Products).
3. Food Science and Nutrition.
4. Chemical Technology.
5. Library and Information Services. (See appendix 5 for further details).



RESEARCH AND DEVELOPMENT DEPARTMENT, BANANA BOARD

1. History and objectives of the organization:

- Established in 1955 to conduct research in banana production and pest and disease control.

2. Organization and function:

(i) Structure

As per attached organization chart.

(ii) Relations with other organizations

The department maintains contact with U.W.I., Scientific Research Council, J.I.D.C., Ministry of Agriculture, WINBAN Research, I.F.A.C. and through the Banana Board is a member of the Association for Cooperation in Banana Research in the Caribbean and Tropical America and the Caribbean Food Crops Society.

3. Resources (over last three years) of the organization:

(i) Human

Nine to twelve senior scientific officers (University Graduates) in Chemistry, Entomology, Nematology, Plant Pathology, Physiology, Agronomy.

Supporting Staff

Farm Manager	-	1
Senior Extension Officer	-	1
Field Officers	-	6
Technical Assistants	-	5 - 6
Secretary/Stenographer	-	1
Stenotypist/Book-keeper	-	1
Librarian/Steno-typist	-	1
Handyman	-	1
Laboratory Attendants	-	3
Farm workers/Orange River	-	23

(ii) Physical

Office accommodation	-	11
Laboratories	-	7
Library	-	1
Cold & Ripening Rooms	-	4
Dark Room	-	1
Vehicles	-	7
Research Station	-	1
Chemical and general	-	3
Storerrooms	-	3

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

RESEARCH REPORT
NO. 100

BY
J. H. GOLDSTEIN

AND
M. L. HUGGINS

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CHICAGO

CHICAGO, ILLINOIS

1954

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(iii) Financial (capital and operational costs)*

1974	-	\$151,218
1975	-	\$176,376
1976	-	\$164,514

4. Range or scope of each organization:**(i) Geographical range**

Generally, banana growing parishes - St. James, Hanover, St. Mary, Portland, St. Thomas, St. Catherine, Manchester.

(ii) Clientele

- Mainly export growers through extension and operations.
- Banana processors.

(iii) Areas or problem solving

- irrigation and water management
- pest and disease control
- packing and processing for export
- nutrition
- cultural practices (weed control, spacing, drainage, pruning, fruit protection, etc.)

5. Efficiency and effectiveness of the organization:**1. Quantity and quality of research results (in terms of production) in the rural development of the country**

The Department publishes an annual report of research results and recommendations. Extension/educational bulletins are distributed to growers through research staff and the extension service. The Department has also prepared manuals on "Boxing plant operations and quality control", "Material Specifications", "Leaf Spot Control". Services include advice on fertilisers and team visits to growers having special problems.

2. Assessment of the production of the organization as it relates to the clientele needs and to the relevance to the priorities of agricultural problems

Transmission of modern techniques of banana production are hampered by too few officers, inadequacies of the extension service and numerous small growers.

* operational - vehicles, laboratories, experiments (excluding staff salaries).

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3. Diffusion of technical information and its adoption by those who could make use of it

Information is diffused as outlined in 5.1. There is often considerable resistance to new methods.

6. Perspectives of the evolution of each Agricultural Organization with respect to projections:

1. Objectives

Recommendations have been made to merge the Department with the Ministry of Agriculture.

2. Internal organization, functions and external relations

Will depend on 1 above.

3. Resources

As for 2 above.

4. Scope

As for 2 above.

7. Suggestions for institutional improvement:

To be considered with recommendations for Ministry of Agriculture and overall plan for agricultural research.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that this is crucial for ensuring the integrity of the financial statements and for providing a clear audit trail.

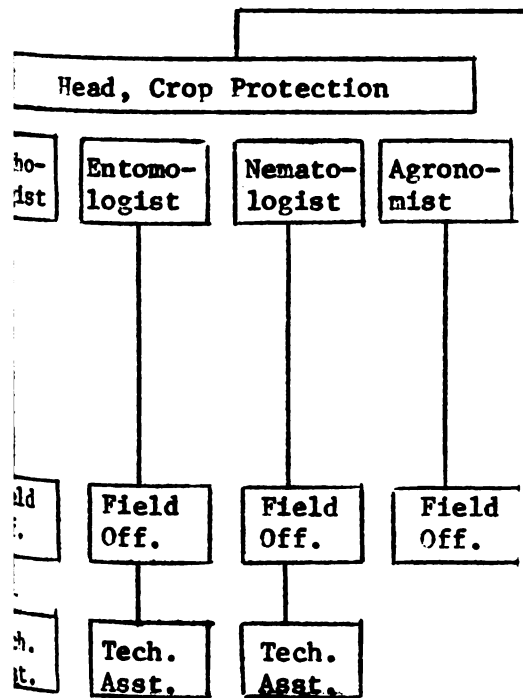
2. The second part of the document outlines the various methods used to collect and analyze data. It includes a detailed description of the sampling techniques employed and the statistical tests used to evaluate the results.

3. The third part of the document provides a comprehensive overview of the findings of the study. It discusses the implications of the results and offers recommendations for future research and practice.

4. The final part of the document is a conclusion that summarizes the key points of the study and reiterates the importance of the findings.

THE COCONUT INDUSTRY BOARD

1. INTRODUCTION



1943

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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THE COCONUT INDUSTRY BOARD

1. INTRODUCTION

The Coconut Industry Board is a statutory body established under the Coconut Industry Control Law (Cap. 62 enacted in 1945), a Law to promote the interests and efficiency of, and to control, the coconut industry, to encourage the production of, and to regulate the purchase, sale and exportation of coconuts, and the processing, manufacturing, purchase, sale, distribution and exportation of coconut products, and for purposes incidental thereto and connected therewith.

The Board consists of nine members, four of whom, including the Chairman, are appointed by the Minister under whose portfolio the industry falls. The remaining five are elected by coconut growers. Organizational Chart is attached.

2. RESEARCH

The Research Programme in coconuts was undertaken in 1959 in pursuance to Section 14 (g) of the Law which stipulates "the Board may with the consent of the Authority and subject to the prior approval of the Minister, conduct, finance and assist research activities and experiments for the elimination or control of any coconut disease and for the development, extension and betterment of the production of coconuts and coconut products".

3. MODUS OPERANDI

The Board guides and directs the research programme with a budget approved for this work.

4. RESEARCH PROGRAMME

The present research programme is concerned with two main aspects of the coconut crop:

- (a) Development of more efficient cultural methods.
- (b) Improvement in yield by seed selection and breeding with emphasis on resistance to lethal yellowing disease.

Owing to the frequency of hurricanes, attention is also given to the need for early bearing and wind resistance.

The coconut is also considered in the light of its association with inter-crops. Some investigation is performed on other oil crops, e.g. Soyabean and oil palms.

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5. MAIN AREAS OF RESEARCH

Currently, the main fields of research are:

(a) Botany/Plant Breeding

Importation and field testing of coconut varieties
Production and testing of hybrids
Botanical and commercial characterization of varieties and hybrids
Sibbing of selected varieties
Research on pollen collection, storage and handling
Establishing male parent blocks
Mass controlled pollination for commercial hybrid seed production
Quality control of Malayan Dwarf seed production

(b) Agronomy/Crop Physiology

Spacing
Fertilizer and foliar analysis
Cultivation and mulching
Herbicides
Rat control
Intercropping
Root growth experiments
Tissue culture work in conjunction with U.K. Ministry of Overseas Development

(c) Miscellaneous

Operation of a Chemistry Laboratory
Research on coconut pests and diseases
Supervision of all island seed production
Establishment of hybrid seed farms

(d) Advisory

Approximately 9,000 advisory visits are made each year by staff employed from the research budget and by officers under the Lethal Yellowing Rehabilitation Scheme.



The Advisory programme of the Research Department also includes field training days, farm tours, resident courses, participation in Agricultural Shows and radio broadcasts. Explanatory leaflets are frequently sent to growers.

6. RESOURCES

(a) Human

The research staff consists of three fully qualified experienced scientists, four field officers, five laboratory assistants, nineteen field assistants, two advisory officers. The nine inspectors employed under the Lethal Yellowing Rehabilitation Programme also act as advisory officers during their visits to farmers. Five of the officers and inspectors are graduates of the Jamaica School of Agriculture.

All employees connected with research are on continuing contracts with the Board. There is no scale of emoluments and salaries are similar to those paid by Government and private enterprises.

(b) Physical

Research is conducted from the Board's Headquarters where offices, laboratories and equipment are provided.

Suitable vehicles are provided where necessary for use on the job only. The Board owns and maintains them and no mileage or upkeep rates are paid to the operators.

(c) Financial

Research expenses are chiefly recurrent and capital expenditure is mainly for replacement of vehicles. Recurring expenditure during the last five years on research and advisory work was as follows:

(i) Provided by the Coconut Industry Board

1970	J\$150,435
1971	139,188
1972	129,909
1973	143,367
1974	181,407

(ii) Provided by Food & Agriculture Organization for Lethal Yellowing Research only

1972	US\$ 22,850
1973	32,400
1974	27,950



(iii) Provided by U.K. Ministry of Overseas Development for Lethal Yellowing Research only

1972/3	£53,043
1973/4	33,330
1974/5	21,150

(iv) Provided by U.K. Ministry of Overseas Development for Sundry Research

1973/4	£ 8,040
1974/5	9,510

7. EFFICIENCY AND EFFECTIVENESS OF PROJECTS WITHIN RURAL SECTOR7.1. Research

Projects are geared to continued testing of introductions to produce varieties and hybrids resistant to Lethal Yellowing, and development of this crop so as to provide copra for the industry, (see under Statutory Bodies).

Development

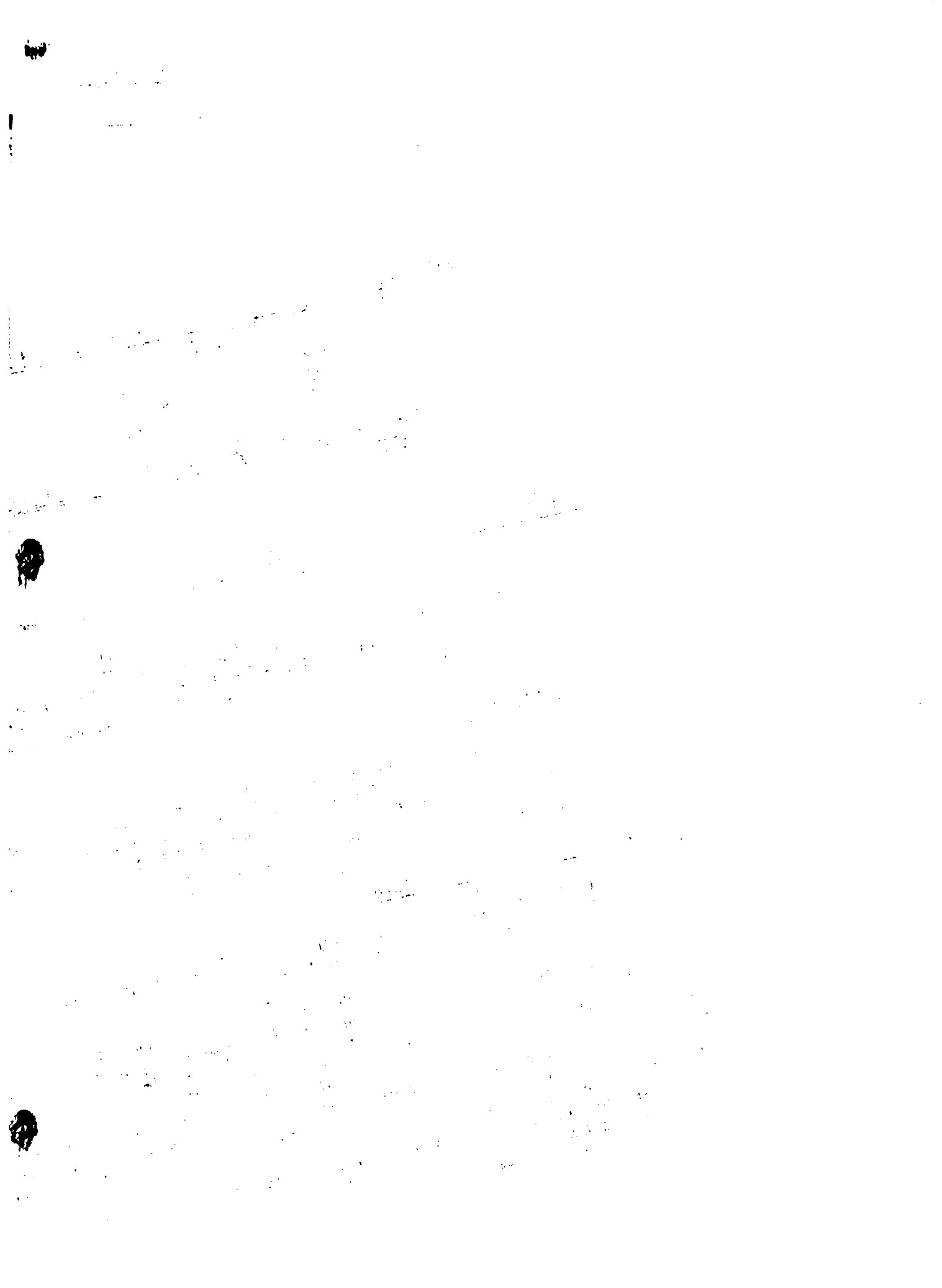
Rehabilitation of plantations being ravaged by the crop and in the planting of new ones introducing tested agronomic practices, viz. correct spacing, fertilizer application, rodent control (rat bait devised locally) provision of adequate nurseries, and close supervision in the first 4 years of establishment.

7.2. Achievements and Failures

7.2.1. With the assistance of external aid, ODM and FAO, the cause of Lethal Yellowing disease has now been defined.

7.2.2. Successful establishment of the crop is due to surveillance by the Board's Extension staff on the preparation of planting holes before delivering free seed. Cash grants during the period of establishment are an additional incentive. Appropriate fertilizers and chemicals are actually delivered by the Board to the grower and may either be bought outright by him or else deducted from the cash grant. Spraying pans may be borrowed under strict terms, e.g. washing and speedy return.

7.2.3. Establishing good cultural practices during this 4-year surveillance by field officers so that the farmer is now convinced that he must adopt these practices.



Failures

- 7.2.4. Mostly developmental control of praedial larceny and reluctance to plant a long-term crop. With discouragement from invasion by animals, e.g. goats, general care of fences, etc. are allowed to lapse.
- 7.2.5. Due to the scarcity of coconut oil, illicit boiling takes place, as there is a ready market - thus aggravating the situation. The price of water coconuts is also high and has the same effect.
- 7.2.6. Insufficient budget does not allow for widescale planting so as to step up production.

7.3. Number and Title of Publications

See Annex 4.

7.4. Transfer Process of Technology

Intensive extension work from the free delivery of coconuts without cost, dependent on preparation, etc. (see also under advisory service).

7.5. Degree of Adoption by Clients

- 7.5.1. Number of trees are more significant than actual acreage in the rating of size of enterprise. Of about 8,000 farmers, 6,000 have less than 100 trees. Government owned or leased farms are not significant clients.
- 7.5.2. On small and medium sized farms a section may be planted as a stand-by crop which is guaranteed to produce some fruit, whereas quick catch crops may fail. He can also attend to the cultivation without undue urgency, and can fill a space which he may be able to handle without extra unavailable labour. He can also obtain assistance in lining up, etc. from the board's officers. Even before Lethal Yellowing attacks, he can participate in the rehabilitation cash grants in proportion to the rate that the disease catches up with his crop. All clients are able to benefit from any aspect of the care of the crop.

7.6. The Significant Changes (Economic & Social) Observed as a Direct or Indirect Result of Research

The devastation of plantations by the L.Y. disease is evident, as also the underplanting by resistant varieties, but the disease is overtaking faster than the pace at which the Malayan Dwarf can replace the previous production, although the gap is being narrowed.

7.7. Perspective

The status of the Coconut Industry Board is not immediately slated to undergo any change.

The first part of the document discusses the importance of maintaining accurate records. It emphasizes that proper record-keeping is essential for ensuring the integrity and reliability of the data collected. This section also outlines the various methods used to collect and analyze the data, highlighting the challenges faced during the process.

The second part of the document provides a detailed description of the experimental setup. It includes information about the equipment used, the procedures followed, and the conditions under which the data was collected. This section is crucial for understanding the methodology and the potential limitations of the study.

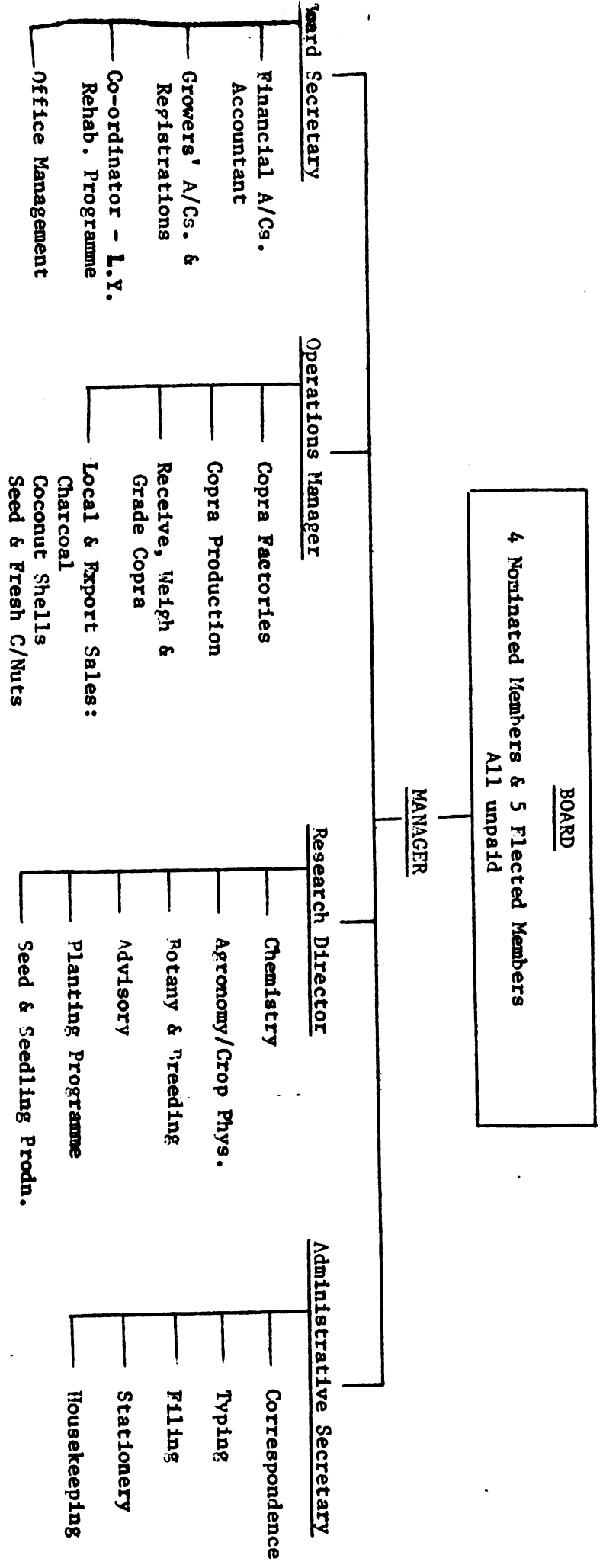
The third part of the document presents the results of the study. It includes a series of tables and graphs that illustrate the data collected. The results show a clear trend, indicating that the variables studied are significantly related. This section also discusses the implications of the findings and how they relate to the research objectives.

The final part of the document concludes the study and provides a summary of the key findings. It also discusses the limitations of the study and suggests areas for future research. The authors express their appreciation to the funding agencies and the participants who made this study possible.

COCOONUT INDUSTRY BOARD ORGANIZATIONAL STRUCTURE

Established under Laws 8 & 19 of 1945

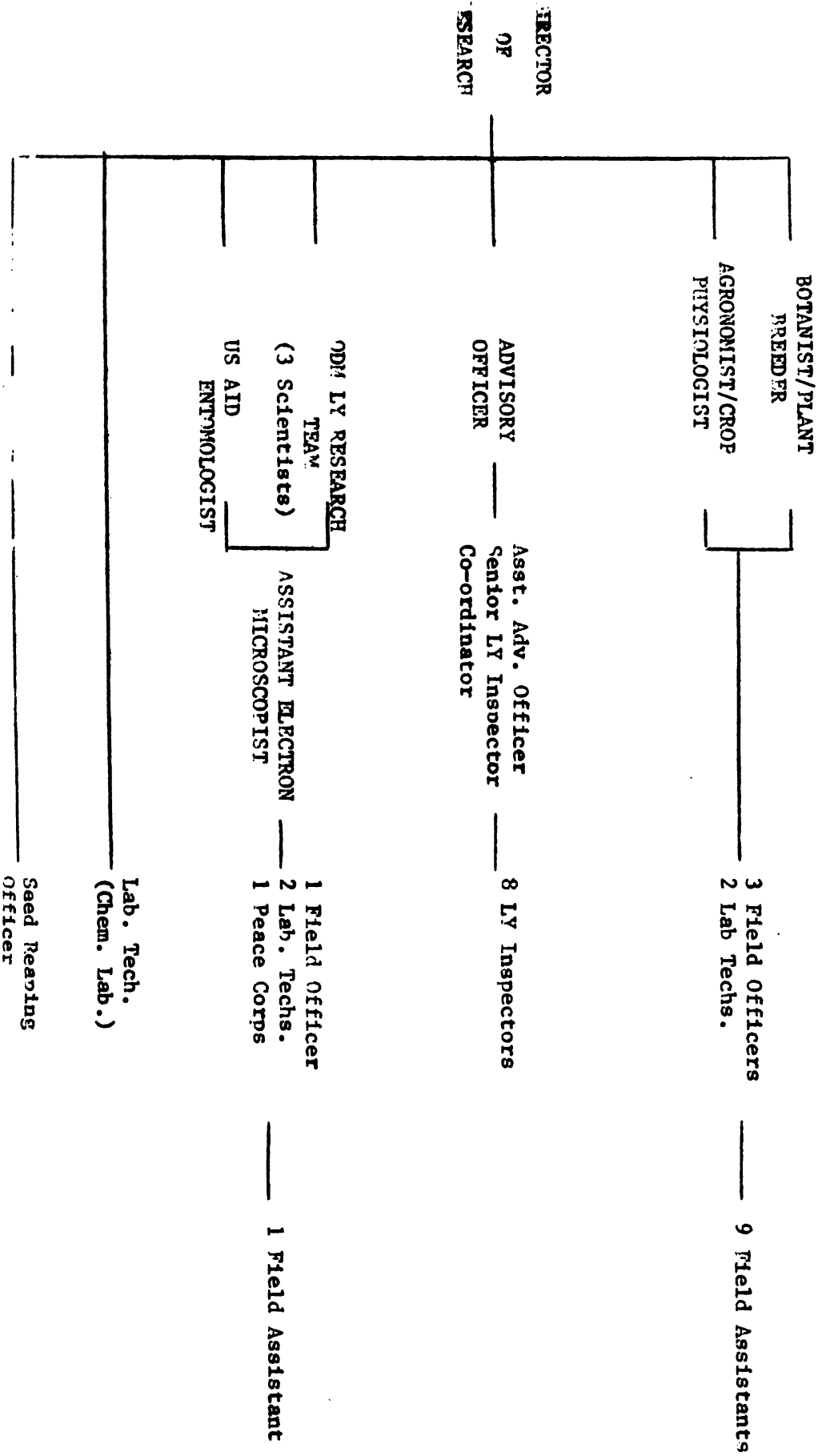
ADMINISTRATION

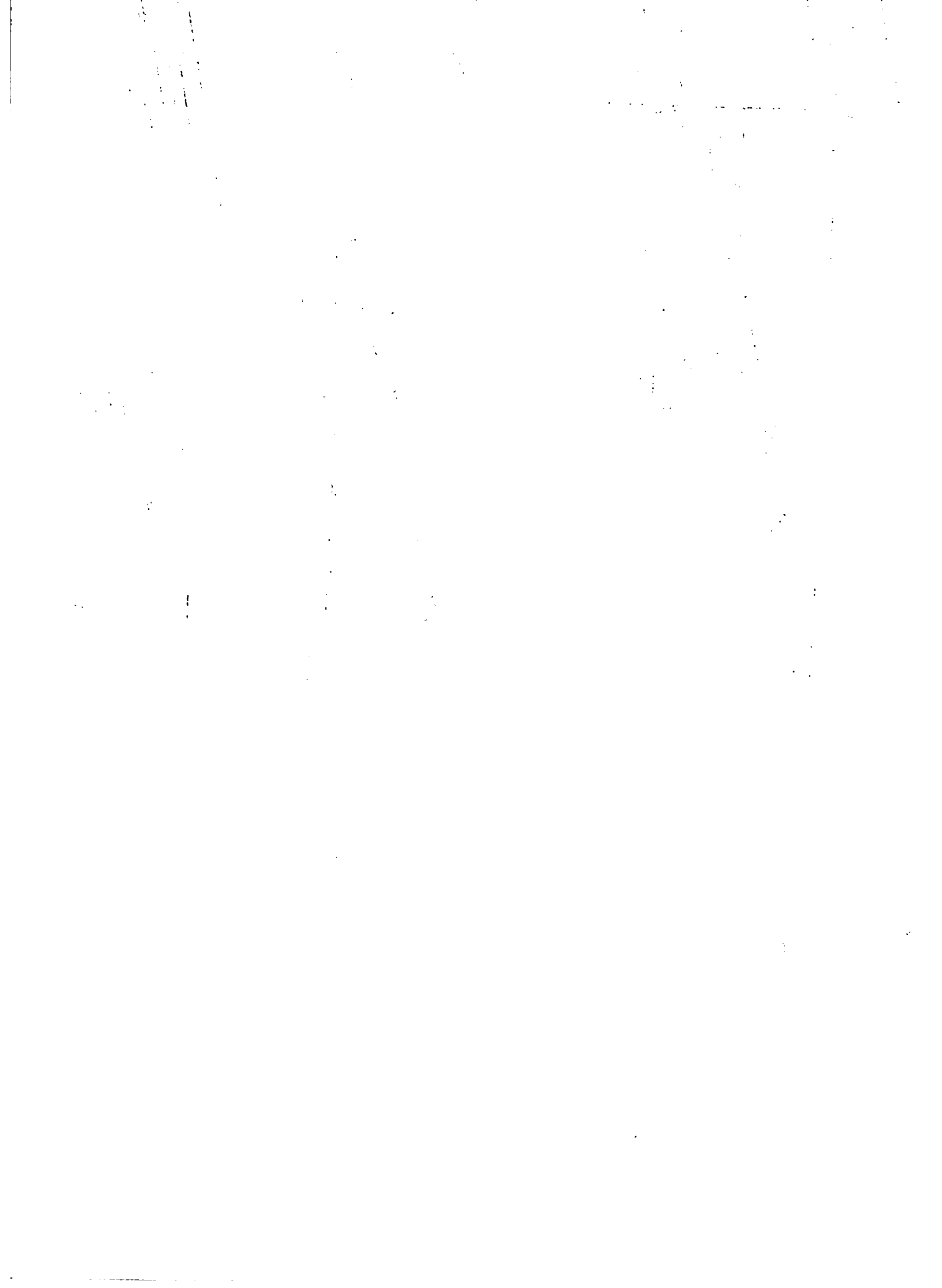


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COCONUT INDUSTRY BOARD

Research Department Structure





TOBACCO INDUSTRY CONTROL AUTHORITY (TICA)

1. Established in 1970 to conduct research in tobacco production in Jamaica in (1) Plant Breeding; (2) Nutrition; (3) Cultivation Methods, and (4) Plant Protection. The research unit is located at Old Harbour and consists of 5 acres with irrigation facilities and also demonstration plots on farmers' land. The unit is responsible for producing a good quality high yielding disease resistant variety of filler tobacco.
2. The research section is a small component of the TICA organisation and was set up in 1970 following feasibility study and pilot trials undertaken under Dutch Government assistance with the objective of reviving the Cigar Tobacco Industry in Jamaica. Project details are set out in Investigations 1964 - 70, page 178.* Related aspects of the Industry, e.g. quality assessment and curing, were included in these investigations. The Dutch Aid terminated in 1975, and research was continued along the lines recommended.
3. The Soil Chemist/Agronomist utilizes the services of the Soil and Land Use and Plant Protection Departments (MA). Free technical assistance is obtained from the University of North Carolina through the Carreras Company.

4. Resources of each ARS during the last 5 years

4.1. Human Resources

1 Graduate Agronomist, 1 JSA diplomate Agronomist, 1 Lab. Assistant (non-technical, but being trained to carry out routine job under supervision) all with approximately 5 years experience. Job security is stable as long as the Industry remains viable.

4.2. Physical

Small Office and simple Laboratory

\$3,000 Barn for air curing of tobacco

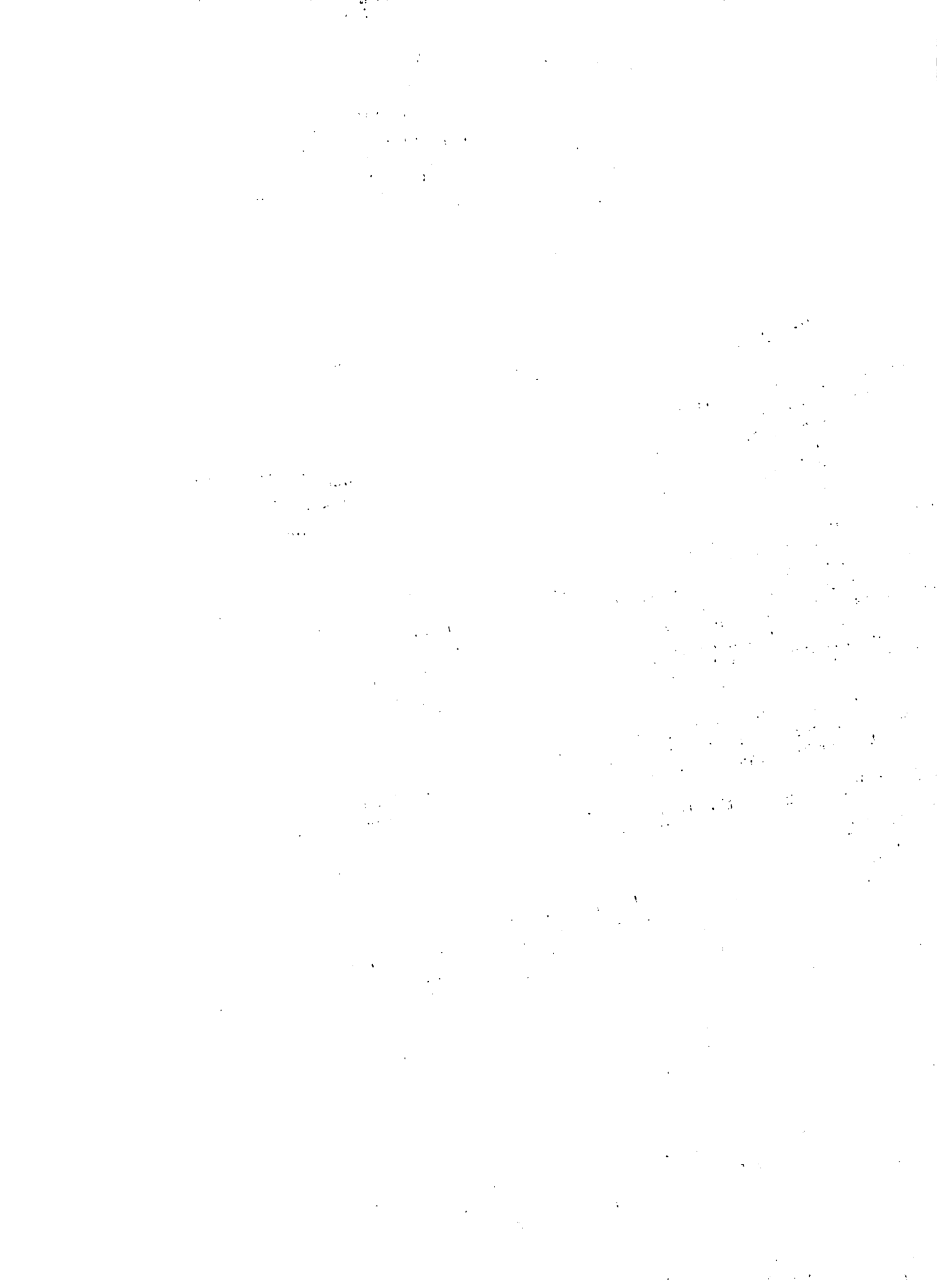
4.3. Financial

The total annual budget for research is approximately \$40,000, of which \$20,000 is at present contributed by Government and the remainder by TICA. These costs do not include personnel salaries.

4.4. Scope

The farmers engaged in the growing of filler tobacco are located in the parishes of Clarendon and St. Catherine. They receive technical guidance in all phases of their operation.

* Investigations, Bulletin No. 63 Ministry of Agriculture, Jamaica, 1964 - 70.



4.5. Clients

The clients consist of those mentioned under 4.4. In addition the tobacco factory management dictates the required quality of the tobacco leaf. Before the Dutch Aid project was started in 1970, the total of 330 acres in tobacco was farmed by 24 farmers. This acreage was subsequently increased to 473 acres. The farmer group, 20 - 25 acres, doubled their acreage and the smaller farmer group increased acreage by 67%. It is not the policy at present to increase the acreage of these two groups as the labour and management capacity would not be capable of producing an adequate economic return. The farm size, 25 acres and over, continued to maintain the largest acreage. It is worthy of note that 25% of the farmers were of the 30-39 age group and only 12% were 60 years and over. Ninety-two percent were full-time farmers.

5. Effectiveness of Research

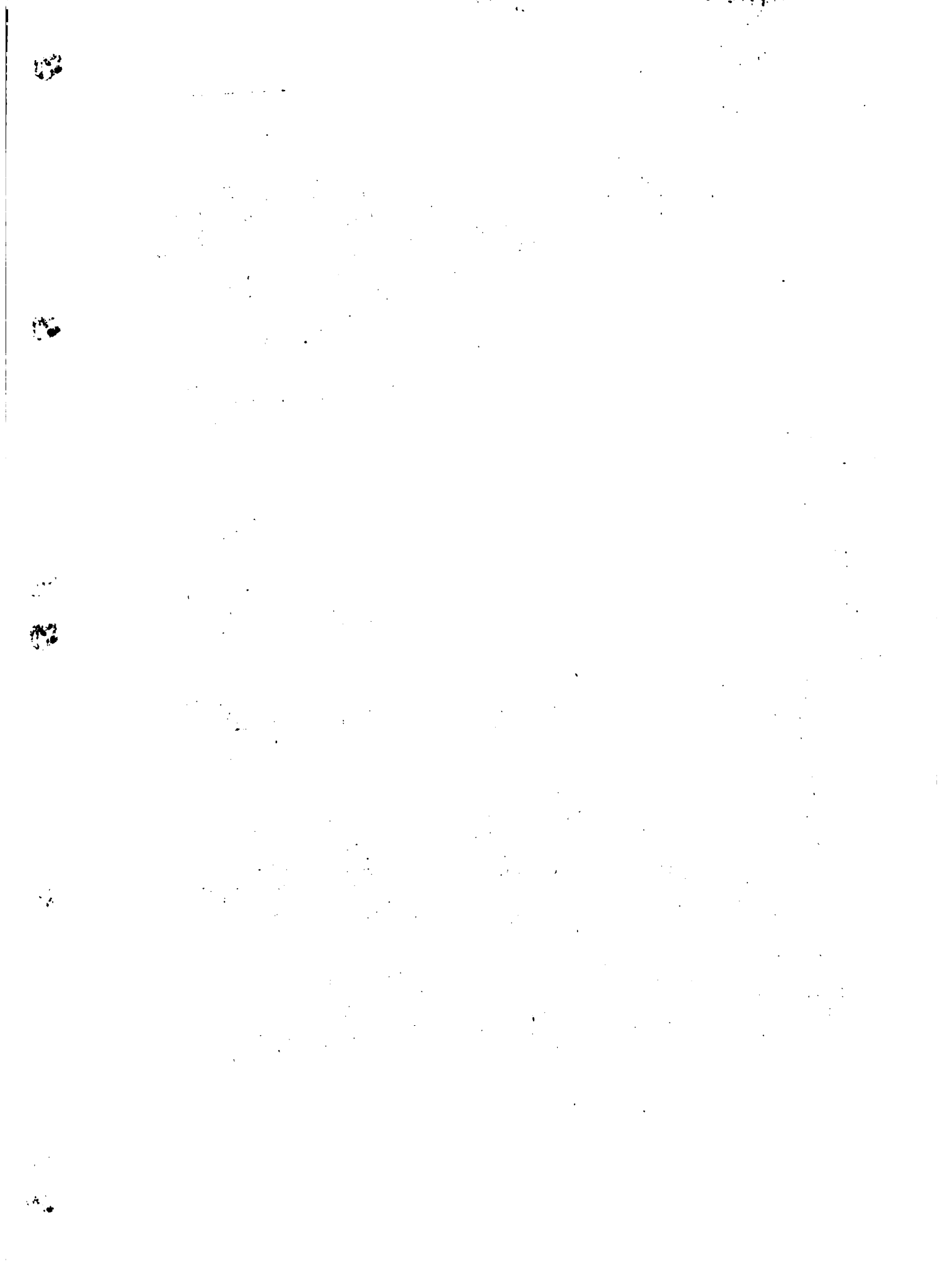
This research unit has started and maintained its role as a project orientated unit, and as it covers a relatively small acreage and number of farmers, it is able to proceed at the pace required.

The research project results have been fully documented in investigations and the projects have on the whole achieved what they set out to do. The project was successful in increasing average yield from 708 to 1,394 lbs./ac., i.e. 97%.

5.1. The transfer process of technology is effected by the production of a Growers Manual and Bulletins, but TICA extension officers use these as many of these farmers cannot read. Demonstration plots are used to demonstrate new technology and compared to adjacent farmer plots.

5.2. The main resistance to adoption of technology was to (1) use of clean seed instead of farmers' seed; sometimes reduced yields were only later explained as being due to this factor; (2) reluctance to use of fertilizer at the recommended rates, for example, of the 5 bags recommended, only 1 was used at first, then 2, and at present 3 plus, but there has been an increase in yield at this rate. The use of less than 2 bags gave a yield of 850 lbs., and now at 3+ is 1,350 lbs.

No change in the status of the research unit is envisaged. Research objectives will vary, and at present there is need to study the utilization of off-crop use of the land at a time of year when irrigation water is not available from river or wells. The rainfall is variable in the area concerned.



SUGAR RESEARCH INSTITUTE (S.R.I.)

1. History and Objectives of the Organization

The first research unit of the Sugar Industry was established in the island as a Government body in 1923. In 1929 this research unit was incorporated into the Sugar Manufacturers Association. The Sugar Research Department was founded in 1942 in Mandeville, where new introductions could be tested under quarantine conditions and in isolation from the cane fields. In 1970 the Sugar Industry Authority was established by the Sugar Industry Control (Amendment) Act. One of its functions was to undertake, foster and coordinate scientific research in relation to all sectors of the industry and served the sugar estates. In 1973 the Sugar Research Institute was founded under the aegis of the Sugar Industry Authority (S.I.A.) and served all cane growers, both estate and private.

2. Organisation and Function

The organizational structure is attached to this Appendix. The units and functions at present are as follows:

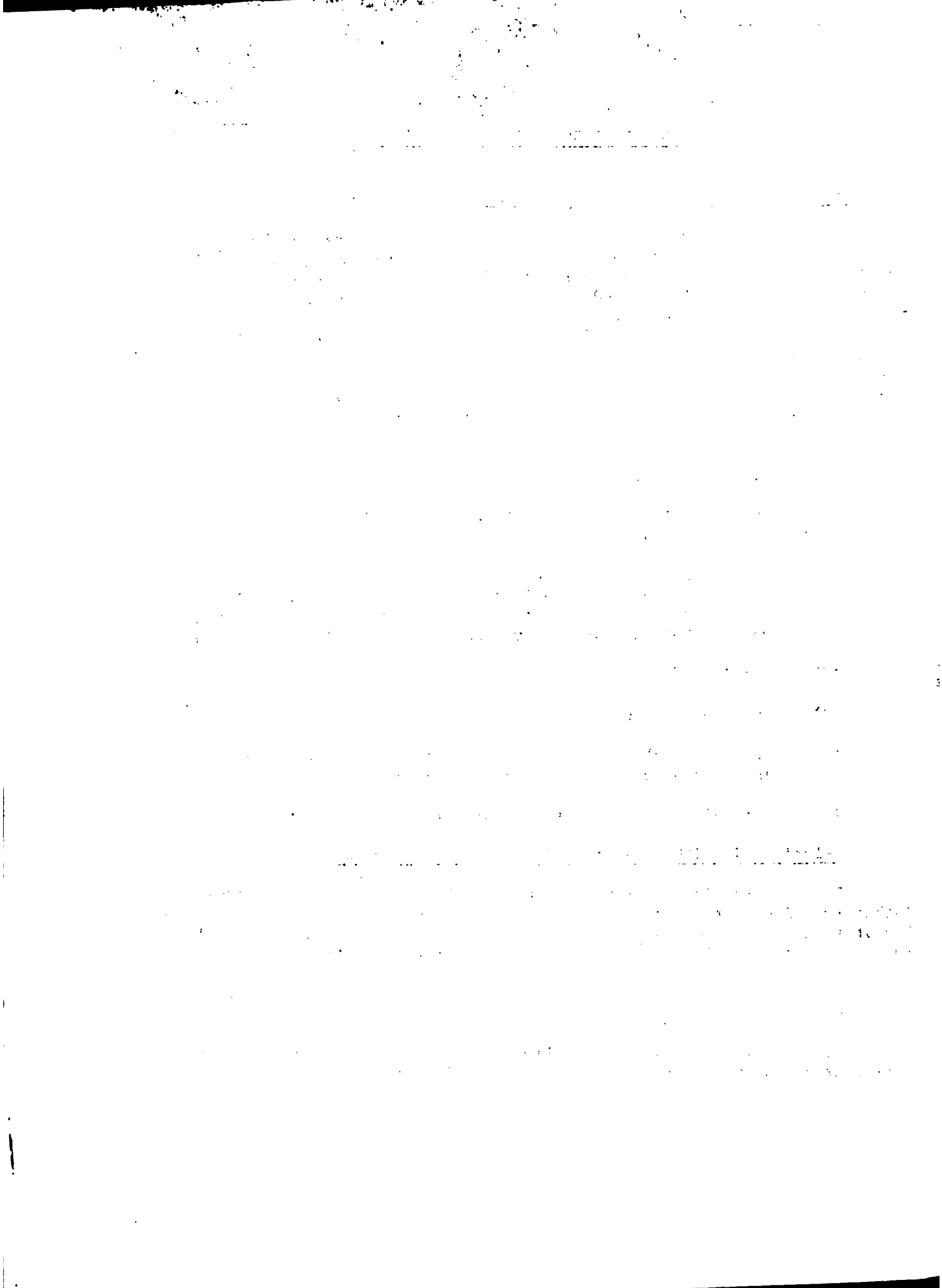
- (1) Agronomy/Extension - serving research and extension among cane farmers. The current principal problem is Smut disease. In 1976 Production and Development services for the Irrigated Plains were placed in charge of the Extension Division within the S.R.I.
- (2) Chemistry/Biology.
- (3) Engineering Section.
- (4) Sugar Technology Section (since 1975 this section has been operated in Kingston under the Factory Research Unit).
- (5) Agricultural Economist appointed in 1977.

3. Relationship with other organisations of the sector

The Research is integrated under the umbrella of the Sugar Industry Authority which embraces all aspects of the industry. The Research Department has at various times collaborated with U.W.I. (Chemistry Department) and is currently participating with C.A.R.D.I. in intercropping trials.

U.W.I. offers post-graduates a course in Sugar Technology in conjunction with the National Sugar Authority.

C.A.S.T. (College of Arts, Science and Technology) offers a technician course at a supervisory level for sugar technologists.



4. Formal relationship (technical, financial) with regional and International organizations

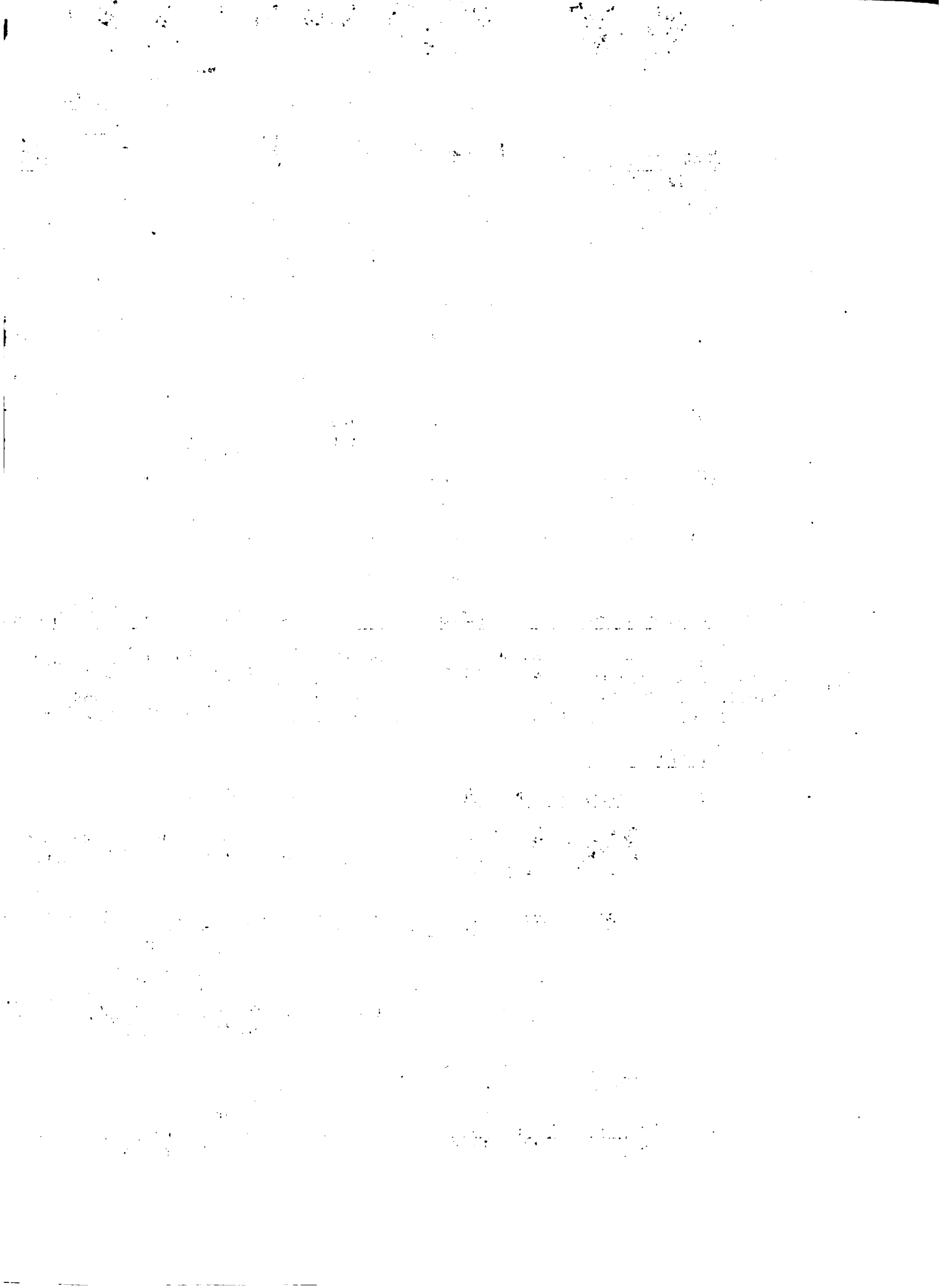
- (1) Professional members of the I.S.C.T. (Institute of Sugar Cane Technologists) - attending conferences, etc.
- (2) Member of GEPLFACA - a technical body comprised of African, American, Caribbean and Pacific sugar producing countries.
- (3) Member of the West Indies Sugar Cane Breeding Station (Barbados).
- (4) CIDA - Canadian Aid currently monitoring Cane Transport Receivals.
- (5) CURA - quarantine station donated to the Government of Jamaica for screening of Smut disease resistant varieties.
- (6) USDA is to build a Quarantine Laboratory in connection with Smut disease control work.
- (7) CARDI - intercropping trials with the plant/cane crop.
- (8) U.W.I. - special projects as required.

5. Planning, Programming Systems (basis, formulation, financing, execution)

The change in structure of the Research Department reflects the fluidity of the Sugar Industry. The programme of work itemised below reflects the priorities. The financing of the Unit is by the Sugar Manufacturers and the Cane Growers. A cess is levied on a per ton basis of actual sugar produced.

5.1. Program of Work:

1. Variety improvement: study of variety "decline".
2. Fertilizer trials - NPK treatments; forms of N and P, methods of fertilizer placement; determination of N status; sulphur nutrition; subsoil fertilizer.
3. Growth regulators: chemical ripening agents; interaction between fertilizers and varieties; effects on early growth.
4. Plant Protection: Survey of diseases and pest populations. Determining economic damage thresholds for specific insect pests. Life history and biology studies of major pests. Role of natural enemies of insect pests. Subterranean termite control.
5. Weed control: screening of new herbicides. Monitoring weed population in plantations.
6. Land and Water management: Trickle and overhead irrigation investigations. Saline land restoration. Narrow-row planting.



- 7. Agricultural Engineering: Minimizing land preparation operations. Machinery testing. Improving productivity of cane-cutters.
- 8. Statistics: Computerization of cane yield. Computerization of meteorological data.
- 9. Meteorology, Climatology: crop forecasting.
- 10. Farm Management: production economics of farm size categories.

6. Resources 1974/77

6.1. Human

Agronomy/Extension

1974	4 B.Sc.	6 Diplomates	2 Field Assistants
1977	* 1 M.Sc., 6 B.Sc.	12 Diplomates	2 Field Assistants

Chemistry/Biology

1974	1 Ph.D., 2 B.Sc.	-	(1 Field Assistant (1 Clerk (6 Analysts
1977	1 M.Sc., 1 B.Sc.	-	3 Analysts

Engineering Section

1974	1 M.Sc., 2 B.Sc.	-	1 Field Officer
1977	1 B.Sc.	-	1 Harvest Operator

Sugar Technology Section

1974	* 2 M.Sc. (section gone over to factory research in 1975)		
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Economics

1977 only 1 Agricultural Chemist.

* Graduates with more than 5 years experience.

Specialization of graduates: agronomy, zoology, biology, botany, engineering, agriculture (chemistry), economics.

Supporting Staff - 1 Office Manager
 1 Secretary
 1 Senior Clerk
 3 Clerk/typists.

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 a systematic approach to data collection and the importance of using reliable sources of information.

3. The third part of the document describes the process of identifying and measuring key performance indicators (KPIs). It explains how these indicators are used to track progress and identify areas for improvement.

4. The fourth part of the document discusses the role of technology in data management and analysis. It notes that modern tools and software can significantly enhance the efficiency and accuracy of data processing.

5. The fifth part of the document focuses on the importance of data security and privacy. It stresses that organizations must implement robust security measures to protect sensitive information from unauthorized access and disclosure.

6. The sixth part of the document addresses the challenges of data integration and interoperability. It explains how different systems and data sources can be brought together to provide a comprehensive view of the organization's performance.

7. The seventh part of the document discusses the role of data in strategic decision-making. It notes that data-driven insights can help leaders make more informed choices and drive the organization's success.

8. The eighth part of the document concludes by emphasizing the ongoing nature of data management and analysis. It states that organizations must continuously monitor and refine their data practices to stay competitive in a rapidly changing environment.

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Reasonable stability and job security - average turnover.

6.2. Physical Resources

Office accommodation:

Chemistry laboratory with facilities for performing 25 - 40,000 analyses/year on leaf, soil, cane juice, irrigation water, fertilizers, etc.

6.3. Financial

The Capital investment in research facilities in 1973/75 amounted to \$220,000. Annual expenditure on research in 1974/75 was \$589,000.

7. Range or scope of the S.I.A.

1. Geographical Range

All cane growing areas in the lowlands of Jamaica. The scope is indicated by the work programme outlined under 5.1.

2. Clientele - Estates and small private growers.

3. Areas of problem solving - indicated by work programme.

8. Efficiency and effectiveness of the Organization

The fluidity of the organisation allows for implementation of priorities as they arise. The Research Department publishes an Annual Report giving details of research results. The publication (monthly) "Sugar Cane" is distributed to all employees and farmers, as well as a few schools currently giving specific information on Smut disease. The Advisory Extension Service has been improved and a Production and Development Service started under Extension in 1976.

9. Assessment of the organization as it relates to clientele needs and to the relevance of agricultural problems

As an export crop it has been essential to relate research to production and to upgrade all aspects of the sugar industry.

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SCIENTIFIC RESEARCH COUNCIL

Agro-Industry Division: Located in Kingston; has 3 well equipped organic chemistry laboratories and 1 chemical plant. The professional staff consists of: 2 Ph.D. and 4 B.Sc. with a support staff of 7 laboratory technicians.

The annual expenditure on research is J\$460,000; the 1973 budget for all activities of the Research Council was Agro-Industry, J\$114,601; and Food Science and Nutrition, J\$40,844.

Program of Work:

Economic utilization of agriculture crops and by-products in industry:

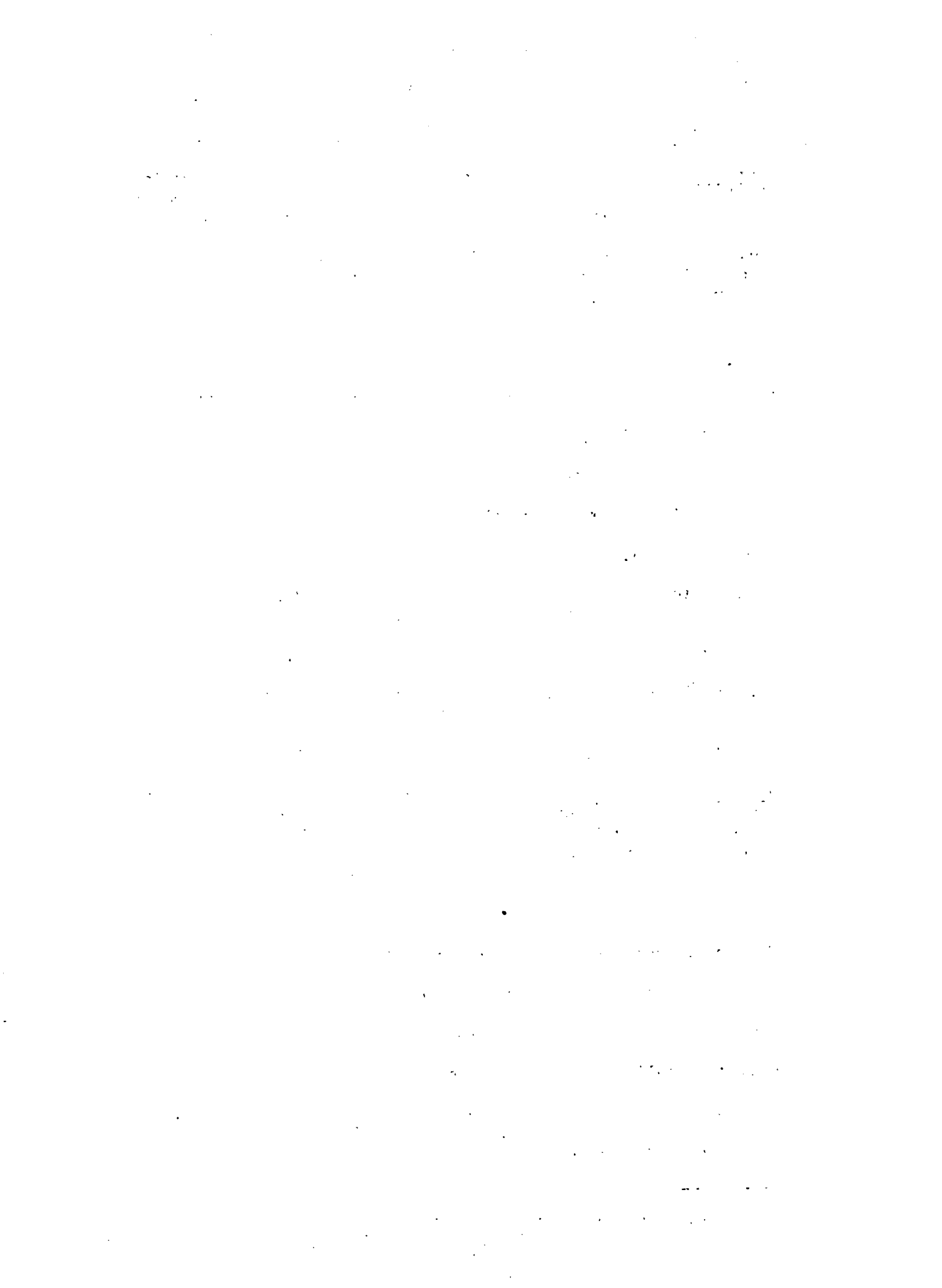
- 1) Essential oils, spices, oleoresins:
 - a) Production of secondary products;
 - b) Evaluation of new essential oils and spices.
- 2) Oil Seeds, Protein, New Oil Seed Crops:
 - a) Analytical studies to establish economic yields, composition and value of oil and protein components.
 - b) Study of techniques of processing of seed oils.
- 3) Production of useful products from sugar and from by-products of the sugar industry.
- 4) Analytical method for the determination of hypoglycine in Ackee.

Food Science and Nutrition Division has 2 M.Sc. and 2 B.Sc. and a supporting staff consisting of 1 experimental officer (J.S.A.) and 4 laboratory technicians. A well-equipped laboratory is available. Facilities for biological studies and sensory evaluation of foods are in the planning stage.

Program of Work:

1. Development of enriched foods (for school feeding programmes and general use).
2. Development of composite flours (substitute of local flours for wheat flour).
3. Determination of calories, nutrients, and toxic content of food.
4. Organoleptic, culinary and shelf life assessment of Irish Potato varieties.
5. Dietary quality of cassava varieties.
6. Assessment of guava selections.

N.B. The above investigations have been carried out at the request of the Crop Research Department of the Ministry of Agriculture, and in some cases have determined the selections worthy of propagation.



CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE (CARDI)

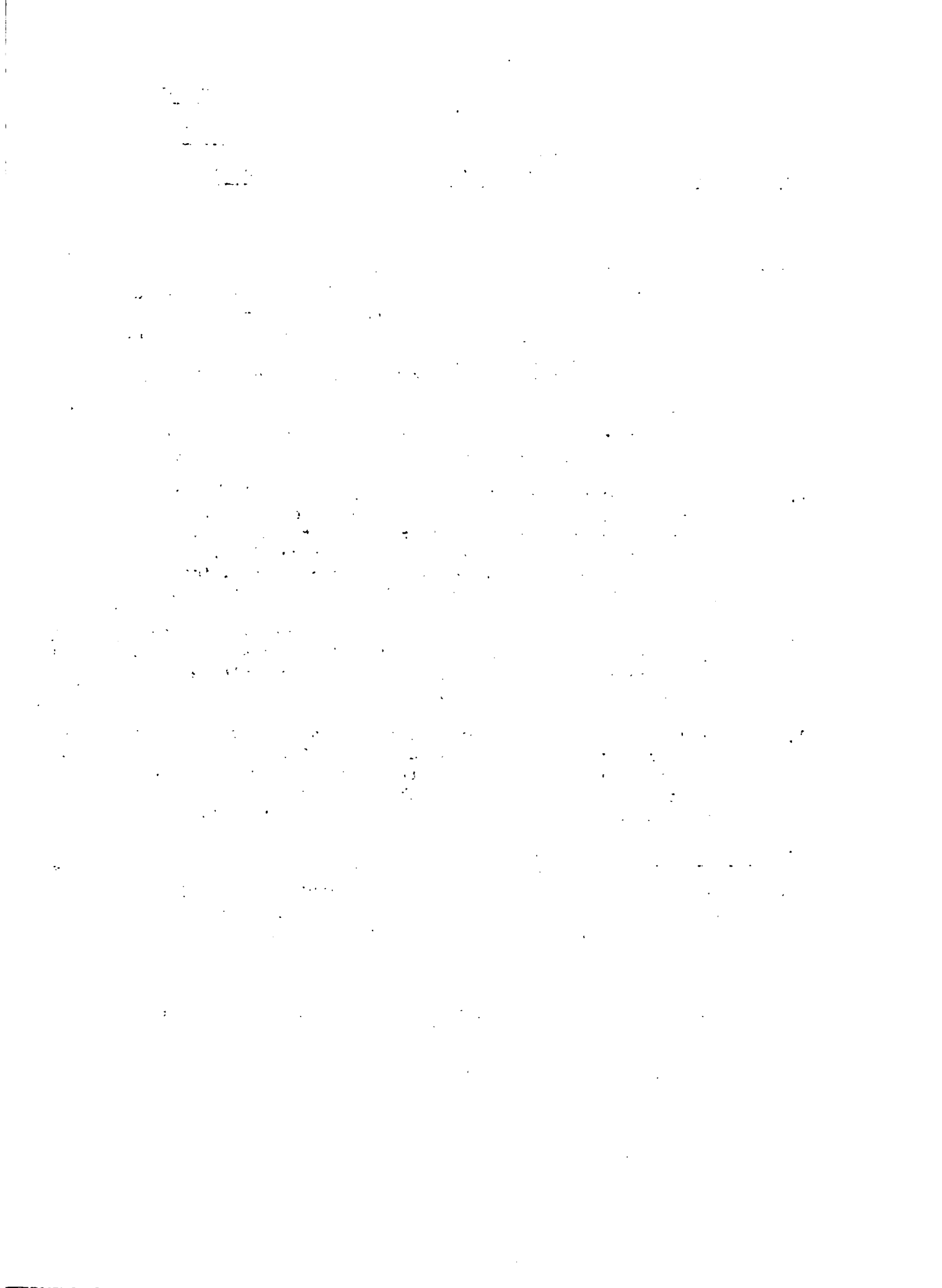
1. HISTORY OF ORGANISATION

- 1.1. The Caribbean Agricultural Research and Development Institute, with Headquarters in Trinidad, serves the 12 member states of the Caribbean Community, viz. Antigua, Grenada, St. Kitts-Nevis-Anguilla, Barbados, Guyana, St. Lucia, Belize, Jamaica, St. Vincent, Dominica, Montserrat, Trinidad and Tobago.
- 1.2. CARDI was established in 1975, replacing the Regional Research Centre, when a majority of Member Governments of the Caribbean Community signed the Articles of Agreement.
- 1.3. The Regional Research Centre (R.R.C.) was established in 1955 by the United Kingdom Government to execute regional research programmes in Agriculture. At that time the R.R.C. was part of the Imperial College of Tropical Agriculture (ICTA) and conducted research in the fields of soils, cacao, banana, food crop improvement, stored products, herbicides and statistics.
- 1.4. In 1960 the R.R.C. as part of the ICTA was merged with the University College of the West Indies in Jamaica and R.R.C. became an integral part of the Faculty of Agriculture, but continued to be financed separately.
- 1.5. In 1971 the United Kingdom Government advised the Council of Ministers, the governing body of the R.R.C., of its intention to phase out its financial contributions over a 6-year period, and the Member Governments of the Commonwealth Caribbean were expected to provide the necessary financial support.

CARDI - Jamaica

Consequent on the above, it will be seen that CARDI was established in 1975; however the predecessor of CARDI, the R.R.C., identified itself with Jamaican agriculture from as early as 1955 in the following fields:

1. Soil Surveys;
2. Regional Field Experimental Programme: Fertilizer usage in Beans (*Phaseolus*), Corn and Peanuts;
3. Banana Research - Breeding;
4. Herbicide evaluation;
5. Citrus Research.



A significant event in the development of the Faculty of Agriculture was the discussion in 1966 to identify itself more closely with Jamaican agriculture; to this end staff was added to work on

- (a) Edible grain legumes and
- (b) vegetables.

In 1968 a single storey building having accommodation for 6 research workers and supporting laboratory and secretarial staff was formally opened on the University Campus, Mona, CARDI - Jamaica Unit, is currently housed in this building.

2. OBJECTIVES

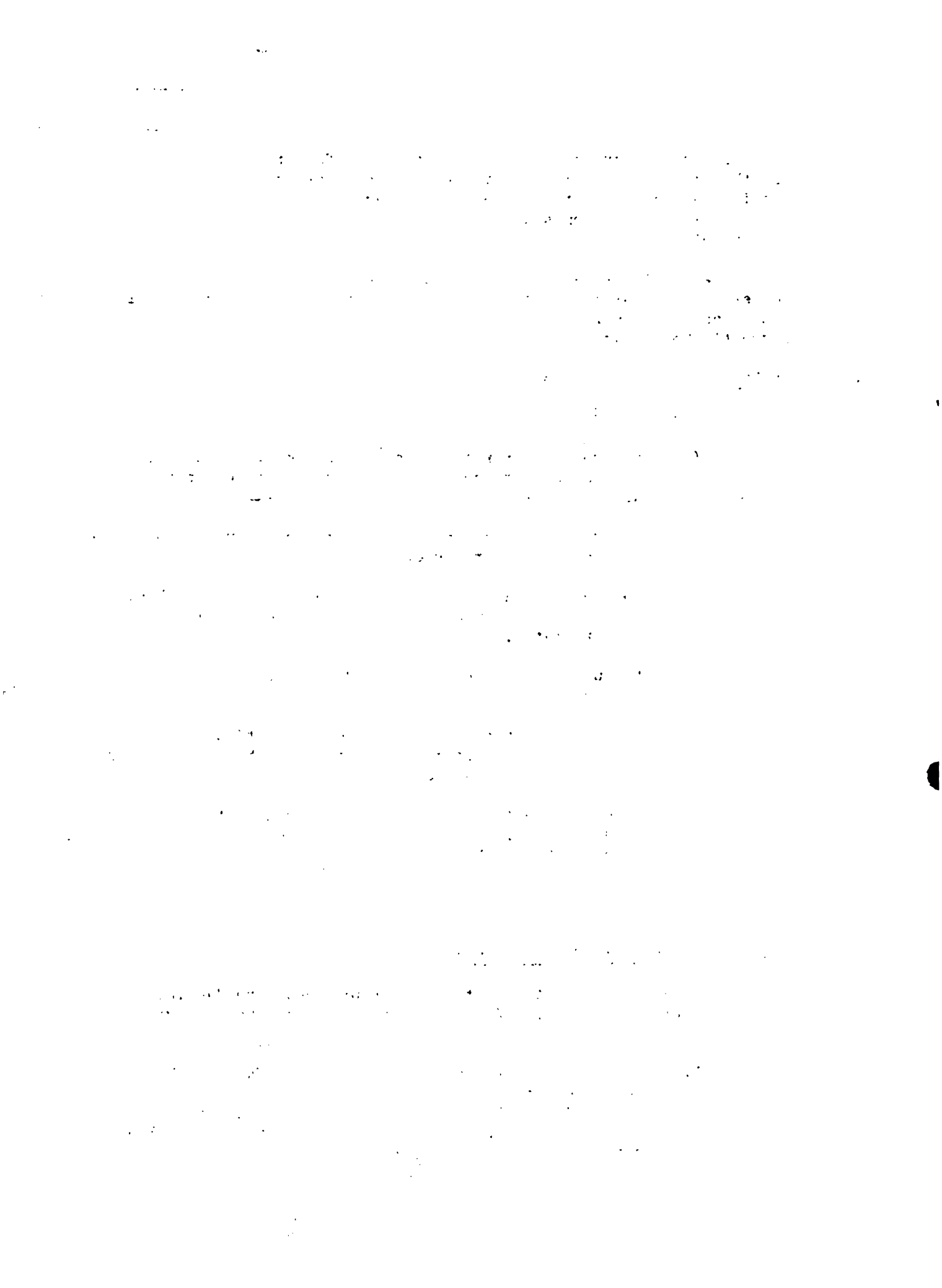
2.1. General

- (a) to provide for research and development needs of the agricultura of the region as identified in national plans and policies;
- (b) to provide an appropriate research and development source to the agricultural sector of Member States;
- (c) to provide and extend the application of new technologies in production, processing, storage and distribution of Member States;
- (d) to pursue for specified periods long-term research in pertinent areas;
- (e) to provide for coordination and integration of the research and development efforts of Member States where this is possible and desirable;
- (f) to undertake teaching functions normally at the post-graduate level, limited to the development of the relevant research by any Member State;
- (g) to seek to achieve the optimum decentralisation of facilities.

2.2. Objective: CARDI - Jamaica Unit

In pursuance of the Institute's objectives, the Jamaica Unit during the year 1977/78 will pursue work in the following projects:

- 1. Proposed Ministry of Agriculture Seed Farm (member of management team) provision of improved varieties for evaluation, making available specialist assistance on short term attachment in the field of virology, plant pathology and a herbicide Agronomist.



2. Intercropping of sugar cane and multiple cropping.
3. Cowpea: Introduction, evaluation, spacing, fertilization and collaboration with M.A. entomological trials.
4. Dry beans: continued introduction and evaluation.
5. Onion: introduction, evaluation, out of season production and collaboration with M.A. in Herbicide evaluation.
6. Tomato: evaluation aimed at adaptability of varieties for hot season production.
7. Peanuts: varietal evaluation (large and small seeded types), spacing, herbicide evaluation and development of package of practices.
8. Livestock Development:
 - (a) provision of assistance to M.A. Shettlewood Dairy project;
 - (b) training in Trinidad of one (1) officer at Sugar Cane Feed Center (1 yr.) - Officer to be assigned to Shettlewood at end of training.

3. ORGANISATION AND FUNCTION

3.1. Structure: CARDI

- (a) a Governing Body, i.e. the Standing Committee of Ministers of the Member States who are responsible for agriculture;
- (b) a Board of Directors - with a Chairman and Deputy Chairmen; the Board of Directors are composed of appointees from Member States, University of Guyana, Caribbean Community Secretariat, the Caribbean Development Bank, the Chairman and the Deputy Chairman;
- (c) an Executive Director;
- (d) a Deputy Executive Director (Administration);
- (e) such other officers and staff as may be necessary.

3.2. Relations

- (a) CARDI, Jamaica Unit, maintains contact with all other CARDI Units; however communication at times is difficult and needs to be improved.

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 reducing the risk of errors.

4. The fourth part of the document addresses the challenges associated with data security and privacy. It stresses the importance of implementing robust security measures to protect sensitive information and ensure compliance with relevant regulations.

5. The fifth part of the document provides a summary of the key findings and recommendations. It concludes that a comprehensive data management strategy is crucial for the organization's success and that ongoing monitoring and evaluation are necessary to ensure its effectiveness.

- (b) CARDI - Jamaica Unit has as one of its major objectives complete integration with the Ministry of Agriculture, Jamaica: it should be noted that 1/3 of the core budget of CARDI is subscribed by the Jamaica Government; however, despite efforts on CARDI's part, this integration has not been accomplished, with particular reference to the Crop Research Department. Currently CARDI collaborates with the Plant Protection Division (M.A.) and the Sugar Research Institute.
- (c) CARDI - Jamaica Unit, currently has a collaborative programme with IITA - Nigeria, and has concluded another with CIAT - Colombia, contacts have been established with AVRDC - Taiwan, ICRISAT in India, IICA - Jamaica.

4. RESOURCES

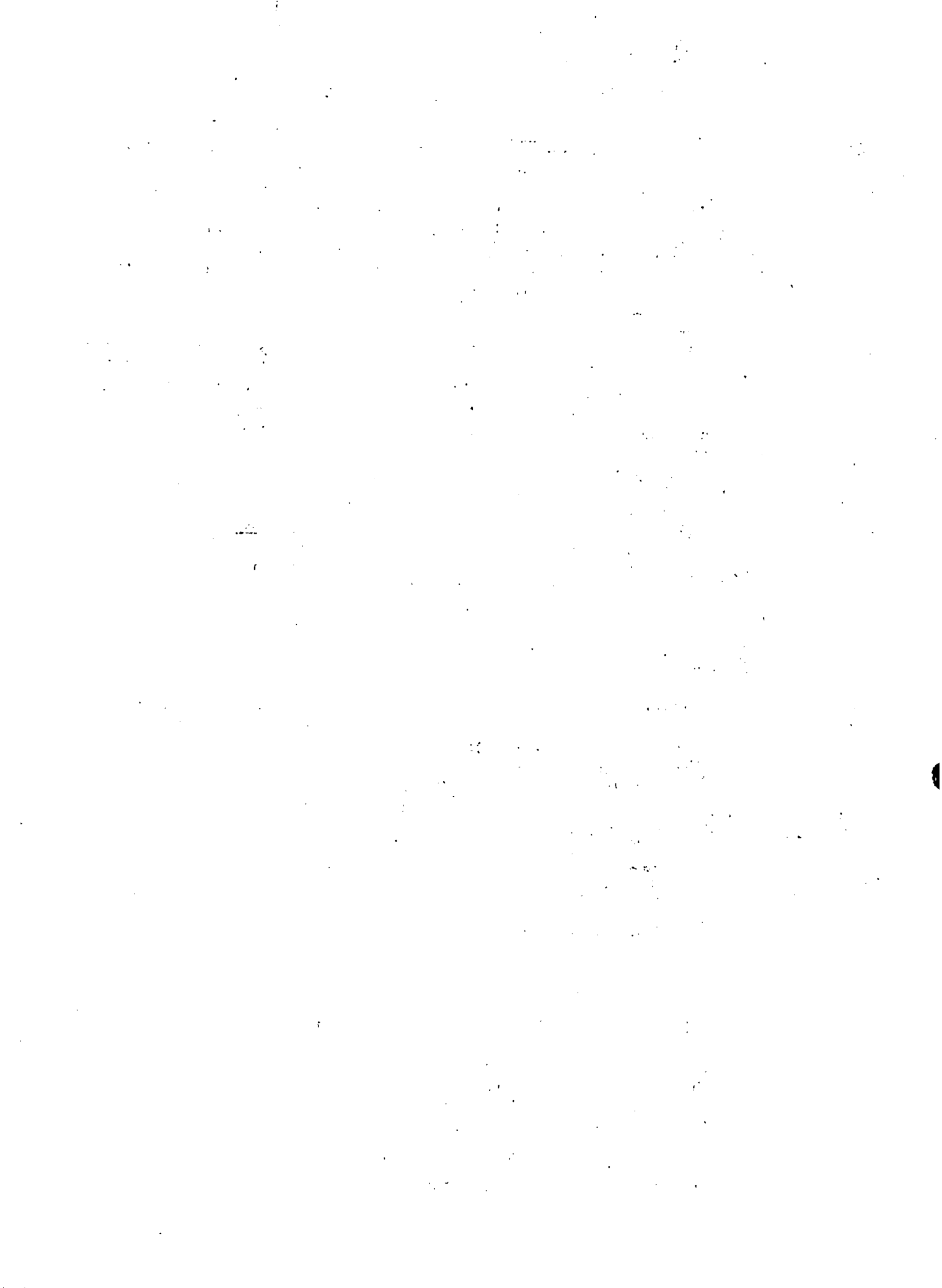
<u>Year</u>	<u>Human</u>	<u>Physical</u>	<u>Financial</u>
1975-76	1 Plant Pathologist 2 Agronomists 1 Field Assistant 1 Lab. Technician 2 Typists Office Attendant Field Workers	Single storey bldg. Lab. & Equipment Field Equip. Tractor Irrigation, spray equipment	J\$100,000
1976-77	2 Agronomists *1 Ph.D., 1 M.Sc. 1 Peace Corp. - B.Sc. 1 Field Assistant - Tech. Staff 2 Typists 1 Office Attendant 3 Field Workers	As above, except major Lab. Equip. transferred to Trinidad	<u>Expenditure</u> \$60,000
1977-78 ***	3 Agronomists 1 Ph.D., 2 M.Sc.s 1 Field Asst. 2 Typist 1 Office Attendant 3 Field Workers	** As at 1976-77	<u>Allocation</u> J\$176,422

*** Proposals have been submitted for the following in 1978.

- (a) Reduction of Agronomists to 2
 (b) Addition of 1 Virologist, 1 Soil Physicist, 1 Entomologist
 (c) Addition of 2 Field Assistants
 (d) Increased Field Workers

** 1 Agronomist departed August, 1976.

* 1 Plant Pathologist departed October, 1975.



5. SCOPE

5.1. Geographical range:

Work currently proceeds on the southern plains in the irrigated areas; 3 other sites are proposed in other ecological areas where irrigation is not practised.

5.2. Clientele

Currently Sugar Industry - to elucidate problems of mechanized production of legumes, other projects as per objectives of unit are directed towards small farmer problems.

5.3. Areas of Problem Solving

See under 2.2.

5.3.1. CARDI - Jamaica Unit, during 1975-76 contributed in the field of Legume Pathology, Varietal Evaluation and Herbicide evaluation. These technological advances may not have made an impact on rural development due to the slow rate of diffusion of this information and the financial constraints of the farmer preventing him from adopting these advances.

5.3.2. All projects bear significant relevance to selected Government priorities. However, maximum productivity of the Jamaica Unit is not being realised due to a shortage of funds, staff and field facilities. Work to its maximum proceeded with private farmers.

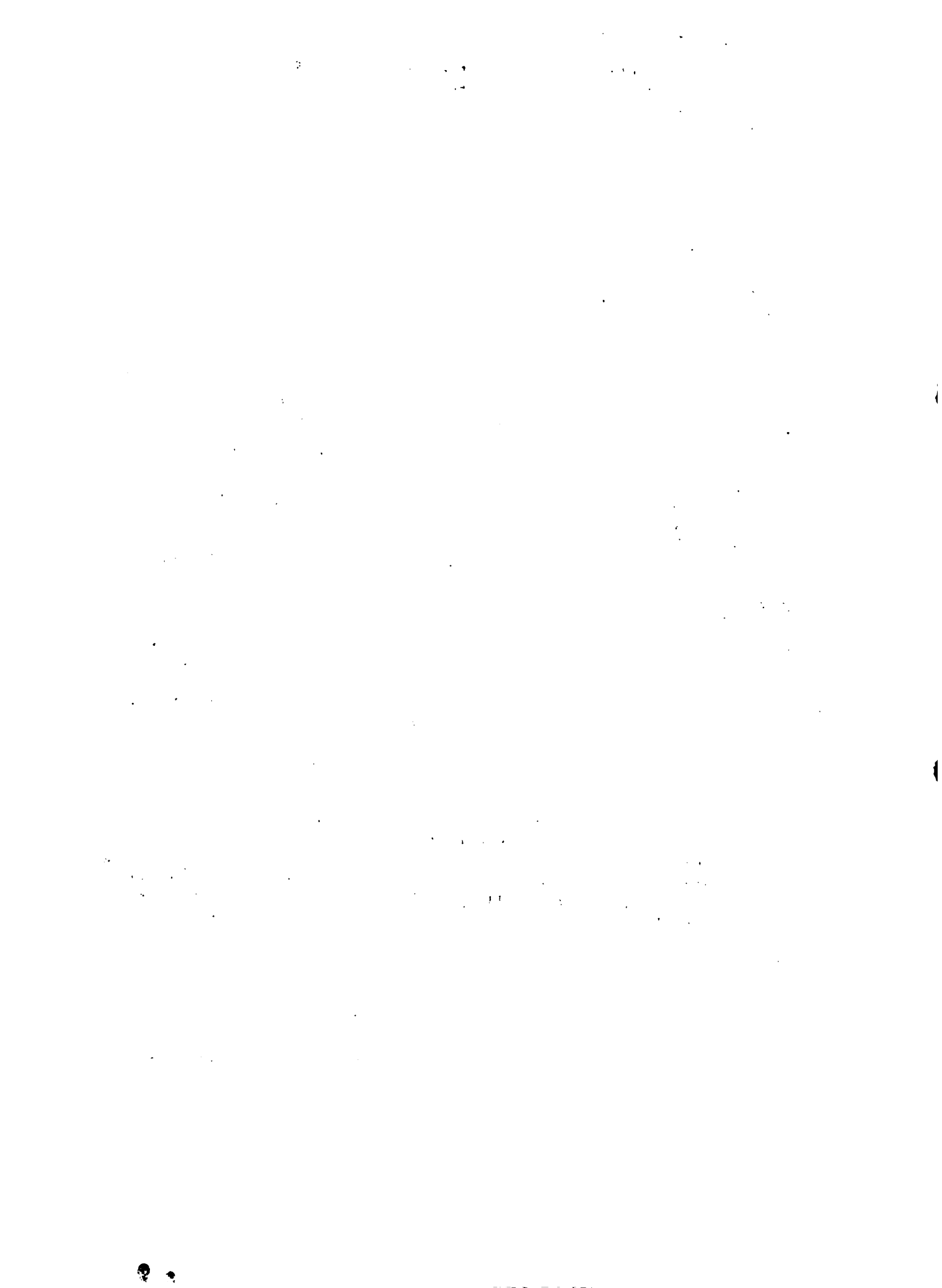
6. PERSPECTIVES

6.1. The objectives of the Unit as outlined previously remain relevant, however, these objectives will not be fully met unless:

(a) The Government's approach to integration and research development improves substantially; or

(b) The Unit becomes self-supporting with respect to all facilities necessary to effect its work.

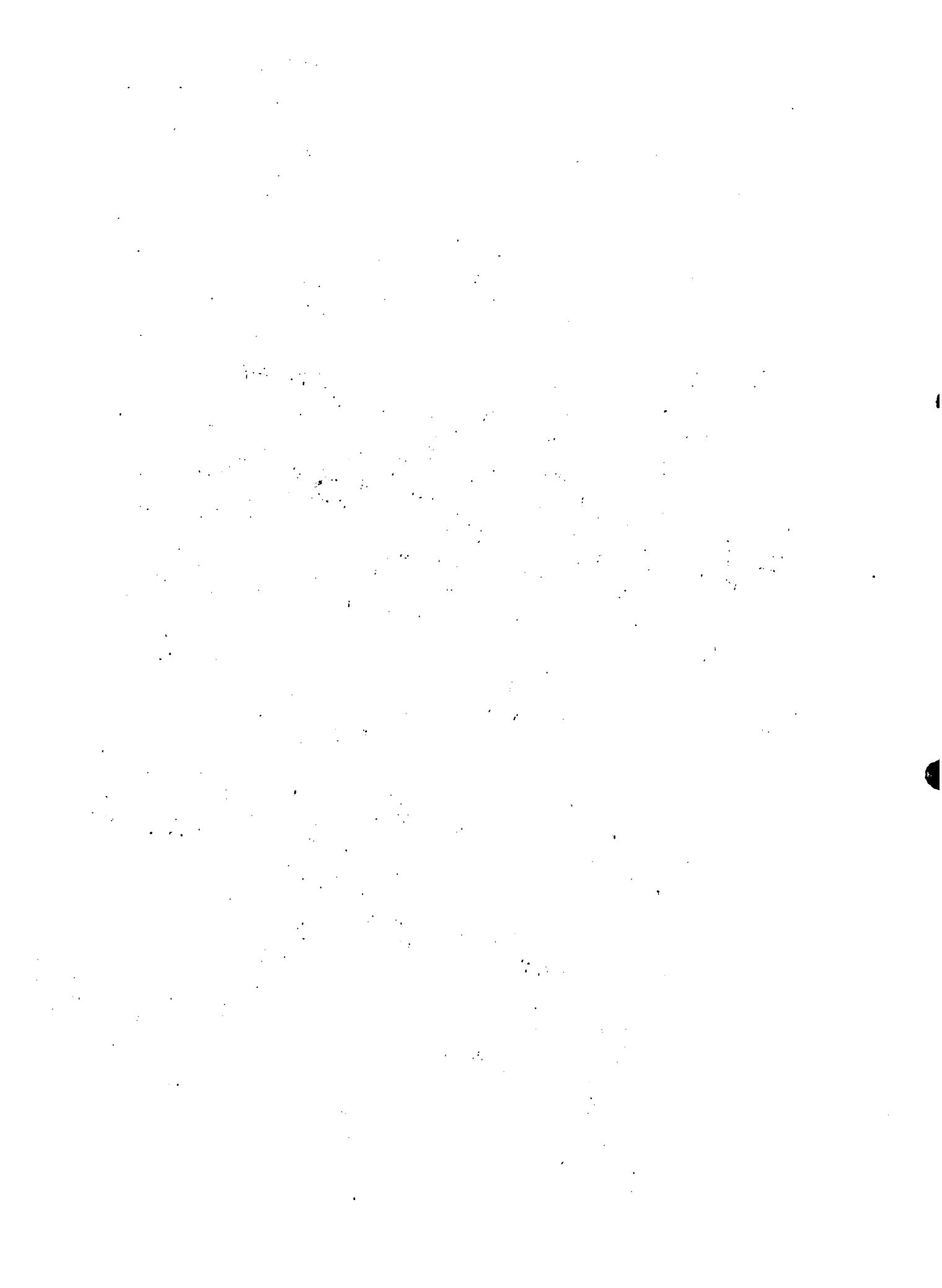
6.2. Present internal organisation and functions are expected to be satisfactory so long as conditions in 6.1. above are met. External relations with M.A., University of the West Indies and relevant International organisations need to be substantially strengthened if the full potential of the organization is to be realised.



- 6.3. Future resources are dictated by the Board of Directors and the Executive Director of the Institute, following consideration of the budgetary estimates presented yearly by the Jamaica Unit.
- 6.4. CARDI will maintain its present collaboration with other Agencies. However, full productivity will not be attained until the constraints mentioned in 6.1. are removed. CARDI's ability to assist Government's programmes is not being developed fully due to Government's failure to make use of the large regional research resource personnel and control services of CARDI.

7. SUGGESTIONS FOR IMPROVEMENT

- (a) Accelerated decentralisation of the Trinidad staff - to increase disciplines at Jamaica Unit.
- (b) Increased publicity of CARDI's functions and capabilities.
- (c) Maximum integration with the Ministry of Agriculture should be pursued with all haste; this would entail:
- CARDI being involved in discussions at the planning and decision making stage of research and development programmes where it was felt CARDI could make an input;
 - complementing usage of M.A. facilities and a supportive role for CARDI professional staff.
- (d) If 7 (c) cannot be fulfilled, the local Unit should acquire its own facilities.
- (e) All inter-regional and international technical cooperation agencies concerned with agricultural research and developmental problems in the island should strive to achieve central planning and coordination of efforts to achieve maximum results from the country.
- (f) The above suggestions are subjects for the consideration of the Directorate of CARDI.



UNIVERSITY OF WEST INDIES

Mona

Kingston, Jamaica

BOTANY DEPARTMENT: has a teaching and research staff consisting of 1 Professor (Head of the Department); 1 Reader, 3 Senior Lecturers, 2 Lecturers, and a number of Graduate students. The supporting staff consists of 5 demonstrators. Research laboratories are being planned.

PROGRAMME OF WORK: (In collaboration with the Ministry of Agriculture)

Pathology:

- (a) Lethal Yellowing and leaf-spot disease of coconuts (in association with Coconut Board)
- (b) Rust and Cercospora diseases of peanuts.

Crop Production:

- (a) Production and utilization of Thalassia in Kingston Harbour, Jamaica.
- (b) Production of leaf material of thatch palm for rural craft industries
- (c) Interaction of light and nutrients in vegetable production
- (d) Effect of soil type and NK nutrition on growth and yield of pineapples
- (e) Improved methods of propagation of pimento.

Crop Physiology:

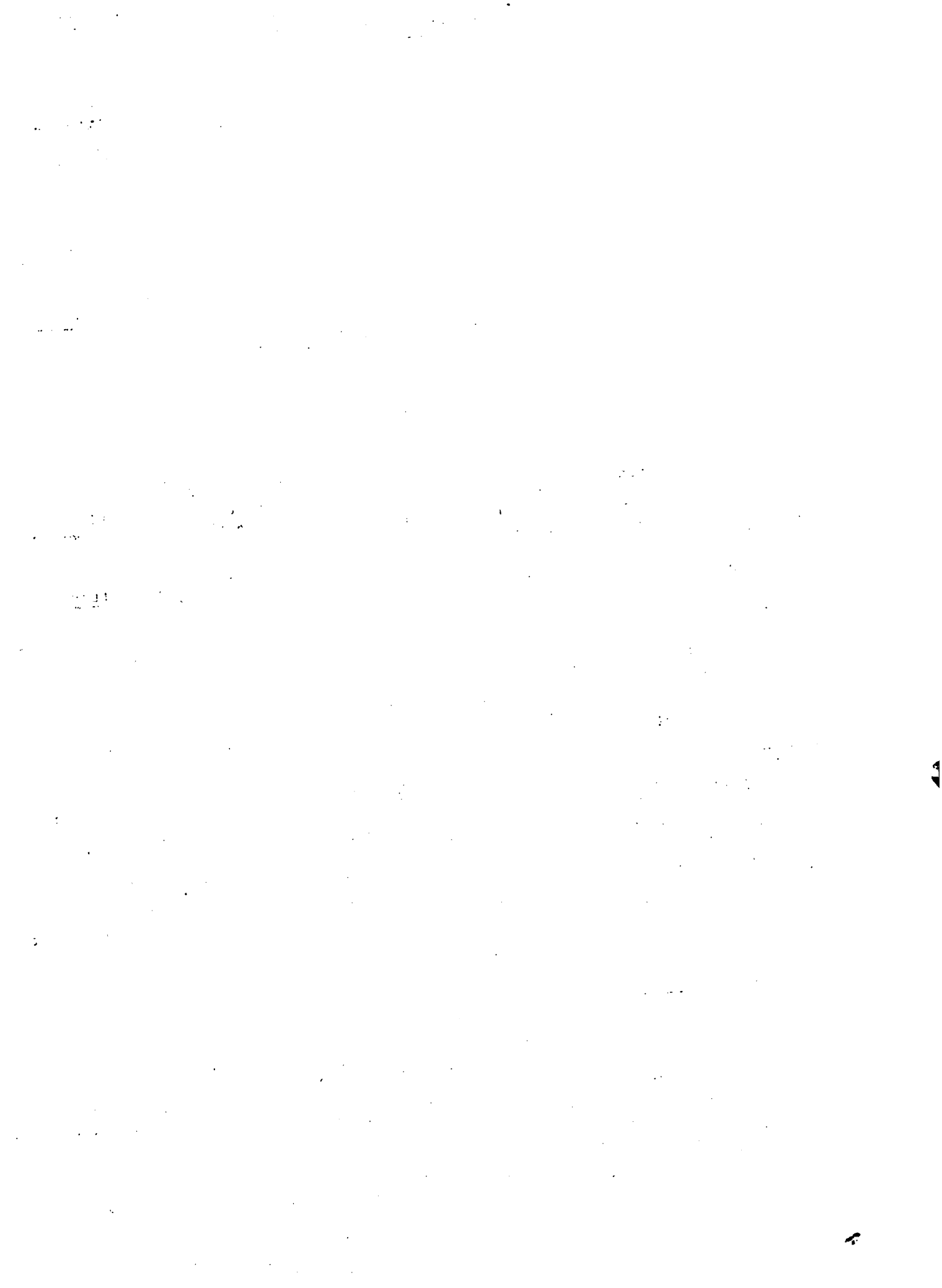
- (a) Physiological effects of anti-transpirants.
- (b) Water relationships of irrigated and non-irrigated bananas.
- (c) Tissue culture methods for developmental studies in tree and root crops.

Plant Breeding:

Protein improvement by mutation breeding of soybeans, pigeon peas and red peas.

Ecology:

Physiological ecology and plant regeneration on bauxite red mud ponds have been studied. Plans for future development include practically all aspects of agricultural research, as they relate to the environment.



CHEMISTRY DEPARTMENT:

Programme of work undertaken:

- (1) Partly in collaboration with the Sugar Industry Authority:
 - (a) studies in rum production;
 - (b) sugar production.
- (2) Partly in collaboration with Crop Research, Ministry of Agriculture:
 - (a) studies on essential oils of pimento - establishing chemical varieties of oils of parent trees, thus forming a basis of selection for propagation (TPI supported);
 - (b) artificial drying of pimento - design and testing of a drier (TPI supported);
 - (c) Yam - (1) mucilage, and (2) diosgenin content of edible yams.

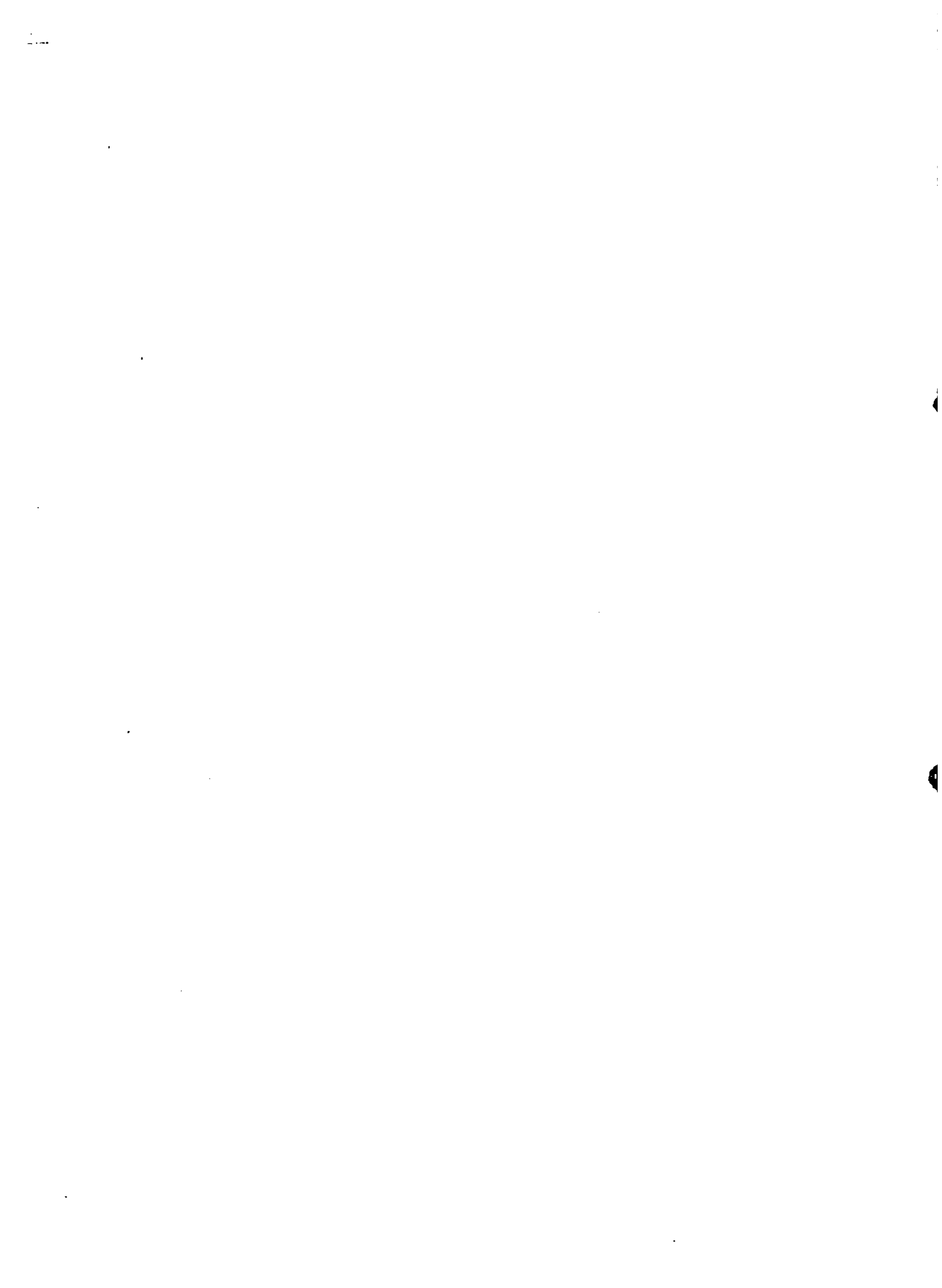
The laboratory has general facilities, including a Gas Chromatograph and Atomic Absorption spectro photometer. It is anticipated that with USAID a Gas Chromatograph and Mass Spectrometer will be used in connection with Food processing and fermentation studies. It is also hoped to set up a Food Science Laboratory.

ZOOLOGY DEPARTMENT:

There is considerable collaborative and separate studies on the environment e.g. Kingston Harbour, also with the Fisheries Division, (M.A.) on (1) pelagic studies in the western part of the island, and (2) oyster culture.

FACULTY OF AGRICULTURE:

A comprehensive report on the activities of this Faculty will be presented by the Trinidad representative.



STORAGE AND INFESTATION DIVISION

This Division falls under the Ministry of Industry and Commerce. Its principal objective is to conduct research relating to:

- Storage and infestation of a wide range of food crops
- Prevention of spoilage of food
- Testing of warehouse storage structures and facilities
- Storage systems and fumigation
- Rodent control and pesticide evaluation

The unit maintains contact on technical matters and training with the Tropical Products Institute in London. It has benefited from technical aid in terms of personnel, technology and equipment from the Overseas Development Ministry, U.K.

The Research Department is staffed with one Ph.D.; three M.Sc.s two B.Sc.s; and two laboratory technicians most of whom have more than five years experience.

A summary of recent research projects is presented below:

ROOT CROPS

Cassava

- Investigation on tylosis and vascular streaking moisture stress conditions.
- Prolongation of storage using polyethylene lined boxes and coir (see Caribbean Food Crops Soc. 1974. Storage in coir).
- Investigations on effect of different types of wounding.

Yam

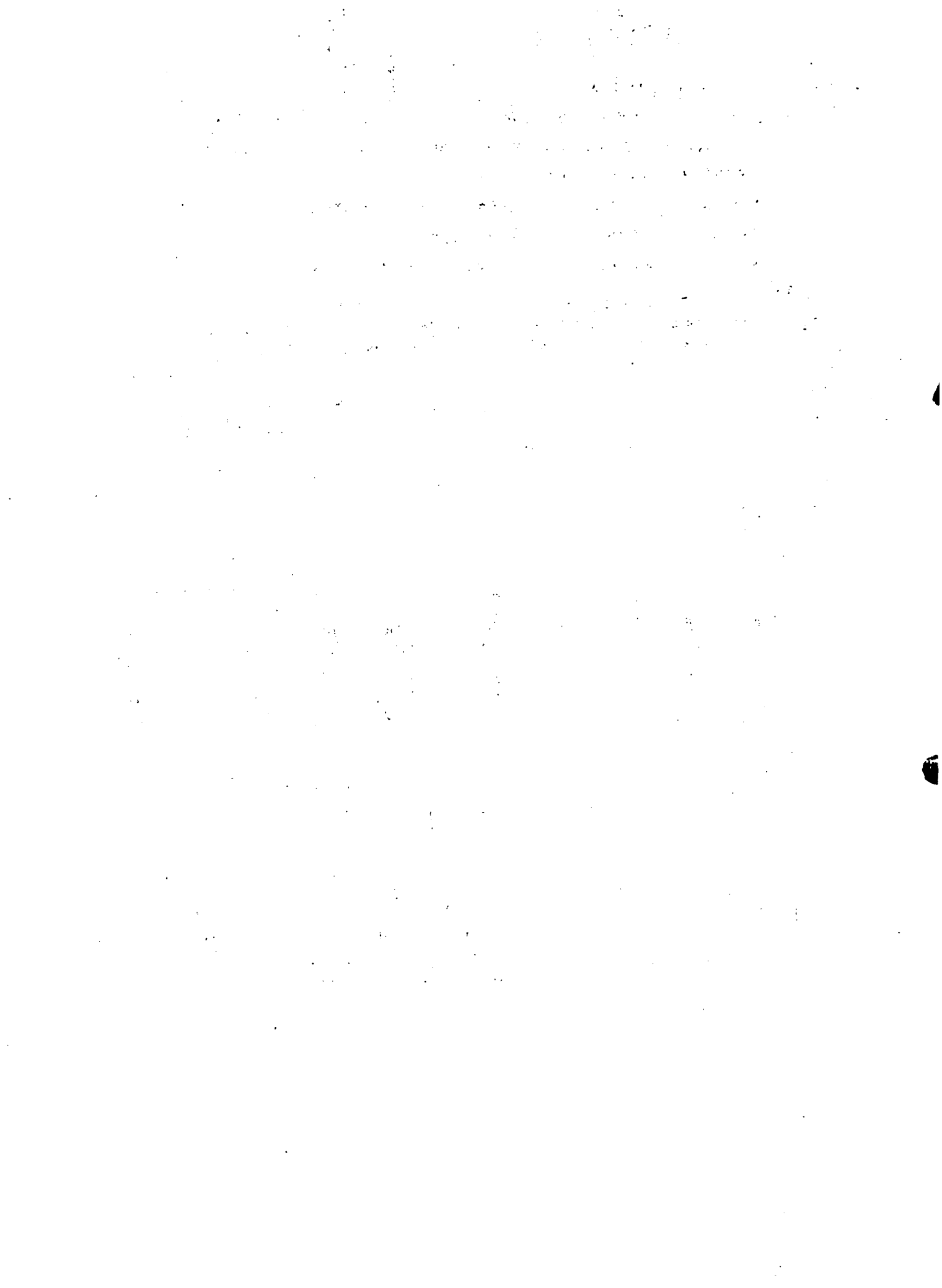
- Experiments on Curing, Losses and Yellow yam.
- Temperature effects on nematode control.
- Sprouting inhibitor studies

Sweet Potato

- Studies on storage and sprouting of several varieties.

Irish Potato

- Storage trials - have resulted in a reduction of losses from 20 - 30% to 3 - 5% of stored tubers.



Dasheen

- Studies on wound healing vs storage.

Legumes

- Cowpea - Dieldrin and Captan seed treatments are currently used but are not effective in Bruchid attacks and germination is poor - hence tests of 3 insecticides and 3 fungicides at 4 levels are under-way.
Insecticides - Dieldrin, Malathion, Sevin
Fungicides - Maneb, Cupravit, Captan
Results are awaiting statistical analyses.
- Seed treatment using inert dust rather than chemical treatment. This trial was to test safe dust treatments for use by small farmers. Dust treated seeds were not satisfactory for periods exceeding 3-4 months although seed moisture content was kept at 7 - 8%. Seeds were treated by drying the beans for 2 to 3 days in the sun followed by the following dust treatments:

- (1) Red mud
- (2) Wood ash
- (3) Alumina - fine white powder
- (4) Ca (Lime powder)

Treatments (1) and (2) were most satisfactory.

Other Crops

- Ginger. Cleaned scraped ginger is usually washed with lime juice and washing soda. Trials to ensure minimal subsequent invasions of pests and diseases showed that water was equally efficient, but that drying should be done in strong sun - to 12 - 14% moisture and sent to Kingston for storage (where it is drier than Christiana) in jute bags.

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Other Crops

- Rice (Paddy) at Old Harbour. Trials were made to test the relative efficacy of Malathion W.P. vs Malathion in emulsion for and Fabric spray on crocus bag v. surface (ground spray). The wettable powder sprayed on fabric bag was most effective and lasted longer. Pests identified for control were Sitophilus oryzae and Rhyzopertha dominica.

Plantains

- Effect of humidity on ripening (Experimentia: Proc. Sympos. Colombia, 1974).
- Due to splay nature of hands it was found best to pack plantains as fingers in cartons and dipped in TB2 and Benlate.
- Best harvesting time.

Avocados

- Best harvesting time and wrapping (ongoing)

Breadfruit

- Thin polyethylene bag at 12.5°C for 15 - 16 days. (See Tropic. Ag. 1975).

Cabbage

- Variety testing and general storage - ongoing.

Tomato

- Storage for 6 - 7 weeks at mature green stage is recommended at 12.5°C.

Limes

- Green limes are preserved at 7°C in perforated polythene bags.

OTHER RESEARCH ACTIVITIES

To test response of various surfaces in warehouse to efficacy of malathion treatment. The pesticide broke fastest on cement, then jute, but the wooden floor was the best surface.

Testing of pertinent pesticides to assess their effectiveness in storage over a period of time.

Shelf life constraints. To investigate at what stage infestation occurs, e.g. corn meal - weevils may have been in warehouse and not at store. Source can then be dealt with.

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 the context of public administration and financial management.

2. The second part of the document outlines the various methods and tools used to collect, analyze, and report data. It highlights the need for standardized procedures and the use of modern technology to ensure the accuracy and reliability of the information gathered.

3. The third part of the document focuses on the role of the audit committee in overseeing the organization's financial and operational performance. It details the committee's responsibilities, including reviewing financial statements, assessing internal controls, and providing recommendations to the board of directors.

4. The fourth part of the document discusses the importance of communication and reporting in the audit process. It stresses the need for clear, concise, and timely communication of findings and recommendations to all relevant stakeholders, including management, the board, and the public.

5. The fifth part of the document concludes by summarizing the key findings and recommendations of the audit. It reiterates the importance of continuous improvement and the need for the organization to take prompt action on the identified issues to enhance its overall performance and integrity.

Evaluation of new pesticides in all grains and cereals, e.g., ongoing are Actillic and Fentothiol v. Malathion.

Calibration of instrument (moisture meter) for Pimento warehouse.

Test for germination - rate of fumigants applied yet ensuring seed viability.

Quality checking - rice, corn etc. for grading purposes.

Identification of insects, and cultures made to establish their biology.

Rodents - Experiment with the black rat, Rattus rattus, and the Rattus norvegicus to establish best bait, both practical, acceptable (palatable), and viable. Cornmeal with Warfarin was found to be most suitable. Investigation are ongoing on locally grown rodenticides.

TECHNICAL INFORMATION disseminated:

- (a) Drying of paddy and peanuts - moisture, tempature. Found that much breakage of paddy at Rice mill was due to too high a tempature used - ongoing work.
- (b) Moisture level of storage.
- (c) Storage systems and fumigation.
- (d) Rodent control - extension work.

Case 1

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PIONEER HI-BRED INTERNATIONAL INC.

This U.S. based private company was established in 1958 in Jamaica under the name of Hi-Bred Corn Company. The objective was to use Jamaica as a winter location for corn and sorghum breeding for the U.S. Programme. In 1964 it became a tropical breeding station for the purpose of breeding corn and sorghum for the U.S. and Jamaica, and since that time two crops a year are grown. In the last three years there has been a phasing out of the commercial growing of corn, and the programme has gone over entirely to sorghum breeding since 1976. Since 1974 the company has accommodated a small soya bean testing programme, including nursery lines from INTSOY (University of Illinois). Planting is carried out bimonthly.

The station covers 120 acres. The staff comprises 1 graduate, 1 JSA technician, 14 full-time skilled labour, and during peak periods the station employs about 50 people. Buildings include a seed processing plant, cold storage for 9,000 bushels for commercial corn for Jamaica, and a Research Cold Room.

FECHA DE DEVOLUCION

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ALCAN JAMAICA LTD.

Research on Rehabilitation of Bauxite Mined-out Lands in Jamaica

Reclamation and restoration research on mined-out land was initiated at Alcan Jamaica Ltd. in 1968. Bauxite soils cover approximately 400,000 acres in Jamaica (14% of the total acreage of the country). Reclamation included all activities necessary to reshape and restore a mined area and associated non-mined marginal lands. Restoration is defined to include activities necessary to produce a crop on the land after it has been reclaimed. All the other bauxite companies involved in bauxite mining activities at present are cooperating financially in this work. Soil depth/crop relationship, pasture and water management have been studied. Several papers have been published on this subject in the Journal cited below.

Reclamation and Restoration Research on Mined Lands in Jamaica and other papers, Journal of the Geol. Soc. of Jamaica, Bauxite/Alumina Symposium 1971.

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Fecha: NOV 1988

FECHA DE DEVOLUCION

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