INTER-AMERICAN INSTITUTE FOR COOPERATION
ON AGRICULTURE

INTER-AMERICAN DEVELOPMENT BANK

Program for the Analysis of Agricultural Policies vis-a-vis Women Food Producers in the Andean Region, the Southern Cone and the Caribbean

WOMEN FOOD PRODUCERS IN JAMAICA

TECHNOLOGY AND MARKETING

Conrad Smikle

TECHNICAL COOPERATION AGREEMENT IICA/IDB/ATN-SF-4064-RE

AREA OF CONCENTRATION IV
SUSTAINABLE RURAL DEVELOPMENT

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The author of this document was a consultant hired by the Program for the Analysis of Agricultural Policies vis-a-vis Women Food Producers in the Andean Region, the Southern Cone and the Caribbean (IICA/IDB). Therefore, the ideas, interpretations and conclusions expressed must be attributed to him, and do not necessarily reflect those of IICA, IDB or any of their Member States.

IICA's Editorial Service was responsible for the stylistic revision, typesetting and layout of this publication, and IICA's Print Shop for the printing.

Smikle, Conrad
Women food producers in Jamaica : technology and marketing / Conrad Smikle. — San Jose, C.R. : Inter-American Institute for Cooperation on Agriculture, 1996.
148 p. ; 28 cm.

Technical Cooperation Agreement IICA/IDB/ATN-SF-4064-RE. Program for the Analysis of Agricultural Policies vis-a-vis Women Food Producers in the Andean Region, the Southern Cone and the Caribbean.

1. Mujeres rurales - Jamaica. 2. Tecnología agrícola - Jamaica. 3. Mercadeo - Jamaica. I. IICA. II. BID. III. Título

AGRIS E51
Dewey 305.4

February, 1996
San Jose, Costa Rica

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PREFACE

The Program for the Analysis of Agricultural Policies vis-a-vis Women Food Producers in the Andean Region, the Southern Cone and the Caribbean, executed by the Inter-American Institute for Cooperation on Agriculture (IICA) and financed by the Inter-American Development Bank (IDB) under Technical Cooperation Agreement ATN/SF-4064-RE, is the second phase of a program which included 18 countries in Latin American and the Caribbean: Barbados, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela.

The first phase of the Program was implemented in 1992-1993 in six countries in Central America, under the auspices of the Council of Central American Ministers of Agriculture. The second phase was carried out by request of the First Ladies during their Summit Meeting on the Economic Advancement of Rural Women, held in Geneva, Switzerland, in February 1992.

This document is one of three reports per country which present the technical results from the four areas of Program research, as well as the recommendations and preliminary action proposals related to women food producers. The three documents are:

Assessment and Policies. *Assesses the participation of women in the agricultural sector and their contribution as food producers on small-scale farms, and presents an analysis of the agricultural policy and program environment and its effects on rural women.*

Technology and Marketing. *Analyses the technology utilized on small farms and by women in food production processes, and the role of women in the processing and marketing of farm food production; agricultural technology and marketing policies and programs and their effects on rural women are also examined.*

National Summary. *Drawing from the above two reports, this document synthesizes the major findings and research results, and presents the principal policy, program, and project proposals.*

Other activities carried out under this Program included the elaboration of regional comparative documents; the formulation of policy proposals and other actions in conjunction with the ministries of agriculture, the Offices of the First Ladies, and other public and private organizations involved in agricultural and rural development; national and regional seminars to present and discuss Program recommendations; and the publishing and distribution of the final results.

I. INTRODUCTION

A. Background

Jamaica, with a population of some 2.4 million people,[1] obtains the food it consumes from local production and imports. Significant quantities of locally produced crops are also exported, giving rise to the broad classification of local production as either domestic food crops or traditional export crops.

Women are mostly involved with domestic food crops, which includes just over 50 items divided into the following food groups:

Legumes
Vegetables
Condiments
Fruits
Cereals
Plantains
Potatoes
Yams
Other

A detailed list of these crops, together with the estimated annual production during the period 1981-91 is provided in appendix 1.

Traditional export crops, on the other hand, are defined as those crops for which Jamaica has a long history in export markets: coffee, citrus, banana, sugar cane, pimento, cocoa, and ginger. Women have also played major roles in the production of these crops, specializing in harvesting and postharvest activities such as picking, peeling, threshing, and drying.

Over the last decade, the classification of locally produced crops has broadened to include a third category, nontraditional export crops. These are not, however, new crops, but rather a subset of the list of domestic crops listed in appendix 1. They are now classified as such because of their recent entry into the export market.

A description of locally produced food crops would not be complete if mention were not made of a relatively long list of crops that are not recorded in the official statistics on food crop production. They are, nevertheless, significant items in the total domestic supply of foods. This group is made up mainly fruit trees, which include the following:

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[1] 1991 Jamaican population census.

Breadfruit (Artocapus Altilis)
Mango (Mangifera Indica)
Avocado (Pear) (Persea Americana)
Ackee
Naseberry (Mamilkara Zapota)
Sweet Sop (Annona Squamosa)
Sour Sop (Annona Muricata)

Traditionally, these crops have not been part of farmers' planned production. For the most part they grow haphazardly as individual trees and as part of the natural vegetation, particularly on small farm holdings. It is only in recent times that attempts have been made to grow a number of these crops in orchard cultivation. The main crops grown in this manner are ackee, mango, and avocado. Here again, women have always played leading roles in gathering, selling, processing, and otherwise handling these crops.

In terms of domestic animals, the main livestock reared locally are cattle, goat, pigs, and poultry (mainly chicken). The main livestock products are beef, milk, goat meat, pork, broiler meat, and eggs. Fishing is also a traditional economic activity in Jamaica, producing much of the nation's requirements. In recent times, inland fish farming has been introduced. In the small livestock group, women normally play dominant roles in the rearing. For example, feeding, cleaning of pens and coops, collection of eggs, and slaughtering of chickens are considered to be mainly women's jobs.

Notwithstanding the wide range of crops and livestock products produced locally, Jamaica imports substantial quantities of its food requirements annually. The total value of food imports averaged US$130.6 million annually over the four year period 1988-91.[2] The major categories of food imports are meats, dairy products, cereals (mainly rice and flour), fish (canned and salted), and processed vegetables. Significant quantities of condiments, mainly onions, are also imported.

In 1992, the total area of domestic food crops under cultivation was 49,026 hectares, which yielded an estimated 415,416 tons of fresh food. The planned increases over this area will reach approximately 5000 hectares annually during the period 1990-95.[3] A national export drive over the past two decades, as well as increasing tendencies in the tourism sector to decrease dependence on imported foods through "Jamaicanization" of menus has opened opportunities for small-scale producers in the production, distribution, and processing of foodstuffs.

While the majority of large farmers and other business operators have been able to accumulate wealth and increase their productivity, however, small-scale producers are characterized by low

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[2] Jamaican external trade statistics (various years).

[3] Jamaica's Five Year Plan, 1990-1995, Agricultural Sector Plan.

levels of income and generally poor socioeconomic conditions. This is despite considerable efforts by governments over several decades to assist this group.

Technology is one of the most important factors influencing productivity, along with credit and use of other types of farm inputs. Yet there are several elements of traditional technology that persist on the farms of small-scale producers. The most noticeable of these is the widespread use of hand tools. In Jamaica, however, it appears that there is little or no choice to the use of hand tools given the characteristically steep and sometimes stony slopes on which the vast majority of small farms are found.

Government policies relating to technology generation and transfer with respect to small-scale agricultural producers have been perhaps the most consistently supported agricultural policies over many years. The existence of a fair number of old research and training institutions lends support to this observation. On the other hand, many other policies--for example those concerning price support, land distribution, credit, and marketing--have experienced change, discontinuation, or reformulation over time.

Since the days of slavery, women have been known to play significant and sometimes leading roles in the food system. Overall, they have participated as independent farmers, farming partners of their spouse, hired laborers, marketing agents, and food processors. In production activities they account for between 15% and 25% of the total number of independent producers.

In the marketing system women are undoubtedly the leading agents in collection and distribution of domestic food crops, and play significant roles as well in the distribution of some imported food items such as onions and red kidney beans. It is estimated that through urban and parish markets women distribute some 80% of total domestic production annually.

In food processing, women function both as individual food processors and as hired laborers, mainly in the commercial food processing plants. As individual food processors, their roles are restricted largely to cottage industry-type operations and very small home-processing activities.

The employment of women as hired laborers in agriculture has been found predominantly on large farms and agricultural estates. They also, however, provide a significant portion of the labor requirements for small male-operated farms, sometimes in the form of unpaid labor. Generally, the more labor-intensive operations are reserved for women. Example include the following:

Picking (harvesting) of coffee
Weeding of vegetables and onions
Peeling (postharvest handling) of ginger
Picking and threshing (harvesting and postharvest handling of pimento)
Cleaning, grading, and packaging (postharvest handling) of export bananas and winter vegetables
Collection and grading (postharvest handling) of onions

These tasks are not only labor intensive, but they are repetitious and are perceived as boring for men.[4] The practice, then, has been to use women for these tasks, since they have been found to be more efficient. **For this reason, women are, in a true sense, the backbone of the agricultural estates on which they are employed. Nevertheless, they are paid lower wages than their male counterparts.**

The magnitude of women's contribution to the agricultural sector is further demonstrated by their numbers at other points in the food system. The agricultural census of 1978/79 indicated that female accounted for 19.3% of the total number of independent farmers. This converts to approximately 35,000 female farmers. In addition, in two separate studies conducted in the mid and late 1970s, it was estimated that in the marketing and distribution of fresh agricultural produce, the number of female marketing agents was between 14,000 and 20,000.[5] Thus, by these early estimates, the number of women active in the food system was well over 50,000. This number is even larger when we take into account that the 35,000 statistic represents only independent operators, and excludes other women who participate in these operations. Adjusting to include these women, the number could be well over 100,000. The impact of technology and marketing on the agricultural sector, therefore, is strongly influenced by female participation.

B. Objectives

This document will analyze technologies used in food production, including those used by women. On the basis of this analysis, recommendations will be formulated for policies, institutional systems, and possible programs and projects that will provide rural women access to more advanced, but appropriate, technology.

In addition, the characteristics of the processing and marketing of agricultural products will be identified, including how they affect women food producers. In general, emphasis will be placed on the role of women in these processes. On the basis of this analysis, recommendations will be formulated regarding policies, institutional systems, and possible programs and projects.

C. Methodology

In the course of this study, a combination of research methodologies were used, including the following:

1. Literature review
2. Formal and informal discussions and consultations

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4 FAO. An Assessment of Farm Inputs on Farming System Development in the Rio Minho Watershed. 1989.

5 Ministry of Agriculture, Higgler Survey (1977); IICA, Marketing Study (1977).

3. Observations
4. A field survey using a structured questionnaire

The literature reviewed included a large body of texts on the agricultural sector, but with particular orientation to rural women producers and marketers. It encompassed published and unpublished studies, annual reports, pamphlets, brochures, national and sector plans, seminar presentations, project evaluation reports, and other project documents.

The persons with whom formal and informal discussions were held included government agricultural extension personnel, leaders and members of selected community groups, local representatives of funding agencies, marketing agents, and farmers of both genders. Observation visits were made to a select number of agricultural extension "field days,"[6] retail market outlets, and food processing sites operated by rural women's groups.

The field survey was conducted using a purposive sample of 150 women farmers distributed among the major producing areas of yams, vegetables, and cassava. Figure 1 shows the geographic location of these areas. The sample was selected based on names provided by agricultural extension officers in each of the study areas. The selection of the areas was based on an analysis of parish production statistics obtained from the Data Bank and Evaluation Division of the Ministry of Agriculture.

Interviews were conducted from November 20, 1993, to January 28, 1994, using a team of five data collection officers who were specifically trained for the exercise. The interviewing exercise was closely supervised by the national consultant, and several team meetings were held over the period. The respondents were generally quite cooperative and provided the information sought willingly. This contributed to the successful completion of all 150 questionnaires.

D. Organization of This Book

This report is presented in four main parts whose content is organized in the following manner.

Part 1 presents a historical review of official policies, stated and implied, on the generation and transfer of technology in the agricultural sector, with special reference to small-scale production. This section also presents a historical review of agricultural marketing and agro-processing policies, again focusing on the agroproducts of small-farmer holdings. Since policies for the most part were not explicitly stated, the review identifies public and private sector institutions that were engaged in activities which had direct or indirect impacts on technology generation and transfer or on the marketing and processing of the products of small-scale producers. A brief evaluation of the policies, with respect to their success or failure over the years, is also presented.

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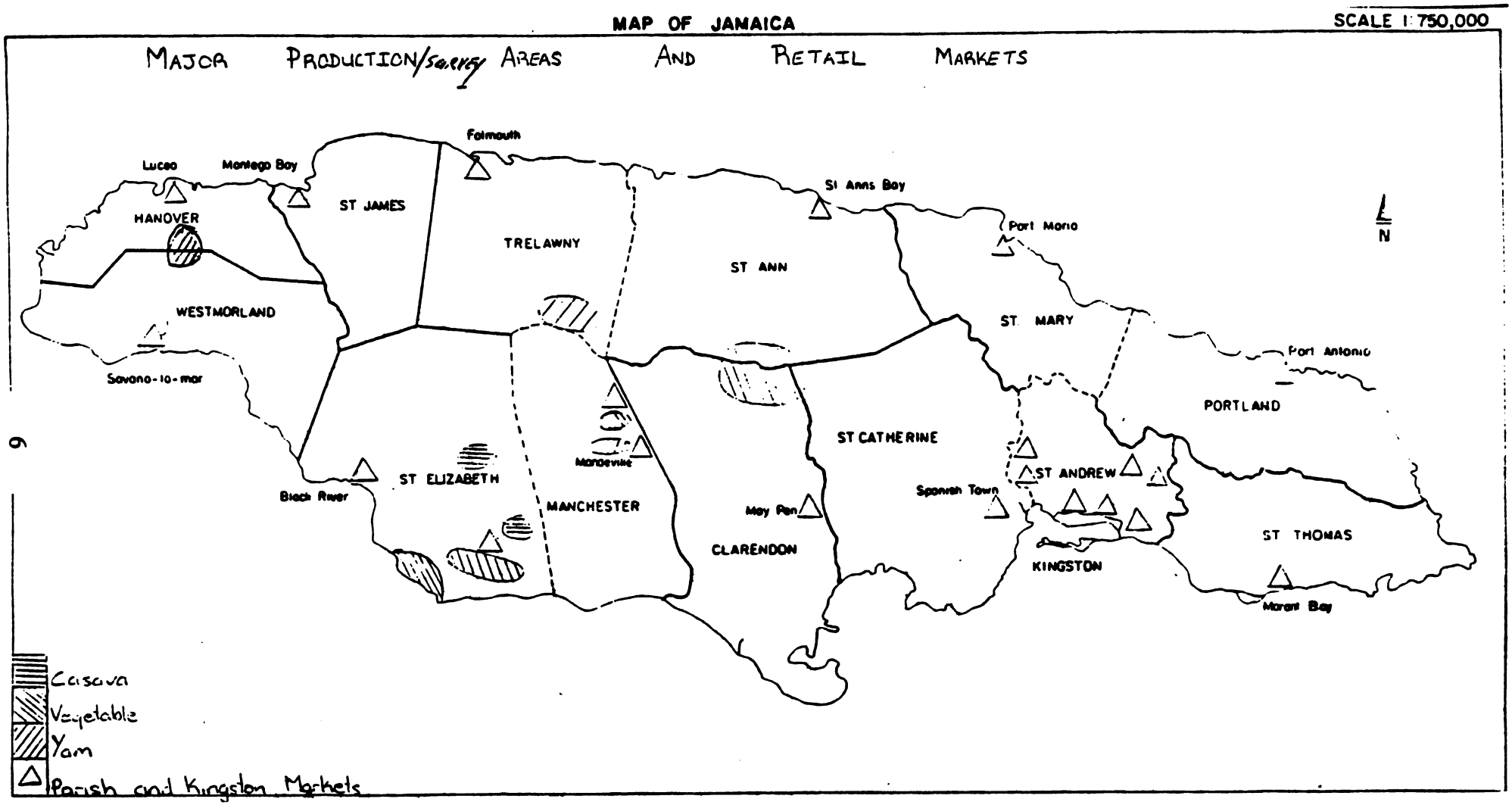
[6] A field day is a day on which extension officers provide "hands-on" training to farmers in selected communities.

Figure 1. Major Production/Survey Areas and Retail Markets.



Part 2 attempts to identify, describe, and classify existing technologies on the farms of small-scale producers. A classification is made based on whether the technology being applied is considered improved or traditional. In describing the technologies, several indicators are established and an analysis is conducted on a crop-by-crop or crop-category basis. Much of the discussion focuses on the use of implements and tools as an indicator, but other indicators, including types of inputs and production systems, are also consider.

This section also analyzes the appropriateness of the identified technologies to small-scale producers generally, and to female farmers in particular. It further evaluates the extent to which improved technologies have been adopted, highlighting constraints to adoption, particularly by female food producers.

Part 3 discusses the national demand for the agroproducts of small-scale producers, and notes the difficulties in determining demand, including a lack of information on these products. The section also discusses the supply of these products and highlights several key factors that determine supply. This part establishes that there is a large gap between demand and supply, although the size of this gap is not precisely known. The issue of price setting is also discussed, and the case is made that small-scale producers are price-takers of both inputs and outputs. The implications of this phenomenon for increased production and productivity are discussed.

The section also includes a description of the national marketing system for agrofood products of small farmers, as well as a brief evaluation of its efficiency. The discussion entails a detailed description of the characteristics of the major marketing outlets (parish markets) and agents (higglers). This section also reviews and evaluates the marketing infrastructure and the performance of the main marketing functions, including the constraints impeding the marketing activity and the availability of market-related services and facilities. The suitability of market facilities and services for women food producers is also discussed.

Finally, this section discusses women's involvement in food processing at the farm and village level. It cites specific agro-processing projects being operated by rural women, and examines the sustainability of these organized group efforts in agro-processing.

Part 4 concludes the report with a set of conclusions and recommendations. The conclusions relate to a range of issues on technology and marketing, constraints to adoption of improved technology at the preharvest and postharvest stages of the production chain, the focus of research, the position of women in the marketing system, and the sustainability of group processing activities managed by women. The recommendations focus on the development of private and nongovernmental organizations for women at the farm and community levels, and the training of women food producers, processors, and marketers.

PART ONE: POLICIES

II. SECTORAL POLICIES ON FOOD TECHNOLOGY AND MARKETING

A. Review of Technological Policy

Although as late as 1960 there was no explicit public policy on the technological aspects of agricultural production, starting as early as 1914, when the Hope Botanical Garden was established, a number of institutions reflected government concerns in this area. Further evidence of concern in this area was the establishment of a department of agriculture and a farm school in 1910.

The first explicit policy on technology was the Scientific Research Council (SRC) law, passed in 1960. Under this law, a council was formed and empowered to do the following:

1. Promote research on the use of indigenous raw materials.

2. Undertake management of scientific and technological information and coordinate scientific research within the public sector.[7]

Following the establishment of the SRC, the government continued to emphasize the importance of technology in the agricultural sector with the establishment of a number of regional, statutory, and central government institutions, including seven agricultural research laboratories and agricultural research stations islandwide.

While the intention of the government to promote the development and transfer of technology in the agricultural sector was never in doubt, the absence of clear and explicit policies over several decades severely constrained the achievement of this objective. This resulted in a number of specific problems that plagued the development and transfer of technology in Jamaica from the early days of the plantation system. The most important of these, as identified by a task force set up in 1989 to prepare the science and technology component of the National Five Year Plan (1990-95), and as quoted from their document, include the following:

1. The transfer of technology does not follow an organized pattern which favours indigenous technology over imported technology.

2. Training of local counterparts is not a basic non-negotiable feature of transfer deals.

3. A combination of poor science education in the school system and the conditions of employment have produced a chronic shortage of technical personnel.

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[7] National Five Year Plan on Science and Technology, 1990-1995.

4. Applied research projects have not always been derived from a careful assessment of the real needs of the productive sector. Results therefore fail to satisfy existing demand.

It was against these and other constraints that the Science and Technology (S&T) Five Year Plan, as part of the 1990-1995 National Five Year Plan, was prepared. The specific aims of the S&T policy as contained in the plan are wide-ranging, but those most relevant to the agricultural sector are listed as follows:

1. Assess, develop and manage, as appropriate, the nation's natural resources.

2. Utilize the results of world-wide research and development to strengthen productive sectors such as Agriculture, Industry and Manufacturing.

3. Ensure that scientific and technological developments improve the welfare of citizens.

4. Increase the nation's competitiveness in trade.

5. Enhance the cultural, social and economic development of the country and contribute to programmes of self-reliance.

The 17 institutions that reflected the government's policies on technology before the first explicit policy in 1989 are conveniently grouped into regional (4), statutory (8), and central government (5) bodies. A detailed list of these institutions is presented in Appendix 2, and a description of their activities is summarized in Table 1.

The early establishment of statutory bodies (mainly commodity boards), which focused predominantly on tree crops or traditional export crops, was a clear indication of the priority the Jamaican government placed on the export subsector. Small-scale producers, therefore, benefited only marginally from those early policies, since their involvement has historically been predominantly in the domestic food crops subsector. Furthermore, and as mentioned in the introduction, in contrast to other agricultural policies (for example land, credit, and price support), which have been formulated, changed, and reformulated over time, the policies on technology, though implicit, have been sustained over several decades.

The data in Table 1 also show that the technological policies (i.e., food crops, soil conservation, soil and water, pests and disease control, and agricultural extension) that would have impacted on small-scale producers were historically vested in departments of central governments in this region. Unlike statutory bodies, those departments were normally inadequately funded and, consequently, they remained inefficient and ineffective. It should be noted, in addition, that the formulation of technological policies has been, until now, largely devoid of gender concerns.

Table 1. Objectives and Programmes of Selected Research and Development Institutions in Jamaica, 1973-1993.

Institutions	Objectives		Program orientation							Program orientation by producer Size & Gender		
	Technology Generation	Technology Transfer	Tree Crops	Food Crops*	Soil & Water	Soil Conservation	Farm Machinery	Pest & Disease	Livestock	Large	Medium	Small
Regional CARDI	XX	X	X	X	X		X	X		X	X	X
IICA	X	XX		X		X					X	X
UWI	X	X	X	X	X					X	X	X
Statutory RADA		X	X	X	X	X	X		X	X	X	XX
BB	X								X	X	X	X
CIB	X								X	X	X	X
SIRI	X		X	X					X	X	X	X
SRC									X			
Central Government Department RDD	XX	X										
FD												
FSCD	X	X				X						X
PPD	X											
VSD		X								X	X	X

* includes sugarcane XX indicates emphasis

B. Review of Marketing Policy

The importance of marketing to agricultural production has made agricultural marketing policies notable priorities among agricultural policies for well over 300 years in Jamaica. However, the marketing policies affecting small-scale agricultural producers, including women, have been fewer in number and less sustained than those affecting large producers. Indeed, early policies appear to have focused largely on the export subsector, the sector in which small-scale producers were only marginally involved. Generally, agricultural marketing policies in Jamaica have tended to reflect the sectoral priorities of the government over the years. Accordingly, the recorded policies and the related impacts on small-scale women food producers are best discussed on a subsector basis, as presented below.

1. Traditional export crops

The creation and support of commodity boards has been the traditional policy of the Jamaican government for the marketing of export crops. This policy has generally worked well over many decades as the marketing of export crops has never been a serious problem for producers. The only significant policy shift with respect to traditional export crops came with the liberalization policies enunciated over the last three to four years. This policy removed the monopoly power of commodity boards over the marketing of such crops as coffee and cocoa. As a result, a number of private marketing companies have sprung up to compete with the traditional commodity boards. As discussed earlier, the involvement of women in the production of these crops has been limited largely to that of hired or unpaid labor. Therefore, they have so far benefited only marginally from the policies concerning this subsector.

3. Domestic food crops

Domestic food crops, which include some 50 items in seven subgroups (vegetables, tubers, legumes, etc.), represent the bulk of women food producers' agricultural outputs and, indeed, their main source of income. Traditionally, the marketing of these crops has been the most problematic among agricultural products in Jamaica and consequently policies in this category have always been a urgent need for the small-scale producers. The last 100 years have seen the implementation of many policies that have impacted directly or indirectly on the marketing of domestic food crops, but the three most worthy of note are discussed below.

a. The creation of the Agricultural Marketing Corporation

The creation of a marketing board--the Agricultural Marketing Corporation (AMC)--in 1963 was perhaps one of the most significant policies for the domestic food crop subsector during the decades of the sixties and seventies. The AMC was mandated to purchase the production of small-scale producers irrespective of the items and or the quantities. The immediate effect of this policy was that it provided an additional outlet for producers and, to the extent that it offered a guaranteed price for some items, it also provided an assured market.

The policy was implemented against the background of widespread complaints about the existing and much older marketing arrangement, the "higgler" system. This system consists of marketing through small individual traders, mainly women, and has always been the main means of marketing domestic food crops. The main complaint about this means was based on the perception that the higgler system provided a limited outlet to individual producers, consequently, it was a disincentive to increased production. Furthermore, the system was judged to lack the physical and information infrastructure necessary to effect rational distribution of food stuff islandwide, since scarcities and gluts were simultaneously experienced even on the same market day in the major consumption centers. Additional complaints concerned high postharvest losses and low prices.

The offering of guaranteed prices resulted in significant increases in the production of some vegetables, and increased income for the producers of these items. The AMC's operations--through a network of 9 branch offices, over 100 purchasing stations, and more than 5 retail outlets--provided marketing opportunities not just for the large number of individual small-scale producers, but also to many higglers who became their wholesale customers. Overall, the AMC, through this elaborate physical and communication infrastructure, as well as its trained personnel, provided a significant improvement to traditional arrangements for the marketing of small-scale producer production.

A combination of factors, however, led to the abolishment of the AMC in the early 1980s. These included the following:

- Widespread and perennial complaints from farmers with respect to the prices and efficiency of the AMC.
- Weak internal management.
- Accumulated financial losses, which made the organization a burden to the government budget.

The abolition of the AMC resulted in great hardships, at least in the short run, for the small farming community and contributed to a change in the political direction around 1989.

b. The creation of a Marketing Division in the Ministry of Agriculture

In a policy paralleling the closing of the AMC, the Marketing and Credit Division in the Ministry of Agriculture was created and Producer Marketing Organizations were established in a number of farming communities, under a United States Agency for International Development (USAID) funded Agricultural Marketing Project. The marketing division provides a wide range of services including the following:

- Setting up of Producer Marketing Organizations as private farmer entities.
- The provision of market information services to a network of agencies involved in advertising and assisting farmers in production and marketing.
- Marketing extension services.

- Produce inspection and preclearance facilities and services for the exporting of fresh produce.

This policy, while specifically targeting small-scale producers, appears to date to have benefitted this group only marginally. The formation of Producer Marketing Organizations was extremely slow, the process being plagued with organizational difficulties. Even those that were established have either failed or are still struggling to survive. The most successful element of this policy appears to have been the infrastructural support for the export marketing of fresh produce, the bulk of which is the output of small-scale producers, including women. This move has stimulated increased productions of nontraditional export items. This segment of the market has also afforded better prices to producers.

c. The provision of parish markets

Another important government policy in terms of marketing small farmer production is its provision of market infrastructure for these foods. The major infrastructure has been an islandwide network of parishes, sometimes called parochial markets. These markets reflect very early policies of the government, dating back over 100 years. The total number of these markets is in the region of 100. The government has supported this policy over the years through various programs of market construction and upgrading. The most recent of these included the following 2 Inter-American Development Bank (IDB)-funded projects:

1. The Sixteen Market Upgrading Project.

2. The West Kingston Market Expansion Project.

The Parish and Kingston Markets (parochial markets) comprise a network of mostly retail, but including some wholesale, outlets and are an integral part of the higgler system of distribution of small farmer production. It is estimated that over 80% of production is distributed through these markets.

While this policy represents the core of the domestic marketing arrangements for small-scale producers, its formulation and maintenance over the last 100 years have clearly not addressed gender concerns. For the most part, these markets are poorly maintained and in many instances lack even basic sanitary facilities. Women food producers and higglers, therefore, suffer great indignity in marketing their products in these markets. Another area of failure with this policy lies in the fact that the markets and the associated facilities have not been designed from a marketing perspective, but rather with the political objective of providing a sheltered space for as many people as possible. The result is that the facilities are frequently ignored and marketing activities are carried out inefficiently and under unsuitable conditions.

3. Small livestock and cattle

Government policy over the years in the marketing of small livestock and cattle is reflected in the provision of infrastructure and public health services. The main infrastructure has been a

number of public abattoirs, or slaughterhouses, constructed and operated by the government as well as meat handling and storage facilities provided in some parochial markets. In addition, public health services are provided through a network of public health inspectors trained and employed by government.

These policies have had little or no direct impact on small-scale women food producers since the rearing of animals is not a significant activity on these farms. Furthermore, marketing of the animals reared is quite informal and takes place outside of the formal system of facilities and regulations established by the government. The practice has been to sell the animals live at the farm gate.

4. Nontraditional export crops

As discussed earlier, these make up a subsector of domestic food crops that are, therefore, produced mainly by small farmers. This is a relatively new category, where government attention has increased alongside its growth in popularity among farmers because of its status as an important earner of foreign exchange. The main government policies for this subsector have been provision of infrastructure and services to private individuals and entities engaged in the export marketing of these crops. Infrastructure includes warehousing, storage, and packaging facilities that utilize the facilities of the now-defunct AMC. The main government services include fumigation and preclearance services, as well as extension assistance in the grading and packaging of fresh produce for export. The government also participates in the export marketing of these crops through the Jamaica Export Trading Company (JETCO). The government is, however, presently pursuing a policy of divestment and it is expected that at least some markets and market infrastructure will be turned over to the private sector.

This recent policy on nontraditional export crops has created opportunities for small-scale producers to sell in the export markets. Not only does it provide an additional outlet for this group, but the attractive prices received in these markets provide incentives for increased production and income. Like most of the other policies, however, the main objective of government policy in this subsector concerns national interests, in this case foreign exchange earnings, and does not take into consideration gender concerns.

C. Institutional Structure and Current Programs

1. The Rural Agricultural Development Authority (RADA)

The most explicit and far-reaching technological policy directed at small-scale producers, and which encompasses some gender concerns, was the replacement of the Ministry of Agriculture's extension service with a statutory body, the Rural Agricultural Development Authority (RADA).

RADA became operational in August 1990 under the RADA Act of 1990, which replaced the Land Authorities Act. Its mandate was spelled out as follows:

1. To enhance the development of farming through an effective, efficient and sustainable Extension Service.

2. To supplement information to rural development agencies thereby assisting to advance improvements in rural infrastructure.
3. To provide supplemental social services required for the improvement of the quality of life of farm families.

4. To provide technical advice to farmers of any size.

5. To provide a reliable market information service.

6. To assist in the implementation of specified rural development projects.[8]

The main methods used by RADA extension officers for continuous contact with farmers in the transfer of appropriate technology were reported to be group meetings, farmer training, field days, and individual farm visits.

A summary of the activities involving direct contact with farmers from the organization's inception include the following:

- Organization of 656 field days.

- Establishment of 422 plots demonstrating cultural practices associated with yam cultivation and proper use of fertilizer, which involved some 29,000 farmer contacts.

- Individual farm visits totaling over 97,000.[9]

In addition to the institutionalized extension services of government and statutory bodies, a number of special projects through nongovernmental organizations, including farmers' organizations and private input supply companies, have been involved in technology transfer to small-scale producers.

2. Special projects

Some recent projects include the following list.

1. **The Mini-Sett Yam Technology Project**. This project began in 1991 and is aimed at improving the methods of yam growing in Jamaica through use of mini-sett technology. The project is funded jointly by the Government of Jamaica and USAID

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[8] RADA, Annual Report, 1992.

[9] RADA, Annual Report, 1992.

with administrative and technical monitoring support provided by the Inter-American Institute for Agricultural Corporation (IICA). The project is being implemented by RADA in major yam growing areas islandwide. Extracts from a farmer's manual developed by IICA for this technology is provided in appendix 3.

2. **The Hillside Agricultural Project (HAP).** This project began in 1988 and has as its main objective "to increase productivity and expand acreage of both export and domestic[ally] used perennial crops." The enhancement of productivity is expected through the improvement of simple agronomic techniques for both production and marketing.

3. **The Crop/Livestock Production and Extension Project.** This project was started in 1986 and is funded by the European Economic Community (ECC). One of its main objectives is "to expand the production of a range of crops produced by small farmers including domestic food crops and some traditional export crops."

4. **The Rural Farm Credit Project.** This project is funded by the International Fund for Agricultural Development (IFAD) and the IDB.

5. **The Hillside Farmer Support Project.** This project is funded by the IFAD.

6. **Agricultural Skills Training.** Agricultural skills training is provided through the Human Employment and Resource Training (HEART) Trust/Programme. HEART was established in 1982 by a act of Parliament. The HEART/Ebony Park Academy is one of several academies that provide a wide range of vocational skills to young people and adults so that they can successfully pursue careers in agriculture.

7. **The College of Agriculture (COA).** The COA is a tertiary institution providing a diploma and associate degree program in agriculture. The program is available for both males and females. Graduates normally work as agricultural extension officers, but many become farm operators either as hired staff on large farms or as owners/operators of small- to medium-sized farms.

Earlier projects with extension components included the First Rural Development Project and the Second Integrated Rural Development Project.

3. Farmers organizations

The major farmer organizations include the Jamaica Livestock Association, the All-Island Banana Growers Association, the Jamaica Cane Farmers Growers Association and the Citrus Growers Association. These organizations are formed on a parish or regional basis. Their main focus, however, has been on traditional export crops. In the case of the Jamaica Livestock Association, the services are provided for all livestock reared in the country. The Jamaica Agricultural Society (JAS) has been the leading small-farmer organization, providing extension services to this group. However, the staging of agricultural shows is perhaps the most consistent means of technology transfer through the JAS.

4. Input supply companies

There are at least 20 input supply companies islandwide involved in technology transfer to small-scale producers, as well as to large-scale farmers. The objectives of input suppliers, however, relate solely to the marketing of their products, and have little or no concern with the development and transfer of technology or with gender concerns. The major inputs are fertilizers, seeds, chemicals, tools, and livestock supplies.

In the area of agro-processing, the government has identified the agro-processing subsector as one of seven major vehicles for socioeconomic development. The national policy on S&T also identifies agriculture and food as one of 14 areas to be accorded priority over the planning period 1990-95. Presently, a wide range of products are manufactured. These include meat, milk products, canned and preserved fruits and vegetables, oils and fats, seafood, baked products, confectionery, coffee, and beverages. The strategies for food processing as contained in the National Five Year Development Plan include the following:

- More centralized processing plants in closer proximity to farms.
- Determining the feasibility of decentralizing quality control, which is now centralized in the Bureau of Standards.
- Government assistance to processing plants for becoming more efficient; specifically, through the provision of financial assistance at concessioner rates to repair and update buildings and machinery.
- Credit for processing firms at the Agricultural Credit Bank (ACB) rate for provision of inputs to contract farmers; this in order to boost raw material production for processing.[10]

Prior to the formation of the national S&T policy in 1990, government policies in the food processing subsector were largely unstated, but were reflected in the creation and support of a number of public organization and departments within some existing organizations. A short description of the main public organizations is provided below.

a. The Food Technology Institute

The main purpose of the Food Technology Institute (FTI) is "to develop formulations utilizing indigenous foods and to provide consultancy services to agro-industrial operations." The current programs of the FTI include the development of low acid canned foods, dehydrated sausage, and local french fries.

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[10] Jamaica's Five Year Plan, 1990-1995, Agricultural Sector Plan.

b. The Social Services/Home Economic Division of RADA

The Social Services/Home Economic Division (SS/HE) is the main medium through which food processing technology is transferred to rural small-scale women food producers. The division has a relatively short history in the ministry but suffered low priority in the ministry's budget and programs for many years. It has, however, been afforded greater attention in its new home under RADA. Some specific projects in which the Division is currently engaged include the following:

1. A bammy (cassava bread) project in the Flower Hill community in St. James.
2. A dasheen chips project in Lucea Hanover.
3. A food processing project in Trelawny.
4. A bammy project in St. Elizabeth.

c. Jamaica Investment Promotion Agro-Processing Unit[11]

This unit of the Jamaica Investment Promotion (JAMPRO) is aimed at strategic planning for the agro-processing industry and the provision of marketing support, technical assistance, and information. Other activities include: design, labeling, packaging, and training.

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[11] M. E. Bardowell, Agro-Processing Sector in Jamaica (Jamaica: FAO, 1993).

PART TWO: TECHNOLOGY

III. TRADITIONAL TECHNOLOGIES AND IMPROVED TECHNOLOGIES IN JAMAICA

This section attempts firstly to develop indicators of traditional and improved technologies and to determine the extent to which these technologies are applied on small-scale production units in Jamaica. The exercise is carried out on a crop category basis and is presented in tables 2a-2d. An analysis is then undertaken, highlighting the specific areas in which traditional technologies persist and linking these to past policies. The level of adoption of improved technologies and the constraints to adoption, with specific reference to gender, are also discussed. The range of methods of technology transfer used by the various providers in Jamaica is also examined and a brief analysis of the suitability of these to women food producers is undertaken.

In discussing traditional and improved technologies in Jamaica, an attempt is first made to identify the specific indicators of these technologies. Accordingly, a total of seven indicators have been identified. These are as follows:

1. Type of planting material (improved vs. traditional).

2. Land preparation (mechanical vs. manual).

3. Plant nutrition (use of commercial fertilizers vs. the nonuse of commercial fertilizers).

4. Weed control (chemical vs. manual).

5. Pest and disease control (the use of chemicals vs. nonuse of chemicals).

6. Production system (recommended cropping or livestock system vs. traditional systems).

7. Postharvest handling (recommended facilities and practices vs. traditional facilities and practices).

In the absence of a detailed audit of the production processes of each of the over 50 crop and livestock enterprises, which was not possible in this study, studies of cost of production conducted for these farms provide the most complete guide to the type of technologies that are being applied. A review of these studies (appendix 4), which was conducted recently by IICA and the Ministry of Agriculture, provides a description of the existing technologies. These are summarized in tables 2a-2d.

These tables show that for any given crop category the applied technology comprises both traditional and improved methods. In the vegetable category, improved technology is indicated in areas of planting materials, the use of fertilizers, agricultural chemicals, and production system. Further evidence of the use of improved technologies in this category is provided by the list of a wide range of seeds and chemicals (Appendix 5) that are imported annually.

Traditional technologies in this category are indicated in the areas of land preparation, weed control, and postharvest handling. Overall, it seems that there is a crude balance between improved technologies and traditional technologies in this crop category. This situation may well reflect the efforts of the private sector, mainly through input distribution companies, rather than direct technological policies of the government.

Table 2a. Technologies Applied in the Vegetable Subsector.

Indicator	Traditional Technology	Improved Technology
Planting Materials: (improved varieties)		X
Land Preparation (manual)	X	
Fertilization (NPK blends & straights, fertilizer practices)[a]		X
Weed Control (manual vs. chemical using weedicide)	X	
Pest & Disease Control (imported commercial pesticides & fungicides)		X
Production Systems (intercropping & pure stands)		X
Postharvest Handling and Storage (makeshift facilities at room temperature)	X	

[a] Includes the quantities used and methods of application.

Table 2b. Technologies Applied in the Legumes and Cereals Subsector (Peas, Beans, and Corn).

Indicator	Traditional Technology	Improved Technology
Planting Materials (Seeds) (locally produced)	X	
Land Preparation (manual)	X	
Fertilization) (imported inorganic fertilizer: NPK)		X
Weed Control (mainly manual)	X	
Production System (intercropping & pure stands, layout & spacing arbitrary)	X	
Pest & Disease Control (imported commercial agricultural chemicals)		X
Postharvest Handling (traditional methods of drying, storing, threshing, & shelling)	X	

Table 2c. Technologies Applied in the Plantain and Banana Subsector.

Indicator	Traditional Technology	Improved Technology
Planting Material (suckers in the case of improved varieties)		X
Land Preparation (manual, using hand tools)	X	
Fertilization (commercial NPK blends & straights)		X
Weed Control (using mainly weedicide)		X
Pest & Disease Control (imported agricultural chemicals)		X
Production Systems (intercropping & pure stands)		X

Table 2d. Technologies Applied in the Root Crops Subsector (Yams, Sweet Potato, Dasheen, and Cassava).

Indicator	Traditional Technology	Improved Technology
Planting Materials (vegetable recycled material)	X	
Land Preparation (manual, using hand tools)	X	
Fertilization (commercial NPK blends & straights)		X
Weed Control (manual, using hand tools)	X	
Pest & Disease Control (chemicals imported)		X
Production Systems (intercropping & pure stands)	X	
Postharvest Handling (makeshift storage facilities, etc.)	X	

In the case of the legumes and cereals subsector, traditional technologies appear to dominate. This can be seen from the fact that five of seven indicators fall under the traditional technology subgroup (table 2b). Improved technologies are indicated only in the areas of plant nutrition (fertilizer use) and in pests and disease control. The level of technological development in this subsector is not surprising since the technological policies of governments for many years have not focused on this category.

In the plantain and banana category, improved technology dominates. Traditional technology is indicated only in the area of land preparation. The dominance of improved technology here is reflective of the technological policies, which over the years have favored traditional export crops over the other two categories discussed above.

Like the legumes and cereals category, the root crop category (table 2d) is dominated by traditional technologies. Indeed, only two of the seven indicators fall in the improved technology category. This is also reflective of the low priority this category was afforded in technological policies over many decades. For the four crop categories discussed above, the dominant forms of existing technologies are summarized in table 3 below.

Table 3. Dominant Types of Technology by Crop Category.

Crop Category	Dominant Technologies
Vegetables	Improved
Legumes & Cereals	Traditional
Plantains & Bananas	Improved
Root Crops	Traditional

Source: Tables 2a-2d.

IV. THE USE OF TECHNOLOGIES BY WOMEN IN SMALL-SCALE PRODUCTION UNITS

A. Inputs, Instruments, and Practices

For purposes of this section of the book, inputs will be restricted to the following: (1) planting materials, including traditional and improved seeds, (2) fertilizers (inorganic and organic), and agricultural chemicals (fungicide, insecticides, nematocide, and weedicide). Similarly, instruments will be restricted to on-farm equipment, tools, buildings, and structures.

The results of the survey for this study show that women food producers employ a wide range of inputs, and that these inputs reflect both traditional and improved technologies. Table 4 shows the types of inputs on these farms and the participation of family members in using them.

The data in Table 4 show that in the case of planting material there is an almost equal mix of traditional technology (53%) and improved technology (45%). This is, undoubtedly, mainly the case with production of vegetables in which seeds are the sole planting material. In the case of other types of planting materials, however, the data show a clear dominance of traditional materials (81%) over the improved materials (33%). The relevant subsector in this case must logically be the root crops, which as was discussed earlier, is dominated by the use of traditional technologies.

With respect to the use of commercial fertilizer, the data in table 4 also show that the vast majority of the farms (90%) use this input. This is consistent with the findings of a recent baseline survey of fertilizer use in Jamaica conducted by the Soil Nutrient for Agricultural Productivity Project, a Jamaica/Canada project. According to this survey, 80% of farmers reportedly used fertilizers in 1992.

This survey shows also that the main crops on which fertilizers were used in 1992 were yams, vegetables, coffee, sugarcane, bananas, and legumes, and to a lesser extent, cocoa, citrus, and coconuts.

Table 4 also shows that in terms of the participation of family members using fertilizers, women (68%) are the main users, with men's participation amounting to only 10%. Both women and men account for 22% of all the farms on which this input was used.

The results of the survey also show that while 90% of the farms surveyed use inorganic fertilizers, the number of farms using this input also varies with different crops and farm size. Table 5 shows the number of farms using inorganic fertilizers for six selected crops, by size of farm.

Table 5 also shows that the vast majority of the survey farms use inorganic fertilizer on vegetables, with large percentages also using inorganic fertilizer on yam (82%) and peanut (81%) crops. In the case of cassava and sweet potato, however, those using inorganic fertilizer amount to only 59% for cassava and 36% for sweet potato.

Table 4. Farms Using Inputs by Type of Input and Usage.

Inputs	% of Farms	Fam. Members Using Inputs		
		Women	Men	Both
Traditional Seeds	45.0	64	10	25
Improved Seeds	53.0	75	4	21
Trad. Planting Material	81	62	15	23
Impr. Planting Material	33	63	8	29
Inorganic Fertilizer	90	68	10	22
Organic Fertilizer	13	74	11	16
Insecticide	51	55	21	23
Fungicide	66	53	27	19
Weedicide	17	52	32	16
Nematocide	<1	100	0	0
Animal Feed	35	85	6	9
Vaccines	2	100	0	0
Other	10	53	27	20

Source: Women Food Producers Survey (IICA/IDB 1993).

The data also show that for each of the six crops, the farm size category with the highest number of farms using inorganic fertilizer is the 0.4-<2.0 hectare category. The percentage of farms in this category using inorganic fertilizer ranges from a low of 55% for vegetables to a high of 100% for sweet potato.

Ranking second to this farm size in use of inorganic fertilizer is the 2.0-<4.0 hectare farm size category. Here, the number of farms using inorganic fertilizer on selected crops ranges from a low of 8% for peanuts to a high of 33% for fruits. Table 6 shows the average quantities of fertilizers used on yam.

Table 5. Number of Farms Using Inorganic Fertilizers on Selected Crops by Size of Farm.

Farm Size (ha)	Vegetables		Yams		Cassava		Peanut		Sweet Potato		Fruits	
	No	%	No	%	No	%	No	%	No	%	No	%
< 0.4	14	15	12	16	3	19	1	8	0	0	0	0
0.4 - < 2.0	53	55	45	61	10	62	11	84	6	100	2	67
2.0 - < 4.0	21	23	13	18	3	19	1	8	0	0	1	33
4.0 - < 10.0	7	7	4	5	0	0	0	0	0	0	0	0
total	95	100	74	100	16	100	13	100	6	6	3	100
sample	78		90		27		16		16		N/A	
% of sample			82		59		81		36		N/A	

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 6. Average Quantities of Fertilizer Used on Yam by Size of Farm.

Farm Size (ha)	Sulfate of Ammonia		NPK	
	Number of Farms	Avg. Amount (kg) per ha	Number of farms	Avg. Amount (kg) per ha
TOTAL	28	795.04	58	901.19
< 0.4	4	840.74	8	971.52
0.4 - < 2.0	20	619.03	33	848.33
2.0 - < 4.0	4	1541.36	14	1183.41
4.0 - < 10.0	-	-	3	166.28

Source: Women Food Producers Survey (IICA/IDB 1993).

The data show that for three of the four farm size categories there are only marginal differences in the average quantities of NPK mixtures used on this crop. The quantities range from a low of just over 848 kg/ha in the 0.4-<2.0 hectare category to approximately 1184 kg/ha in the 2.0-<4.0 hectare category. These quantities appear quite high when compared with the recommended quantities of approximately 503 to 751 kg/ha for this crop (see Appendix 4).

Sulfate of ammonia is the main fertilizer straight that is used on the survey farms. Table 6 shows that the average quantities of this fertilizer used on yam range from a low of 619 kg/ha in the 0.4-<2.0 hectare category to a high of 1541 kg/ha in the 2.0-<4.0 hectare category. However, sulfate of ammonia is not officially recommended for this crop.

Returning to Table 4, the percentage of farms in which the four main types of agricultural chemicals (insecticide, fungicide, weedicide, and nematocide) are being used ranges from a high of 66% for fungicide to a low of less than 1% for nematocide. As with fertilizers, women are the main users of these chemicals, accounting for between 55% and 100% of the farms on which the four chemicals are being used. There is, however, a significant increase in the percentage of male users of chemicals as compared to male users of fertilizers: the number of farms with male users range from 0% to 32% for the four chemicals, compared to 10%-11% for the two types of fertilizers. The number of farms where both women and men use agricultural chemicals ranges from 0% to 23%.

The use of agricultural chemicals for pest and disease control was also found to vary with the type of crop and size of farm. Table 7 shows the number of farms, by size, using insecticides on the six selected crops. The table also shows that in the case of insecticide, one of the most popular agricultural chemicals, all of the survey farms use this input on vegetables. Among the six selected crops, peanuts (57%) rank second to vegetables, followed by cassava (30%) and yam and sweet potato with 6% each.

Close examination of Table 7 also reveals that, like the case of fertilizers, farms falling in the 0.4-<2.0 hectare category account for the highest percentage of farms (55% to 100%) using insecticide across the six selected crops, and that the 2.0-<4.0 hectare category ranks second, with a range of 0% to 22%.

Table 7. Number of Farms Using Insecticides on Selected Crops by Size of Farm.

Farm Size (ha)	Vegetables		Yam		Cassava		Peanut		Sweet Potato		Fruits	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<0.4	13	15	2	40	3	38	1	9	0	0	0	0
0.4 - <2.0	47	55	2	40	4	50	9	82	1	100	2	100
2.0 - <4.0	19	22	1	20	1	12	1	9	0	0	0	0
4.0 - <10.0	7	8	0	0	0	0	0	0	0	0	0	0
Total	86	100	5	100	8	100	11	100	1	100	2	100
Sample	78		90		27		16		16			
% of sample			6		30		67		6		N/A	

Source: Women Food Producers Survey (IICA/IDB 1993).

The use of fungicide shows a similar pattern to that of insecticide. Table 8 shows the distribution of farms using this chemical on the six selected crops. The root crops yam, cassava, and sweet potato show the lowest usage of fungicide with 9%, 30%, and 19% of farms respectively using this chemical.

This is consistent with the fact that these crops are not normally bothered by fungus during the preharvest stages. The use of fungicide on peanuts (75%), although relatively high, is not considered sufficient since this is a crop that is normally plagued by various strains of the fungus disease.

The survey shows that hand tools are the most widespread items of equipment and tools used by women on small-scale production units. The distribution of farms using equipment and tools (disaggregated by family members who use them) is shown in Table 9.

Table 8. Number of Farms Using Fungicide on Selected Crops.

Farm Size (ha)	Vegetables		Yam		Cassava		Peanut		Sweet Potato		Fruits	
	No.	%	No.	%	No.	%	No.	%	No	%	No.	%
< 0.4	14	16	1	12	2	24	1	8	0	0	0	0
0.4 - < 2.0	48	54	4	48	5	64	10	84	3	100	2	67
2.0 - < 4.0	20	22	3	40	1	12	1	8	0	0	1	33
4.0 - < 10.0	7	8	0	0	0	0	0	0	0	0	0	0
Total	89	100	8	100	8	100	12	100	3	100	2	100
Sample	78		90		27		16		16			
% of sample	59		5.3		9	30	75		19		1.3	

Source: Women Food Producers Survey (IICA/IDB 1993).

The data in this table show that almost all the farms surveyed (93.3%) use hand tools (including spades, garden forks, garden shovels, cutlasses, files, axes, and hoes). Spraying equipment ranks second to hand tools in use, with 35% of farms using this type of equipment.

The data also show that the use of mechanical equipment, which includes plough, cart, animal power, tractor, and mechanical digger, has been quite low, since together they are used on less than 7% of the farms. Also significant is that only 2% of the survey farms use irrigation equipment, and less than 1% use solar driers.

A significant percentage of farms (24%), however, were reported to use some forms of indigenous implement, including implements for pounding coffee, corn, and cassava, for pulping coffee, and for juicing sugarcane.

The data also show that in the use of equipment and tools by family members, women are the main users of a number of these items. The items include hand tools (52%), animal power (67%), and irrigation equipment (67%).

The data in Table 9 also show that except for spray equipment and mechanical diggers, for which males are the main users (accounting for 38% and 50% of the users respectively), male use of equipment on tools is quite low. In fact, the percentage of male use of the other tools ranges from 0 to 5%. Both women and men use equipment and tools on a relatively high percentage of the farms. In this regard, the main items are hand tools (43%), cart (67%), animal power (33%), spray equipment (28%), and indigenous implements (46%).

Table 9. Farms Using Equipment and Tools by Type and Usage.

I. Equipment/ Tools	% of Farms	Family Members Who Use Equipment/Tools			
		Women	Men	Both	Other
Hand Tools	99.3	52	5.0	43.0	0.0
Plough	0.7	0.7	0	0	0.7
Cart	2.0	0	0	67.0	33.0
Animal Power	2.0	67	0	33.0	0.0
Tractor	0.7	0	0	0.0	0.7
Mech. Digger	1.4	50	50	0.0	0.0
Irrigation Equipment	2.0	67	0	0.0	33.0
Sprayers	35.0	28	38	28.0	5.7
Solar Driers	0.7	0	0	0.0	0.7
Indigenous Implements	24.6	46	5	46.0	3.0
Other	1.4	0	0	50.0	50.0
II. Building & Structures					
Storage House	11.O	N/A	N/A	N/A	N/A
Pens	17.0	N/A	N/A	N/A	N/A
Coops	5.0	N/A	N/A	N/A	N/A
Nursery	<1.0	N/A	N/A	N/A	N/A

Source: Women Food Producers Survey (IICA/IDB 1993).

The source of equipment and tools (classified according to size of farm) was also investigated by the survey. The results are shown in Table 10.

Table 10. Farms Using Equipment and Tools by Farm Size and Source.

Farm Size (ha)	Number of Farms	Source of Equipment/Tools			
		No response	Foreign Mfr.	Local Mfr.	Made on Farm
< 0.4	24	-	6	24	6
0.4 - < 2.0	95	9	33	85	35
2.0 - < 4.0	22	-	13	18	8
4.0 - < 10.0	8	-	4	4	7
Total	149	9	56	134	56

Source: Women Food Producers Survey (IICA/IDB 1993).

The data in Table 10 show that the major source of equipment and tools has been from local/off-farm manufacture, accounting for approximately 90% of the total number of farms. This is followed by on-farm manufacture, with 38%.

An analysis of the relationship between source of equipment and tools, and farm size reveals the following:

- For all farm size categories, the local (off-farm) manufacture source has been the most popular. In fact, the number of farms using this source range from 50% in the 4.0-<10 hectare category to 100 percent in the <0.4 hectare category. This compares with foreign source, in which the number of farms range from 25% to 50% over the same farm sizes.

- The foreign sources appear to increase in popularity as farm size grows. This is borne out by the ratio of farms with foreign sources in each farm size category to the total number of farms in the same size category. The ratios calculated from Table 10 are presented in Table 11 below.

Table 11. Foreign Source of Equipment and Tools by Farm Size.

Farm Size (ha)	Number of Farms	No. of Farms Using Foreign Source	Ratio
< 0.4	24	6	0.25
0.4 - < 2.0	95	33	0.35
2.0 - < 4.0	22	13	0.60
4.0 - < 10.0	8	4	0.50

Source: Women Food Producers Survey (IICA/IDB 1993).

The existence of buildings and structures on the survey farms appears quite low. The data in Table 9 show that the main items reported in this category are storage houses, animal pens, coops, and plant nurseries. The data also show that storage houses are found on only 11% of the farms, pens on 17%, coops on 5% and plant nurseries on less than 1%.

While the low incidence of building and structures relating to livestock enterprises (e.g., pens and coops) may not be a serious problem on these farms, the apparent acute shortage of storage houses must necessarily be a matter of serious concern. This is because the farms are predominantly crop farms, with most of these crops being of a highly perishable nature. Storage should, therefore, be a well-developed postharvest activity on these farms.

B. Adoption of Improved Technologies

1. Preharvest technologies

The improved aspects of technology are reflected largely in the type of inputs (improved seeds, commercial fertilizers), as well as in the full range of agricultural chemicals that are used on these farms. The traditional aspects of technology, on the other hand, are reflected in the tools and equipment, as well as the cultural practices and the farming system approaches being employed.

The rate of adoption of technology must, however, be linked to small producers' access to improved technology on the one hand, and to improvements in productivity on these farms on the other. Available data and information show that over the last two decades a considerable amount of research has been conducted on a great diversity of production problems, covering almost all of the main crops and livestock produced and reared on small farms. Government research organizations, along with a number of regional institutions, have generated a massive body of data on improved technologies for small-scale producers. Appendix 6 shows a summary of the research work conducted over the four-year period 1970-74. However, it does not appear that these large volumes of research findings are proportionately reflected in increased

productivity of small farms. Table 12 provides a sample of yield data over the ten-year period 1982-91.

Table 12. Average Yield for Selected Crops, 1982-91 (Ton/Hectare).

Year	Red Peas	Gungo Peas	Cabbage	Carrot	Cucumber	Tomato	Pine-apple	Irish Potato	Yellow Yam	Plantain
82	0.92	0.95	11.9	10.1	9.6	11.8	13.8	10.1	12.7	11.6
83	0.84	0.92	12.6	9.8	10.2	11.7	13.2	9.9	12.7	11.2
84	0.94	0.93	12.6	11.0	10.7	18.4	14	11.6	13.2	12.1
85	0.97	0.91	12.1	10.1	15.3	12.1	14.3	11.3	13.3	12.5
86	0.93	0.98	12.1	10.3	12.9	12.1	14.5	8.8	13.4	13.0
87	0.87	0.91	11.5	9.6	13.1	11.2	14.5	1.11	12.8	27.2
88	0.87	0.95	12.3	9.9	11.7	11.4	15.9	11.5	13.0	12.4
89	0.92	0.84	13.2	10.5	11.3	13.1	17.0	11.6	12.8	12.7
90	0.86	0.97	13.3	10.6	11.4	11.4	34.8	12.2	13.4	13.8
91	0.86	0.91	12.6	9.9	11.1	10.3	16.1	9.1	13.9	13.5

Source: Derived from production statistics provided by the Data Bank and Evaluation Division of the Ministry of Agriculture.

The data in Table 12 show that average yields over the last decade have remained relatively stable since the yields for some crops declined marginally while only marginal increases were recorded for others. From this yield data, the conclusion could easily be drawn that although improved technologies were generated, the rate of adoption has been very slow.

This conclusion would be supported by the fact that, as already discussed, the Agricultural Extension Service has deteriorated over the years, which has been a matter of great concern to the Jamaican government and the farming community. This concern led to the creation of RADA, established only within the last two years.

The matter is, however, more complicated than supposing that available technology is adopted with an automatic increase in productivity. In the context of small-scale farming in Jamaica, there are inherent conditions that have constrained access to, adoption of, and application of improved technology. First, the steep and sometimes rocky slopes of Jamaica restrict the type of equipment and tools that can be used. Second, small scale producers are "price takers" for both inputs and outputs, a situation that has made them generally poor. Accordingly, there is a persistent shortage of working capital, which limits the purchase of improved inputs and, consequently, the adoption of the recommended practices. This observation is also supported

by Le France, in her set of quotes by farmers. The most vivid of these is "small man can't afford to do what is right."[12]

The third condition that affects implementation of improved technology is the generally of low educational standards of farmers and their resulting dependence on public or voluntary private extension services for technological advice and guidance. Fourth, water is undoubtedly the most critical input in agricultural production, but rain-fed production dominates the agricultural system of small-scale producers. Water is therefore not only unreliable, but more importantly, the farmer has little or no control over the quantity and timing of this input. In these circumstances, it is clear that efforts to adopt recommended practices can easily be frustrated by the lack of and control over water. Table 13 presents the main sources of water for farming purposes. It shows that over 86% of the survey farms depend on rainfall as a source of water for farming.

Table 13. Source of Farm Water.

Source	Number of Farms	Percentage of Farms
Public--Piped to Yard	4	2.67
Public Standpipe	5	3.33
Public Tank	2	1.33
Stored Rain Water	7	4.67
Private Catchment	20	13.33
River/Spring/Well/Pond	48	32.00
Rainfall	130	86.67
Other	1	0.67

The survey results, as well as the secondary data sources (e.g., cost of production studies) have established that a number of inputs reflecting improved technologies are being used by women on small-scale production units. These inputs include commercial fertilizers and certain agricultural chemicals. An improved technology, however, is not merely the use of a particular input, but consists of a package of practices that go with its use. For example, the use of fertilizers would go with a set of recommended practices that would include type of fertilizers, quantities, methods of application, and frequency of application. The same would be true for any given agricultural chemical. The reported use of fertilizers and chemicals, therefore, is a necessary but not a sufficient indicator of the adoption of improved technologies.

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12 FAO, Integrated Post-harvest Techniques and Farm Management: An Impact Assessment (July 1993).

The available data and information also show several gaps and inconsistencies among small-scale producers in adopting recommended practices in the case of commercial fertilizers. The data on yam, presented in Table 6, show that the reported quantities of NPK being used on the survey farms were almost twice the recommended quantities for this crop, and that large quantities of sulfate of ammonia were being used on these farms, although this type of fertilizer is not officially recommended for yam.

This misuse of fertilizers is also supported by the findings of the recent baseline survey of fertilizer use in Jamaica.[13] This survey found that the rates of application of selected fertilizers on specific crops are generally low and very variable, as some farmers apply more than twice the amount of fertilizer per hectare than other farmers.

It also shows that, in terms of frequency of application, fertilizers are being applied in fewer applications than is recommended. Table 14 shows a comparison of the actual and recommended number of applications per crop per year.

Table 14. Comparison of Actual and Recommended Number of Applications per Crop per Year.

	Recommended	Actual
Vegetables	2	1.49
Yam	1	1.17
Citrus	2	1.42
Coffee	4	1.44
Banana	4	1.64
Coconut	2	1.65
Sugarcane	1	1.15

Source: Baseline Survey on Fertilizer Use in Jamaica (SNAP 1993).

With respect to the methods of application, the fertilizer use survey found that traditional methods of applying fertilizers are up four times as common as agricultural extension methods learned through the official government and commodity extension services. Table 15 shows farmers' reasons for choosing popular methods of applying fertilizers.

[13] SNAP, Report on the Baseline Study of Fertilizer Use in Jamaica (1993).

Table 15. Percentage Distribution of Farmers by Reported Reasons for Method Application.

Selected Methods of Application		
Reported Reason	**Broadcast**	**Placement on Surface**
Efficient Utilization of Labor	20.7	9.3
Advised by Extension Officer	14.5	12.1
Advised by Other Farmers	11.9	24.2
Traditional Method	55.8	44.9
Other	3.2	7.2
Not Stated/Not Applicable	0.9	21.3
Total	100.0	100.0

Source: Baseline Survey on Fertilizer Use in Jamaica (SNAP 1993).

The baseline survey suggests that the apparent widespread misuse of fertilizers calls for relevant agricultural research and dynamic and up-to-date agricultural extension education.

While detailed and specific studies similar to the baseline study on fertilizer use have not been conducted for agricultural chemicals, there is no evidence to suggest that these chemicals are not being misused in a manner similar to fertilizers. In fact, it is quite often reported that many farmers do not know the difference between a fungicide and an insecticide, and that a fungicide may be used to treat insects, and vice versa.

As seen from Table 9, hand tools are the main implements on small-scale production units. Generally, the use of hand tools is regarded as traditional technology. In the case of Jamaica, however, consideration must first be given to the appropriateness of these tools given the context of the steep, and sometimes stony, slopes on which the greater number of small farm holdings are to be found. In these circumstances, hand tools present the only alternative. The persistent use of traditional hand tools, however, must necessarily contribute to inefficiencies in the agricultural sector and points to an urgent need for research into more efficient types of equipment and tools for these farms. There are also many farming communities in which the slopes and general physiography are suited to mechanical implements, but hand tools remain dominant. This points to a low rate of adoption of mechanized technology even where mechanization is applicable.

Table 16. Percentage of Production Lost or Given Away by Crop and Reason of Loss.

Crops	Total Production	Reason not stated	Praedial Larceny	Spoilage	Pests/Disease	Natrual Disaster	Given Away
		%	%	%	%	%	%
Gungo	4643.96	4.58	-	-	14.32	-	0.63
Red Peas	4387.39	1.90	-	1.78	2.32	-	3.80
Peanut	8226.49	0.77	-	1.49	-	-	0.99
Carrot	44475.93	0.40	0.71	1.94	1.38	-	0.15
Cabbage	36669.02	5.02	0.25	4.39	0.49	9.52	-
Lettuce	18230.18	1.24	1.24	6.82	0.25	27.87	-
Cauliflower	3544.88	2.56	-	3.20	5.12	1.92	1.28
Pak Choi	3333.96	17.01	2.72	10.88	-	1.36	0.27
String Bean	1592.14	0.57	-	14.25	1.42	3.13	0.28
Tomato	81457.49	1.28	-	1.84	2.28	4.37	0.36
Cucumber	5066.71	0.45	-	6.27	0.67	-	4.92
Pumpkin	20752.20	0.22	0.44	0.22	-	0.98	6.56
Escallion	9609.52	5.19	0.24	-	2.69	-	-
Sweet Pepper	1485.54	2.29	-	1.53	-	12.21	3.05
Corn	4297.41	2.11	1.01	-	-	-	2.43
Irish Potato	33650.32	1.89	1.21	2.62	0.07	6.20	0.04
Sweet potato	10491.77	3.46	0.22	5.62	2.59	-	0.43
Cassava	73165.68	0.19	-	5.64	0.12	-	-
Yam	333425.48	0.23	3.78	0.29	0.03	-	0.28

Source: Women Food Producers Survey - IICA/IDB 1993

2. Postharvest technologies

In the area of postharvest handling, traditional practices dominate. With few exceptions, there is little or no evidence of improved methods of storage, drying, packaging, and transporting of the products produced on these farms. Cool or cold storage facilities are mostly absent, as are drying and curing facilities. Containers for collecting and transporting consist mainly of bags and straw baskets. The bags are usually recycled from other uses, such as the containers for fertilizers and animal feed. The exceptions are observed mainly in the case of tomato and ripe bananas, where wooden crates with indigenous protective materials such as dried grass or banana thrash are used in combination. Threaded recycled paper is also used as an alternative to grass or thrash.

Poor methods of postharvest handling have been reflected in high rates of postharvest losses over the years. Various estimates have put these losses at between 20% and 40%. The results of the survey, however (Table 16), show that these losses vary widely with different crops and range from less than 1% to about 14%.

Community norms and practices have placed the responsibility for postharvest handling largely in the hands of women. Table 17 shows the distribution of preharvest, postharvest, and marketing activities by gender. These women are generally poorly educated and lack the resources and knowledge to acquire appropriate equipment, as well as to construct suitable postharvest handling facilities. As was pointed out earlier (Table 9), only 11% of the survey farms reported having some form of storage facility.

Table 17. Number of Family Members Who Participate in Crop Production Activities by Type of Activity.

Activities	Respondents	Other Women	Men
Preharvest	1111	123	877
Postharvest	156	42	110
Marketing	155	37	103

Source: Women Food Producers Survey (IICA/IDB 1993).

C. Familiarity with and Access to Improved Technologies

Technical information on agriculture is disseminated through four main channels in Jamaica: (1) direct contact with farmers, (2) print media, (3) electronic media, and (4) agricultural shows.

1. Direct contact

Direct contact with farmers is the most popular means of technology transfer used by the various bodies providing agricultural extension services.

The specific methods and techniques popularly used in direct contact include the following:

- Field days
- Demonstration plots and field demonstrations
- Group meetings (community)
- Seminars involving farmers, dealers, and the government extension personnel

All forms of direct contact are organized on normal working days and during the official working hours of the extension personnel, whether they be from the Ministry of Agriculture, the commodity boards, or the private input suppliers.

The day and time of these extension activities, therefore, normally conflict with the routine activities of the small-scale producers generally, and with women in particular, who have the added responsibility for reproductive activities. Accordingly, the scheduling of extension activities without due consideration for the special circumstances of women will necessarily limit their access to the available improved technology.

A second but important factor that limits the access of women to improved technology is the format of field days. These normally take the form of lecture and discussion sessions. Presenters are often technical specialists in particular subject areas.

The level at which the material is presented is quite often above the educational standard of small-scale producers. It seems quite clear, therefore, that there is limited transfer of knowledge through the medium of field days.

Community group meetings and seminars suffer much the same limitations as field days. Furthermore, these are very rare and normally poorly attended. As the survey data show, the vast majority of women are not members of community groups or farmers organizations through which group meetings and seminars are organized.

Demonstration plots and field demonstrations are perhaps the most effective of the direct contact methods of extension education for women food producers. These are, however, very limited in coverage, and with little or no provision for follow-up and continuity.

Table 18. Number of Respondents by Frequency and Type of Leisure Time Activity.

Activity	Total	Frequency							
		Daily	Weekly	Twice Weekly	Monthly	Twice Monthly	Seldom	Never	Other
Listen to radio	149	130	6	2	-	-	11	-	-
Watch TV	139	65	15	2	1	1	36	19	-
Get together with neighbors	146	28	55	8	12	1	38	4	-
Speak to someone you consider a leader	142	10	54	6	35	-	33	3	1
Leave community to go visiting	148	3	11	3	26	13	85	6	1
Other	2	-	1	-	-	1	1	-	-

Source: Women Food Producers Survey (IICA/IDB 1993).

2. Print media

The print media available on improved technologies include materials available through an agricultural library service, brochures, farmers' manuals on specific technological packages, technical booklets, newspaper articles, and labels and posters. There are two main limitations with this method of transfer of technology to women food producers. The first lies in the inadequate distribution of most of these print materials. Second, the already discussed low educational level of the food producers severely limits the access these producers have to print materials. With respect to library services, this is a centralized facility in the capital city of Kingston and is, therefore, almost totally out of reach of the vast majority of women food producers.

3. Electronic media

Sponsored radio programs represent the main form of electronic media used for transfer of technology. The results of the survey show that there is much potential for this channel of technology transfer because of the generally wide listening audience of radio. Table 18 provides some details on the respondents' use of leisure time.

4. Agricultural shows

There is an annual display of agricultural technology through agricultural shows organized by the Jamaica Agricultural Society. The most popular of these is the Denbeigh Agricultural Show held in August every year. At this show, a range of public and private sector organizations that provide goods and services to the agricultural sector are normally represented to promote the goods and services they sell. New techniques in agriculture are also demonstrated, and a considerable quantity of technical information is provided through face-to-face discussions and distribution of pamphlets. The main limitations of this method lie in the frequency with which they are held and the centralized siting of these shows.

D. Access to Training

The number of women who received training in key aspects of the production marketing system was generally found to be quite low. Table 19 shows the distribution of family members who received training, classified by the subject area in which they received training. The data in this table show that the percentage of women who received training in the selected subject areas ranges from less than 1% to 12%. Training in the use of fertilizers and pesticides ranked highest (12%), followed by seed selection/production (7%), and farm management and marketing (4% each). Training in the areas of postharvest storage, packaging, and processing is even more scarce among this group, since the number of women receiving training in these subjects does not exceed 3%. Table 19 also shows that fewer men were reported to have received training in the selected subject areas, with the percentage ranging from less than 1% to a maximum of 3%.

Table 19. Number of Family Members Who Have Received Training.

Subject Area	Women		Men		Both	
	No.	%	No.	%	No.	%
Seed Selection/Production	33	7	10	3	16	2
Use of Fertilizers/Pesticides	55	12	8	2	24	3
Postharvest Storage	13	3	2	<1	18	< 3
Marketing	16	4	3	1	16	2
Feeding & Grazing	2	< 1	3	1	4	< 1
Farm Management	16	4	3	1	9	1
Packaging	13	3	2	<1	12	< 2
Processing	11	2	1	<1	2	< 1

Source: Women Food Producers Survey (IICA/IDB 1993).

E. Access to Inputs

The number of input suppliers covering the island varies from time to time, but is usually in the region of 20. Almost all of these suppliers participate in technology transfer either through field days and demonstrations or the provision of technical booklets.

Selected extracts from one of the technical booklets distributed by a leading supplier are presented in Appendix 7. This appendix includes detailed specifications of seeds, fertilizers, agricultural chemicals, livestock supplies, and agricultural equipment, along with recommendations for use and rates of application by individual crops and livestock enterprise. Overall, it provides a good indication of the technological packages being offered by input suppliers to small farmers.

A tentative list of leading suppliers is presented in Appendix 8. The leading suppliers are linked to a network of farm stores islandwide and are located in relatively close proximity to the farming communities.

Table 20 provides an indication of the availability of selected inputs to small-scale producers.

Table 20. Average Distance from Source of Selected Inputs and Cost of Input at Nearest Place of Sale.

Technology	Average Distance from Farm to Nearest Outlet (Miles)	Average Cost at Nearest Outlet (J$)
Vegetables		
HYV Seeds	3	456
Fertilizers	3	
Agricultural Chemicals	3	240
Yams		
Fertilizer	9	
Cassava		
Fertilizer	5	
Agrochemical	5	240

Source: Derived from various secondary data sources.

IV. THE APPROPRIATENESS OF THE TECHNOLOGICAL OFFERING FOR WOMEN FOOD PRODUCERS

As discussed previously, recommended technology has mainly to do with the use of certain inputs, typically fertilizers, agricultural chemicals, and improved planting materials. Agricultural chemicals carry some health risk and must, therefore, be used with a set of precautions to minimize these risks. These precautions include proper handling practices, correct storage facilities, and the use of protective clothing.

Women food producers, however, are generally poorly educated in the nature and use of these chemicals and, therefore, lack a good appreciation of the risks involved. Further, they lack the resources to acquire the necessary handling, storage, and protective facilities. Considering that the participation of women in the use of agricultural chemicals is quite high (Table 5), then it is quite clear that under the present circumstances this element of improved technology exposes not only women but men to the health risks associated with the use of agricultural chemicals.

While hand tools may not be considered an improved technology, they are, in fact, the dominant form of technology being used by women food producers.

This technology is considered inappropriate for two main reasons:

1. They are woefully inefficient when compared with mechanical or motorized equipment and tools.

2. A number of hand tools are not only inefficient but are clearly hazardous to women's health. For example, the use of hand forks and pick axes require a great deal of physical force in pushing, lifting, pulling, and dragging, which makes them impractical for women to use, particularly during pregnancy.

   At the same time, hired male agricultural labor is increasingly scarce and expensive. Table 21 shows that 61% of the women surveyed reported that labor was a principal problem. Women farmers are, therefore, clearly at a disadvantage in carrying out normal farming activities.

In the area of postharvest handling, Chapter 3 showed that traditional and indigenous technologies dominate in storage, packaging, and handling. Apart from being inefficient, these do not pose any serious problems for women food producers.

In the area of transportation, however, the available facilities are, for the most part, quite inappropriate. Trucks, pick-ups, vans, and passenger buses are the main means of transportation available to this group. None are designed to transport perishable commodities. In addition, trucks and pick-ups are not designed for passengers. Women, therefore, suffer grave indignity in using these modes of transportation.

Table 21. Principal Problems That Women Face.

Problems	No. of Women	As Percentage of All Women
Theft	17	11.33
Insects/Pests/Animals	29	19.33
Drought	45	30.00
Expensive Inputs	48	32.00
Labor Problems	92	61.33
Lack of Financing	85	56.67
Lack of Equipment	16	10.67
Spoilage	1	0.67
Lack of Ext. Assistance	3	2.00
Natural Disaster	2	1.33
Lack of Roads/Transportation	14	9.33
Lack of Water	9	6.00
Low Farm Gate Prices	24	16.00
Inadequate Information	15	10.00
Lack of Markets	6	4.00
Sex Discrimination Against Women	10	6.67
Lack of Technical Assistance	1	0.67

Source: Women Food Producers Survey (IICA/IDB 1993).

PART THREE: PROCESSING AND MARKETING

VI. THE NATIONAL MARKET FOR AGROFOOD COMMODITIES PRODUCED ON SMALL PRODUCTION UNITS

A. Demand, Price, and Supply

1. Demand for products of small-scale producers

The demand for the products of small-scale producers naturally varies according to individual items or crop category. It will also vary for each item according to the market outlet and the price at which the product is offered, as well as the availability and prices of substitutes.

Demand, however, is not precisely known for any of the crop categories or items, since market studies specific to individual items and market segments have so far not been undertaken. The total annual demand for any item would be the aggregate demand for that item in the parochial (consumer) markets, the export markets, catering institutions, and the agro-processing factories. The determination of demand by market segment has been complicated by changing import policies over the years. These policies have ranged from the extreme of prohibiting imports through quota and quantitative restrictions to the present extreme in which the policies are tending toward total liberalization. Nevertheless, it is a popular view that domestic supplies of most, if not all, items are well below the demand in all market segments. This view is strongly supported by the following observations:

- There have been consistent and heavy imports of identical and close substitutes for locally produced food items for each of the local market segments. Major items include red kidney beans, onion, rice, flour, peanuts, tomato paste, and some fresh and canned fruits and vegetables. The quantities of selected food items imported over the 1985-91 period are shown in Table 22.

Table 22. Quantities of Selected Food Items Imported During the 1985-91 Period (in 1000 Metric Tons).

Year	Rice	Maize	Wheat	Soya & Beans	Peas & Beans	Onion (Fresh)	Vegetable (Fresh)
1985	55.1	147.0	201.90	-----	0.265	0.164	0.190
1986	61.7	121.8	167.90	48.00	0.531	0.110	0.184
1987	52.5	153.55	198.80	62.50	1.700	0.145	0.004
1988	69.8	187.1	165.50	37.500	1.400	0.323	0.41
1989	45.83	131.000	74.35	51.420	1.970	0.693	-----
1990	40.08	161.04	33.09	58.070	1.350	0.247	0.021
1991	46.35	165.000	187.000	51.120	1.156	0.177	0.046

Source: ESSJ (1989 and 1990 issues).

- Significant disruptions in imports in the mid- and late 1970s, caused mainly by a shortage in foreign exchange, resulted in sharp increases in prices of locally produced food items.

- Statements by hoteliers, agro-processors, and export agents are commonly heard to the effect that they are willing to purchase whatever quantities of certain food items that farmers can produce. While such statements cannot be taken literally to mean an infinite demand, they do give an indication of the magnitude of the gap between present supplies and existing demand.

- The government has a stated policy to encourage increases in production of domestic food crops over and above existing levels.

2. Prices and market margins

a. Pricing decisions

It is widely established that only in exceptional cases have small-scale producers been able to set the prices they receive for their farm products. This observation has been recently supported by Le France in her impact assessment of postharvest techniques and farm management for small-scale producers in Jamaica, a project funded by the FAO. She observes that "the size of [small-scale producers'] output, and therefore their market share of any given commodity either individually or collectively is such that impact on the operations of the market system and its price setting mechanism will be minimal if at all existent."[14]

This situation however holds mainly for farm gate prices, as retail prices are set by the sellers and not the buyers. It is also known that small-scale producers do not normally keep records of their costs and, therefore, they are unable to compute their cost of production. In most cases they do not know whether the price they receive covers their cost, let alone a return to their capital labor and management. It is, therefore, a distinct possibility that when farmers are price takers (and this is usually the case), they could be knowingly or unknowingly selling at prices below their cost of production. There are many factors that combine to place small-scale producers in the situation of price takers. In addition to the size of their output, as suggested by Le France, other factors include the following:

- Production is largely unplanned; this means that production decisions are not based on the availability of an assured market but, rather, on a combination of factors that include (1) the traditions of the farming system in a given area, (2) the availability of resources (e.g., land, capital, and labor, and (3) the season of the year, particularly rainy seasons.

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[14] FAO, Integrated Post-harvest Techniques and Farm Management: An Impact Assessment (July 1993).

- The level of competition among market agents at the farm gate. Higglers make up the largest number of marketing agents for any one segment of the market. Yet individually, they purchase rather small quantities. As noted in a earlier survey, "The individual purchases of higglers during a given week are usually very small."[15]

  The other marketing agents operating at the farm gate (i.e., for export and food processing) are relatively few in number. Export agents number just about 50 islandwide, with a smaller number of agro-processing agents. Furthermore, these agents are not necessarily buying the same products. The farm gate as a point of sale is, therefore, faced with very low competition among buyers and stiff competition among sellers (farmers).

- The perishable nature of most agricultural products and the absence of improved postharvest technologies at the farm level.

  This phenomenon, which puts small-scale producers in the unique position of price takers for both inputs and outputs must be one of the factors that have made them powerless and poor on a sustained basis. It is only partially true that large-scale producers are price-takers for their outputs, as these producers are able to lobby for higher prices in the case of export commodities and dictate the price of domestic food crops even at the farm gate.

b. Market margins

The size of the market margins normally gives an indication of the efficiency of the marketing system. In the case where small-scale producers are price-takers, the market margins could be a source of much discontent between farmers and market agents. Table 23 provides average farm gate and retail prices, as well as computed margins over the four-year 1988-91 period.

The data in Table 23 show that while there have been some fluctuations in the margins, for most items margins have generally declined in relative terms over the period. Overall declines range from as low as 1.1% for onion in the condiment category to a high of 41.1% for lettuce in the vegetable category. The declines may reflect increased competition at the market place arising from either increases in supplies and/or an increase in the number of sellers.

In absolute terms, the size of the margins for most items appears unusually high, ranging over the four years from a low of 27.4% for yellow yams in 1991 to a high of 200.1% for escallions in 1989. Approximately 25% of the margins over the period were above 100%. Since market margins are normally inflexible, high margins indicate high marketing cost and support the view that the marketing system is inefficient.

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[15] FAO, Socio-economic Survey of Farmers in the Rio Minho Watershed (May 1989).

Table 23. Prices and Market Margins for Selected Crops, 1988-91.

CROP	1988			1989			1990			1991		
	Fg.	Rtl.	Mrg.	Fg.	Rtl.	Mrg.	Fg.	Rtl.	Mrg.	Fg.	Rtl.	Mrg.
Red Peas	1010	1468	43.5	1197	1578	31.8	1459	1860	27.4	2101	2303	9.6
Cabbage	295	564	91.1	273	507	85.7	335	708	111.	703	1124	59.8
Carrot	545	851	56.1	500	880	76	478	974	103	944	1480	56.7
Cucumber	187	291	55.6	249	456	83.1	289	439	51.9	476	633	32.9
Lettuce	474	1257	165.1	675	1409	108.7	877	1598	82.2	1667	2363	41.7
Pumpkin	269	498	85.1	295	494	67.4	381	573	50.3	589	810	37.5
String Bean	333	880	140.2	432	866	100.4	613	1027	67.5	939	1595	69.8
Tomato	417	800	91.8	340	653	92.05	516	1052	104	904	1561	72.6
Escallion	699	1455	108.1	401	1207	200.9	589	1499	154	1301	2526	94.1
Onion	1122	1695	51.0	668	1345	101.3	783	1362	73.9	1437	2128	47.5
Sweet Pepper	545	935	71.5	681	1052	54.4	802	1241	54.7	1109	1802	62.4
Pineapple	212	545	157.0	298	679	127.8	340	712	109	494	948	91.9
Irish Potato	522	820	57.08	569	955	67.8	467	941	101	1078	1558	44.5
Sweet Potato	234	359	53.4	280	467	66.7	309	465	50.4	522	745	42.7
Yellow Yam	353	494	39.9	584	796	36.3	441	633	43.5	798	1017	27.4
Cassava	128	185	44.5	174	388	122.9	207	392	89.3	300	586	95.3
Dasheen	192	291	51.5	295	456	54.5	291	439	50.8	450	633	40.6

Source: Data Bank Division, Ministry of Agriculture.

Fg. = Farm gate Rtl. = Retail Mrg. = Margin
N.B. Prices are in cents/kg and margins in percentage.

3. Supply

The estimated production of domestic food crops shown in table 24 provides a crude estimate of the supply of these items by small-scale producers to the various market outlets discussed above. It is considered a crude estimate because no allowance is made for postharvest losses at the farm level and for home consumption.

While estimates of postharvest losses range from 20% to 40%, these have not been disaggregated to indicate the margin of loss at the different points in the farm to market chain. Similarly, there is no objective estimate of home consumption. Several researchers have estimated that at least 80% of supplies pass through the parochial markets. This leaves about 20% to be shared among exporters, catering institutions, and agro-processors.

Table 24. Estimated Production of Domestic Food Crop by Major Categories, 1982-91 (Tons).

Year	Legumes	Vegetables	Condiments	Cereals	Plantain	Potatoes	Yams	Fruits	Other Tubers
1982	8,873	97,421	6,519	4,630	28,409	28,657	116,979	5,386	42,552
1983	9,583	112,300	9,684	7,040	25,101	31,693	130,634	11,469	42,177
1984	10,383	137,420	15,147	9,044	29,515	48,208	149,061	15,649	50,706
1985	10,861	116,571	15,366	8,151	30,404	38,751	163,767	11,969	49,319
1986	10,058	109,395	13,417	7,030	30,563	32,417	164,973	11,835	48,123
1987	10,298	109,949	33,354	6,241	58,731	33,765	175,452	14,139	43,789
1988	7,708	88,002	10,167	3,799	26,713	29,693	166,866	15,799	33,357
1989	7,960	104,353	10,501	3,427	9,916	32,636	132,373	16,913	32,243
1990	7,907	108,128	13,158	2,387	27,568	35,758	161,462	19,273	35,058
1991	8,422	101,196	10,224	3,491	26,692	25,007	186,104	19,320	344,336

Source: Data Collection and Evaluation Division, Ministry of Agriculture.

Using the data in Table 24, the distribution in absolute terms of selected crops is computed and shown in Table 25.

Table 25. The Average Annual Distribution of Selected Crops Among Market Outlets, 1982-91 (Tons).

Crops/Market Outlet	Vegetable	Condiments	Fruits	Yam
Average Annual	108,450	13,760	14,170	154,760
Parochial Markets	86,760	11,008	11,336	123,808
Other Outlets[a]	21,690	2,752	28,334	30,952

Source: Computed from Table 24.

[a] Catering institutions, agro-processors, and export markets.

Given the fact that yam is not processed and is one of the leading items among nontraditional export crops, it is expected that the greater share of the 30,952 tons would go to the export market outlet. Similarly, in the fruit category, pineapple is the dominant fruit and is the leading fruit item for the local agroindustry. It is expected that this industry would receive the greater share of the average annual allocation of the 2834 tons going to the three minor outlets.

Catering institutions and agro-processors could share equally the allocation of 21,690 and 2752 tons of vegetables and condiments respectively.

Further analysis of table 24 indicates that the supply of all crop categories fluctuated annually over the ten-year period under review. In the case of legumes, there was a marginal decrease (5%) in production in 1982 as opposed to 1991. In the case of vegetables, a marginal increase of approximately 4% occurred between the two years. Marginal declines were recorded for some crops (e.g., cereals, plantains, potatoes, and other tubers (e.g., cassava, cocoa, and dasheen). The only two categories that showed significant increases were fruits and yams.

An important characteristic of the supply of agricultural products from small-scale producers is that for most products it is strongly seasonal. Seasonality, however, is more pronounced for certain items (e.g., cereals, vegetables, and fruits) than it is for others (e.g., legumes, condiments, and plantains). Seasonality is strongly linked to the rain-fed system of production, as well as, in some cases, to the varieties of individual crops.

B. National Marketing Channels

The main market outlets for small farmer agroproducts are presently the following:

1. A network of some 100 markets located in parish capitals, major rural towns, and in the Kingston metropolitan area (see figure 1).
2. A growing number of street or curbside markets.
3. Hotels, restaurants, and other catering institutions, such as colleges and hospitals
4. Canning or agro-processing factories.
5. Overseas markets, mainly in the USA, U.K., and Canada

Added to this list is the AMC, a government marketing board, which operated over the 17-year period from 1963 to 1980.

1. Parish and Kinston markets

Traditionally, the parish and Kingston markets have been the dominant marketing outlets for the outputs of small-scale producers. They normally carry an almost inexhaustible list of food items, including every possible fresh vegetable, fruits, tubers, legumes, cereals, condiments, and spices. The representation of items of livestock foods in these markets is also close to complete. Milk is perhaps the only fresh livestock product that is not normally found in these markets.

Parish and Kingston markets function predominantly as retail outlets, but wholesale operations are also carried out in many. The most popular markets that function as both wholesale and retail outlets are the Coronation Market in Kingston, Browns Town Market in St. Ann, and New Market in St. Elizabeth.

The share of total annual output that is normally distributed in parish and Kingston markets is still not precisely known. Estimates of over 80% have been quoted by those researchers who venture to put a number to it, but these are really crude estimates based purely on observation and not supported by any form of empirical measurements. It appears, however, that there is consistency and consensus among researchers on this number, since no one has ever suggested anything vastly or even slightly different.

The most outstanding characteristic of these markets is the large number of individual sellers who display often identical products in a contiguous layout. It is often said that the characteristics of these markets approach those of perfect competition. Still, price discrimination is a known practice among the sellers, but executed quite subtly. As expected with a large number of individual decision makers, there is great variation in the way the functions of storage, grading, packaging, and display of products are carried out. With few exceptions, cold storage facilities are not provided in these markets, and in the few cases where such facilities are found, they are for meats and fish. No form of chilled or cold storage facilities are provided for even the most perishable items of crops being sold in the markets.

Grading is strongly practiced but informal, judgmental, and implicit. Different grades are not always separated and displayed in separate lots. The buyer learns that there is a grading system only from the different prices being quoted for the same lots of goods. It is not surprising to find three or four different prices per unit being quoted for a given lot of goods. Packaging is done, but only to a limited extent. Only in rare cases are the agroproducts placed in convenient packages, and even in these cases packages consist of polyethylene bags of arbitrary size, shape, and thickness. The manner in which goods are displayed range from a very loose and unstructured layout to very artistic and attractive displays.

Overall, the marketing functions carried out in the parish and Kingston markets can be described as, for the most part, unstructured, informal, and, in some cases, traditional and inefficient. The lack of storage and proper display and handling facilities contribute to the significantly high levels of spoilage usually observed in these markets.

2. Curbside and street markets

Curbside markets have been growing in importance as outlets of small farmer production over the last two decades. The 1977 Higgler Survey counted 210 curbside markets in the Kingston metropolitan area.[16] Based on observation it appears that there are many more today. The same survey found that the number of sellers at a curbside market could range from 1 to as many as 250. Curbside markets have similar characteristics to the parish and Kingston markets, except that there are no physical facilities and they function as purely retail outlets. In addition, they are unplanned and not under any statutory regulation. They spring up rather spontaneously, either as overflows from the established Kingston markets or attempts by sellers to provide convenient shopping to the growing urban population.

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[16] Ministry of Agriculture, Higgler Survey (1977).

3. Supermarket or green groceries

Supermarkets distribute only a very limited number of agroproducts as a single line among the hundreds of lines of consumer goods they sell. Shelf space allocated to agroproducts, therefore, accounts for only a very small percentage of total space.

Green groceries, while carrying other food items, carry fresh agroproducts as their main focus. The greatest percentage of shelf space is, therefore, allocated to these products. They also do not normally carry as wide a range of items as are found in the parochial markets. Green groceries are individually quite small in size and sparsely located. In terms of volume of products distributed by supermarkets and green groceries, these sites cannot be considered significant outlets of small farmer production. Nevertheless, they provide the best example where marketing functions are properly carried out. Cold and chilling facilities are normally provided, while grading, convenience packaging, and strategic displays are normal practices in these outlets.

4. Hotels and other catering institutions

Hotel and other catering institutions also provide limited outlets for fresh locally produced agroproducts. Hotels rely mainly on imports for their food requirements, citing poor quality and unreliable local supplies as barriers to larger purchases from domestic sources. The seasonality of small-scale production and the standard of postharvest handling required by hotels are normally outside the control and capability of the suppliers, whether these be farmers or higglers. The products they purchase must be of a high standard and supplies must be reliable, consistent, and timely. To meet these requirements, there must be proper postharvest handling facilities and practices. Nevertheless, hotels remain a potentially excellent outlet for small farmer agroproducts.

5. Canning factories

Canning factories provide an outlet for some fruits and vegetables typically produced on small farmer holdings. The major items and processed products are as follows:

pineapples:	pineapple juice and slices
carrots:	carrot juice
oranges:	orange juice and concentrate
mangoes:	mango nectar, juice, and chutney
callaloo:	canned callaloo
ackee:	canned ackee
tomato:	canned whole and tomato paste

Although the local agro-processing subsector has grown significantly over the last two decades, it remains a very small outlet for small farmer production. Like the hotels discussed above,

canning factories rely heavily on imported raw materials.[17] Many of the problems the small-scale producer faces with respect to hotels are also true with the canning factories. The most critical problem, however, concerns price. Prices offered by canning factories are usually much lower than the prevailing fresh market prices. Prices offered by factories will be unavoidably lower since the recovery rate from processing is usually below 50%. The second but related factor in this regard is that the yields per unit area of crops produced on the small-scale farms are comparatively quite low, thus contributing to high production costs. Faced with these price relations, therefore, it is usually uneconomical for the farmer to produce for canning factories. The productivity on small farms will have to be increased significantly if the agro-processing industry is to be exploited as an important market outlet for small-scale producers.

C. Social Agents

The leading distributors of small-farmer production are a group of traders popularly referred to as higglers. Research dating as far back as 1960 has established that higglers have been the backbone of the marketing arrangements for the outputs of small farmer holdings. It has also been established from previous surveys that traditionally and consistently females account for 80% of the total higgler population.[18] The Higgler Survey (1977) summarizes the main characteristics of higglers as follows:

- Higglers are predominantly middle-aged and old women.
- These women could find no alternative means of employment at the time of choosing higglering as an occupation.
- Most higglers have had many years of experience in higglering, but collectively they are not organized and there is no system of coordination.
- Each higgler operates in her/his own interest and is indifferent to any national objective.
- Higglers generally have a low educational level. In fact, approximately 20% are unable to read and write, yet approximately 70% express a negative attitude toward training.

In terms of trade practices, the survey found that approximately 50% of the total number of higglers purchase their products directly from the farmer at the farm gate. The remaining 50% obtain their supplies from several other sources, including their own farm, Kingston markets, country markets, and, at the time of the survey, the AMC. The data from the survey also show that approximately 40% of higglers purchase their supplies on a cash basis, 14% on a credit

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[17] M. E. Bandowell, Agro-processing Sector in Jamaica (Jamaica: FAO, 1993).

[18] M. Katzin, The Business of Higglering in Jamaica (1960); Ministry of Agriculture, Higgler Survey (1977).

basis, and approximately 20% purchased on a cash and credit basis. In the case of farm gate purchases, the arrangement ranges from consignment of goods to the higgler on one hand, to advance payments to the farmer on the other. In addition to the purchasing of whatever crop the farmers produce, the higgler sometimes assists the farmer in performing such tasks as harvesting, assembling, and transporting of the crops. These services are normally free to the farmer and are provided mainly in situations of scarce supplies.

Higglers were also found to operate predominantly as retailers, selling directly to consumers in parochial and curbside markets.

Only 15% of higglers were found to sell at the wholesale level of distribution. The higglers' week is divided between buying and selling. It was found that on an average basis, approximately three days per week are spent in the selling activity. The selling days coincide with the official opening days of the parish and Kingston markets in which the higglers sell.

The vast majority of higglers own no means of transportation and use whatever means are available to take them to the market. These normally include trucks, passenger bus, taxi, vans, and so on.

"Open-bodied" trucks have been a popular means of transportation, particularly for the rural higglers. These trucks are normally designed for transporting bulk cargo such as dry goods (sugar, flour, rice, etc.), animal feeds, fertilizers, lumber, cement, and other building materials. They are, therefore, quite unsuitable for the transportation of perishable agricultural products, and even more unsuitable for the transportation of passengers. Yet these are the dominant means of transportation for rural higglers and the products they take to the markets.

As the Higgler Survey established, it has been very difficult to determine the pattern of higgler distribution among parish and Kingston markets in relation to their parish of residence. Indeed, higglers residing in the extreme end of the island sell in markets at the opposite end, having passed many markets between these extremes. On a weekly basis higglers travel varying distances in purchasing and selling their products. The recorded distances traveled show that approximately 60% of higglers travel between 50 and 100 miles per week, while about 30% travel over 100 miles per week.

While higglers are the dominant traders in the distribution system, there are at least two other agents representing the export and the agro-processing outlets. Unlike higglers, these agents purchase a limited range of products and insist on specified quality standards. Product specifications are also predetermined. Export agents purchase mainly tubers, such as yams, potatoes, and dasheen, but items such as plantains, peppers, and pumpkin are often included in their purchases. Purchases are in most cases carried out at the farm gate and on a cash-and-delivery basis. Export agents, apart from taking delivery and making payments, provide assistance to farmers in postharvest handling. Such assistance normally includes selecting, packaging, and handling, along with packaging materials. These agents also provide guidance on varietal selection for planting and the use of other inputs. The prices offered by export agents are normally higher than those offered by other agents.

Agents for the agro-processing subsector are mainly involved in organizing and purchasing their required supplies of fruits and vegetables. Purchases of these specific crops are normally made through a system of factory gate delivery, and prices are generally lower than prices offered by higglers or the export agents. These agents sometimes establish formal contracts with farmers to supply the required crops, but informal agreements are more popular.

VII. THE PROCESSING AND MARKETING OF FOODS ON SMALL PRODUCTION UNITS BY WOMEN

A. Processing: Relationship between Type of Product and Specialization by Gender

The survey shows that the main crops being processed on small-scale production units are fruits, vegetables, legumes, and tubers (mainly cassava).

Table 26 presents a list of products processed by the respondents, classified according to family members' participation in the processing.

Table 26. Processed Products by Family Member Participation in Processing.

PRODUCTS	TOTAL	RESPONDENT	MAN/ COMPANION	OTHER WOMEN
Bammy	41	38	-	3
Pastries	1	1	-	-
Cassava Flour	9	9	-	-
Starch	4	4	-	-
Juices	29	29	-	-
Jams	5	5	-	-
Jellies	1	1	-	-
Pickled Vegetables	5	5	-	-
Pickled Meat	6	4	2	-
Salted/Roasted Nuts	8	8	-	-
Peanut Butter	1	1	-	-
Dried Coffee Beans	2	2	-	-
Other Goods	13	13	-	-

Source: Women Food Producers Survey (IICA/IDB 1993).

The data in this table also show that for 12 of the 13 products, women are the sole participants in the processing. Only in the processing of one product--pickled meat--are males involved. The data also show that cassava is the main crop being processed, with three principal products: bammy, cassava flour, and starch.

These three products account for over 43% of the agro-processing activities. The data also show that the processing of these products is the activity of women, as the respondent and other women constitute 100% of family members' participation. Juices appear to be the other popular product being processed, accounting for about 23% of the agro-processing activities.

Unlike cassava products, however, in which participation is shared by other women, the respondent appears to be the sole participant in the processing of juices. The processing of cassava products and fruit juices are traditional activities, with very old technologies having been handed down from generation to generation.

Table 27 shows the distribution of farms by the source they use for inputs. The data show that on-farm and off-farm were the dominant sources of inputs for processing. This is not surprising, given the dominance of indigenous raw materials and traditional technologies.

With respect to the provision of labor for processing activities, women again appear to be the dominant providers. This can be seen in tables 28 and 29, which show the source of labor for bammy and juices respectively, classified by the size of the farm.

Table 27. Percentage Distribution of Farms with Agroindustrial/Artisan Activities by Size of Farm and Source of Inputs.

Size of Farm (Ha)	Source of Inputs			
	On-farm	Off-farm	Local	Foreign
	%	%	%	%
TOTAL	100.00	100.00	100.00	100.00
< 0.4	4.29	14.29	-	-
0.4 - < 2.0	63.57	59.52	100.00	-
2.0 - < 4.0	21.43	19.05	-	-
4.0 - < 10.0	10.71	7.14	-	100.00

With respect to the production of raw materials, it appears that there is greater participation of female family members in harvesting and in the preharvest and marketing activities. Tables 30 and 31 show family members' participation in the production and marketing activities of cassava and vegetables. The data indicate greater participation of men than women in crop care

activities. For the harvesting, postharvest, and marketing activities, however, the respondents and men appear to participate equally, with high participation of other women.

Table 28. Percentage Distribution of Farms with Bammy as an Agroproduct by Size of Farm and Source of Labor.

Size of Farm (Ha)	Source of Labor	
	Respondent	Other women
	%	%
Total	100.00	100.00
< 0.4	13.16	-
0.4 - < 2.0	57.89	100.00
2.0 - < 4.0	21.05	-
4.0 - < 10.0	7.89	-

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 29. Percentage Distribution of Farms with Juices as an Agroproduct by Size of Farm and Source of Labor.

Size of Farm (Ha)	Source of Labor
	Respondent
	%
TOTAL	100.00
< 0.4	6.90
0.4 - < 2.0	62.07
2.0 - < 4.0	17.24
4.0 - < 10.0	13.79

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 30. Family Member Participation in Agricultural Production of Cassava by Type of Activity.

ACTIVITIES	RESPONDENTS	OTHER WOMEN	MEN
Purchasing/Preparation of Planting Material	17	-	5
Land Preparation	12	7	8
Planting	19	7	10
Crop Care	22	7	22
Purchase/Use of Fertilizer & Chemicals	18	6	9
Harvesting	18	7	10
Postharvest	16	7	9
Marketing	14	6	7

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 31. Family Member Participation in Agricultural Production of Vegetables by Type of Activity.

ACTIVITIES	RESPONDENT	OTHER WOMEN	MEN
Purchasing/Preparation of Planting Material	109	1	30
Land Preparation	76	5	57
Planting	103	7	67
Crop Care	89	11	112
Purchase/Use of Fertilizer & Chemicals	121	13	90
Harvesting	109	21	81
Postharvest	103	28	74
Marketing	86	23	60

Source: Women Food Producers Survey (IICA/IDB 1993).

B. Marketing: Access to Different Types of Markets

Data taken from the Women Food Producers Survey show that from the sample of 150 farms, a total of 35 crops were produced and marketed. Appendix 9 provides a list of these crops classified by the number of farms producing them. Data on the disposal of main crops are provided in Table 32.

The data in Table 32 show that for the 19 selected crops, most of what is produced is marketed. The amount sold as a percentage of the amount produced ranges from a low of 52% for corn to a high of 91% for carrots. Only three crops--gungo peas, lettuce, and corn--fell below 70%. The amount consumed as a percentage of amount produced has been generally quite low, ranging from a low of approximately 4% for various products to a high of approximately 42% for corn. These relationships are shown graphically in figures 2 and 2a.

The amount of postharvest loss reported among the 19 selected crops ranges from a low of less than 1% for yam to a high of 37% for lettuce. In fact, the losses for 14 of the 19 crops were below 20%. Table 16 shows the distribution of total production reportedly lost or given away, classified by the reason given for the loss.

Spoilage, pests, and disease appear to be leading causes of loss, accounting for losses in 23 of the 35 crops produced. This is followed by predial larceny, which accounts for losses in 10 crops, and natural disaster, with losses in 9 crops. The percentages of losses due to spoilage, pests, and disease was generally higher than is the case for predial larceny and natural disaster. The highest reported case of loss due to spoilage, pests, and disease was 29%, while the highest reported case of loss due to natural disaster was 27%. Surprisingly, the percentages of loss due to predial larceny were quite low, ranging from a low of less than 1% to a high of approximately 4%. For several crops (pumpkin, escallion, carrots, and sweet potatoes), losses due to predial larceny were below 1%.

It appears that small-scale producers sell the bulk of their produce at the farm gate. Table 33 provides data on the typical market outlets used by farms for 19 selected crops. The data show that the farm gate accounts for 84% of the purchases from producers. The central market ranks second to farm gate, with 9%, followed by neighborhood outlets, with 5%.

C. Factors that Influence the Participation of Women

The participation of family members in the selling activity points to gender differences in the choice of market outlets, as well as in the crops sold. Women appear to be involved in a wider range of crops than men. In fact, from the list of 34 crops, the data show that men participated in the selling of only 9, while women are involved in all 34. Women also appear to have a larger number of market outlets than men. Women sell in some six market outlets compared with three for men. With few exceptions, men sell all their crops at the farm gate. In contrast, there are many fewer cases in which women sell all their crops at the farm gate. There is great consistency, however, in the use of the farm gate as the dominant outlet for both women and men. Table 34 provides further details on the participation of women and men in the selling of selected crops in typical market outlets.

Table 32. Production and Disposal by Crop.

Crop	No. of farms	Amt. produced (kg)	Amt. Consumed (kg)	Amt. Lost (kg)	Amt. sold (kg)	Amt. sold as % of amt. produced	amt. consumed as % of amt. produced
Gungo	19	4643.96	1102.70	906.75	2634.51	56.73	23.74
Red Peas	37	4387.39	628.69	430.01	3280.68	74.78	14.33
Peanut	16	8226.49	577.89	267.62	7380.98	89.72	7.02
Carrot	30	444475.93	1839.80	2036.66	40599.47	91.28	4.14
Cabbage	26	36669.02	2068.42	7216.78	27383.83	74.68	5.64
Lettuce	17	18230.18	657.72	6822.14	10627.85	58.30	3.61
Cauliflower	10	3544.88	324.32	498.96	2721.60	76.78	9.15
Pak Choi	9	3333.96	360.61	1075.03	1898.32	56.94	10.82
String Bean	7	1592.14	90.72	312.98	1188.43	74.64	5.70
Tomato	36	81457.49	3229.63	8260.06	69967.80	85.89	3.96
Cucumber	7	5066.71	360.61	623.70	4082.40	80.57	7.12
Pumpkin	7	20752.20	476.28	1746.36	18529.56	89.29	2.30
Escallion	13	9609.52	415.04	780.19	8414.28	80.00	0.00
Sweet Pepper	8	1485.54	118.84	283.50	1083.20	72.92	8.00
Corn	19	4297.41	1787.64	238.59	2271.18	52.85	41.60
Irish Potato	26	33650.32	2585.52	4046.11	26973.32	80.16	7.68
Sweet Potato	16	10491.77	1828.01	1292.76	7371.00	70.26	17.42
Cassava	27	73165.68	2789.64	4354.56	52322.76	71.51	3.81
Yam	90	333425.48	20532.20	15372.50	291261.10	87.35	6.16

Source: Women Food Producer Survey (IICA/IDB 1993).

Figure 2. Production and Distribution of Selected Crops.

	amt. produced	amt.consumed	amt.lost	amt.sold
tomato	81457.49	3229.63	8260.06	69967.8
red peas	4387.39	628.69	430.01	3280.68
peanut	8226.49	577.89	267.62	7380.98
gungo	4643	1102	906	2634
corn	4297.41	1787.64	238.59	2271.18
lettuce	18230.18	657.72	6822.14	10627.85

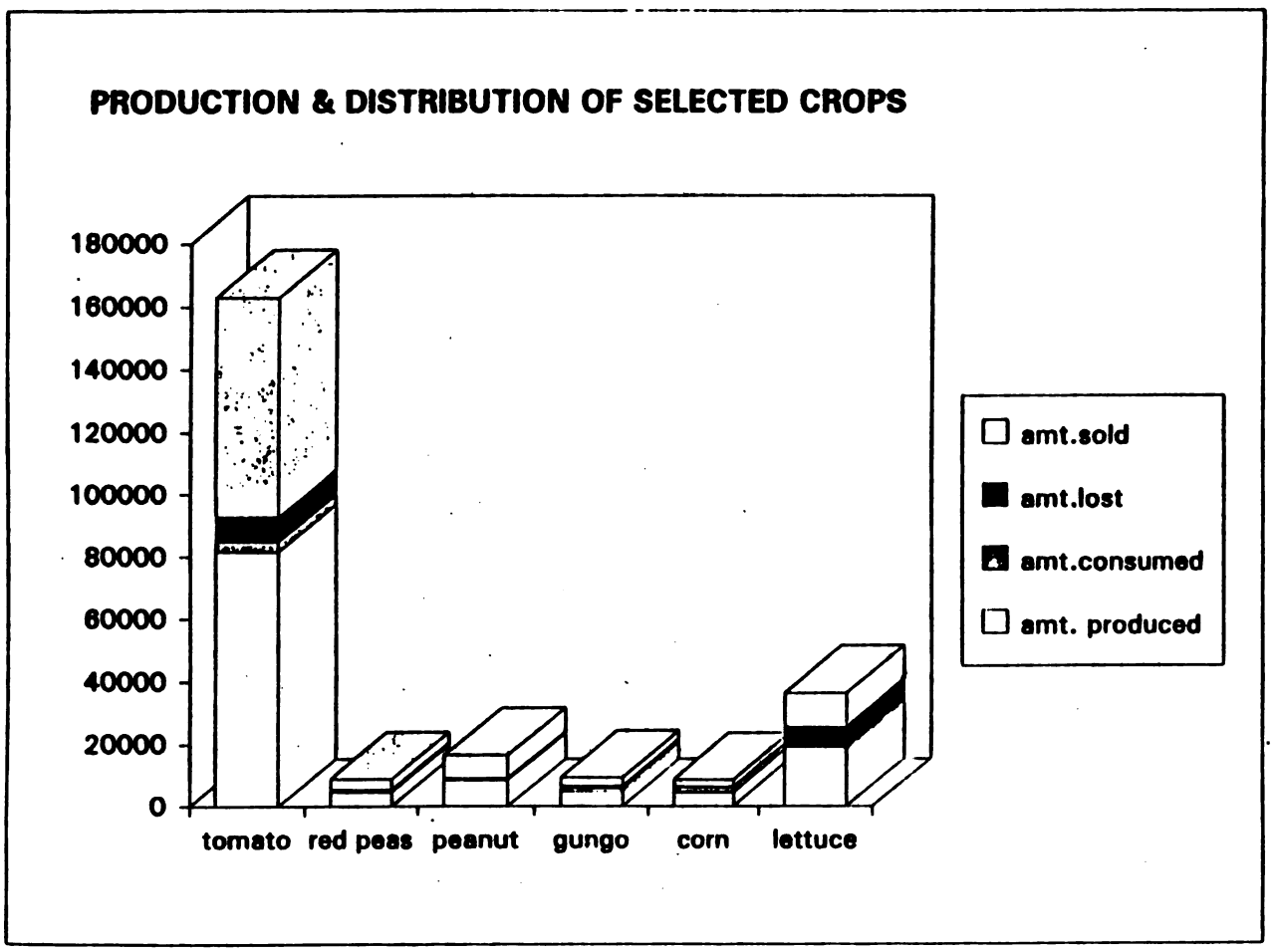

Figure 2A. Production and Distribution of Selected Crops.

	amt. produced	amt.consumed	amt.lost	amt.sold
yam	333425	20532	15372	291261
cassava	73165	2789	4354	52322
sweet potato	10491	1828	1292	7371
pumpkin	20752	476	1746	18529
carrot	44475	1839	2036	40599
irish potato	33650	2585	4046	26973

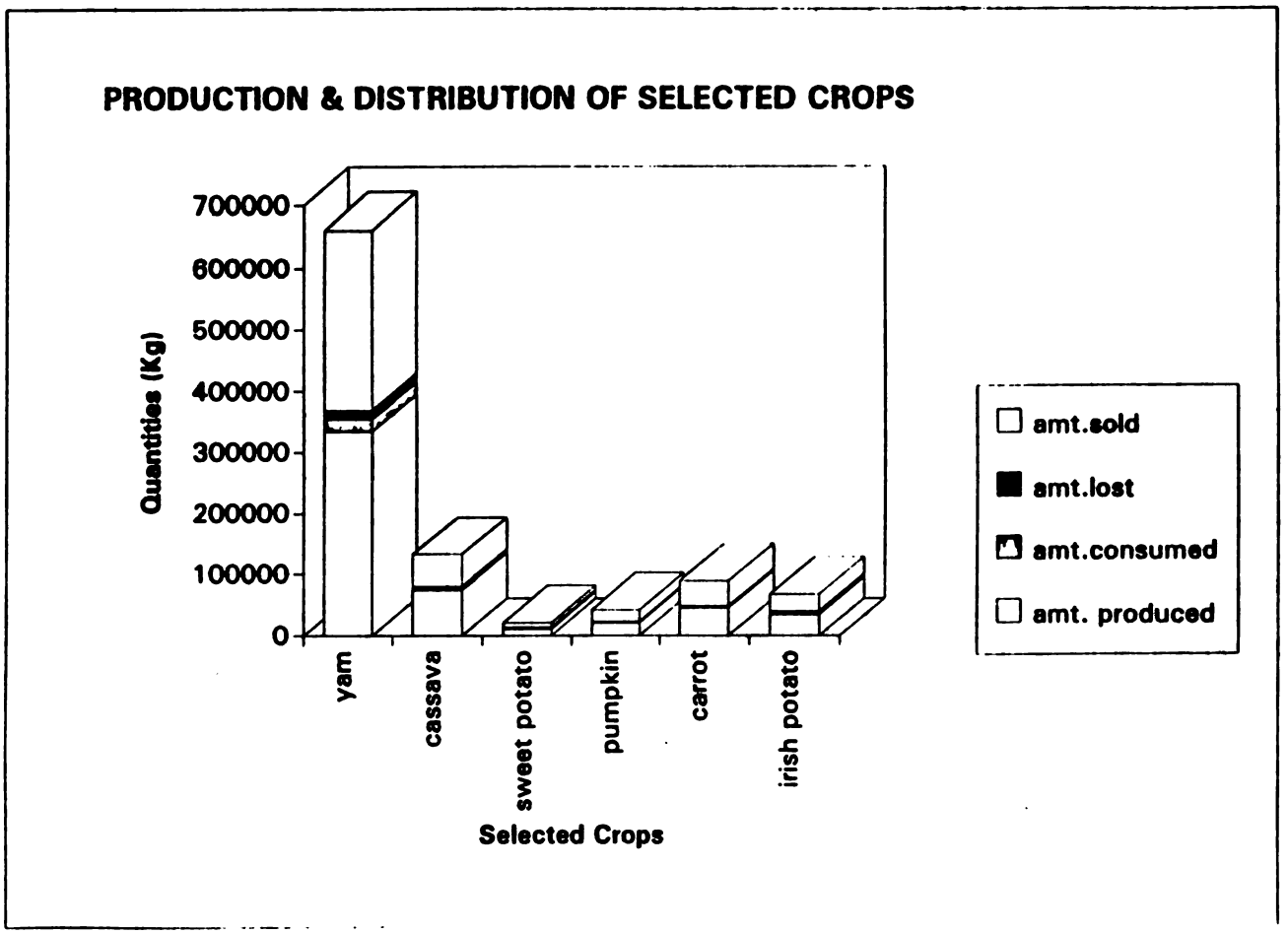

Table 33. Typical Marketing Channel by Crop Type.

Crop	No. of farms	Not stated (kg)	Farm gate (kg)	Neighbourhood	Village Market	Town Markets	Central Market
Gungo	17	-	14	2	-	-	1
Red Peas	35	-	31	2	-	-	2
Peanut	16	-	15	-	-	1	-
Carrot	30	-	26	1	-	-	3
Cabbage	26	-	21	-	-	-	5
Lettuce	17	-	14	-	-	-	3
Cauliflower	10	-	10	-	-	-	-
Pak Choi	9	-	8	-	-	-	1
String Bean	7	-	3	-	-	-	3
Tomato	36	-	30	1	-	-	4
Cucumber	7	-	5	-	-	-	2
Pumpkin	7	-	6	-	-	-	1
Escallion	13	1	12	-	-	-	-
Sweet Pepper	8	-	7	4	-	-	1
Corn	16	-	3	-	-	-	-
Irish Potato	26	-	19	-	-	-	3
Sweet Potato	14	-	14	1	-	-	-
Cassava	24	-	24	2	-	-	-
Yam	83	-	70	5	-	-	4

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 34. Participation of Family Members in the Selling of Selected Crops in Typical Market Outlets.

	PLACE OF SALE											
	Farm gate		Neighbourhood		Village market		Town Market		Central Market		factories	
Who Sells	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
	%	%	%	%	%	%	%	%	%	%	%	%
Red Peas	88	100	6						6			
Beet Root	100	50										50
Cabbage	79	100							21			
Cucumber	83	-							17	100		
Green banana	100	100	-									
Sweet potato	100	100.										
Yam	87	60	4				6		3	40		
Coffee	100	100										

Source: Women Food Producers Survey (IICA/IDB 1993).

Table 35. Typical Customers by Crop Type.

Crops	CUSTOMER				
	Not stated (%)	Consumer (%)	Higgler/Hawker (%)	Agent/middle-man (%)	Processor (%)
Gungo		17.65	82.35		-
Red Peas	5.71	14.29	77.14	2.86	-
Peanut	-	6.25	93.75	-	-
Carrot	3.33	10.00	80.00	3.33	33.33
Cabbage	11.54	19.23	42.31	26.92	3.33
Lettuce	5.88	11.76	29.14	52.94	-
Cauliflower			10.00		-
Pak Choi		11.11	44.44	44.44	-
String Bean	14.29	14.29	57.14	14.29	
Tomato	8.33	11.11	77.78	2.78	
Cucumber	14.29	14.29	71.43	-	-
Pumpkin	-	-	71.43	28.57	-
Escallion	7.69	7.69	84.62	-	-
Sweet Pepper		12.50	62.50	25.00	-
Corn	6.25	12.50	81.25	-	-
Irish Potato	7.69	26.92	61.54	3.85	-
Sweet Potato	-	21.43	78.57		-
Cassava		8.33	58.33		33.33
Yam		9.64	83.13	3.61	-

Source: Women Food Producers Survey (IICA/IDB 1993).

Among the typical customers of small-scale producers, the higgler/hawker appears to be the most popular. Table 35 shows the distribution of customers by type of crop. The data in this table show that the higgler/hawker makes purchases of individual crops ranging from a low of approximately 30% for lettuce to a high of 94% for peanuts. Only for 4 of the 19 selected crops does distribution to higglers/hawkers fall below 70% of the sales. It also seems that women food producers sell the bulk of their produce at the wholesale level of distribution. This can be seen from the data, which show that while purchases by consumers range from between 6% and 27% of the selected crops, wholesale purchases (which include the combined purchases of higglers/hawkers and agents/middlemen) account for between 20% and 100%. This is consistent with the data in table 34, which show that the bulk of produce is sold at the farm gate. Higglers/hawkers must, therefore, be the dominant purchaser at the farm gate. This is also consistent with earlier studies of higglers.

This selling practice implies either a lack of interest in further marketing of their produce or a lack of means to do it. Several factors appear to have influenced this behavior:

- Women food producers appear to fully utilize their time on farming and reproductive activities during the working week. Table 36 provides some indication of the day of the week with most free time. The data in this table show that Sunday is the day when most women have available time. Sunday, however, is not an official or popular market day.

- Nearly all women food producers have to rely on public transportation, which is inconvenient and unsuitable. Table 37 shows that less than 1% of survey producers own any of the popular modes of transportation. When transportation is unreliable and presents inconveniences for the producer, extra time is needed to access such transportation. Small-scale women food producers, however, are already strapped for time. Their many farming and reproductive chores leave little or no time for marketing beyond the farm gate, which by itself is a time-consuming activity.

In the area of agro-processing, the main factors that influence the participation of rural women can be drawn from a case study of two agro-processing projects involving women at the community level. The first of these is the St. Elizabeth Bammy Project. This project is perhaps the first attempt to modernize and commercialize the processing of cassava through community organizations of rural women. Although the project is over 20 years old and is judged to be potentially economically viable, it has never been able to operate on a sustained basis from internally generated revenues. It has survived this long with periodic doses of grants from governments and external donor agencies. Each grant serves only to revive it from near death after the previous grant has been totally expended.

With this stop-and-go situation, participating women have lost interest and confidence in the project and, as a consequence, the project presently has only a skeleton of the original membership, with the scale of operation drastically reduced. It now awaits another dose of grant to revive itself.

The second case study is the North Clarendon Development Project. This is also a community agro-processing project involving mostly rural women, but it also includes men.

Table 36. Respondents Days of the Week with Most Free Time in Parish.

Parish	DAY						
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Total	112	6	2	5	4	1	27
St. Ann	8	2	-	-	-	-	1
Trelawny	24	2	1	-	-	1	4
Hanover	4	-	-	1	-	-	-
Westmoreland	4	-	-	1	-	-	-
St. Elizabeth	36	2	1	2	4	-	3
Manchester	28	-	-	1	-	-	9
Clarendon	8	-	-	-	-	-	10

Source: Women Food Producers Survey - IICA/IDB 1993.

Like the cassava project, this project uses indigenous raw materials, substituting fruits for cassava. It processes mainly mixed peels from a range of fruits produced or gathered from the community. This project started in 1975.

In contrast to the cassava project, however, it has remained self-sustaining and has exploited marketing opportunities for its products. The community members have remained loyal, motivated, and interested. The main difference between the two projects appears to lie in the organization and management aspects.

The cassava project had tentative management and apparently poor leadership, with a proper management structure never put in place. It operated using the concepts of a cooperative, but the cooperative management structure was never fully implemented. A management audit conducted on the project in 1991 revealed the following, among other things:

1. The project was not self-sustainable.

2. Wide-ranging deficiencies in management were linked to the poor education of the women.

3. The project was potentially viable, but there was a danger of outside leadership dominating and acting in their own self interest.[19]

In contrast, the North Clarendon project had consistent leadership and a sound management structure in place. It was started using cooperative principles of management, but was changed to a limited liability company in which the shares were sold to the members. Further, the company pursued a policy of training its members in all areas relevant to the operations of the business.

From this comparison of the two projects, it seems clear that given the generally low educational level of rural women, the ability to identify good leadership and to implement an appropriate management structure is perhaps the single most important factor to the success or failure of women's participation in agro-processing at the community level.

As pointed out earlier, there are also a number of other agro-processing projects involving rural women at the community level. These fall under the SS/HE division of RADA and are presently in the early years of operation. Accordingly, they are being supported by grants in one form or another. The sustainability of some of these projects is still to be tested and proven. Preliminary information, however, indicates that access to certain raw materials could be a constraining factor. The price of locally produced raw materials has always been a problem for the agro-processing industry. High prices have not made the products competitive with products processed from imported raw materials. The items typically used in the processing industry include peanuts, pineapples, and tomatoes.

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[19] Management audit commissioned by the Canadian High Commission, one of the supporters of the project.

PART FOUR: POLICY RECOMMENDATIONS

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

Although a fair amount of improved technologies are available for small-scale producers in Jamaica, the rates of adoption remain largely inadequate. Recommended practices are either not followed, as in the case of land uses, cropping systems, and postharvest handling, or misused, as in the case of inorganic fertilizers and chemicals for crop care. As a consequence, productivity remains below expectations. Several factors appear to have contributed to this state of technology on the farms of small-scale producers generally, and on women's farms in particular:

- The government agricultural extension service, which has been the main agent for the transfer of technology, has never been given the resources to provide adequate coverage for the large number of producers.

- The generally low educational level of small-scale food producers has seriously constrained their access to improved technologies through the print media, which are widely used, in the form of pamphlets, brochures, labels, manuals, and so on.

- The operations of small-scale food producers are characterized by a persistent shortage of working capital, which is linked to their limited access to credit. This has restricted the purchase of vital inputs relating to improved technologies.

- The dual roles of women in production and reproduction have curtailed their participation in agricultural training activities, which are normally planned and executed without gender concerns.

Notwithstanding the availability of improved technologies in many aspects of small-scale agricultural production, much remains to be done. Research so far in the domestic food crops subsector has focused mainly on traditional problems such as varietal improvements, fertilizer use, and disease control. Less attention appears to have been placed on techniques that would explicitly take into account the built-in problems of water, terrain, and the financial resource base of the small-scale producers.

There is a dominance of traditional implements and tools on the farms of small-scale producers. These are not only contributing to inefficiencies in production, but some of these are clearly inappropriate for women, particularly during pregnancy. At the same time there is an increasing shortage of male labor. Given these circumstances, normal farming activities on female farms are severely hampered.

Historically, less attention appears to have been given to the development of technologies for food processing at the farm level than has been given to crop and livestock production, or even

to postharvest handling. Until recently, whatever was accomplished in this area was largely restricted to the efforts of the government Food Technology Institute. But even in this case, the focus has been on the formal agro-processing subsector.

In recent years, however, a number of initiatives have been directed toward the development of agro-processing at the farm and community levels, with women playing leading roles. While market studies indicate positive responses to the products, however, the availability and price of raw materials appear to be a very serious constraint to the success of these organized operations.[20]

The position of women as the leading distributors of agricultural commodities on the domestic market spans many decades. Today, upwards of 20,000 women (popularly known as higglers) make a livelihood from this economic activity. This means that, with the size of the household averaging about five individuals, this occupation impacts directly on well over 100,000 family members annually. It is very likely that women will hold this position for the foreseeable future and that their numbers may even increase, given the planned increases in production of the products they sell.

As small individual operators with generally low education levels, they lack many of the resources to provide themselves with the infrastructure, facilities, and services required to carry out the functions of marketing efficiently and economically. Accordingly, their operations are characterized by the following:

- A lack of not only the appropriate techniques for storing, grading, packaging, and general handling of the commodities in which they trade, but the proper facilities as well.

- A reliance on private transportation services which are not designed or prepared for the transport of perishable agricultural commodities or for the transport of passengers in many cases. Transportation facilities are, therefore, in most instances, quite unsuitable for the higgler's purpose.

- A reliance on government provision of market buildings that are often not provided with basic amenities, or equipped with marketing facilities. And even where these are provided, they are usually not properly maintained.

As a consequence, not only are the operations of the higgler regarded as economically inefficient, but they suffer great hardships and indignity in providing what is generally accepted as a very vital service. Their survival has been, for the most part, at a subsistence level and has been made possible, perhaps, by the resilience and resourcefulness they display. It is not surprising, therefore, that unlike most other business operators, the vast majority of higglers have not been able to accumulate wealth after 20 or 30 years in the business. Instead, their standard of living remains one of the lowest in Jamaican society.

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[20] FAO, Processed Fruits and Food Market Study (1993).

B. Recommendations

1. Given the generally low educational level of women food producers, agricultural extension methods must rely heavily on the direct contact techniques for technology transfer to this group. At the same time, the traditional extension services of the government cannot be relied on to effect adequate transfer through this method. It has also been established that the leading source of agricultural information for any given farmer has been other farmers in the community.

   Under these circumstances, it is recommended that an extension program that would take into account the special situations of women, be designed and implemented for small-scale producers. This program would target selected farmers in farming communities and would utilize demonstration plots and field demonstrations as the main dissemination technique. The farmers trained in this program would then pass on the knowledge to other farmers through the existing systems of informal communication in each farming community. In this way, the training would achieve wide coverage on a sustainable basis.

2. As a matter of urgency, a combination of research and extension efforts needs to be directed toward the raw material situation for agro-processing. The objective must be to reduce the cost of production through increased productivity. Additionally, the training of women in the management of small processing operations appears to be essential.

3. It is recommended that the problem of equipment and tools on the farms of small-scale producers generally, and of those of women food producers in particular, be further investigated and given priority for research and extension services.

4. Policy directives are well overdue to address the conditions of higglers. In this regard, the following areas are recommended for policy consideration:

   - **Institutional development**. There seems to be a need for the organization of higglers into some legal entity that would allow for the ownership, control, and sharing of appropriate marketing infrastructure, facilities, and services. The existing Producers Marketing Organization concept in the Ministry of Agriculture and the government's privatization programs may be good starting points in considering a policy for higglers.

   - **Long-term credit.** This will be necessary for the provision of the necessary facilities and services, including transportation.

C. Project Ideas

1. Extension Training Program for Women Food Producers in Jamaica

Summary

This project plans to train some 4000 women farmers in the application of improved farming practices, including the proper use of fertilizers, agricultural chemicals, the Mini-Sett Yam

Technology, and other improved farming practices. The main objective will be to improve the productivity of small-scale women producers.

Training will be provided through on-farm demonstrations on some 80 plots strategically located in the parishes of Trelawny Manchester and St. Ann. A public education awareness program will be an integral part of the training strategy. A technical assistance team involving agricultural extension officers, gender issues experts, and subject matter specialists will design and deliver the training.

The project will be implemented through RADA under the Technology Transfer and Training Division. A project manager will be assigned to have specific responsibility for implementation.

The project is estimated to cost just over US$1 million and will have a duration of about 5 years.

Problem statement

Agriculture continues to be the fastest growing sector in the Jamaican economy, growing at 8.8% in 1993 and accounting for 24% of the employed labor force in that same year.

Women food producers account for between 20% and 25% of independent farmers. In absolute terms, this amounts to between 35,000 and 40,000 female farmers islandwide.

Domestic food crops make up the bulk of agricultural production and are produced largely by small-scale producers. In 1992, the total area of these crops under cultivation was in the region of 490,000 hectares. Small farms, however, suffer from relatively low levels of technology and, consequently, low productivity and farm family incomes.

While a fair amount of improved technologies are available, there is still a need for many more. Improved seeds, commercial fertilizers, and agricultural chemicals represent the main areas of available technology at present. Improved technology are, however, urgently needed in other areas such as farming system approaches and on-farm equipment and tools.

Not only are offering inadequate, but small-scale producers have only limited acces to what is available. As a consequence, recommended practices are only partially adopted. For example, fertilizers are widely used but largely missused. The same is true for agricultural chemicals. Similarly, conservation structures are put in place but are not maintained and recommended cultural practices are initiated but are not followed through.

Several factors contribute to the low rate of adoption. These include the following:

1. The main technology transfer institutions, the government agricultural extension service (now RADA), is inadequately staffed and lacks the financial resources to give adequate coverage to the large number of individual producers and to be efficient and effective.

2. The small-scale producers generally have low educational levels and, consequently, have little or no access to improved technologies that are provided through the print media, mainly in the form of bulletins, brochures, manuals, pamphlets, and labels.

3. The operations of small-scale producers are characterized by a shortage of working capital linked to limited access to credit. Hence, they are unable to purchase recommended inputs in recommended quantities and on a timely basis.

4. The planning and implementation of agricultural extension training does not explicitly take into consideration the special circumstances of women, namely that women have less time and less flexibility of available time to participate in extension training.

Given the growing trends for the government to reduce spending, it cannot be expected that meaningful technological improvements will take place through the traditional interventions of the government.

It is against this background that a special project is needed to address the problem.

Objectives and outputs

The goal of this project is to increase the productivity and incomes of small-scale women food producers in the parishes of Trelawny Manchester and St. Ann. The specific objectives are as follows:

1. To train 4000 women farmers over the three parishes in the following subject areas:

    a. Proper use of commercial fertilizers and agricultural chemicals.

    b. Improved methods of postharvest handling.

    c. Mini-sett yam technology and other improved methods of farming.

2. Design a system to facilitate the continued dissemination of information by the trained farmers to other community members.

The main outputs of the project will be the following:

1. Eighty demonstration plots distributed between the three parishes and strategically located in each parish.

2. 4000 small-scale women produced trained in improved agricultural practices, including the proper use of inorganic fertilizers and agricultural chemicals.

3. A community-focused arrangement in place and functioning for the continued dissemination of improved agricultural information among community members.

Technology

The project will be implemented through a combination of a public awareness program and a series of on-farm demonstration sites strategically located in selected farming communities in each parish. Each parish will have between 20 and 30 sites. Sites will be located on private farm holdings on a voluntary basis. Demonstrations and discussions will take place on these sites on scheduled days. The public education program will inform community members of the location of sites and the schedule of demonstration and discussions sessions. Further dissemination of the information received at demonstration sites will be passed on to family members, neighbors, and friends through existing community communication channels.

Scarce skills required

Among the requirements for this project will be agricultural extension specialists and a gender issues specialist.

These will be available from the pool of active or retired agricultural extension specialists in Jamaica. The gender issues specialist may be available from government or regional institutions in Jamaica, or Latin America and the Caribbean region.

Organization and Management

RADA will be the institutional home for this project. The project will fall directly under RADA's technology transfer and training division (TTTD). The director of this division will, therefore, have overall responsibility. A project manager will be assigned the specific responsibility for the day-to-day implementation activities. A technical advisory committee, chaired by the director of the TTTD and with representation of a cross section of relevant bodies, will be established to support the project manager.

Project schedule and duration

The project will be implemented in phases over a four- to five- year period. Phase 1 will be implemented as a pilot project in one parish. Phases 2 and 3 will include the other selected parishes.

2. Rural Highlers Association and Marketing Improvement Ventures

Summary

This project plans to assist rural higglers in organizing themselves and establishing a marketing organization owned and operated by them. Specifically, associations will then establish business entities to provide market facilities and infrastructure to the population of higglers.

The main objective of the project is to improve the efficiency of domestic marketing and the working conditions of higglers.

A program of technical assistance involving specialists in institutional development, agricultural marketing, and gender issues will be implemented, which, in collaboration with the Marketing Division of the Ministry of Agriculture and the Bureau of Women's Affairs, will provide the foundation for the planning and establishment of the associations. The project will be executed by the Ministry of Agriculture through the Marketing and Credit Division. It will be implemented over a period of about eight years, commencing with a pilot project in the parish of Manchester.

The project is estimated to cost approximately US$770,000, or just over J$23 million.

Objectives and outputs

The goal of this project is to improve prices and income levels of small-scale producers generally, and women producers in particular.

The specific objectives are as follows:

1. To improve the physical working conditions of rural higglers.

2. To improve the levels of income of this group.

3. To reduce the existing levels of inefficiencies in the system of internal distribution of domestic agricultural production.

The main outputs of the project will be the following:

1. Associations of rural higglers legally established and functioning.

2. A marketing company owned and operated by higglers.

3. A core group of higglers trained and skilled in the management and operation of the marketing company.

4. Adequate, appropriate, and reliable transportation services owned, or otherwise controlled, by higglers.

5. Postharvest handling services and facilities owned and operated by higglers.

Methods and technology

The objectives of this project will be achieved through a program of institutional development and training specifically for rural higglers islandwide. Higglers will first be organized into legal

associations on a parish basis. Each association will then establish business entities (marketing companies) to provide various marketing services and facilities. For example, under the government's privatization program, parish markets could be divested to associations of higglers. Similarly, the associations will purchase or otherwise acquire transportation services appropriate and adequate for the transportation of goods and passengers.

The ventures will be financed through equity contribution in the form of shares from the association membership and from loans. A technical assistance program, which would include a long-term institutional development adviser, will work with the Bureau of Women's Affairs and selected NGOs to assist in the establishment of higglers associations and the subsequent business entities.

Short-term specialists in marketing and gender issues will support the long-term advise.

Scarce skills required

No scarce skills are required for this project.

Organization and management

The Ministry of Agriculture will have overall responsibility for the project, through its Marketing and Credit Division. Day-to-day implementation will, however, be the responsibility of a project manager.

Project schedule and duration

The project will be implemented in phases over a period of about eight years. Phase 1 will be implemented in the parishes of Manchester and Trelawny as a pilot project.

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APPENDICES

Appendix 1. List of Domestic Food Crops and Annual Estimates of Production 1981-91 (t).

CROPS	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
LEGUMES											
Broad Bean	179	167	203	257	281	213	208	176	167	229	232
Sugar Bean	222	179	213	300	278	184	176	132	143	218	189
Cow Pea	725	678	848	851	748	536	1134	525	408	440	454
Gungo Pea	2543	2209	2104	2150	2139	2513	1813	2138	925	1534	1623
Red Pea	4286	3377	3619	4292	4199	4478	4097	3139	3886	3625	3538
Peanut	2085	2263	2596	2533	3216	2134	2870	1598	2431	1861	2386
SUB-TOTAL	10040	8873	9583	10383	10861	10058	10298	7708	7960	7907	8422
VEGETABLES											
Beetroot	562	585	511	763	683	650	690	889	861	875	631
Cabbage	15796	16293	17152	17954	16124	15159	14195	13069	17413	17336	14999
Calaloo	12201	10384	10209	11776	11089	10822	9778	9178	10336	11393	10744
Carrot	14554	14804	15665	17635	14580	14674	15293	11598	14179	15530	15225
Cauliflower	11	44	97	174	349	262	207	217	371	551	399
Celery	35	39	69	58	93	82	100	70	81	115	78
Cho-Cho	5184	4454	4355	6032	4884	4469	4471	3258	4289	4726	3493
Cucumber	5990	5124	6486	7135	11882	13182	13567	8565	8202	8115	6885
Egg-Plant	51	55	44	67	49	624	320	39	184	80	61
Iceburg Lettuce	912	1285	1996	1870	1690	1826	2077	1950	2580	1910	3025
Other Lettuce	271	200	94	211	335	275	340	298	492	445	354
Okra	1315	1524	1540	2243	1331	1188	1336	851	1119	1255	1177
Pak-Choi	-	-	-	-	635	1054	1209	1235	1601	2096	3009
Pumpkin	27620	23317	32473	39007	30354	25659	26947	21763	23696	26249	26337
String Bean	814	764	1105	1367	1581	1801	1792	1081	2179	2087	3079
Tomato	22536	17032	19162	29539	19500	16457	15966	12957	15270	14261	10936
Turnip	1432	1517	1342	1589	1412	1211	1661	984	1300	1104	864
SUB-TOTAL	109284	97421	112300	137420	116571	109395	109949	88002	104353	108128	101196
CONDIMENTS											
Escallion	5706	2400	3972	4521	3459	3061	4466	2735	3036	4211	2643
Ginger	446	535	402	552	613	1094	836	632	660	865	827
Onion	1572	1429	1846	3831	4031	1680	2033	1972	2732	3178	1210
Hot Pepper	1229	997	1978	2908	2191	2106	20210	1914	1725	2137	2595
Sweet Pepper	1293	965	1285	3133	4905	5281	5577	2703	2077	2414	2551
Thyme	195	193	201	202	167	195	232	211	271	353	396
SUB-TOTAL	10401	6519	9684	15147	15366	13417	33354	10167	10501	13158	10224
FRUITS											
Pineapple	4870	5193	6326	8004	7412	7066	7394	9385	9711	9332	9764
Paw-Paw	1929	1662	1652	2127	2081	2202	2885	2902	3175	3861	2769
Watermelon	4866	2905	3491	5518	2476	2567	3860	3512	4027	6080	4787
SUB-TOTAL	11665	5386	11469	15649	11969	11835	14139	15799	16913	19273	19320
CEREALS											
Hybrid Corn	1931	104	-	4	74	1218	1110	59	778	114	752
Ordinary Corn	2611	2990	3653	3676	3817	3319	2859	2003	2120	2047	2152
Sweet Corn	-	-	-	-	-	22	15	6	16	6	25
Rice	1860	1536	3387	5364	4260	2471	2257	1731	513	220	562
SUB-TOTAL	6402	4630	7040	9044	8151	7030	6241	3799	3427	2387	3491
PLANTAINS											
Horse Plantain	16518	20003	17643	21221	23074	22669	22134	20694	7790	22113	21223
Other Plantain	7625	8406	7458	8288	7330	7894	6034	5479	2126	5455	5469
SUB-TOTAL	24143	28409	25101	29515	30404	30563	58731	26173	9916	27568	26692
POTATOES											
Irish Potato	13808	7383	7603	12310	7075	5439	9443	9893	10818	14296	7548
Sweet Potato	30228	21274	24090	35898	31676	26978	24322	19800	21818	21462	17459
SUB-TOTAL	44036	28657	31693	48208	38751	32417	33765	29693	32636	35758	25007
YAMS											
Lucea Yam	14303	12069	12069	13225	17290	15695	14812	13891	12966	13233	12962
Negro Yam	24412	18632	18963	20015	24201	19020	22999	18789	15720	16843	19476
Renta Yam	23348	21201	22880	24743	26726	27436	28507	28531	13023	17830	19356
St. Vincent Yam	10152	9764	11276	11960	12207	10875	11628	8938	6774	7427	7001
Sweet Yam	7448	6894	8325	9366	10070	10445	11052	9157	9643	11111	12901
Tau Yam	5885	5512	6186	7501	7659	7766	7984	8657	5272	8448	9599
Yellow Yam	46136	39390	47851	58802	62119	70542	75647	75670	66935	84607	102113
Other Yam	4498	3517	3084	3369	3495	3194	2823	3233	2040	1963	2696
SUB-TOTAL	136182	116979	130634	149061	163767	164973	175452	166866	132373	161467	186104
OTHER TUBERS											
Bitter Cassava	13166	10010	10034	10232	9771	8597	9594	7445	5334	6705	6448
Sweet Cassava	8714	6947	7154	9445	8083	7925	7426	6131	4794	5098	5663
Coco	12976	12087	11767	14866	13728	13161	10321	10624	9060	10249	10320
Dasheen	15231	13508	13222	16163	17737	18458	16448	9157	13055	13006	11905
SUB-TOTAL	50087	42552	42177	50706	49319	48123	43789	33357	32243	35058	34336
Sorrel	508	468	581	702	802	693	668	420	431	540	624
GRAND TOTAL	402240	339426	379681	465133	445159	427811	485518	381564	350322	411239	415416

Appendix 2. List of Technology Institutions in Jamaica as of 1989.

The Main Regional Institutions include the following:

1. Caribbean Agricultural Research and Development Institute (CARDI)
2. Caribbean Food and Nutrition Institute (CENI)
3. University of the West Indies (UWI)
4. Inter-American Institute for Cooperation on Agriculture (IICA)

The Main Statutory Institutions are the following:

1. Rural Agricultural Development Authority (RADA)
2. Banana Board (Research Department) (BB)
3. Citrus Growers Association (CGA)
4. Coconut Industry Board (CIB)
5. Sugar Industry Research Institute (SIRI)
6. Scientific Research Council (SRC)
7. Food Technology Institute (FTI)
8. Agricultural Development Foundation (Research Program) (JADF)

Within the Ministry of Agriculture, the relevant departments are the following:

1. Research and Development division (RDD)
2. Fisheries Division (FD)
3. Forestry and Soil Conservation Division (ESCD)
4. Plant Protection Division (PPD)
5. Veterinary Services Division (VSD)

Appendix 3

Extracts from Farmers Manual on the Mini-Sett Technology Yam Project

ISSN-0534-5391
A21JM-93/001

RADA IICA

GROWING MINI-SETT YAM IN JAMAICA

A MANUAL FOR FARMERS

Prepared By Maria Protz

For

IICA OFFICE IN JAMAICA

Inter-American Institute for Cooperation on Agriculture

CONTENTS

WHAT IS

MINI-SETT YAM?

Mini-Sett is a new technology for growing yam for the export market. In traditional yam cultivation, the yam heads of large yams must be removed before exporting. In Mini-Sett technology, however, you can produce small, whole yams that are more uniform in shape which do not need to be treated with chemicals before they are exported. For this reason, Mini-Sett yams are very desirable for the export market.

SOME ADVANTAGES OF GROWING MINI-SETT YAM

SOME ADVANTAGES OF GROWING MINI-SETT YAM:

1. Mini-sett is a valuable export crop which does not need to be chemically treated before export.

2. Mini-sett can be grown on hillsides using sustainable agricultural methods.

3. Mini-sett makes better use of planting material so that more yam is harvested.

4. Mini-sett does not require the large sticks that are used for traditional yams.

5. Mini-sett is a low risk crop with a secure export market that will yield good profits.

Appendix 4. Cost of Production Studies of Selected Crops.

Cost of Production Estimate for a One (1) Acre Farm (J$)

Crop: Negro Yam

ITEMS	Unit	No. of Units	Cost per Unit ($)	Total Cost ($)
LABOR OPERATIONS				
Land Clearing (prorated)	ac.	1	900	900
Digging Hills (prorated)	work day	20	80	1 600
Dropping & Planting	work day	15	80	1 200
Staking & Tying	work day	6	80	480
Cut & Clean Trench (prorated)	work day	10	80	800
Weeding & molding	work day	15	80	1200
Fertilizing	work day	1	80	80
Twining & Tending	work day	6	80	480
Reaping and Preparing for Market	work day	20	80	1600
Transport to Farm Gate	lb.	14 000	0.4	5600
SUBTOTAL				13 940
MATERIAL INPUTS				
Heads	lbs	6 000	7	42 000
Stakes	each	1 000	4	4 000
Fertilizer	cwt.	4	255	1 020
SUBTOTAL				47 020
OTHER COSTS				
Contingencies	10% of Labor & Material			6 096
Tools	5% of Material			2 351
Land Charges	$100/ac/yr.			100
Supervision	15% of Labor & Material			9 144
Interest on Working Capt.	23%/yr. for 9 months			13 567
SUBTOTAL				31 258
TOTAL COST				92 218

ASSUMPTIONS

1. Casual labor rate = 80 ($)
2. Marketable yield = 12 000 (lbs)
3. Interest rate not calculated for 12 months and transport to farm gate will not be incurred at the beginning of the crop.

Cost of production per lb. = 7.68 ($)

FARM MANAGEMENT SECTION
ECONOMIC PLANNING DIVISION
MINISTRY OF AGRICULTURE
HOPE GARDENS (6)
JUNE 1993

Cost of Production per Acre (J$)

Crop: Sweet Potato

ITEMS	Unit	No. of Units	Cost per Unit ($)	Total Cost ($)
LABOR OPERATIONS				
Land Clearing	ac.	1	900	900
Ploughing	ac.	1	1 000	1 000
Cross Ploughing	ac.	1	700	700
Ridging	ac.	1	700	700
Applying Preemergence	appl	1	85	85
Prepare, Treat, Plant, Slips	work day	15	80	1 200
Spraying	appl	2	85	170
Fertilizing	work day	1	80	80
Weeding & Molding	work day	15	80	1 200
Reap, Grade & Bag	work day	12	80	960
Transport to Farm Gate	lbs	10 000	0.4	4 000
SUBTOTAL				10 995
MATERIAL INPUTS				
Slips				
(Purchase, Cut & Transport	each	1500	0.35	535
Fertilizer	cwt.	4	255	1 020
Pesticides	pt.	2	280	560
Weedicide	pt.	2	1 262	2 524
SUBTOTAL				4 629
OTHER COSTS				
Contingencies	10% of Labor & Material			1 562
Tools	5% of Material			231
Land Charges	$100/ac/yr.			50
Supervision	15% of Labor & Material			2 344
Interest on Working Capt.	23%/yr. for 6 months			2 278
SUBTOTAL				6 466
TOTAL				22 090

ASSUMPTIONS
1. Casual Labor rate = 80 ($)
2. Normal yield = 10 000 (lbs.)

Cost of production per lb. = 2.21 ($)

FARM MANAGEMENT SECTION
ECONOMIC PLANNING DIVISION
MINISTRY OF AGRICULTURE
HOPE GARDENS (6)
JUNE 1993

Cost of Production Estimate for a One (1) Acre Farm (J$)

Crop: Gungo Peas

ITEMS	Unit	No. of Units	Cost per Unit ($)	Total Cost ($)
LABOR OPERATIONS				
Land Clearing	ac.	1	900	900
Digging Holes	work day	6	80	480
Planting	work day	3	80	240
Fertilizing	work day	3	80	240
Sprayling	appl.	4	85	340
Weeding	cycles	3	80	240
Reaping & Threshing	work day	12	80	960
Transport to Farm Gate	work day	1	80	80
SUBTOTAL				3 480
MATERIAL INPUTS				
Seeds	lbs.	8		360
Fertilizer	cwt.	3		765
Pesticides	lbs.	8		2 240
SUBTOTAL				3 365
OTHER COSTS				
Contingencies	10% of Labor & Material			685
Tools	5% of Material			168
Land Charges	$100/ac./yr.			100
Supervision	15% of Labor & Material			1 027
Interest on Working Capt.	23%/yr. for 12 months			2 030
SUBTOTAL				4 009
TOTAL				10 854

ASSUMPTIONS
1. Casual labor rate = 80 ($)
2. Normal yield = 1 200 (lbs.)

Cost of production per lb. = 9.00 ($)

FARM MANAGEMENT SECTION
ECONOMIC PLANNING DIVISION
MINISTRY OF AGRICULTURE
HOPE GARDENS (6)
JUNE 1993

Cost of Production Estimate for a One (1) Acre Farm (J$)

Crop: Tomato

ITEMS	Unit	No. of Units	Cost per Unit ($)	Total Cost ($)
LABOR OPERATIONS				
Land Clearing	ac.	1	900	900
Ploughing	ac.	1	1 000	1 000
Refining	ac.	1	500	500
Nursery Cost	work day	12	80	960
Transplanting	work day	15	80	1 200
Fertilizing	work day	12	80	960
Spreading Mulch	work day	4	80	320
Weeding	work day	20	80	1 600
Stkng; Typing; Gormandizing		20	80	1 600
Spraying	appl.	7	85	595
Reaping & Grading	work day	25	80	2 000
Transport to Farm Gate	lbs.	10 000	0.4	4 000
SUBTOTAL				15 635
MATERIAL INPUTS				
Seeds	lbs.	0.5	775	388
Fungicide	lbs.	20	185	3 700
Fertilizer	cwts.	8	280	2 240
Insecticide	lbs.	15	180	2 700
Stakes	each	7 000	0.7	4 900
Mulch (Incl. Transport.)				1 700
SUBTOTAL				15 628
OTHER COSTS				
Contingencies	10% of Labor & Material			3 126
Tools	5% of Material			781
Land Charges	$100/ac./yr.			100
Supervision	15% of Labor & Material			4 689
Interest on Working capt.	23%/yr. for 4 Months			3 033
SUBTOTAL				11 730
TOTAL				42 992

ASSUMPTION

1. Casual labor rate = 80 ($)
2. Marketable yield = 10 000 (lbs.)
3. Interest rate not calculated for 5 months since weeding, reaping, and transport to farm gate will not be incurred at the beginning of the crop.
4. Insecticide used is Dipel.

Cost of production per lb. = 4.30 ($)

FARM MANAGEMENT SECTION
ECONOMIC PLANNING DIVISION
MINISTRY OF AGRICULTURE
HOPE GARDENS (6)
JUNE 1993

Appendix 5

List of Seeds and Chemicals Imported Annually into Jamaica.

SEEDS

STRING BEANS ..... Avalanche, Harvester
LIMA BEANS ..... Fordhook
KIDNEY BEANS ..... California Light & Dark Red
BEET ..... Detroit Dark Red
BROCCOLI ..... De Cicco
BERMUDA GRASS ..... Hulled & Unhulled
CABBAGE (HYBRID) ..... Fortuna, K.K. Cross, K.Y. Cross
CABBAGE ..... Early Jersey, Wakefield
CALLALOO ..... Local Strains
CANTALOUPE ..... Magnum 45, Perlita
CARROTS .... Kuroda, Danvers 126, Chantenary Red Cored
CAULIFLOWER ..... Snow Queen, Snow Ball
CUCUMBER ..... Dasher II, Poinsett
CELERY ..... Tall Utah
CORN (SWEET) ..... Bonanza
EGG PLANT ..... Black Beauty
LETTUCE ..... Mignonette, Great Lakes 659, Minetto
OKRA ..... Emerald, Clemson Spineless
ONION ..... Texas Early Grano, New Mexico Yellow
ONION (HYBRID) ..... Granex Hybrid
PEPPER (SWEET) ..... Yolo Wonder, California Wonder
PEPPER (HOT) ..... Scotch Bonnett (Local Strains)
PAK CHOY ..... A Strain (Japanese)
PUMPKIN ..... Local Strains
RADISH ..... Crimson Giant, Early Scarlet Globe
SQUASH ..... Onyx, Zuchlong, Dark Green Zucchini
..... Ambassador,
TOMATO ..... Roma, Manalucie, Tropic, Floradade, Oxhart
TOMATO (HYBRID) . . .Duke, Peto 98, M.H.V.F. 785, UHN 63,
..... UHN 65, M82
TURNIP ..... Purple Top White Globe
WATERMELON ..... Charleston Grey
WATERMELON (HYBRID) . . Prince Charles, Royal Charleston,
..... Royal Jubilee
GRASS ..... Bermuda
SNOW PEAS ..... Melting Sugar
BRUSSELS SPROUTS

HERBICIDES

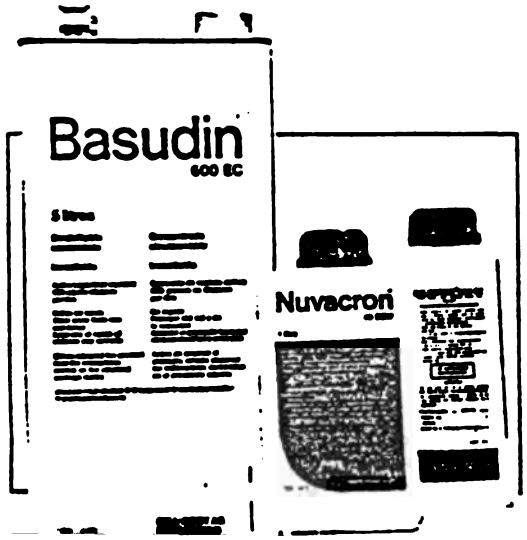
Gramoxone Super ..... 1 L, 1 Gal., 200 L
Fusilade 2000 ..... 250 Ml., 1 L., 25 L
Gesapax 500 FW ..... 20 L. Pail
Gesapax 80 WP ..... 20 Kg.
Gesapax Combi 500 FW ..... 20 L. Pail
Gesapax Combi 80 WP ..... 20 Kg.
Gesaprim 80 WP ..... 20 Kg.
Gesaprim 500 FW ..... 20 L. Pail
Gesatop Z 500 FW ..... 20 L. Pail
Gesagard 50 WP ..... 20 & 5 Kg.
Gardoprim ..... 20 Litre
2,4-D, Estemine, Amine . . 44,5 & 1 Imp. Gal. Drums or Pails
Dalapon Grass Killer ..... 55 lb.
Daconate 4 (M.S.M.A.) ..... 55, 5, 1 U.S. Gal Drums/Pails
Dacthal W75 ..... 24 & 4 Lb.
Propanil 35 EC (Rice Herbicide) ..... 55 & 5 U.S. Gal.
Treflan ..... 200 Litres, 5 U.S. Gal.
Igran ..... 20 L.
Dual ..... 5 & 1 L.

STICKER SPREADER
Surfactant AP ..... 55,5, 1U.S. Gal. Drums/Pails and 16 oz.

GROWTH INHIBITOR
Luxan Anti Sprout ..... 1 Litre

INSECTICIDES/RODENTICIDES

CYMPERATOR	1 Litre
PRIMICID	25 Litres
ACTELLIC	250 Mls., 1 Litre
BASUDIN 600 EC.	250 Ml., 1 Litre, 5 Litres
BASUDIN 40 WP	1/2, 1, 5 and 50 Kg.
MALATHION 57 EC	55, 5 and 1 U.S. Gal. Drums
FENITROTHION 50 EC	55,5 and 1 U.S. Gal. Drum/Pail
DIMETHOATE 40 EC.	1 Litre, 55, 5 and 1 U.S. Gal. Drum/Pail
NUVACRON	1 Litre
SELECRON	500 Mls., 1 Litre
FENOM	250 Mls., 1 Litre
SLUGOCIDE	1, 3 and 25 Lbs.
RATTEX (RAT BAIT)	2, 40 Lb. Block/Carton
KLERAT	4 X 20 Gm. and 20 X 20 Gm. Blocks
NEORON	500 Mls., 1 Litre
TRIGARD	300 Gm.



FUNGICIDES/NEMATICIDES/BACTERICIDES

DACONIL 2787-75 WP	2.2, 55 and 44Lb. Drum/Packet
BRAVO 500 FW	16 oz., 2.5 Gal., 3.5 Litre, 30 Gal.
MANCOZEB	1/2 lb., 3 lb., and 55 lb.
RIDOMIL MZ	1 Kg. and 1/2 Kg.
RIDOMIL PLUS	5 Kg. and 25 Kg.
RIDOMIL 5G	5 Kg. and 20 Kg.
AGRI STREP	1/2 lb., 25 lb.
CAPTAFOL	1 Litre
TILT	5 & 50 Litres
BANROT	2 lb.
COPPER OXYCHLORIDE	55 lb.
MANZATE D	3 lb.
MANZATE 200	3 lb.
BENLATE	2 lb.
MIRAL	2 & 25 Kg.

Appendix 6

Summary of Research Work Conducted in 1970-74 in Jamaica.

CEREALS

Maize (*Zea mays*)

Programme

1. Mass Selection in Composite material.
2. Breeding.
3. Variety, Fertilizer Spacing and Interplanting trials

1970: (a) Variety Trial - Bodles - to test the relative performance in terms of yield of two Pioneer hybrids and two open pollinated varieties.

(b) Variety Trial– Grove Place - to test the relative performance of Composites and hybrids at high altitude.

(c) Variety Trial –Bodles—to test relative performance of Composites and hybrids at low altitude on Bodles Clay Loam (Map No. 217).

(d) Variety Trial—Bodles -to test the relative performance of two open pollinated varieties and 6 Pioneer hybrids.

(e) Variety Trial- Petersfield - to test the relative performance of two open pollinated varieties and six hybrids on Brown Bauxite soil.

1971: (f) Variety Trial—Grove Place - to test the relative performance of 6 Pioneer hybrids, 2 Composites and 2 locally bred 3-way crosses in Brown Bauxite soil at 1,600 ft. altitude.

(g) Variety Trial –Bodles—to test the relative performance of 6 Pioneer hybrids, 2 Composites and 2 Local 3-way crosses on Clay loam soils at 100 ft. altitude.

1972: (h) Maize Variety Trial - Bodles - to test comparative performance of a local Three-way-cross and seven Pioneer hybrids on Bodles Clay Loam soil.

(i) Maize Variety Trial—Petersfield - to test comparative performance of a local Three-way-cross and seven Pioneer hybrids.

(j) Maize Fertilizer Trial– Bodles - to determine the optimum nitrogen uptake in maize on Bodles Clay Loam.

(k) Maize Fertilizer Trial—Petersfield - to determine the optimum nitrogen uptake in maize on Brown Bauxite soil.

1973: (l) Maize Spacing/Fertilizer, Soil Treatment Observation Trial – Lawrencefield.

1974: (m) Maize Variety Trial interplanted with Pangola Grass – Grove Place.

Introduction: Two years after the Pioneer Hi-Bred Seed Company had been established in Jamaica in 1964 the Crops and Soils Department discontinued its limited plant breeding programme, but vigorously pursued the development of open pollinated varieties by means of the Mass Selection process. Breeding materials of two single crosses and one inbred line were however maintained, as these formed the parent material of a promising three-way cross developed by the Crop Agronomy Division. Other acceptable materials of good yield potential were unfortunately lost because of the unavailability of a suitable cooling unit for the seed store at Hope. Full collaboration was maintained between the Pioneer Seed Company and the Ministry in testing and evaluating successive hybrid varieties at various locations.

The areas of research undertaken were--

(1) Mass Selection in Composite Material
(2) Breeding
(3) Variety/Fertilizer/Spacing and Intercropping trials.

Justification: Redkote has reportedly performed exceptionally well in the United States. It gave high yields, showed resistance to Halo Blight strain 1, is highly tolerant but not immune to Common Blight, resistant to the alpha strain of seed-borne Anthracnose. The disease-resistant character of Redkote qualified it for trial in Jamaica as its resistance was in areas where local types showed much susceptibility.

Procedure: A rectangular plot of approximately ¼ acre was planted alongside the variety Miss Kelly to observe and compare its performance.

Observations: Redkote matures earlier than Miss Kelly but comparative yield was less. Redkote matures at a shorter height with stronger stout stalks, sheds about 30% of its leaves and shows higher resistance to shattering than Miss Kelly. It was not as susceptible to Golden Mosaic as Miss Kelly under similar conditions during the Summer of 1971.

1971: (2) ***Red Peas Variety Trial*** **Petersfield, Manchester, planted 26/5/71, harvested 10/8/71**

Soil Type: **Brown Bauxite (Map No. 73)**

Objective: **To compare at High elevation and on Brown Bauxite soils the relative performance of the four leading local cultivars (Miss Kelly, Round Red, Portland Red and Cockstone) against California Light Red and the most recent introduction, Redkote (both from the U.S.A.). These varieties have previously been evaluated at Bodles (low elevation) on Bodles Clay, Soil Type No. 217.**

Justification: **The cultivars to be examined in his trial have been assessed under lowland conditions on Bodles Clay. It is an accepted policy not to plant peas in the lowlands during the summer months as beans planted at this time are prone to a severe attack of Golden Mosaic which robs the farmer of 20-50% of his potential yield from beans planted during the optimum period (15 November-15th December). With local production falling so far short of the national requirements (1,500 short tons) every effort should be made to maximize and spread production. Hence the need for high elevation-summer trials.**

Procedure: **Varietal inputs were Miss Kelly, Round Red, Portland Red, Cockstone, Redkote, and California Light Red. Six replicates of randomized blocks were laid down. Plots were 12 x 12. Peas were planted in 2' rows 3" along the rows. Each plot comprised 6 rows, 4 experimental with 2 guard rows. 1½ ft. of guard plants were left at ends of each experimental row. Soil treatment included application of 3 pints of Heptachlor in 75 gals. water in (2 gals of mixture to 82' of row). Insecticide and Fungicide treatments included alternate sprayings of Sevin or Dipterex (insecticide) at 2 lb./acre and 2 lb. Dipterex and 2 lbs. M-45 or Kocide per acre applied every 8 days. Twelve plants were selected at random and No. Pods, No. Peas in Pods, and weight of grains checked—Table I, No. of plants reaped and overall plot weight noted-Table II.**

Results: **Round Red produced highest pod/plant ratio; Portland Red the highest pea/pod and Miss Kelly the highest weight of grain (Table I). Although Redkote yielded the lowest pod/plant and pea/pod ratio it gave the second highest weight of grain.**

LEGUMES

COW PEAS: *(Vigna sinensis)*

Programme:

1971: (1) ***"African Red" variety increase plot*** – Bodles, planted Spring 1971 from seed obtained from Surinam—to observe determinacy.

1972: (2) ***"African Red" variety increase plot*** – Lawrence field—planted December 1972—to further increase seeds and to observe determinacy.

1971: (1) ***"African Red" Increase plot*** –Bodles (Spring 1971)

Soil Type: Bodles Clay Loam—Map No. 217

Objective: To increase a small sample of the African Red variety of cowpeas obtained from Dr. Raunard of Surinam.

The African Red variety of cowpea was highly recommended as being a good yielder, early maturing, determinate in character, and as the name implies red in colour. These desirable qualities were not common to the types of cowpeas previously grown on a commercial scale in Jamaica. The determinate characteristic of this pea, coupled with the red which it gives to the popular Jamaican dishes –'Rice and Peas' and Red pea Soup—made it a potential favourite among farmers and consumers alike. In these circumstances there exists an urgent need for seed increase to be followed by expanded production.

Procedure: A small rectangular plot approximately one square, (66'x66') was planted at Bodles and all the inputs of pesticides and herbicides applied, and a high level of management maintained. Data in respect of time of maturity, determinacy and yield were taken. A further increase of seeds was planned for Fall planting.

Results: The African Red variety was found to be an early maturing (11-12 weeks), highly determinate, and gave a fairly good yield.

Discussion: The determinate character of African Red makes the variety highly desirable, and this quality has been one of the main factors which restricted production of cowpeas. The indeterminacy resulted in a time-consuming and thus expensive harvesting operation, and made mechanization impossible at this stage thus confining its production to small scale family enterprises. The red colour was popular and the small size of the seed was offset by its other desirable characteristics.

1972: (2) ***"African" Red Increase***—Lawrencefield planted December 1972

Soil Type: Caymanas Clay Loam—Map No. 127.

Objective: To further increase seeds secured from initial increase in order to make commercial expansion and consumer evalution of crop possible.

Procedure: 2 acres of peas were planted mechanically at a seeding rate of 30 lb/ac. A bed shaper with Planet Junior planters attached was used to plant rows 15" apart. The plot was sprayed at 8-day intervals with Dipterex insecticide at 2 lb/acre. Dithane M45 at 2lb/acre was added to alternate spray mixtures as a safeguard against fungus attack. The area was kept free from weeds and observed closely for disease symptoms.

Result: An yield of 900 lb/acre was realized. No disease problems were encountered. The determinate character of the peas was confirmed and wide consumer acceptance was acknowledged.

P.E.J.

GUNGO PEAS *(Cajanus cajan)*

Programme

1971: (1) *Variety Trial* - Caenwood Field Station— to compare determinacy and yield of dwarf varieties with the local "Pedro Giant"—under high rainfall conditions.

1972: (2) *Variety Trial* - Lawrencefield, Charlton, Bodles—as above, under low rainfall conditions.

1972: (3) *Increase Plots* of Pedro Giant, local Khaki variety and dwarf 27/4A at Bodles, Grove Place and Lyssons Field stations.

1972: (4) *Variety Fertilizer Trials* at Charlton and Bodles Field stations of 27/4A 12/2, Races, No. 17 and Pedro Giant.

1973: (5) *Increase Plots* of local Khaki, 27/4A and imported khaki at Bodles and Lawrencefield Stations.

1971: (1) *Variety Trial* –Caenwood Field Station (Portland) June 1970

Objective: To compare determinacy and green pea yield of five dwarf varieties 27/4A, 26/2, C11/33/34, 12/2, 54/3 with the local Pedro Giant. The dwarf types were obtained from selections of the University of the West Indies.

The dwarf types were being examined for determinacy to see if thought could be given to mechanical harvesting aimed at reducing labour cost in harvesting. Because of the wet weather for which Portland (a major producing area) is noted during the maturity months of the peas (December-January) it was decided that the green weight (unthreshed) would be examined.

Design: Rectangular plots were established as follows:—

27/4A	160	sq.	yds.	12/2	593	sq.	yds.
26/2	593	"	"	54/3	350	"	"
C11/33/34	660	"	"	Pedro Giant	667	"	"

All varieties, except Pedro Giant, were planted in rows 3 feet apart and 3 feet above the rows. Pedro Giant was spaced 4 ft. x 4 ft.

Observations & Results: None of the dwarf varieties could be regarded as determinate. The maturity period of some varieties was shorter than others, 54/3 and C11/33/34 being examples. 27/4A was the most prolific at blossoming and had the longest span of harvesting period. All dwarfs produced green peas in time for Christmas. There was no harvesting of gungo peas from Pedro Giant during the month of December. Yields, period of harvesting are summarized below:–

Variety	*Harvesting Months*	*Acreage*	*Yields: lbs/acre*
27/4A	December — March	1/30	23,760
26/2	" "	1/8	6,512
C11/33/34	" "	1/7	5,208
12/2	" "	1/8	6,504
54/3	" "	1/14	6,032
P G	January – March	1/7	3,920

Miss Kelly and Redkote gave a significantly higher number of harvested plants than the other cultivars. Miss Kelly gave the highest number of harvested plants and weight of grains (Table II). Redkote matured 7 days earlier than other varieties.

There was a comparatively low incidence of Golden Mosaic which usually plagues peas grown at low elevations during the summer months.

1971: (3) ***Red Peas Variety Trial***

Location: Albion, Manchester Planted 4/6/71, Reaped 24/8/71

Soil Type: Red Bauxite (Map No. 78)

Objective: To compare at high elevation (2,000 ft.) and on Red Bauxite soils the relative performance of the four leading local varieties (Miss Kelly, Round Red, Portland Red and Cockstone) against California Light Red and the most recent introduction from the U.S.A.—Redkote. These varieties have previously been evaluated at low elevation at Bodles of Soil Type 217 (Bodles Clay).

Justification: This trial aims at determining certain information about the production of the varieties of red peas:

1. Do the varieties perform at the same level of efficiency on the low lands as at high elevations?
2. Is there a differential in the yields potential of some varieties with the climb from sea level to the higher elevations?
3. Is soil type a factor of yield fertilizer level remaining constant? Will the performance on Red Bauxite be equal to or better than that of Bodles Clay or Brown Bauxite Soils?

Procedure: Six (6) varieties were used in this trial, namely, Miss Kelly, Round Red, Portland Red, Cockstone, California Light Red and Redkote. Six (6) replicates of randomised blocks were laid down. Plot size 12' x 12'. Planting distance 3 inches along furrows 2' apart. Fertilizer formulation of 12:24:12 at 3 cwt. per acre was applied in furrows, covered to a depth of 4" and peas planted 2" deep. Plots were sprayed with pre-emergence herbicide Dacthal, and Diphenamid and Gramoxone at 2¼ lbs. each of Dacthal and Diphenamid and 1 pint Gramoxone. The furrows of peas were watered down with Heptachlor at 3 pints per acre in 75 gallons water (2 gallons to 82 ft. of row.) Fungicide M45 and Insecticide Sevin or Dipterex were used to control pests. Insecticide at 2 lb/acre was applied every 8 days with fungicide added to alternate spray mixture.

Four (4) experimental rows were harvested with one (1) guard row bordering each plot. Six (6) plants at the end of each experimental row were left as guard plants.

Seed factors such as pod/plant and pea/pod ratio, weight of grain were evaluated.

Results: Round Red gave the highest pod/plant ratio. Portland Red gave the highest pea/pod ratio, and Miss Kelly produced the highest grain/weight ratio. Redkote produced the lowest pod/plant and pea/pod ratio but gave a higher yield than California Light Red, which gave the lowest yield. Miss Kelly was placed second to Portland Red in the pod/plant ratio and third to Round Red in pea/pod ratio.

Chalimbana
Makulu
Nachingivea white strain 43 (NWS-43)
Red Mwitude
Ex-Mazad NAP 117
Samkura 1969 70 Dodoman Bold seed
Ex - Songea
Natal Common
Sambura III 500 kg
Samgura 1969-70 Natal Common

Design and Layout: Single rows and half rows were planted with the few seeds that were available. Standard planting distance 2ft. rows. and 3 inches along rows. Sprayings were done with Dipterex or Malathion (insecticides) and Dithane (fungicide) to control pests. Fertilizer 12:24:12 at 3 cwt. per acre was applied.

Observations and Results: The yields were poor as a result of a severe attack of rust. Some of the varieties appeared scorched. Weed control was very poor as a result of strikes on the farm. Spraying was irregular and delayed irrigation often caused severe moisture stress.

P.E.J.

RED PEAS ***(Phaseolus vulgaris)***

Programme:

1971: (1) *'Redkote" Observation Plot*-Lawrencefield Field Station.

1971: (2) *Red peas Variety Trial* - Petersfield, Manchester, on Brown Bauxite soil - to compare the relative performance at high elevation with Bodles (low elevation) of local Red peas against imported Californian Light and Red Redkote.

1971: (3) *Red peas Variety Trial* - Albion, Manchester,—as above —on Red Bauxite soil (Map No. 78.)

Red Peas are the most widely consumed of the edible beans in Jamaica and are almost consistently in supply. Any programme which addresses itself to greater yield/acre is of high economic importance. The factors which give rise to higher yields (variety selection, disease, pest and weed control) were implemented with the utmost care and a high level of management maintained. The pride of place held by Miss Kelly among the local varieties has not varied and it is to be re-emphasized that this variety is to be preferred at this time. Various cultivars were examined in statistical trials and observation plots. Clean seed production of the Miss Kelly variety was maintained.

1971: (1) *Redkote Observation Plot*—Lawrencefield Field Station

Soil Type: Caymanas Sandy Loam (No. 128)

Objective: The continuing search for a variety of red peas having the potential of out-yielding the best local type (Miss Kelly) currently in production cannot be over-emphasized. Redkote, an introduction from the U.S.A., considered to possess the required potential, was planted in order to verify its high rating.

Appendix 7

Extracts from Technical Booklet of a Leading Supplier of Agricultural Inputs

AGRICULTURAL EQUIPMENT

COMPRESSED AIR SPRAYERS

		P6 Poly Sprayer	1 1/2 Gal.
		P12 Poly Sprayer	3 1/2 Gal. (US)
D.B. Smith	-	21 GP Yorktown	3 1/2 Gal. (US)
		19 GP Rocket	3 1/4 Gal. (US)
		25 GP Justrite	2 Gal. (US)
		28 GP Tomthumb	1 1/2 Gal. (US)
Solo	-	Handjet No. 455	

BURGESS SPRAYERS

S_1	1 Gal. (US)
S_2	2 Gal (US)
S_3	3 Gal. (US)

KNAPSACK SPRAYERS

D. B. Smith	-	EZMS Stainless Steel	5 Gal. (US)
Solo	-	Plastic Knapsack No. 425	4 Gal. (US)
Solo	-	Plastic Knapsack No. 475	4 Gal. (US)

MISTBLOWERS

Solo	-	412 Motorised 4 H.P.
Solo	-	423 Motorised 5 H.P. 70 cc Engine .10 Litres

CENTURY-BOOM SPRAYERS-TRACTOR MOUNTED

200 US Gals. Tank
100 US Gals. Tank

FERTILIZER SPREADERS -TRACTOR MOUNTED

Lely - Model 1250
Gyro - Model S-250 (B)

SHADE NETTING — TILDENET — 73,70 & 55 %

AGRICULTURAL HAND TOOLS

Spades	Roll Cut
Garden Shovels	Hedge Share
Garden Forks	Curry comb
Cutlasses	Grass Share
Files	Pruners
Fan Rakes	Hoes
Garden Hoses	

SPRAY NOZZLES

Fan Type — Teejets. TK Floodjet
Cone Jets

SPARE PARTS FOR ALL ABOVE EQUIPMENT

RAT & MOUSE TRAPS

PRODUCT	ANIMAL SPECIES	DISEASES	NOTE
ANTIBIOTICS			
Aureomycin Soluble Powder	Cattle, pigs, chickens	Scours (Enteritis) pneumonia	Not for use in layers
Aureomycin Obiets	Turkeys	Synovitis, CRD.	
Derapen C	All	As prescribed	
Oxytet 100	Cattle, sheep, goats, pigs	As prescribed	
Embacillin C	Cattle	Mastitis treatment	
Embacillin C dry cow	Cattle	Mastitis control in dry period	
Masticillin	Cattle	Mastitis treatment	
Neosulfa Boluses	Cattle, horses	Enteritis, pneumonia	
ANTIBACTERIALS			
Sulmet Soluble Powder	Cattle, pigs, chickens	Scours, pneumonia, coccidioses	
Sulmet Solution	All	Puliorum disease, coryza, fowl cholera	
Nitro Urea Boluses	Cattle, pigs	Retained afterbirth	

RECOMMENDATIONS

Key (I) = Insecticide (N) = Nutrient
(F) = Fungicide (A) = Acaricide
(H) = Herbicide (B) = Bactericide

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
All vegetables Legumes, tree crops Ornamentals & Lawns	(I) Basudin 40 WP (I) Basudin 600 EC	Contact & Stomach	Aphids, Mealy Bugs, Scales Leaf Hoppers, White Fly Stinkbug, Caterpillars, Soil Insects	1 1/2-2 lbs/acre or one (1) tablespoon/gal 8 fluid oz./acre 1 teaspoon/gal.	7 days	The EC Formulations may be used at 6x the rate for control of household pests e.g. cockroach.
All vegetables, legumes, tree crops, ornamentals & lawns	(I) Dimethoate 40 EC	Systemic	Aphids, mealy bugs, mites, scales, leaf hoppers, white fly, stink bug, caterpillars	1 pint/acre or 1/2 fluid oz/gal 1 tablespoon/Gal	15 days	
All vegetables, legumes, fruit trees, cereals, & lawns.	(I) Fenitrothion	Contact	For control of chewing & sucking insects - aphids, mealy bugs, scales, leaf hoppers, white fly, stink bug, caterpillars.	1 pint/acre 1/2 fluid oz./gal. 1 tablespoon/gal.	7 days	Used also for fly, mosquito & cockroach control on farms. Recommended rates should be strictly adhered to
Vegetables, tobacco, maize, sorghum, rice, pineapple	(I) Fenom 200 E.C.	Contact & Stomach	Wide range of insect pests particularly lepidoptera	4 imp. fluid oz./ acre 8 tablespoon/acre	7 days	
All vegetables, legumes, tree crops, ornamentals, lawns	(I) Malathion 50%	Contact	Wide range of insects - aphids, spider mites, scales, leaf hoppers, white fly, moths, fruit fly, stink bug, caterpillars.	1 1/2 pints/acre 1/2 fluid oz./gal. 1 tablespoon/gal.	7 days	Controls also house fly & mosquitoes

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVESTING	ADDITIONAL INFORMATION
Vegetables, tree crops, banana & ornamentals	(I) Metaldenyde 3.5%	Contact	Slugs & Snails	Apply to soil around crops affected		Avoid contamination of edible parts of plant
Vegetables, rice, sugar cane, cotton, tobacco, corn, coconut	(I) Nuvacron 40 SCW	Systemetic, Contact & Stomach	Sucking, mining & chewing insects - frog hoppers, leaf hoppers, paddy bugs, thrips, beetles, weevils, stem borers, leaf worm	3/4 pint/acre 1/2 fluid oz./gal. 1 tablespoon/gal.	21 days	High mammalian toxicity
Beans, peas, cole crops, tree crops, ornamentals, lawns	(I) Selecron 500 EC	Contact & Stomach	Wide range of mining & chewing insects, aphids, mites, thrips, caterpillars	1/2-3/4 pint/acre 1/2 fluid oz./gal. 1 tablespoon/gal.	7 days	Tomato & Potato - 4 day waiting period. Don't use on tomatoes in greenhouses or growing under plastic mulch.
Citrus, ornamentals, vegetable crops, field crops	(A) Neoron	Contact	Red spider mites, bud mites, rust mites, grey & flat mites	0.2-0.6 litres/acre or 3-9 fluid oz./acre		Avoid mixing with copper oxychloride.
Banana	(I) Primicid	Residual	Banana Borer	8-12 pints/44 gals. water or 4 fluid oz., mixture per plant		Apply to a 1 ft. radius of stem after irrigation or rainfall.
Citrus	(I) Primicid	Residual	Fiddler Beetle	7 fluid oz./16 gals. water (for citrus)		Apply 1 gal. spray mixutre per plant in citrus.
	(I) Cymperator	Contact & Residual	Cockroaches, mosquitoes, flies & other public health insects	3-8 tablespoon/gal. water	10 days	
	(I) Actellic	Contact & Fumigant	Aphids, thrips, caterpillars, mealy bugs, white flies, fruit flies, scales, cockroaches	**Fumigation:** 2 tablespoons plus 1 pint kerosene (deodorized) for 500 sq. metre **Bulk Grains:** 2 tablespoons/gal. water/top grain **Bagged Products:** 3-5 1/2 tablespoons/gal. water		For control of pests of stored products, public health pests and for the control of insects on agricultural crops

RECOMMENDATIONS

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
Vegetables. tree crops	(I) Trigard 75 WP	Systemic	Leaf Miner	3/4-11/2 oz/22 gal. water or 25-40 gm/100 litres of water 0.25-0.4 gm./litres of water		
Ornamentals	(I) Trigard 75 WP	Systemic	Leaf Miner	1/2-3/4 oz/22 gals. water or 15-25 gm/100 litres of water		
All vegetables. tree crops. ornamentals. legumes. tobacco	(F) Mancozeb	Contact	Early blight. late blight. blue mold. brown spot. anthracnose. ruse. asochyta. leaf spot. downy mildew. rnizoctonia rot. citrus scab.	2-2 1/2 lbs/acre 1 tablespoon/gal.	7 days	
Tobacco. potatoes. tomato. cocoa. cucurbits. (melons. cucumber. pumpkins)	(F) Ridomil MZ 58	Systemic Contact	Blue mold. late blight. early blight. anthracnose. phytophthora. downy mildews. pythium (damping off).	2 lbs/acre 1 tablespoon/gal.	7 days	Waiting period for potato and cole crops is 14 days.
Tree crops e.g. avocadoes, citrus. macadamia. passion fruit. Tobacco. ornamentals. peppers	(F) Ridomil 5G	Systemic	Soil bourne diseases (mostly phytophthora & Phytophthora SPP) causing root, collar & stem rots.	20-30 lbs/acre Tree crops - 4 ozs/tree		
Banana	(F) Tilt	Systemic	Leaf spot, anthracnose	5 1/2 fluid oz/acre		For banana - spray oil or water may be used.
Coffee	(F) Tilt	Systemic	Coffee rust. brown rust. brown spots of coffee	10 fluid oz./acre or 0.5 imp. pints/acre		To be added to the coffee mixture only: 1 3/4 lb. copper oxychloride per acre.

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
Vegetable crops. field crops Fruit trees	(F) Manzate D	Contact	Leaf spots. anthracnose. gummy stem blight. black rot, early and late blight.	1 1/2-2 lbs/acre	4-10 days	
Vegetable crops	(F) Manzate 200	Contact	Fusarium. early and late blight. cercospora leaf blight.	1 1/2-2 lbs/acre	14 days	Use 2-3 lbs/acre for control of downy mildew. neck rot and purple blotch in onions.
Banana	(F) Benlate	Systemic	Sigatoka diseases surface mold crown rot.	1/2-1 lb/100 gal. water		For Sigatoka use 2-4 oz/ acre in water emulsion for aerial spraying with minimum of 2.5 gals. spray mixture. or 5 gals. spray mixture with mist blower.
Tree crops Vegetables	(F) Benlate	Systemic	Fusarium	1/2-1 lb/acre		For Sigatoka use 2-4 oz/ acre in water emulsion for aerial spraying with minimum of 2.5 gals. spray mixture. or 5 gals. spray mixture with mist blower.
Ornamentals	(F) Benlate	Systemic	Powdery mildew. leafspot. anthracnose	1/4-1 lb/100 gals. water or 1 tablespoon/2 gals. water		
Cocoa. coffee	(F) Copper Oxychloride		Black pod. coffee rust	3-4.5 lbs./acre	10 days	
Ornamentals. nursery crop	(F) Banrot	Systemic	Soil borne diseases of ornamentals and nursery crops (include pythium and phytopnthora)	6-12 oz/400 sq. ft. 2-4 oz/400 sq. ft. in bedded plants.		Should not be mixed with pesticides or nutrients. NOT for use on edible crops. Toxic to fish.

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
Cocoa, citrus	(F) Ridomil Plus		Black pod, canker of trunk and branches, gummosis and root rot.	4 gm./litre water or 0.5 oz./gal. water 14 oz/22 gals. water		For canker, use 20 gm./ litre of water (3 oz/gal water)
All vegetables, legumes, tree crops, ornamentals, tobacco	(F) Bravo 500 (F) Daconil 2787 75 WP	Contact	Downy mildew, rust, anthracnose, scab, powdery mildew, grey mold, late blight, early blight, leaf mold, alternaria leaf spot, Botrytis, Cercospora black spot.	1 1/2-2 1/4 pints/acre 1 fluid oz/gal. 2 tablespoon/gal. 1 1/2-2lb/acre 1 tablespoon/gal.	7 days	
All vegetables, tree crops, potatoes	(F) Captafol	Contact	Early blight, downy mildew, late blight, grey leaf spot, anthracnose, purple blotch, gummy stem blight, belly rot.	2-3 pints/acre 1 fluid oz/gal.	7 days	
Sugar cane, pastures, lawns	(H) GAICO 24D Amine	Pre-Emergence Post-Emergence	Broad leaf weeds	1-2 pints/acre in 40 gals. water 1/2 fluid oz/gal.		
Sugar cane, bananas, pine-apples, coffee	(H) Gesatop Z 500	Pre-emergence or early post-emergence.	Annual Broad leaf weeds and grasses	4-8 pints per acre		Rate of application depends on crop and soil types. Higher rates, for very loamy soils.
Non-crop areas, sugar cane, lawns	(H) Daconate	Selective post-emergence	Selective control of grasses	4-5 pints per acre		

RECOMMENDATIONS

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
All broad leaf crops	(H) Fusilade	Systemic Post - emergence	Grass weeds	1-2 pints/acre		Can be safely sprayed over the top of vegetables and broad leaf crops in general.
Sugar cane, citrus, banana, pineapple, coffee	(H) Gesapax Combi 500 FW	Pre- and post-emergence Contact and long residual action	Grasses & Broadleaf weeds	4 imp. pints/acre in 30 gals. of water		
Sugar cane, citrus, banana, coffee	(H) Gesapax	Contact and residual	Grasses and Broadleaf weeds	2-4 lbs./acre in 30 gals. water		
Corn, sugar cane, pineapple	(H) Gesaprim	Selective pre-emergence	Grasses and Broadleaf weeds	2-4 lbs./acre in 20 gals. water		
Onion, red peas, strawberry, cabbage, soyabeans	(H) Dacthal	Selective Pre-emergence herbicide.	Annual grasses and certain broadleaf-weeds	6-8 lbs./acres sandy soils 8-10 lbs/acres medium soil 10-16 lbs/acres heavy soils in 40 gals. water		Effective as pre plant incorporated in the soil
Peanuts, celery, peas (black-eyed peas), carrots, irish potatoes	(H) Gesagard	Pre-emergence and post-emergence acts through roots and leaves of plants.	Annual broadleaf weeds and annual grasses	2-3 lbs per acre		
Sugar cane, banana, citrus, vegetables	(H) Gramoxone Super	Contact	Grasses and broad leaf weeds.	1-2 pints/acre in 40 gals. water		

RECOMMENDATIONS

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
Corn, cotton, grapes, pastures, non-crop areas, sugar cane.	(H) Dalapon	Systemic grass killer, post-emergence.	Annual and perennial grasses	Average 10 lbs. per acre		Higher or lower rates depend on crop and weed growth. Apply with wetting agent.
Coffee, sugar cane, tree crops	(H) Gardoprim	Pre-early post-emergence	Grasses and broadleaf weeds	1-7 litres/acre or 2 quarts/acre		Always add 3 imperial pints of gramoxone super plus 1/2-1 pints surfactant per acre.
Legumes, corn, peanuts	Dual	Pre-emergence	Grasses	400-600 cc/acre or 14-16 fl. oz. per acre		
Tomatoes, peppers, tobacco, ornamentals	(B) Agri-strep	Contact	Bacterial spot Bacterial wilt Bacterial soft rot	1/2-1 lb. in 100 gallons of water	5 days	

RECOMMENDATIONS

CROP	PRODUCT	MODE OF ACTION	PESTS OR DISEASES CONTROLLED	RATE OF APPLICATION	WAITING PERIOD BEFORE HARVEST-ING	ADDITIONAL INFORMATION
All crops	(N) Microzit		Provides compiete range of micro nutrients	2 oz/acre for 1 oz/25 gals. for vegetables.		Foliar fertilizer
Vegetables, lawns, ornamentals, fruit trees	(N) Weigrow 'Standard' & 'Fruit'			1/4-4 teaspoons/gal. water. This rate will vary with plant requirements		N P K Standard 15 - 30 - 15 plus some micro nutrients Fruit N P K 18 - 9 - 27 plus some micro nutrients
All crops, industrial, commercial & domestic areas	(R) Klerat		Rodents (all rat species)	20-60 blocks/acre. (20 gm. blocks)		

VEGETABLE PLANTING INFORMATION

CROP	NO. OF SEEDS PER OUNCE	POUNDS OF SEED REQUIRED PER ACRE FOR DIRECT FIELD SEEDING	QUANTITIES OF SEED REQUIRED TO PROVIDE ENOUGH SEEDLINGS FOR 1 ACRE	DAYS TO APPEARANCE OF SEEDLINGS AT SOIL TEMPERATURE 77-95^{0}F	RECOM-MENDED BETWEEN ROW SPACING	RECOM-MENDED BETWEEN PLANT SPACING
Broccoli	9,000	1½-2 lbs	3 ozs.	3-4 days	24-36"	24"
Beet	1,600	10-16 lbs.	N/A	4-5 days	18-24"	2-4"
Cabbage	8,900	1½-2 lbs.	3 ozs.	3-4 days	24-36"	12-18"
Cauliflower	10,000	1½-2 lbs.	3 ozs.	4-5 days	24-48"	14-24"
Cantaloupe	1,200	1½-3 lbs.	2 lbs.	3-4 days	72-96"	14-23"
Carrot	23,000	2½-3 lbs	N/A	6-8 days	16-36"	1-3"
Celery	70,000	1-1½ lbs.	8 ozs.	Below 77^{0}F 9 days	18-40"	6-12"
Tomato	11,000	2 lbs.	4 ozs.	6-9 days	72"	16-20"
Cucumber	1,000	2-3 lbs.	2 lbs.	3-4 days	72"	8"
Corn	100-200	10-15 lbs.	N/A	3-4 days	34"	6"
Egg Plant	6,000	2 lbs.	5 ozs.	5-8 days	24-54"	18-36"
Lettuce	25,000	1½-3 lbs.	6 ozs.	2 days	18-24"	10-12"
Onion	9,500	3-4 lbs.	2 lbs.	4-12 days	12"	1-1½"
Pumpkin	110	2-3 lbs.	N/A		96"	48-72"
Radish	2,000	10-12 lbs.	N/A	3 days	12-18"	½-1"
Sweet Pepper	4,500	2-4 lbs.	4 ozs.	8-9 days	16"	12"
String Bean	115	60 lbs.	N/A		18-24"	2-4"
Squash	400	4-6 lbs.	N/A	3-4 days	36-72"	36-48"
Okra	500	6-8 lbs.	N/A	6-12 days	24-60"	12-24"

Appendix 8

List of Leading Input Distribution

Agro-Grace

All-Island Jamaica Cane Farmers Association

All-Island Banana Growers Association

T. Geddes Grant

Shell Chemicals Jamaica Ltd.

Jamaica Agricultural Association

Coffee Industry Board

Jamaica Agro-Chemicals

Mussons Jamaica Ltd.

Hardware and Lumber

Jamaica Growers Supplies & Services

Worldwide Marketing

George Kirby Hardware

Raeburn Development Ltd.

Francis Agencies

Christiana Potato Growers Association

C & C Commodities

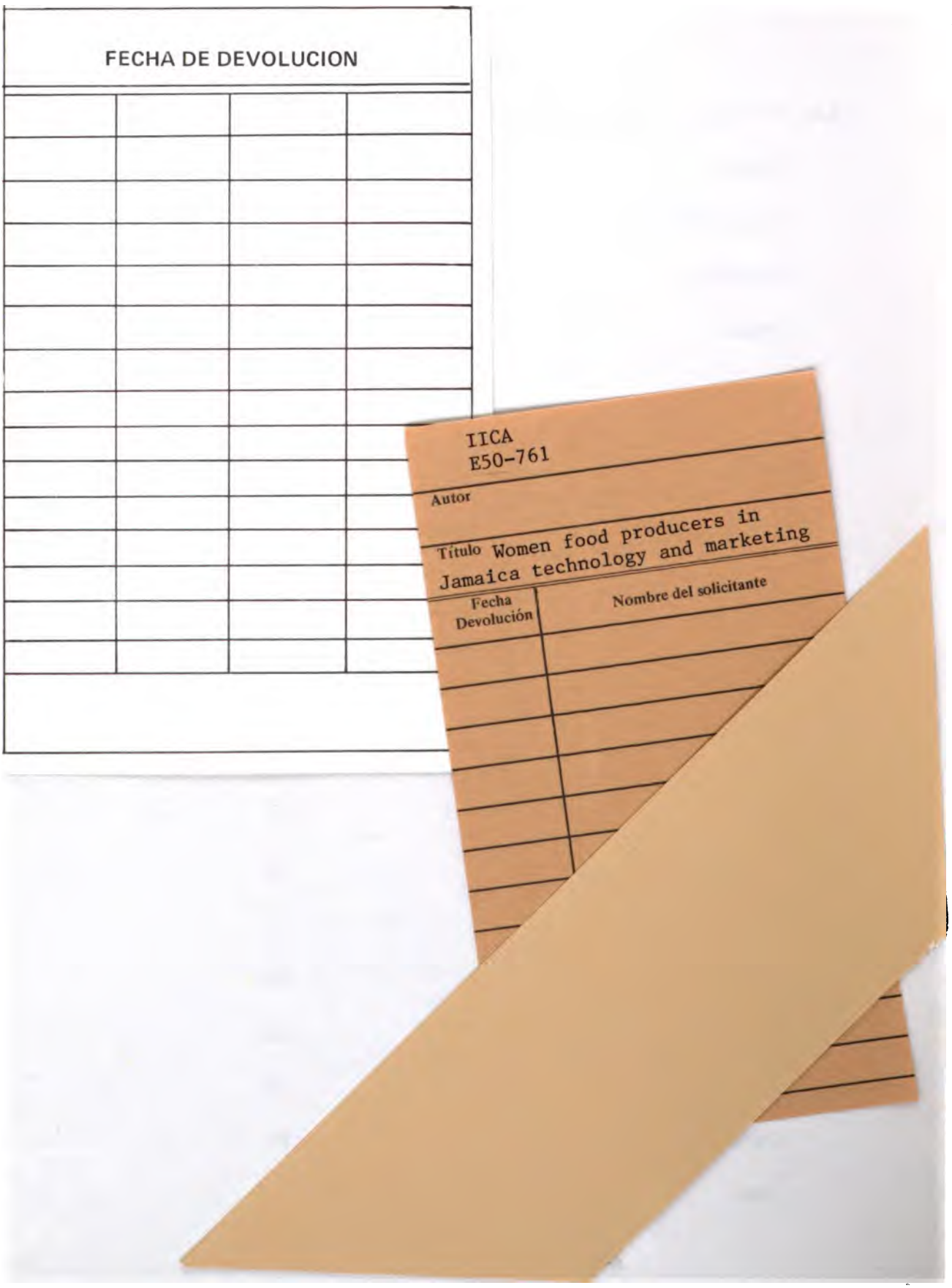
Dolphin Distributers

Appendix 9

List of Crops by Number of Farms from Women Food Producers Survey

Crop	Number of Farms
Gungo Peas	19
Red Peas	37
Peanut	16
Carrot	30
Cabbage	26
Lettuce	17
Cauliflower	10
Pak Choi	9
String Bean	7
Tomato	36
Cucumber	7
Pumpkin	7
Escallion	13
Sweet Pepper	8
Corn	19
Irish Tomato	26
Sweet Potato	16
Cassava	27
Yam	90

Esta edición se terminó de imprimir
en la Sede Central del IICA
en Coronado, San José, Costa Rica,
en el mes de abril de 1996,
con un tiraje de 150 ejemplares.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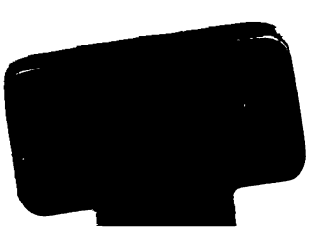
Autor
Título Women food producers in Jamaica technology and marketing
Fecha Devolución
Nombre del solicitante



PROGRAM FOR THE ANALYSIS OF AGRICULTURAL POLICIES VIS-A-VIS WOMEN FOOD PRODUCERS IN THE ANDEAN REGION, THE SOUTHERN CONE AND THE CARIBBEAN

This Program, executed by the Inter-American Institute for Cooperation on Agriculture (IICA) and financed by the Inter-American Development Bank (IDB) under Technical Cooperation Agreement ATN/SF-4064-RE, covered 18 countries in Latin America and the Caribbean. The first phase was implemented in 1992-1993 in six countries in Central America, under the auspices of the Council of Central American Agricultural Ministers in its XII Ordinary Meeting in March 1992. Results were published in the book *Mujeres de Maíz* (IICA/IDB 1995).

The second phase was carried out in the Andean Region (Bolivia, Colombia, Ecuador, Peru and Venezuela), the Southern Cone (Brazil, Paraguay and Uruguay) and the Caribbean (Barbados, Guyana, Jamaica and Suriname), by request of the First Ladies during their Summit Meeting on the Economic Advancement of Rural Women held in Geneva, Switzerland in February 1992.

Three documents were prepared for each country presenting the technical results from the four areas of research of the Program: a) assessment of the participation of women in the agricultural sector and their contribution as food producers on small-scale farms; b) analysis of agricultural policies and programs and their effects on rural women as food producers; c) evaluation of the technology used on small farms by women in food production processes; and d) analysis of the role of women in processing and marketing farm food products.

Other Program activities included the elaboration of regional comparative documents, the formulation of policy proposals and related actions, national and regional seminars for discussion of Program recommendations, and the publishing and distribution of the final results.

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