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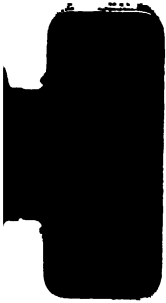
**VEGETABLE PRODUCTION (BRUMDEC)
- REVIEW & PROPOSED SHORT-TERM
ADAPTIVE PRODUCTION ORIENTED
RESEARCH PROGRAMME**

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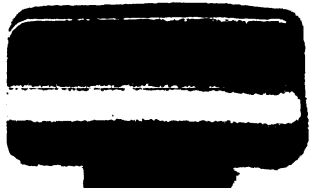
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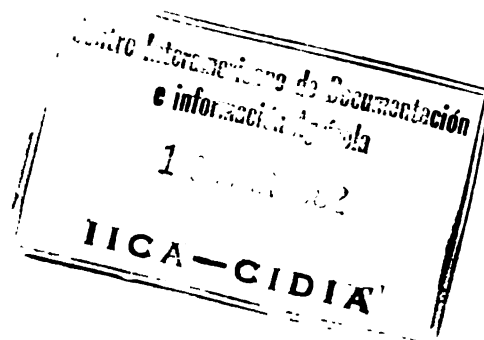
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**VEGETABLE PRODUCTION (BRUMDEC) - REVIEW AND
PROPOSED SHORT-TERM ADAPTIVE PRODUCTION
ORIENTED RESEARCH PROGRAMME**

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by

**Charles Percy Kennard
Vegetable Production Specialist
IICA/Jamaica**

January 1982

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**VEGETABLE PRODUCTION (BRUMDEC) - REVIEW AND PROPOSED SHORT
TERM ADAPTIVE PRODUCTION ORIENTED RESEARCH PROGRAMME**

Introduction

The Black River Upper Morass Development Company Limited (BRUMDEC), a wholly owned subsidiary of the Jamaica National Investment Co. Ltd., (JNIC), is the legally authorized executing agent of the Black River Morass Reclamation Project. The project is concerned with the development of approximately 11,000 acres of land in the Elim and Barton Isle area of St. Elizabeth. The Company plans to cultivate onions, peas and beans, vegetables, rice, cotton, pineapple, cassava, mango, citrus, coffee, plantains, and peanuts.

The general objectives of the project provide for the initiation of research and development for introducing improved agricultural production techniques, and to provide technical assistance to the farmers in the area. In order to achieve this objective, BRUMDEC has signed an agreement with the Inter-American Institute for Cooperation on Agriculture (IICA) for the provision of five (5) Consultants in the areas of:

Rice Production
Grain Production
Vegetable Crop Development
Irrigation and Drainage Management
Farm Management

With respect to vegetable crop development, the consultant is required to prepare a programme of adaptive production oriented research aimed at solving the problems which obtain in vegetable production in the project area. Problems to be addressed include appropriateness of vegetable crops and varieties within the context of:

- (i) Jamaican consumer acceptance
- (ii) Soil/Water considerations

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. The text notes that without reliable data, it is difficult to assess performance, identify trends, and make informed decisions.

2. The second section focuses on the challenges associated with data collection and analysis. It highlights that while digital tools have improved the speed and accuracy of data gathering, they also introduce new risks, such as data breaches and system downtime. Additionally, the complexity of modern datasets often requires specialized skills and resources to process and interpret effectively. The document suggests that investing in training and infrastructure is crucial to overcome these challenges.

3. The third part of the document addresses the ethical implications of data usage. It stresses that organizations must adhere to strict privacy policies and ensure that data is used only for its intended purpose. Transparency in how data is collected, stored, and shared is key to building trust with stakeholders. The text also mentions the importance of regular audits to ensure compliance with relevant laws and regulations.

4. The final section discusses the future of data management. It predicts that as technology continues to advance, the volume and variety of data will increase significantly. This will necessitate the development of more sophisticated analytics and artificial intelligence capabilities. The document concludes by encouraging organizations to embrace a data-driven culture, where data is used to drive innovation and improve operational efficiency.

- (iii) Seasonality of production
- (iv) Culture and harvesting characteristics
- (v) Weed, pest and disease associations
- (vi) Seed production
- (vii) Fertilizer regimes
- (viii) Crop density and yields

2. Background

In order to develop the programme to achieve the desired objectives, it was necessary to review all the reports and recommendations pertaining to the project, to become acquainted with work done in vegetable production in Jamaica and in other countries with similar conditions as existing in the project. Discussions were held with the other consultants, BRUMDEC personnel, Ministry of Agriculture staff and other knowledgeable persons including farmers who have been involved in vegetable production.

2.1. Location

The Black River Morasses are divided into the Upper Morass and the Lower Morass. They are located in the parish of St. Elizabeth in the western part of Jamaica near the south coast. The Upper Morass which is the area being developed by the project consists of approximately 11,000 acres (4,451 hectares) of agricultural land. It is situated between Maggoty in the north and Lacovia in the south.

2.2. Climatic Conditions

Climatic conditions as it pertains to vegetable production is important in determining times of planting and harvesting, irrigation cycles, plant protection methods etc. Unfortunately, this type of information for the project is almost non-existent and figures from other locations have had to be taken as indications of what is likely to occur within the project

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 ensuring transparency and accountability in the organization's operations. This includes tracking financial data, personnel movements, and other key metrics that can impact the overall performance and health of the company.

2. The second section focuses on the role of leadership in setting a clear vision and strategic direction. It highlights that effective leaders must communicate their goals and expectations clearly to their teams, while also providing the necessary support and resources to help them achieve those goals. This involves a combination of vision, communication, and resource allocation.

3. The third part of the document addresses the importance of fostering a positive and collaborative work environment. It suggests that organizations should encourage open communication, teamwork, and mutual respect among employees. This can be achieved through various means, such as regular team meetings, cross-functional projects, and a strong emphasis on employee well-being and development.

4. The fourth section discusses the need for continuous learning and improvement. It notes that in a rapidly changing business landscape, organizations must stay up-to-date with the latest trends and technologies. This requires a commitment to ongoing education and training for all employees, as well as a willingness to embrace change and innovation.

5. Finally, the document concludes by emphasizing the importance of ethical conduct and integrity in all business dealings. It states that organizations should always act with honesty, fairness, and respect for others, and should be held accountable for their actions. This not only builds trust and credibility with stakeholders but also contributes to the long-term success and sustainability of the organization.

2.2.1. Rainfall

The table below shows the average monthly precipitation of the Santa Cruz area for the years 1931-1960.

Month	Inches	MM
January	2.9	73.66
February	2.9	73.66
March	4.2	106.68
April	8.6	218.44
May	11.1	281.94
June	5.9	149.86
July	5.2	132.06
August	9.4	238.76
September	8.8	223.52
October	12.7	322.58
November	6.9	175.26
December	2.9	73.66

*Source: Statistical Yearbook of Jamaica - 1979

The figures indicate a bimodal pattern with the rains falling in April and May, and the main rainy season starts in September and goes on into November. A marked dry season occurs from the end of November through the end of March. However, the pattern is known to vary significantly from year to year.

2.2.2. Temperature

Temperature records for the project are not available as are the records for the areas in close proximity. The meteorological records for Jamaica as a whole indicate that in spite of elevation, the warmest months are July and August and the coolest January and February. Near sea levels the maximum, minimum and daily temperatures are 86°F (30°C), 70°F (21°C), and 78°F (25.6°C) respectively.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. This section also outlines the various methods and tools used to collect and analyze data, ensuring that the information is reliable and up-to-date.

2. The second part of the document focuses on the implementation of these practices across different departments and teams. It provides detailed instructions on how to set up systems for data collection and analysis, including the selection of appropriate software and the training of staff. This section also addresses the challenges that may arise during the implementation process and offers strategies to overcome them.

3. The third part of the document discusses the importance of regular communication and reporting. It highlights the need for clear and concise reports that provide a comprehensive overview of the data and its implications. This section also outlines the roles and responsibilities of different stakeholders in the reporting process, ensuring that everyone is aware of their contribution to the overall success of the project.

4. The fourth part of the document provides a summary of the key findings and conclusions. It highlights the most significant results and discusses their implications for the organization. This section also offers recommendations for future actions and identifies areas for further research and development. The document concludes by emphasizing the importance of continuous improvement and the need to stay up-to-date with the latest trends and technologies in the field.

2.2.3. Humidity

The comments made about the records of temperature for the project also apply to the humidity. The table below shows the range of relative humidity for the Kingston area. The figures indicate that all through the year during the evenings, the relative humidity is over 80%. It is lowest during the day during the months of December to March which more or less coincides with the dry season.

Range of Mean Relative Humidity (1969 - 1978)

<u>Hour</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>
7 a.m.	86-80	86-78	85-75	81-75	84-76	84-73
3 p.m.	66-59	66-59	71-60	71-63	72-63	73-60
<u>Hour</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>October</u>	<u>November</u>	<u>December</u>
7 a.m.	82-63	84 /6	88-81	90-82	87-79	86-77
3 p.m.	65-52	78-60	74-65	75-66	72-64	69-58

* Source: Statistical Yearbook of Jamaica, 1979

2.3. Major Soil Types in the Project Area

2.3.1. Morass Peat Soil - 152

The Morass Peat Soil - 152 is the most wide-spread soil in the project occupying approximately 2,900 acres. It is derived under swampy conditions from the sawgrass Cladium jamaicense and other related sedges. It is reported to be similar to sawgrass peat found in the Negril swamps, Everglades of Florida and many other parts of the tropics. Depending on the level of the water-table, solid black peat forms at mat on the surface which overlies rotting vegetation mixed with water in various forms of decomposition, to depths varying from one foot (0.3m) to over seven feet (2.10 m), until bluish grey clay and sandy clay is encountered (4,7).

The Morass Peat Soil has a slightly acid reaction. The potash, phosphate and magnesium content of the soil appear to be medium and adequate for most crops. The analytical data indicate a very high calcium content (3,162 to 10,714 ppm Ca within the top 6 inches (2.4 cm).

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It is felt that the high calcium content is likely to contribute to manganese, iron and zinc deficiencies (4).

2.3.2. Four Paths Series of Soils - Four Paths Clay 203 and Four Paths Loam - 204

The Four Paths Series of soils are the second most widespread soils after the Morass Peat Soil. This series together with the Linstead Clay Loam - 61 and other old alluvial soils are found in large areas of the parish of St. Elizabeth. They are generally acid, deeply weathered, strongly leached and infertile in most parts.

2.3.2.1. The Four Paths Clay - 203 has a good depth of friable strongly structured top soil in the project area, mottling does not begin to appear until 2-3 feet (0.6-0.9 m). The zinc, copper and boron content of this soil is considered to be adequate and manganese - high (15).

2.3.2.2. The Four Paths Sandy Loam - 204, because of the fact that the highly mottled sub-soil is barely covered by a layer of sand or gravel is considered as the most infertile soil of the project. Drainage through the soil is poor as is its moisture retention capacity (4).

2.3.3. Cashew Clay Loam - 151

The Cashew Clay Loam appears to be derived from alluvium and underlies the Morass Peat in most of the Morass. The soil is an acid heavy clay and may be regarded as being a moderate fertility. Phosphate and potash are both very low whilst calcium and magnesium are considered to be adequate (4).

2.3.4. Wallens Clay - 9

Wallens Clay in the project area is derived from yellow alluvial material. The external drainage is slow and internal drainage regarded as adequate. The top soil is neutral to slightly alkaline with the alkalinity and calcium content increasing with depth. Phosphate is low in some areas and adequate in others where phosphate was previously applied to the crop. Potash is generally low and magnesium adequate (1,4).

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2.3.5. Minor Soils: Linstead Clay Loam - 61
Cave Valley Clay - 116

2.3.5.1. Linstead Clay Linstead Clay - 61 is an acid inland basin. Its properties include poor drainage, high acidity and low phosphate and potash. Manganese and copper are considered to be adequate and zinc and boron low. (4, 15).

2.3.5.2. Cave Valley Clay - 116 is alkaline in reaction with adequate amounts of calcium and manganese, and phosphate and potash being low.

2.4. Cropping Pattern for Major Soils within the Project

2.4.1. Morass Peat Soil - 152

Information supplied by the staff of the Ministry of Agriculture in St. Elizabeth indicates that certain vegetables were successfully cultivated on the Morass Peat Soil within the project during the period 1974-1977 (12). Onions and irish potatoes have been reported to have been grown with limited success in the Negril area (4). In the Everglades peat in Florida which is considered to be similar to the Morass Peat, tomatoes, carrots and particularly the leafy vegetables are being successfully grown (9).

In the utilization of this soil for vegetable production, it is recommended that the peat should be ploughed to a depth of 8 inches (3.1 cm). It is also recommended that ripping should be done to take out weed roots and tubers, land preparation should be done with small tractors and planting done on beds in the flat (3).

2.4.2. Four Paths Series of Soils

2.4.2.1. The Four Paths Clay - 203 is considered to be suitable for a wide range of acid loving crops, including sugar cane, citrus, pineapple, food crops, pasture and tobacco which have been successfully grown in other parts of Jamaica. Within the project, this soil is being utilized for the cultivation of sugar-cane, peanuts, red peas, cassava and for pasture (4).

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.

In the second part, the authors describe the experimental setup and the procedures followed. They detail the selection of participants, the materials used, and the specific tasks assigned to each group. This section provides a clear and concise overview of the methodology employed in the study.

The third part of the document presents the results of the study. The authors analyze the data collected and discuss the findings in detail. They compare the results across different groups and conditions, highlighting the significant differences observed. This section is supported by various statistical analyses and graphs.

In the fourth part, the authors discuss the implications of their findings. They explore the potential applications of the results and discuss the limitations of the study. They also provide suggestions for future research and highlight the need for further investigation in this area.

The fifth part of the document is a conclusion. The authors summarize the main findings of the study and reiterate the importance of the research. They express their gratitude to the participants and the funding agencies that supported the study. This section provides a final overview of the study and its contributions to the field.

The sixth part of the document is a list of references. The authors cite various sources that have influenced their work, including books, articles, and other research papers. This section provides a comprehensive list of the literature reviewed during the study.

The seventh part of the document is an appendix. The authors include additional information that supports the main text, such as raw data, detailed procedures, and other relevant documents. This section provides a more in-depth look at the study and its findings.

The eighth part of the document is a glossary. The authors define key terms and concepts used throughout the study, ensuring that the reader has a clear understanding of the terminology. This section is particularly useful for those who are new to the field or who need a refresher on certain concepts.

The ninth part of the document is a list of figures. The authors provide a detailed description of each figure, including its purpose and the data it represents. This section allows the reader to see the visual representation of the data and understand the trends and patterns more clearly.

The tenth part of the document is a list of tables. The authors provide a detailed description of each table, including its purpose and the data it contains. This section allows the reader to see the numerical data and understand the relationships between different variables more clearly.

2.4.2.2. The Four Paths Loam - 204, within the project area is mainly under pasture. Pineapple and tobacco have been suggested as possible crops. The utilization of this soil for vegetables requires certain management practices e.g. deep cultivation to break the clay pan, graded drains, planting on raised beds, liming and addition of organic matter (13).

2.4.3. Cashew Clay Loam - 151

Rice growing has been recommended for the Cashew Clay Loam - 151 because of the poor internal and external drainage. Sugar cane with extensive irrigation and pasture with or without drainage have been suggested as alternative crops.

2.4.4. Wallens Clay - 9

The Wallens Clay - has been utilized within the project for rice and sugar. It has been suggested that if it becomes necessary to change the cropping pattern, bananas and food crops should be considered if adequate drainage can be provided.

2.4.5. Minor Soils

Of the minor soils, only the Linstead Clay Loam - 61 is considered to be suitable for vegetables. The management practices recommended for this soil when they are to be utilized for vegetables are essentially similar to that of the Four Paths Loam - 204. Within the project, this soil is being fully utilized for sugar cane and as such not available for vegetable production.

2.5. Water Management

2.5.1. Irrigation

The Harza Report (3) indicated that even during the months of high total rainfall, the distribution was often so uneven that the availability in the root zone was depleted by evapotranspiration. From this,

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it was inferred that supplementary irrigation may be needed during any month of the year. It was recommended that the Class III_t and Class II_d (peat soil) should be irrigated by a sprinkler system and the remaining Class II soils by flood, furrow or sprinkler irrigation. Mention was made of the fact that mole drains are being used in a number of countries to irrigate peat soils, and in Florida mole drains are being used in combination with open drains.

It has been suggested that two crops of short duration can be cultivated in a year if sown at the appropriate time during the spring and fall season (11). For vegetables on the peat the following was recommended.

<u>Crop</u>	<u>Growth Period</u>
Carrot	April-June, September-November
Cabbage	September-November
Watermelon	September-November
Onion (green)	April-May, September-October
Onion (bulb)	April-June, September-November

Because of the fact that most of the vegetable production in Jamaica has been geared to coincide with the rainy seasons, this often results in a few months of surpluses (gluts) and many months of shortages. Many of the vegetable crops which are presently only being grown during the rainy seasons can be profitably grown all year round with supplementary irrigation (14). A project of the magnitude of BRUMDEC must gear itself to take care of the periods of shortage within the local markets when prices would also be advantageous. Presently none of the irrigation facilities for the vegetables are in place either on the Morass Peat or the Four Paths Series.

2.5.2. Water Table

Subsidence of peat soils due to oxidation of the organic matter and shrinkage is regarded as the most important factor in their good management. Maintenance of high water and regular flooding is

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recommended as measures to reduce the rate of shrinkages (1,4). The recommended depth of the water table for maximum yield of certain vegetables grown in peat soils, e.g. Morass Peat are:

<u>Crop</u>	<u>Feet</u>	<u>Meters</u>
Tomatoes	1.5 - 2.0	0.41 - 0.61
Beans & Peas	1.5 - 2.0	0.45 - 0.61
Cabbage	1.5 - 2.0	0.45 - 0.61
Carrots	2.0	0.61
Corn (sweet)	2.0 - 2.5	0.61 - 0.75
Lettuce	2.5 - 3.0	0.75 - 0.90
Onions	2.0 - 2.5	0.61 - 0.75

2.6. Fertilizer Practices

As vegetable production is not being done presently on any of the soils of the project, no observations could have been made on the effect of fertilizer practices on production. The recommendations of the Ministry of Agriculture for the Four Paths Loam - 204 (13) and that of Harza (3) for the Morass Peat - 152 are shown below:

2.6.1. Mineral soils e.g. Four Paths Loam - 204

2.6.1.1. Fruit/vegetables e.g. tomatoes, okra, egg plant, snap beans, peppers, sweet corn, cucumber etc. Five (5) cwt. of 7-14-14 applied one week before planting

2.6.1.2. Root vegetables e.g. carrots, beets, radish. Four (4) cwt. of 6-18-27 or 12-14-12 applied one week before planting.

2.6.1.3. Leafy vegetables e.g. cabbage, lettuce, cauliflower, celery. Three (3) cwt. of 7-14-14 applied prior to planting plus three (3) cwt. sulphate of ammonia applied as a side-dressing, 3 weeks after planting.

2.6.1.4. Onions. Six (6) cwt. of 7-14-14 or 4 cwt. of 12-24-12 applied seven (7) days before planting plus two (2) cwt. of sulphate of ammonia applied as side dressing 6-8 weeks after planting.

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

2. The second section addresses the challenges associated with data management in a rapidly evolving digital landscape. It highlights the need for robust security protocols to protect sensitive information from cyber threats and unauthorized access. Additionally, it discusses the importance of data integrity and the implementation of backup and recovery strategies to ensure business continuity in the event of a data loss or system outage.

3. The third part of the document focuses on the role of technology in streamlining operations and improving efficiency. It explores various digital tools and platforms that can be leveraged to automate repetitive tasks, enhance communication, and facilitate data analysis. The text suggests that investing in modern technology is crucial for staying competitive in today's market and for driving innovation within the organization.

4. The final section discusses the importance of continuous learning and professional development for the workforce. It encourages organizations to provide opportunities for training, workshops, and conferences to help employees stay updated on the latest industry trends and technologies. The text also emphasizes the value of fostering a culture of learning and innovation, where employees are encouraged to share their knowledge and collaborate on new ideas.

2.6.2. Morass Peat Soil - 152

2.6.2.1. Onions, carrots, beets, etc. Muriate of potash, 900 lbs per acre per crop. Triple superphosphate, 300 lbs per acre per crop. One half of the fertilizer is to be applied as a basal application, and the remainder in three or more applications.

2.6.2.2. Tomatoes, cabbage and lettuce etc. Muriate of potash, 400 lbs per acre per crop. Triple superphosphate, 400 lbs per acre per crop. One half of the fertilizer as basal application and the remainder in three or more applications.

2.6.3. Micro-Nutrients

With few exceptions all the major alluvial soils including the Four Path Series are fairly well supplied with the micro-nutrients e.g. zinc, manganese, copper and boron (15). The application of micro-elements to crops grown on alluvial soils is not generally advocated. However, for the peat soils, micro-nutrients are considered to be necessary for successful production of vegetables. Hewitt (4) recommends as pre-plant amendments in the last stages of land preparation, the application of 15 lbs of copper, 10 lbs of manganese, 4 lbs of boron, and 5-7 lbs of zinc per acre. Except for zinc, a similar recommendation has been made by Harza (3). Other reports indicate that the application of copper may be lessened and may not be needed at all, whilst manganese and zinc may best be applied as foliar sprays.

2.7. Plant Protection

Under the conditions prevailing within the project area e.g. high temperatures and humidity, pests, diseases and weeds can be expected to be a serious problem in the production of vegetables. Appendix I and II list some of the more important pests and diseases of **vegetable** and their control. Appendix III gives the chemical control **of weeds** in selected vegetables.

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. The text also mentions that regular audits are necessary to identify any discrepancies or errors in the accounting process.

In addition, the document highlights the need for a clear and concise reporting structure. Management should be provided with timely and accurate financial statements that clearly show the company's performance over a specific period. This includes the income statement, balance sheet, and cash flow statement. The reports should be easy to understand and provide a clear picture of the company's financial health.

Furthermore, the document stresses the importance of maintaining a strong internal control system. This involves implementing policies and procedures that minimize the risk of fraud and error. Key areas to focus on include access to assets, segregation of duties, and regular reconciliations. A robust internal control system is essential for ensuring the integrity and reliability of the financial information.

The document also discusses the role of technology in modern accounting. The use of accounting software can significantly improve efficiency and accuracy. It allows for automated data entry, real-time reporting, and easier integration with other business systems. However, it is important to ensure that the chosen software is secure and meets the specific needs of the organization.

Finally, the document concludes by emphasizing the importance of ongoing education and training for the accounting staff. The field of accounting is constantly evolving, and staying up-to-date with the latest trends and regulations is crucial. Providing continuous learning opportunities for employees can help them develop the skills and knowledge needed to excel in their roles and contribute to the overall success of the organization.

3. Programme for Adaptive Production Oriented Research (Short Term)
in Vegetable Production

3.1. Objectives

The programme for adaptive production oriented research in vegetable production has as its overall objective the following:

3.1.1. Establishing the appropriateness of vegetables and varieties for production within the project taking into consideration, seasonality of production, cultural practices, fertilizer regimes, yields, weeds, pests and diseases associations.

3.1.2. Developing a technological package of practices for implementing on-farm vegetable cultivation under conditions which prevail in the project.

3.1.3. Accumulating data on the various aspects of vegetable production and which will provide the basis for determining those areas for future research.

3.1.4. Training of national technicians consistent with the agronomy of vegetable production.

3.2. Strategy

The proposed strategy is as follows:

3.2.1. In order that the programme can produce quick benefits, main emphasis will be given to the selection of suitable crops and varieties of these crops for the cultivation on the major soils of BRUMDEC. The varieties being evaluated are those which have been found to be suitable for Jamaican conditions and to conditions similar to that of the project area. Current recommendations regarding cultural practices, fertilizer applications, pests, diseases and weed control will be followed.

The following table shows the results of the various experiments conducted during the year.

Experiment	Method	Results
1. Effect of temperature on the rate of reaction
2. Effect of concentration on the rate of reaction
3. Effect of surface area on the rate of reaction
4. Effect of catalyst on the rate of reaction
5. Effect of pressure on the rate of reaction
6. Effect of solvent on the rate of reaction
7. Effect of pH on the rate of reaction
8. Effect of light on the rate of reaction
9. Effect of humidity on the rate of reaction
10. Effect of time on the rate of reaction

The results of these experiments show that the rate of reaction is affected by a number of factors, including temperature, concentration, surface area, catalyst, pressure, solvent, pH, light, humidity, and time.

It is clear that the rate of reaction increases with increasing temperature, concentration, surface area, and catalyst. It also increases with increasing pressure, solvent, pH, light, humidity, and time.

The following table shows the effect of temperature on the rate of reaction. The rate of reaction increases as the temperature increases.

Temperature (°C)	Rate of Reaction
20	...
30	...
40	...
50	...
60	...
70	...
80	...
90	...
100	...

The following table shows the effect of concentration on the rate of reaction. The rate of reaction increases as the concentration increases.

Concentration (M)	Rate of Reaction
0.1	...
0.2	...
0.3	...
0.4	...
0.5	...
0.6	...
0.7	...
0.8	...
0.9	...
1.0	...

The following table shows the effect of surface area on the rate of reaction. The rate of reaction increases as the surface area increases.

Since the economic viability of **BRUMDEC** seems to lay to some extent on the utilization of the Morass Peat Soil - 152 for the production of high-priced vegetables, major emphasis would be placed on the evaluation studies of this soil. Selected vegetables would also be tried on the Four Paths Series - Four Paths Clay - 203 and Four Paths Loam - 204, the second most widespread soils in the project after the Morass Peat.

On the Morass Peat Soil, the vegetables to be evaluated included:

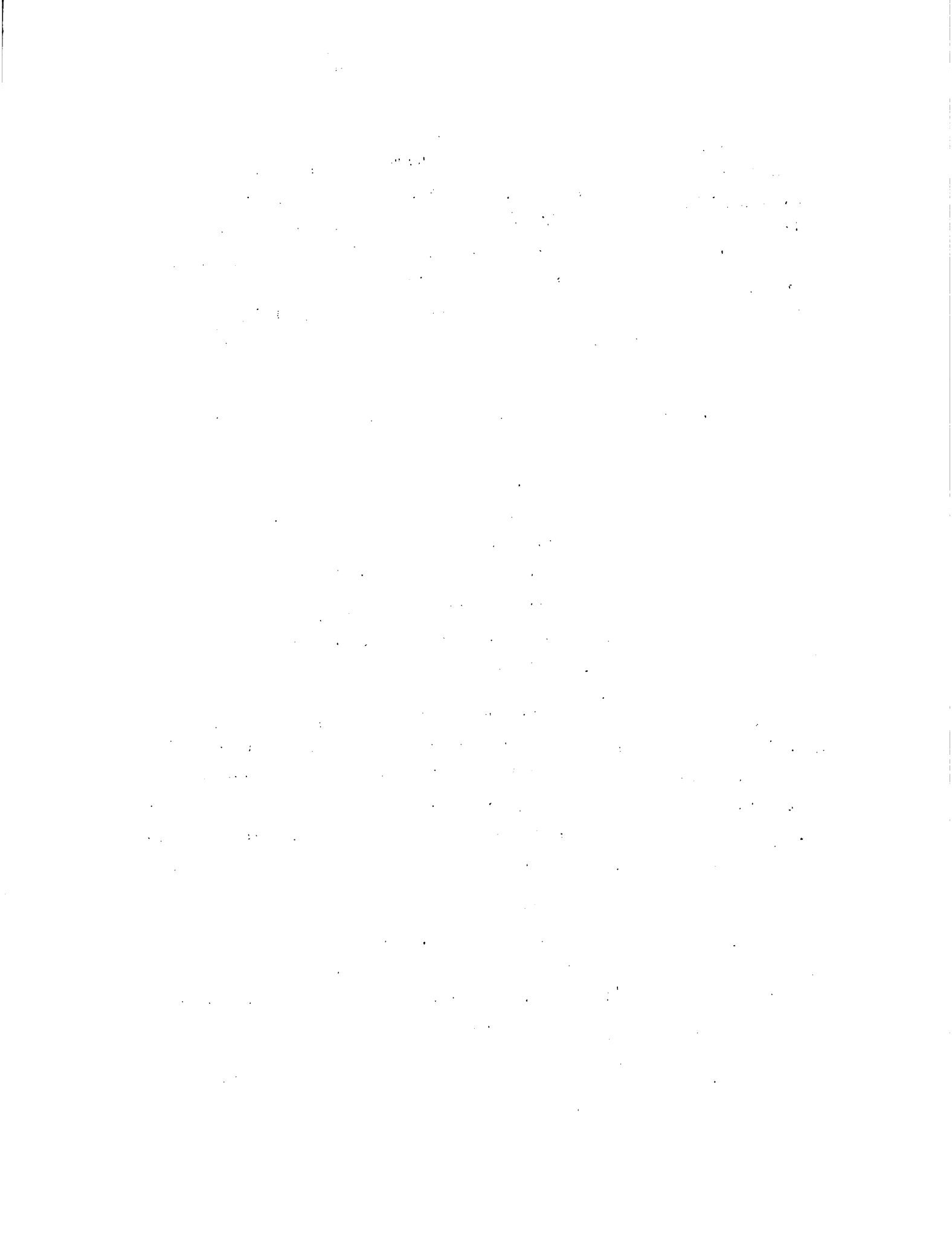
Cabbage, cauliflower, lettuce, peppers (sweet and hot), tomatoes, sweet corn, celery, string beans, egg plant, okra, onions (bulbing), onions (bunching), carrots, beets, garlic.

Those to be tested on the Four Paths Series are: Melons, cucumber, onions, carrots, beets, tomatoes.

3.2.2. Field experiments will be conducted on the Morass Peat Soil - 152, Four Paths Clay - 203 and Four Paths Loam - 204 in order to establish the best N.P.K. treatments. The crops on which the studies will be done include tomatoes, carrots and cabbage which are taken as representing the fruit, root and leafy vegetables respectively. Onions will also be included.

3.2.3. Field studies will be carried out with the micro-elements Cu, Zn, Mn, Fe and Boron on the Morass Peat Soil. The objectives of these studies are to establish whether all these elements are needed, the rates to be applied and the method of application.

The crops which will be used in these studies are tomatoes, carrots, cabbages and onions.



3.2.4. Selected vegetables e.g. tomatoes, melons and onions will be sown on the Four Paths Series, and cabbage, cauliflower, onions, carrots and tomatoes on the Morass Peat Soil during the different season. The objectives of these studies are to establish the optimum period for sowing and harvesting, to determine the irrigation needs of the crops when sown during the different seasons, to observe the incidence of pests, diseases and weeds and other problems associated with growing the various crops in and out of seasons.

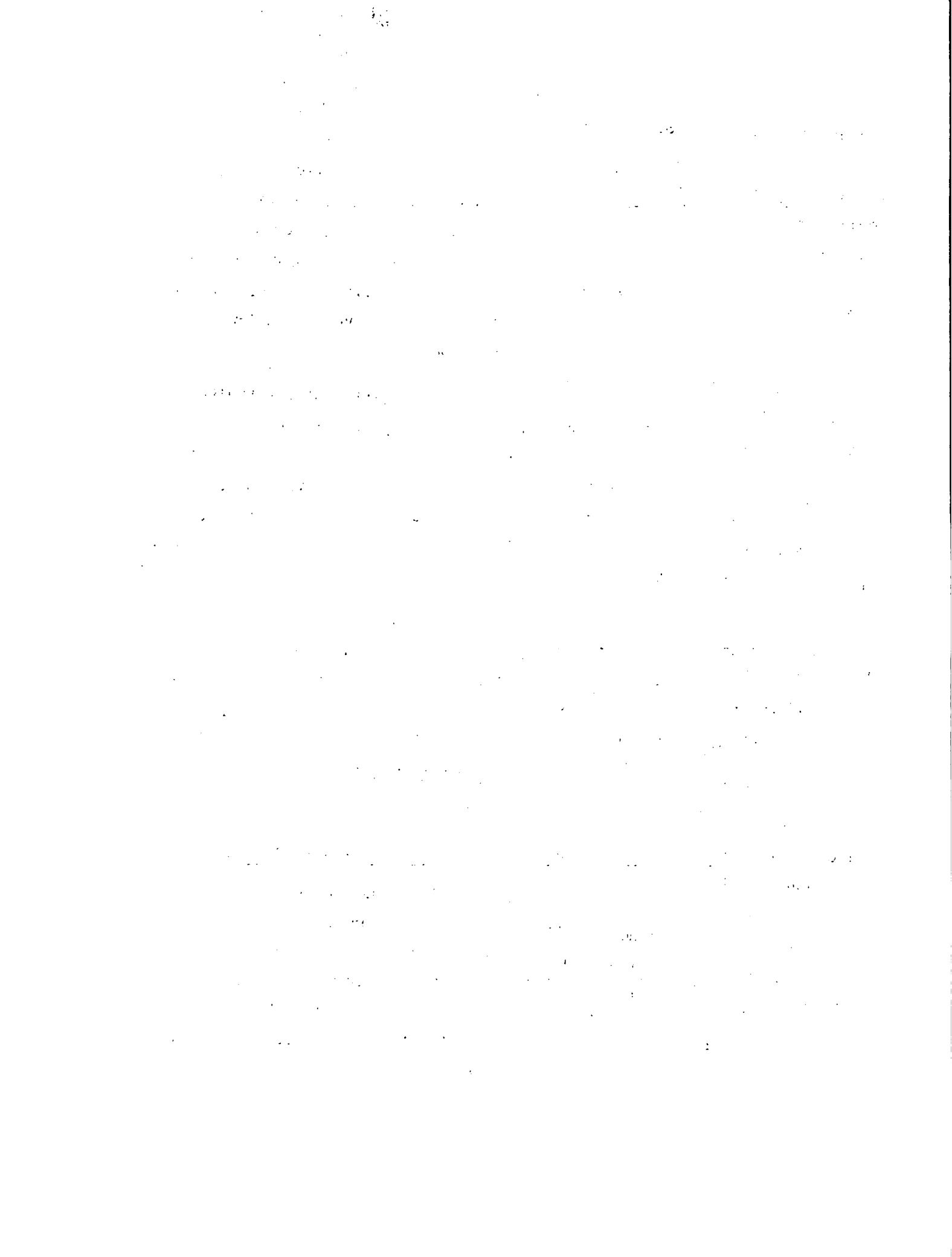
3.2.5. The results obtained from the variety evaluation, N.P.K., micro-elements and time of sowing experiments (3.2.1 to 3.2.4) will be used to develop a package of practices for the production of vegetables on the Morass Peat and Four Paths Series of soils of the project. These would be evaluated in large scale commercial trials of one half to one acre.

3.2.6. The national technicians assigned to the vegetable programme, will as part of their training, be fully involved in all aspects of the programme. The commercial trials will be used as the basis for holding training programmes for farmers and other interested persons. It is expected that the national technicians would be adequately trained by this time to conduct the programme for farmers.

3.3. Methodology

3.1.1. Experimental design for varietal evaluation studies

The design of these studies will be a randomised complete block with four (4) replications. Plot size for each trial will be dependent on the crops being evaluated and the availability of planting material. On the Morass Peat soil a basal application of copper, manganese, boron and zinc will be made at 16.8 kg, 11.2 kg, 4.5 kg and 5.6 kg per hectare respectively. The fertilizer treatments for the different crops on the two (2) soil types are given below.



3.3.1.1. Morass Peat

Cabbage, cauliflower, lettuce, sweet corn, beans, celery:

P_2O_5 - 180 lbs/acre (202 kg/ha)

K_2O - 240 lbs/acre (269 kg/ha)

Carrots, Beets:

P_2O_5 - 200 lbs/acre (225 kg/ha)

K_2O - 300 lbs/acre (336 kg/ha)

Onions:

P_2O_5 - 120 lbs/acre (135 kg/ha)

K_2O - 180 lbs/acre (202 kg/ha)

Tomatoes, peppers, egg plant:

P_2O_5 - 160 lbs/acre (180 kg/ha)

K_2O - 240 lbs/acre (269 kg/ha)

Side dressing of nitrogen fertilizer will be made to the leafy vegetable if the need arises.

3.3.1.2. Four Paths Series

The recommendations of the Ministry of Agriculture which are as follows will be used:

Onions:

6 cwt. of 7-14-14 per acre plus 2 cwt of sulphate of ammonia as a side dressing.

Tomatoes, okra, beans:

5 cwt. of 7-14-14 fertilizer per acre

Carrots, beets:

4 cwt. of 6-18-27 or 12-14-12 per acre

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

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

5. The fifth part of the document discusses the importance of data governance and the role of various stakeholders in ensuring that data is used responsibly and in compliance with relevant regulations.

6. The sixth part of the document provides a summary of the key findings and recommendations. It emphasizes the need for a comprehensive data management strategy that integrates all aspects of data collection, analysis, and governance.

7. The seventh part of the document includes a list of references and sources used in the research. It also provides contact information for the authors and a list of acknowledgments.

8. The eighth part of the document is a conclusion that reiterates the main points of the document and expresses the authors' hope that the information provided will be helpful to the readers.

9. The ninth part of the document is a list of appendices, which include additional data, charts, and tables that support the findings of the study.

10. The tenth part of the document is a list of footnotes and a glossary of terms used throughout the document.

Cabbage, lettuce, cauliflower, celery:

3 cwt. of 7-14-14 fertilizer plus 3 cwt.
of sulphate of ammonia as side dressing.

Routine spraying will be carried out with the appropriate chemicals for control of pests and diseases. Weed control will be done through the use of the recommended herbicides and also manually.

3.3.2. Experimental design for N.P.K. fertilizer experiments

The design of these experiments will be a 3x3x3 factorial arranged in block of nine (9) treatments with two (2) replications. The N.P.K. treatment will be:

On the Morass Peat Soil

N at 0, 40 and 80 kg/ha

P at 100, 150 and 200 kg/ha

K at 150, 250 and 350 kg/ha

On the Four Paths Series

N - 40, 80 and 120 kg/ha

P - 60, 120 and 180 kg/ha

K - 60, 120 and 180 kg/ha

All of the P and half of the N and K will be applied one week prior to planting. The remaining half of N and K will be applied depending on the crop - 3 to 6 weeks after seeding. On the Morass Peat a basal application of Copper and Boron will be applied at 16.8 Kg and 4.5 kg per acre respectively. Manganese and Zinc would be applied as Foliar sprays at 0.375 Kg/ha in 30 - 40 gallons of water. Two applications of the Manganese and Zinc sprays will be made at 3 and 6 weeks.

The recommended cultural practices, pests, disease and weed control measures will be carried out.

Observations will be made on the growth of the plants and yields. Soil and plant analyses will be done at the appropriate times.

3.3.3 Design of micro-nutrients experiments

Two experiments are contemplated. The first experiment will be a randomised block designed and is intended to establish what micro-elements need to be applied to the Morass Peat Soil. The treatments will be as follows:

- (i) No micro-elements
- (ii) Complete package of micro-elements
 - Cu - 16.8 kg/ha (soil application)
 - B - 4.5 kg/ha (" ")
 - Mn - 0.375 kg/ha (two foliar applications)
 - Zn - 0.375 kg/ha at 3 and 6 weeks
- (iii) Complete package minus Cu
- (iv) " " " B
- (v) " " " Mn
- (vi) " " " Zn

A fertilizer application of 180 kg of P_2O_5 and 260 kg of K_2O per hectare will be made one week prior to

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 addresses the issue of proper documentation. It states that all receipts and invoices must be properly filed and indexed to facilitate the audit process. The document also highlights the need for clear and legible handwriting on all documents, as well as the importance of retaining original copies of all records for a sufficient period of time.

3. The third part of the document discusses the importance of timely reporting. It notes that all financial information should be reported to the appropriate authorities in a timely and accurate manner. The text also emphasizes the need for transparency and honesty in all reporting, and that any attempts to conceal or manipulate financial data will be severely penalized.

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seeding to all the plots. Observation will be made on plant growth and yields.

Soil and plant analyses will be done at various stages before and after the application of the micro-elements. The recommended cultural practices, pest, disease and weed control measures will be adopted.

Based on the result of the first experiment, a factorial split plot experiment will be carried out. The micro-nutrients found to be necessary in the first experiments will be tested at various rates both as soil and foliar applications.

3.3.4 Time of planting experiments

The design of this experiment will be a randomised split block in which the main plots will be the variety and the sub-plots - the time of planting. The crop and varieties to be included in these experiments are:

Tomatoes	-	Varieties:	Manalucie, Floradade Tropic
Onions	-	Varieties:	Texas Early Grano, Desex, El Toro
Cabbage	-	Varieties:	K.K. Cross, Roundup, Hybrid YR
Carrots	-	Varieties:	Danvers 126, Walt High- color, Chantenay

The time of planting will be: November - December, February - March, June - July.

Other crops e.g. garlic, cauliflower, melons and lettuce will also be sown in observational plots to observe their performance during the different seasons.

The fertilizer applications will be the same as in experiment 3.3.1 as will be the cultural, pest, disease

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2. The second part of the document focuses on the implementation of internal controls and risk management strategies. It details the process of identifying potential risks and developing effective mitigation plans to minimize their impact on the organization. This section also discusses the role of internal audits in monitoring and evaluating the effectiveness of these controls, ensuring that the organization remains compliant with relevant regulations and standards.

3. The third part of the document addresses the importance of communication and collaboration in achieving organizational goals. It emphasizes the need for clear and concise communication channels, as well as the importance of fostering a culture of transparency and open dialogue. This section also discusses the role of leadership in setting the tone for the organization and ensuring that all employees are aligned with the organization's mission and vision.

4. The fourth part of the document discusses the importance of continuous improvement and innovation in maintaining a competitive edge in the market. It emphasizes the need for regular evaluation and refinement of processes and procedures, as well as the importance of investing in research and development to drive innovation and growth. This section also discusses the role of employee training and development in fostering a culture of learning and innovation.

5. The fifth part of the document discusses the importance of ethical and social responsibility in business operations. It emphasizes the need for organizations to act with integrity and transparency, and to be committed to the well-being of their stakeholders. This section also discusses the role of corporate social responsibility (CSR) in enhancing the organization's reputation and long-term sustainability.

and weed control practices. Irrigation will be provided to the crop when needed and records kept of the water requirements of the crop when sown during the different seasons. Observations will also be made of growth, yield, incidence of pests, diseases and weeds.

3.3.5 Commercial Trials

The commercial trials will be in units of one half to one acre. Records will be kept of the cost of production, yields and returns from the various crops. Based on the profitability of the different crops, recommendations will be made for large scale production at BRUMDEC and for future areas of research.

4. Requirements for the Programme

4.1 Personnel

The following personnel are required for the programme:

One (1) agronomist - as counterpart

Two (2) technicians

Ten (10) workers initially - numbers to be adjusted as the programme develops.

4.2 Land

Five (5) acres on the Morass Peat - 152

Two (2) acres on the Four Paths Clay - 203

Two (2) acres on the Four Paths Loam - 204

4.3 Planting Materials (Seeds)

Appendix V gives the requirements of planting materials (seeds) for the programme.

4.4 Chemicals e.g. fertilizers, insecticides etc.

The requirements of chemicals for the programme are shown in Appendix VI.

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5. The fifth part of the document concludes by summarizing the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data management processes remain effective and aligned with the organization's goals.

4.5 Equipment and other Items

The equipment required for land preparation, irrigation, pest control and other operations connected with the vegetable programme are listed in Appendix VII. The provision of these as well as those listed in Appendices V and VI are vital to the success of the programme.

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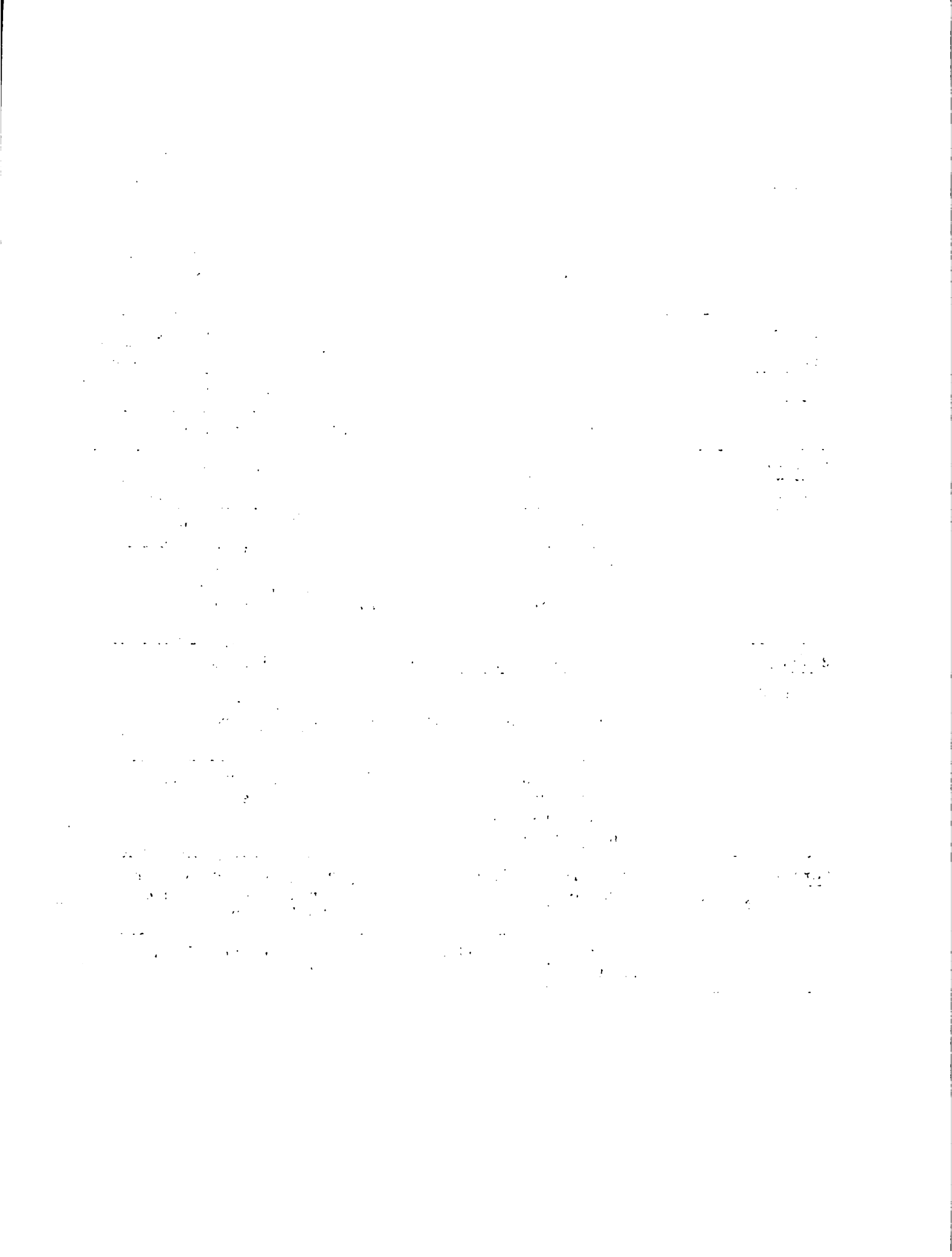
SOME IMPORTANT PESTS OF VEGETABLES AND THEIR CONTROL

<u>CROP</u>	<u>PESTS</u>	<u>CONTROL MEASURE</u>
<u>Crucifers</u> (Cabbage, Cauliflower etc.)	Leafminers	Dimethoate (Rogor) or Fenitrothion
	Cabbage Looper (<u>Trichoplusia ni</u>)	Phosvel, Diazinon or Actellic
	Cabbage Butterfly (<u>Artogeis rapae</u>)	Phosvel, Sevin, Atellic, Ambush or Diazinon
	Diamond Back Moth (<u>Plutella xylostella</u>)	Lannate, Dipterex, Phosvel, Actellic or Ambush
	Cabbage budworm (<u>Hellula, phidilealis</u>)	weekly application of Actellic or Gardona.
<u>Tomato</u>	Tomato fruitworm (<u>Heliothis armigera</u>)	Malathion, Sevin, Diazinon or Gelecron
	Tomato hornworm (<u>Protoparce sexta</u>)	Galecron, Diazinon or Fenitrothion
	Tomato Pinworm (<u>Keiferia lycopersicella</u>)	Lannate or permethrin (Ambush)
	Leaf Sucking Bugs (<u>Nezara sp.</u>) (<u>Phthia picta</u>)	Malathion, Rogor 40 or Fenitrothion
	Thrips (<u>Frankliniella sp</u>)	Fenitrothion, Malathion or Rogor 40
<u>Curcurbits</u> Watermelon,	Aphids	Rogor 40, Diazinon or Malathion
	Banded Cucumber Beetle (<u>Diabrotica separata</u>)	Dipterex, fenitrothion or Malathion
	Sucking Bugs - (<u>Anasa sp</u>) (<u>Phthia picta</u>)	Malathion, Dimethoate or Diazinon
	Melon Worm (<u>Margaronia spp.</u>)	Galecron or Diazinon

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APPENDIX I
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	Leafminers	Dimethoate, Fenitrothion or Malathion
<u>Onions</u>	Leafminers (<u>Liriomyza</u> spp)	Dimethoate or Fenitrothion
	Thrips (<u>Thrips tabaci</u>)	Malathion, Fenitrothion or Dimethoate
	Caterpillars	Malathion, Dipterox or Fenitrothion
<u>Peppers</u>	Whiteflies	Malathion or Dimethoate (Rogor 40)
<u>Lettuce</u>	Leafminers	Dimethoate or Fenitrothion
	Aphids	Malathion or Rogor 40
<u>Carrots</u>	Leafhoppers	Malathion, Sevin or Rogor 40
	Aphids	Malathion or Rogor 40
	Leafminers	Diazinon or Rogor 40
	Caterpillars	Diazinon, Phosvel or Dipterox
<u>Beans</u>	Leafminers (<u>Liriomyza</u> sp.)	Rogor 40, Diazinon, Fenitrothion
	Mites (<u>Tetranychus</u> spp.)	Kelthane, Fenitrothion or Rogor 40
	Caterpillars (<u>Spodoptera</u> sp.) (<u>Pseudoplusia</u> sp.) (<u>Anomis</u> sp.)	Fenitrothion, Diazinon, Dipterox, Phosvel
<u>Corn (Sweet)</u>	Armyworm (<u>Spodoptera frugiperda</u>)	Dipterox, Fenitrothion or Furadan applied to leaves and whorls of plant
	Aphids (<u>Rhopalosiphum msidis</u>)	Malathion, Fenitrothion or Rogor 40



General Pests

Cutworms (Xylomiges sunia)
(Agrotis infecta)
(Prodenia ornitho-
galli)

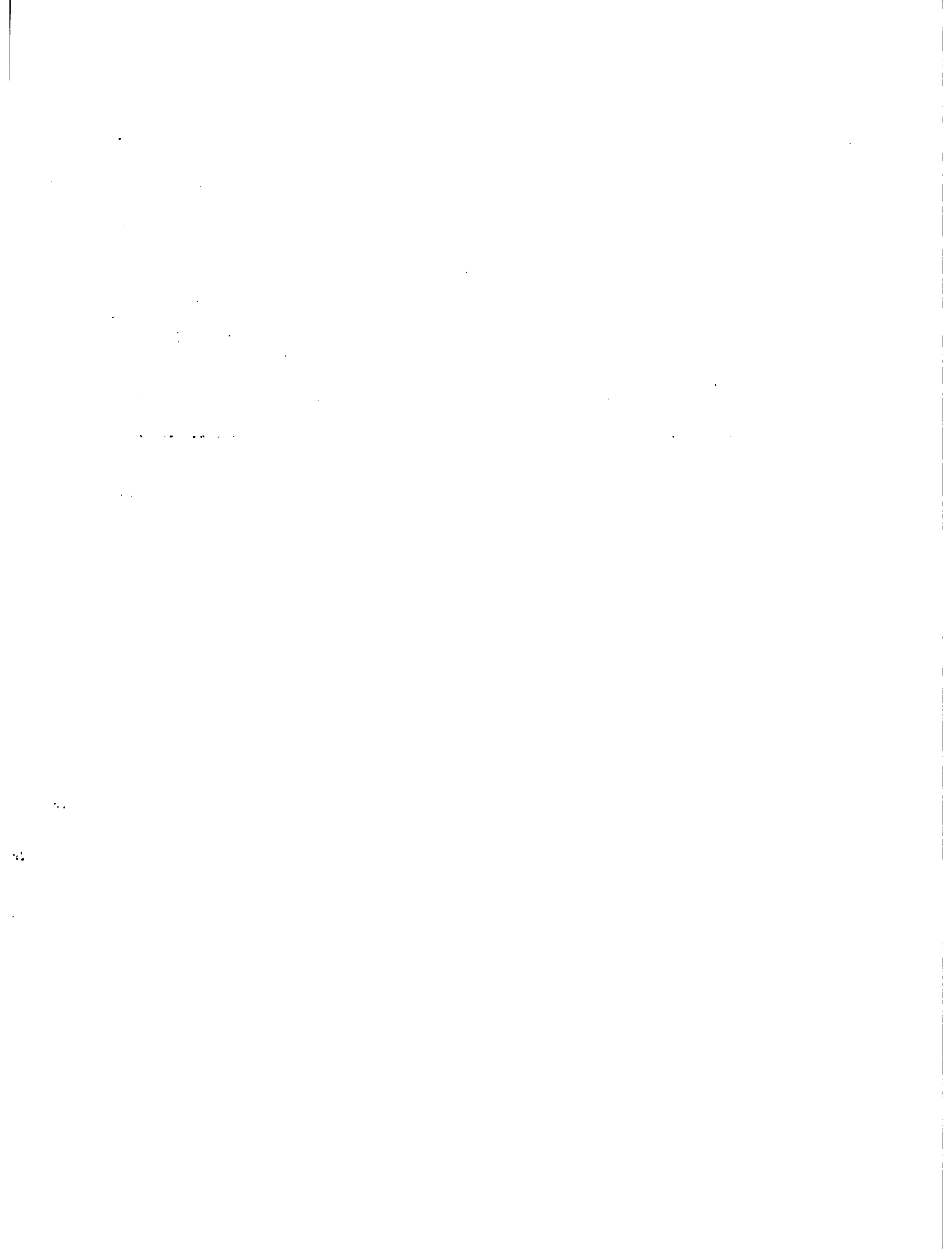
Application of Diazinon, Phosvel or Seyin to the soil. Poison bait containing Dipterex Diazinon or any suitable insecticide

Nematodes (Meloidogyne spp.)
Rotylenchulus
reniformis)

Because of the wide host ranges of these two species of nematode, crop rotation as a control measure is not generally successful. Soil fumigation with DECP, DD, Vydate or Furadan.

Slugs and Snails

Poison bait containing metaldehyde.



SOME IMPORTANT DISEASES OF VEGETABLES AND THEIR CONTROL

<u>CROP</u>	<u>DISEASES</u>	<u>CONTROL MEASURE</u>
<u>Beans</u>	White mold (<u>Sclerotinia sclerotiorum</u>)	Cultural. Chemical - some control is obtained with Benlate 50% wp at 1½ lbs per acre applied just prior to flowering and again 5-7 days later. Some control is also obtained with Difolaton at 3 pints per acre.
	Web blight (<u>Rhizoctonia solani</u>)	Good drainage. Controlled by spraying with Benlate, Daconil, Difolaton and Dithane-45 at the recommended rates at weekly intervals just prior or immediately after heavy rains.
	Powdery Mildew (<u>Erysiphe polygoni</u>)	Controlled by the application of Karathane or Benlate.
	Seed borne diseases - Anthracnose, Common blight, Mosaic	Use seed free of these diseases for sowing.
<u>Carrots</u>	Leaf and Stem Blight (<u>Alternaria dauci</u>)	Seed treatment with hot water at 50°C for 30 minutes or with a chemical seed dressing. Controlled by the application of Dithane-45 or Daconil. Spraying should commence with the first sign of disease or after plants are six weeks old. Use of resistant or tolerant varieties e.g. Waltham Hi-color.
<u>Crucifers</u> (Cabbage, cauliflower etc.)	Downy mildew (<u>Peronospora parasitica</u>)	Controlled by application of Zineb, Dithane M45, Manzate D or Daconil
	Downy mildew (Rhizoctonia)	Control with Benlate 50% WP.
	Bacterial Leaf Spot	Seed treatment with Thiram Spray with Maneb, Zineb, Antracol, Cupromaneb

APPENDIX II

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	Bacterial Black Rot (<u>Xanthomonas campestris</u>)	Treat seed in hotwater at 50°C for 25 minutes. After this treatment dust seed with fungicide e.g. Thiram or Coresan. Crop rotation and strict field sanitation. Grow resistant or tolerant varieties e.g. K.K. Cross, YR 50. Application of Agrimycin 200 ppm, Kocide or Cupravit
<u>Cucurbits</u> (cucumber, melons, etc.)	Downy mildew (<u>Pseudoperonospora cubensis</u>)	Use of resistant or tolerant varieties. Spray with Daconil plus Benlate combination, Antracol, Kocide, Cupravit, Dithane M 45 or Manzate
	Target Spot (<u>Corynespora cassilicola</u>)	Use of tolerant or resistant varieties. Spray with Manzate D + Benlate or Benlate alone or Zineb
	Powdery mildew (<u>Oidium</u> Spp.)	Protective spray of Captan or Dithane - 45
	Mosaic Virus	Use of disease free seeds. Roguing of infected plants at an early stage. Control of aphid vector in the field with appropriate insecticides
<u>Lettuce</u>	Brown Leaf Spot (<u>Cerospora Longissima</u>)	Control by the application of Benlate, Difolatan, Daconil or Dithane M45
<u>Tomato</u>	Light Blight (<u>Phytophthora infestans</u>)	Use of resistant and tolerant varieties e.g. Manalucie. Preventative spray prior to flowering, bi-weekly application of Cupravit Blue, Kocide, Dithane M45, Maneb or Daconil. Sanitation - use disease free transplants, destroy all infected plants.

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APPENDIX II

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<p>Early Blight (<u>Alternaria solani</u>)</p>	<p>Sanitation - Seed treatment e.g. Thiram. Application of chemical sprays e.g. Kocide, Dithane, Maneb, Daconil at weekly intervals. Crop rotation.</p>
<p>Leaf Mould (<u>Cladisporium</u> sp.). Gray Leaf Spot (<u>Stemphylium</u> sp), Septoria leaf spot (<u>Septoria</u> sp.)</p>	<p>Application of Difolaton, Maneb, Cupromaneb, Cupravit, Kocide, Perenox or Daconil</p>
<p>Bacterial Spot (<u>Xanthomonas Vesicatoria</u>)</p>	<p>Combination spray of Kocide 404 plus Nufilm or Citcop plus Dithane M-45 or Agrimycin</p>
<p>Fusarium Wilt (<u>Fusarium oxysporum</u>) (<u>Flycopersici</u>)</p>	<p>No chemical control.</p>
<p>Southern Bacterial Wilt (<u>Pseudomonas solanacearum</u>)</p>	<p>The control measures recommended for these two wilt diseases include strict field sanitation, crop rotation, the planting of resistant or tolerant varieties e.g. Manalucie, Walter etc. tolerant to Fusarium Wilt. Good drainage.</p>
<p>Collar Rot (<u>Sclerotium rolfsii</u>)</p>	<p>Controlled by improving the nutritional status of the soil and by controlling nematodes</p>
<p>Tobacco/Tomato Mosaic Virus</p>	<p>Disease free seeds. Sanitation-avoid infested soil. Care should always be exercised to prevent contamination of hands with virus from tobacco products e.g. cigarettes. Roguing of fields.</p>

APPENDIX I

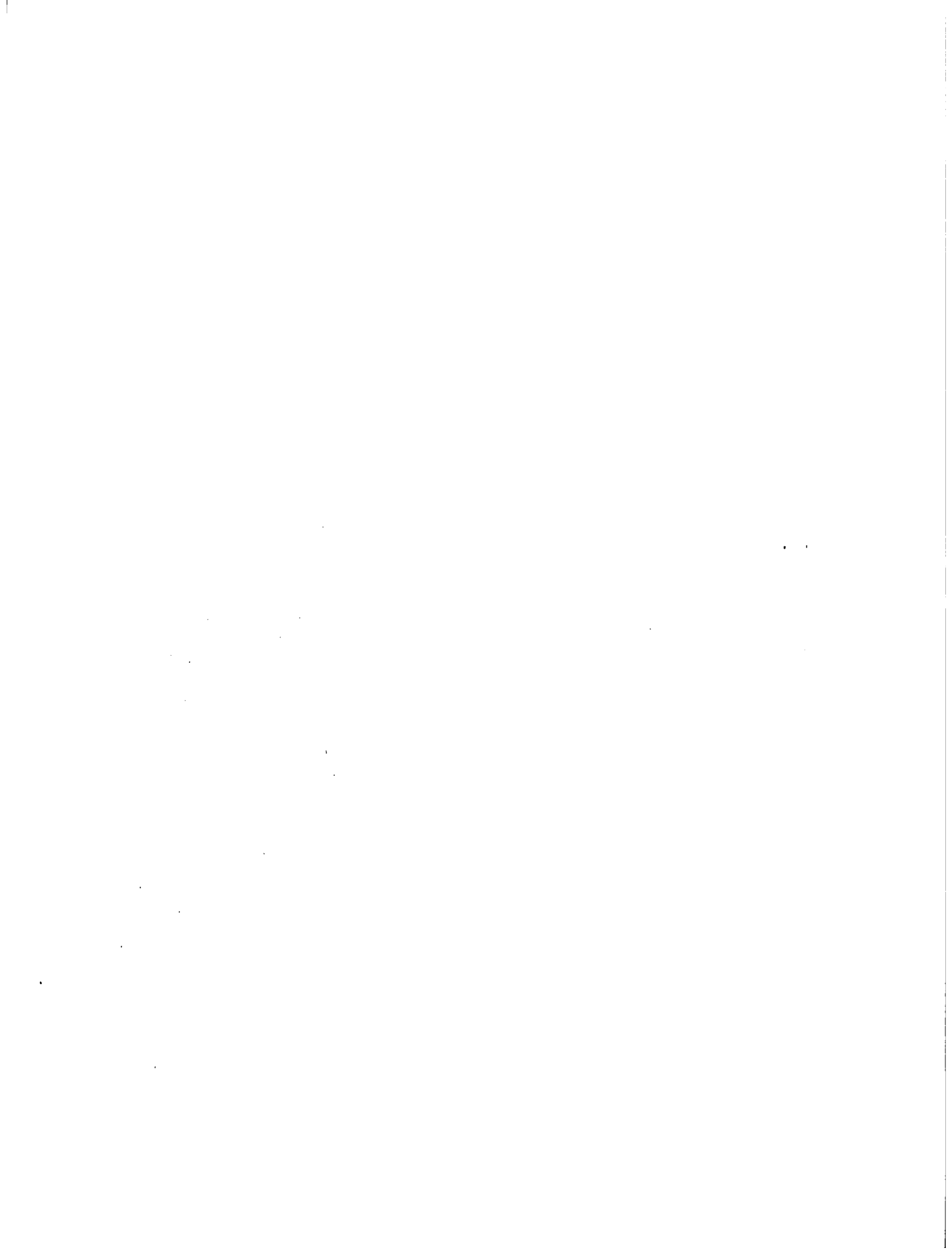
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<u>Onion</u>	Damping off and Root Rot e.g. (<u>Pythium</u> spp.) (<u>Rhizoctonia solani</u>)	Treatment of soil in the nursery with a fungicide such as Thiram
	Onion Blast (<u>Botrytis</u> spp.)	Use of tolerant varieties. e.g. red varieties are tolerant to disease but brown and white varieties are generally susceptible. Proper drying and storage, cultural practices e.g. allow tops to dry properly before harvesting.
<u>Garlic</u>	Purple blotch (<u>Alternaria porri</u>)	Soil application of suitable fungicide e.g. Cupravit Blue prior to planting.
<u>Pepper</u>	Fusarium Wilt (<u>Fusarium solani</u>)	Control measures as for tomatoes
	Bacterial Wilt (<u>Pseudomonas solanacearum</u>)	Good drainage. Roguing of fields. Avoid transplanting in the wet.
	Anthracnose (<u>Collectotrichum</u> sp.) (<u>Gloeosporium</u> sp.)	Seeds from unhealthy plants should not be used for planting. Use of tolerant varieties. Chemical sprays e.g. Kocide at weekly intervals.
	Bacterial Leaf Spot (<u>Xanthomonas vesicatoria</u>)	Use disease free seeds. Crop rotation. Application of Kocide once every two weeks can reduce infection.



CHEMICAL WEED CONTROL IN SELECTED VEGETABLES

<u>CROPS</u>	<u>HERBICIDE</u>	<u>METHOD OF APPLICATION</u>
Cabbage	TOK 50% WP	Applied post emergence when cabbage plants are in 2-3 true leaf stages and weeds quite young.
	Dacthal 75% W	Applied at 10 lbs/acre pre-emergence after seeding or transplanting. Soil must be moist.
	Diphenamid (Dymid)	Applied at 4 to 6 lbs/acre after seeding.
Celery	Kerosene oil or Stoddard solvent	Applied at 30-40 gallons/acre not later than one month after seeding or transplanting.
Carrots	Prometryn 50 WP (Gesagard)	Applied at 2-3 lbs/acre as a pre-emergence spray.
	Stoddard Solvent or Kerosene	Applied as a post emergence spray at the rate of 30-50 gallons per acre when the first true leaf has developed but before the carrots have reached the size of a lead pencil. Application should be made in the late afternoon when temperatures are below 85°F.
	Linuron 60% (Lorox, Afalon)	Applied at the rate of 2-3 lbs per acre when the crop has 2 or more true leaves. At the time of application, the temperature must be below 85°F.
Beans	Dacthal 75% W	Applied as a pre-emergence at 10 lbs/acre plus paraquat at 1 pt/acre if weeds are present.
Beets	Pyrazon (Pyramin 80)	Pre- or post-emergence application at 5 lbs/acre supplied when soil is moist or incorporated in



APPENDIX III

(cont.)

<u>Cucurbits</u> (Melon, cucumbers)	Alanap 2E	1½ - 2 gallons per acre immediately after seeding.
<u>Corn</u>	Atrazine (Gesaprim 80)	Pre-emergence at 1½-1½ lbs/acre
	Bladex 80 WP plus Lasso 4E	Bladex at 2-2½ lbs plus Lasso at 4-5 pints per acre in 20-30 gallons of water after.
<u>Onions</u>	Eptam plus Gramoxone	Eptam at 1/3 gallon plus Gramoxone at 1½ pint/acre applied as pre-plant application. Allow at least three weeks before seeding.
	Dacthal 75W	Applied at 10-12 lbs in 40-100 gallons of water per acre immediately after seeding.
	TOK 50 WP	Applied at 6-8 lbs/acre in 40-80 gallons of water per acre when the onions are at least in the 2-3 true leaf stage.
<u>Tomato</u>	Dymid 80 W	5-7 lbs (4 to 6 lbs active) per acre after direct seeding or transplanting or within one month of transplanting or seeding.
	Dacthal 75 W	10 lbs per acre, 4 to 6 weeks after transplanting or on direct seeded plants at 4" to 6" in height.

LIST OF VARIETIES OF VEGETABLES RECOMMENDED FOR JAMAICA

<u>GROUP</u>	<u>VARIETIES</u>	<u>REMARKS</u>
Tomatoes	Manabaco Floradel Florida 44-1 Homestead Tropics Walter Roma Floradade	
Onions	Texas Early Grand Granex Fi New Mexican White " " Yellow El Toro Granex Fi Dessex	Recommended for sowing in fall sea- son (October end of November) Recommended for spring season March - April
Carrots	Danvers Half Long " 126 Spartan Bonus	
Beets	Detroit Dark RE1	
Cucumbers	Ashley Poinsetta Straight Eight Explorer Spartan Dawn Pickie Wisconsin Sn Ri	Slicing cucumbers " " " " Pickling cucumbers " " " " " "
Watermelon	Charleston Grey	
Maskmelon	Swiss Perfect	
Sweet Peppers	California Wonder New Improved California Wonder Yolo Wonder	
Egg Plant	Black Beauty Long Purple	

APPENDIX IV

(cont.)

Cauliflower	Early Patna	Fall planting
	Snow Peak	"
	Snow Crown	"
	Monarch	"
	Tropical Sureheart	"
Lettuce	Mignonette	Leaf Variety
	Minetto	Head
	Great Lakes	"
Cabbage	K.K. Cross	
	K.Y. Cross	
	Y.R. Cross	
	Roundup	
	King Cole	
	Superette	
	Early Cross	

Source of information. Miss J. Brand, Ministry of Agriculture, Kingston

APPENDIX V

VEGETABLE MATERIAL (LBS)

<u>CROP</u>	<u>VARIETIES</u>	<u>QUANTITY (LBS)</u>
Cabbage	King Cole	1
	Rio Verde	1
	Roundup	1
	K.K. Cross (summer stride)	1
	Hybrid YR Cross 29	1
	Bonanza	1
	Shamrock	1
	Hybrid YR (summer 50)	1
	Danish Bald Head	1
Lettuce	Great Lakes	1/2
	Mignonette	1/2
	Mesa	1/2
	Minetto	1/2
	Fulton	1/2
	Bibb	1/2
	Prizehead	1/2
	Black-seed Simpson	1/2
Cauliflower	Fangshan Extra Early	1/2
	Farmers Early #3	1/2
	Snow Queen	1/2
	Early Patna	1/2
Peppers (hot)	Long Cayenne	1/2
	Scotch Bonnet	1/2
Peppers (sweet)	Early Calwonder	1/2
	Yolo Wonder	1/2
	Resistant Giant	1/2
	California Wonder	1/2
	Wonder Giant	1/2
Tomatoes	Walter	1
	Floradel	1
	Tropic	1
	Madhead or Quickie (local variety from St. Elizabeth)	1
	Manapal	1
	M 118	1
	Manalucie	1
	Calypso	1
	Castlex 1025	1
	Ox-heart	1
	Floradade	1
	Roma	1



APPENDIX V

(cont.)

Sweet Corn	Sweet Tennessee	5
	Sunshine State	5
	USA-34	5
	Lobelle	5
	Golden Cup	5
	Florigold	5
Watermelon	Fengshan #1 Seedless	1
	Sweet Baby	1
	Sugar Baby	1
	Charleston Grey	1
	Jubilee	1
Celery	Golden Self Blanching Dwarf	$\frac{1}{2}$
	Faltham Strain Summer	
	Pascal	$\frac{1}{2}$
	Golden Plume	$\frac{1}{2}$
String Beans	Provider	1
	Harvester	1
	Sprite	1
	Extender	1
	Contender	1
	Eagle	1
	Tender Best	1
	Prince	1
	Top Crop	1
Egg Plant	Florida Market	$\frac{1}{2}$
	Pompano Market	$\frac{1}{2}$
	Black Beauty	$\frac{1}{2}$
	Early Prolific (Hybrid)	$\frac{1}{2}$
	Black Bell	$\frac{1}{2}$
	Royado	$\frac{1}{2}$
	Florida Beauty	$\frac{1}{2}$
Long Purple	$\frac{1}{2}$	
Cucumbers	Poinsett	$\frac{1}{2}$
	Cherokee	$\frac{1}{2}$
	Ashley	$\frac{1}{2}$
	Green Prolific	$\frac{1}{2}$
Okra	Clemson Spineless	$\frac{1}{2}$
	Louisiana Green Velvet	$\frac{1}{2}$
	Emerald	$\frac{1}{2}$

APPENDIX A

(cont.)

Onions (bulbing)	Times Crowned	1
	Tropicana	1
	New Mexican	1
	Granex Hybrid	1
	Yellow Crown	1
	Red Crown	1
	Dessex	1
	Tropi Brown	1
	Hybrid Rio	1
El Toro	1	
Onions (bunching)	Ebenezer	1
	White Portugal	1
	Silverskin	1
	Green Bunching	1
Carrots	Waltham Highcolor	1
	Danvers 126	1
	Chantenay Royal	1
	Chantenay Red Core	1
	Nantes Cross Fi Hybrid	1
Beets	Detroit Dark Red	1
	Early Wonder	1
	Top Market	1
	King Red	1
	Early Wonder Crossby Improved	1

APPENDIX VILIST OF FERTILIZERS AND PESTICIDES

<u>Fertilizers</u>	<u>Type</u>	<u>Amount</u>
	4-12-2 or 12-12-12 fertilizer	6 cwt.
	Urea (45%)	1,800 lbs
	Triple Superphosphate (45-50% P ₂ O ₅)	2,600 lbs
	Muriate of Potash (60% K)	3,200 lbs
	7-14-14 fertilizer	6 cwt.
	Manganese sulphate	200 lbs
	Copper sulphate	200 lbs
	Iron chelate	10 lbs
	Zinc sulphate	30 lbs
	Borax	50 lbs
<u>Insecticides and Fungicides</u>	Metaldehyde Bait	50 lbs
	Dipterex 80-90% SP	50 lbs
	Actellic	1 gallon
	Dimethoate (Rogor 40, Perfekthion)	1 gallon
	Fernasan 75-W	10 lbs
	Benlate 50 W	20 lbs
	Ambush	1 gallon
	Kocide 101 or Cupravit Blue	50 lbs
	Dithane 245	50 lbs
	Furadan 10F	100 lbs

APPENDIX VI

(cont.)

Herbicide

Endosulfan	1 gallon
Kerosene Oil	5 gallons
Dacthal 75 DF	10 lbs
Bladex 50 WP	10 lbs
Lasso 4F	2 gallons
Tek 50 WP	10 lbs
Dymid 80 DF	10 lbs

APPENDIX VII

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AT FIELD STATIONS FIELD STATIONS FIELD STATIONS

<u>Surveying Equipment</u>	Type	<u>Amount</u>
	Knapsack Sprayers (4 gal)	2
	Constant Pressure Knapsack Sprayers (4 gal)	2
	Motorized dustblowers (Model Solo 410)	1
<u>Field Equipment</u>	Irrigation Pump 2'-3' with hose	2
	Garden Fractor (15-25 HP) with ploughs, harrows, rotovators etc.	1
	Portable Irrigation Unit	1
<u>Laboratory and Field Items</u>	Torsion Balance Scale (model BM 2-1)	1
	Gram Scale (Capacity 550 g 16 ozs)	1
	Graduated cylinder (100 cc)	4
	Graduated cylinder (500 cc)	4
	Soil Thermometer	2
	Plastic Bags (2' x 6')	500
	Soil Auger	1
	Tensionmeters (Quick Draw Model 2900)	2
	Measuring Tape (100 ft.)	2
	Tally Meters	2
	Plastic Buckets (20 l.)	5
	Respirators (Seedburo No. 413)	6
	Refrigerator (for storing seeds)	1

APPENDIX VII

(cont.)

Tools

Dikes 10

Hoes 10

Shovels 10

Pachetes 10

Hammer 4

Miscellaneous Items

Stakes 500

Paint (white) 1 gallon

Paint (black) 1 gallon

Brush (Marking) 10

Cord polythene 400 meters

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- No. I - 2 Yvonne Lake, "Agricultural Planning in Jamaica", June 1977
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- No. I - 4 Uli Locher, "The Marketing of Agricultural Produce in Jamaica", November 1977
- No. I - 5 G. Barker, A. Wahab, L. A. Bell, "Agricultural Research in Jamaica", November 1977
- No. I - 6 Irving Johnson, Marie Strachan, Joseph Johnson, "Land Settlement in Jamaica", December 1977
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- No. I - 8 Jose Emilio Araujo, "The Communal Enterprise", February 1980
- No. I - 9 IICA and MOAJ, "Hillside Farming Technology - Intensive Short Course", Vols. I and II, March 1978
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- No. I - 11 Marie Strachan, "A National Programme for the Development of Hillside Farming in Jamaica", April 1978
- No. I - 12 D. D. Henry, "Brief Overall Diagnosis of Hillside Farming in Jamaica", April 1978
- No. I - 13 Neville Farquharson, "Production and Marketing of Yams in Allsides and Christiana", May 1978

STATE OF TEXAS

COMMISSIONERS OF THE GENERAL LAND OFFICE

Section	Acres	Original Patent	Original Patentee	Original Patent Date	Original Patent No.	Original Patent Locality	Original Patent Description	Original Patent Remarks
1	100	1850	John Smith	1850	100	Section 1, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
2	100	1850	John Smith	1850	100	Section 2, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
3	100	1850	John Smith	1850	100	Section 3, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
4	100	1850	John Smith	1850	100	Section 4, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
5	100	1850	John Smith	1850	100	Section 5, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
6	100	1850	John Smith	1850	100	Section 6, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
7	100	1850	John Smith	1850	100	Section 7, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
8	100	1850	John Smith	1850	100	Section 8, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
9	100	1850	John Smith	1850	100	Section 9, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
10	100	1850	John Smith	1850	100	Section 10, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
11	100	1850	John Smith	1850	100	Section 11, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
12	100	1850	John Smith	1850	100	Section 12, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
13	100	1850	John Smith	1850	100	Section 13, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
14	100	1850	John Smith	1850	100	Section 14, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
15	100	1850	John Smith	1850	100	Section 15, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
16	100	1850	John Smith	1850	100	Section 16, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks
17	100	1850	John Smith	1850	100	Section 17, Township 10N, Range 10E, County 10C, State of Texas	Original Patent Description	Original Patent Remarks

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- No. I - 16 Neville Farquaharson, "Production and Marketing of Dasheen in Allsides and Christiana", June 1978

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- No. II - 4 Neville Farquaharson, "ABC of Vegetable Farming", A Draft High School Textbook, Vols. I, II, III and IV, February 1979
- No. II - 5 Jerry La Gra, "Elements of an Agricultural Marketing Strategy for Jamaica", March 1979
- No. II - 6 D. D. Henry, I. E. Johnson, "Agricultural Extension Service in Jamaica", March 1979

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- No. III - 1 H. R. Stennett, "Watersheds of Jamaica and Considerations for an Ordinal Scale of their Development", July 1979
- No. III - 2 IICA-MAJ, "Hillside Farming in Jamaica", A Training Seminar, December 1978
- No. III - 3 A. L. Wright, A. H. Wahab, H. Murray, "Performance of Six Varieties of Red Peas (Phaseolus vulgaris L.) on a Newly Terraced Ultisol in Jamaica", September 1979
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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 the second section, the author details the various methods used to collect and analyze the data. This includes both manual and automated processes. The goal is to ensure that the information gathered is both comprehensive and reliable.

The third part of the report focuses on the results of the analysis. It shows that there are significant trends in the data that have not been previously identified. These findings could have major implications for the organization's strategy.

Finally, the document concludes with a series of recommendations. These are based on the insights gained from the analysis and are designed to help the organization address the identified issues. The author believes that these steps are crucial for long-term success.

The following table provides a summary of the key data points discussed in the report. It shows a clear upward trend in the primary metric over the period analyzed.

Year	Primary Metric	Secondary Metric
2018	120	85
2019	135	90
2020	150	95
2021	165	100
2022	180	105

Overall, the report provides a thorough overview of the current state of affairs and offers a clear path forward. It is hoped that these findings will be used to inform decision-making and drive positive change within the organization.

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

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- No. IV - 1 Joseph Johnson, "Production and Marketing of Red Peas in the Hilly Areas of Jamaica", January 1980
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- No. IV - 10 Henry Lancelot, "Traditional Systems in Hillside Farming, Upper Trelawny, Jamaica", June 1980

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

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

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

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

5. The fifth part of the document discusses the importance of data governance and the role of various stakeholders in ensuring that data is used ethically and in compliance with relevant regulations.

6. The sixth part of the document provides a summary of the key findings and recommendations. It emphasizes the need for a comprehensive data management strategy that integrates all aspects of data collection, analysis, and governance.

7. The seventh part of the document includes a list of references and sources used in the research. It also provides contact information for the authors and a list of acknowledgments.

8. The eighth part of the document is a conclusion that reiterates the main points of the document and expresses the authors' hope that the information provided will be helpful to other organizations in their data management efforts.

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2 MAR 1984

George Buchner

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