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# THE PONTEIRO CENSUS: DESCRIPTIVE RESULTS AND ECONOMIC ANALYSIS

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PONTEIRO AND DOMESTIC RICE MARKET
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# THE PONTEIRO CENSUS:
# DESCRIPTIVE RESULTS AND ECONOMIC ANALYSIS

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# EXECUTIVE SUMMARY

This report presents results of a census of commercial farmers (*ponteiros*) undertaken in 1992. The purpose of this report is to provide descriptive information about the characteristics of commercial farms (pontas) and their economic performance. Until now, there has been no statistical data base which provides quantitative information about the characteristics of the ponteiro sector. The ponteiro census was undertaken to provide this baseline data.

In recent years, the Government of Guinea-Bissau and international donors have become increasingly interested in the economic performance of the ponteiro sector. This interest has arisen as a result of a policy shift in the country of Guinea-Bissau toward liberalization of agricultural markets. Ponteiros, commercially oriented farmers (by definition), have been viewed as the group most likely to respond to the changing market incentives. To date, there has been no study to evaluate the degree to which the ponteiro sector has responded to price liberalization, or to identify possible factors which constrain the degree to which ponteiros can adjust to changing prices. Furthermore, the government has provided incentives, in the form of credit programs, for individuals to open up new pontas, or expand existing farms into more capital-intensive operations. There has been no systematic evaluation of the effects of these policies in terms of the economic performance of the beneficiaries.

In order to address these issues, this report provides the following results from the census:

1) The overall dimensions of the ponteiro sector, including the number of pontas currently in operation, total area farmed, the regional distribution of pontas throughout the country, and aggregate production of the major crops produced within the sector.

2) Patterns of variations in the characteristics of individual farms, particularly, areas farmed, cropping patterns, and utilization of different types of inputs.

In addition, analysis of the variations in economic performance of ponteiros is presented. The following variables which affect economic performance are analyzed using the census information:

3) Farm-level prices. Variations in farm-gate prices provide some indication of the performance of the marketing channels.

4) Yields. Yields provide an indication of the physical productivity which farmers attain. Actual yields are compared with "reference" yields, estimates of the levels of physical productivity which could be obtained under the growing conditions in Guinea-Bissau.

5) Unit costs of inputs. These costs include labor and "modern" inputs--machinery, fertilizers, and pesticides.

Finally, the analysis examines a number of factors which may be expected to account for variations in profitability across ponteiros.

RESULTS

1. The ponteiro sector is presently quite small in relation to the agricultural sector of the country. The census counted 1,098 pontas and a total farmed area of 8,360 hectares. These number are very small in comparison with the cadastral records on land registration. The number of pontas in the census is only slightly over half of the number of land registrations, and the amount of land currently being farmed is approximately 2% of all registered land. Furthermore, only 13% of ponteiros identified in the census have their land registered in the cadastral records, and their farmland is less than 1% of the total registered land.

2. Most pontas are quite small. The average farmed area per ponta is 7.6 hectares. Sixty percent of all pontas in the census reported a farmed area of less than 5 hectares, only 7% farm more than 20 hectares. The level of utilization of modern inputs is also very low in the ponteiro sector. Only 16% of the ponteiros reported having machinery (only 1% had tractors), 5% reported using chemical fertilizers, and 1% reported using pesticides.

3. The ponteiro sector produces predominantly perennial crops, and the production of these crops is destined primarily for sales. Ninety percent of all the farmed area is in perennial crops. By far, the most important single crop is cashews, which alone accounts for 75% of the total agricultural area of the sector. The other important perennial crops are citrus (oranges and limes), bananas, mangoes, and sugarcane. These are all predominantly cash crops. Over 85% of the total production of these crops is marketed. Overall, three-fourths of all agricultural production of the ponteiro sector is sold.

4. Farm-level prices reveal differing levels of market integration for different crops. On the one hand, cashew prices are quite uniform across the country, indicating that this market is highly integrated. The implication of this for producers of cashews is that they face a relatively low risk with respect to market prices. Sugarcane prices also exhibit a relatively low regional price variation. The prices of the other major perennial crops (citrus, bananas, and mangoes) demonstrate much higher levels of price variability, and thus expose producers to greater marketing risks.

5. Average reported yields of ponteiros are quite low relative to potential yields which could be obtained in Guinea-Bissau. Evidence suggests that the low harvested yields obtained by ponteiros may be due in part to high marketing risks. The crops for which actual yields most closely approximate potential, or reference yields, are cashew and sugarcane, the crops with the lowest level of marketing risk. Yields show a general tendency to be lower on larger farms.

6. The average total value of sales per ponta is PG 4 million (US $800). However, this figure varies greatly, depending in large part on the size of the ponta. The average sales per hectare of land farmed is approximately PG 500,000 (US $100).

7. With respect to costs of agricultural activities, labor is by far the most important cost category. The most important annual operations for tree crops are harvesting and clearing of undergrowth. Opening of forest lands is a major investment expense. This is also primarily done with labor. Only a very small portion of the ponteiros use machinery, commercial fertilizers, or pesticides.

8. Estimated profits were calculated using average yields from the ponteiro census and with a reference yield which represent potential productivity levels. With reference yields, all the major perennial crops generate high profits, ranging from PG 1,600,000 (US $320) per hectare for cashews to PG 7,400,000 (US $1,500) for limes. Thus, the crops currently grown by ponteiros exhibit the potential for generating high economic returns. However, profits calculated with average yields reveal that the ponteiro sector generally does not realize these benefits. Average profits per hectare are negative for bananas and very low for limes and mangoes. Oranges and cashews provided average revenues of PG 350,000 - 450,000 (US $70 - 90), and sugarcane was significantly higher at PG 730,000 (US $150).

9. Examination of variations in the characteristics of ponteiros by level of profits reveals several distinct patterns. The most profitable and the most unprofitable pontas are significantly larger and use more modern inputs than the overall average farm size for the sector. In other words, the large, capital-intensive pontas tend to be either very profitable or very unprofitable. Pontas near Bissau are significantly more profitable than those in the outlying areas. One explanation for this result is that high transportation and marketing costs place greater burdens on the more distant pontas.

10. Almost without exception, ponteiros expressed that they would like to increase their agricultural operations. They are constrained by the lack of access to credit, particularly to buy machinery. Almost one-half of all ponteiros indicated that the lack of credit was their major constraint with respect to agricultural activities. An additional 40% cited the lack of machinery and equipment as being their major problem.

CONCLUSIONS

1. Ponteiros represent a very small share of the total agricultural sector in Guinea-Bissau, both in terms of number of farmers and areas farmed. Furthermore, the number of active ponteiros, and the amount of land currently being farmed by ponteiros, are very small proportions of the registrations in the cadastral records. Many active ponteiros do not have their land registered with the cadastral service. These findings have important implications for land law. The current low level of land use by the ponteiro sector implies that competition for land with tabancas is not a serious issue at the national level. Conflicts in specific locations

can occur, but the total amount of land farmed by the ponteiro sector represents less than 1% of the total land requirements of the tabanca sector. However, the potential for conflict between concession holders and the tabancas is much greater, given the much larger amount of land in registered concessions.

2. Agricultural production of the ponteiro sector is oriented predominantly for the market. Furthermore, comparison of relative profitabilities with cropping patterns indicates that ponteiros do respond to price signals, to the extent possible. Namely, the area planted to the major perennial crops is highly correlated with their respective profitabilities. The one exception to this relationship is sugarcane, which is the most profitable crop, but accounts for only a small fraction of all the agricultural area.

   Sugarcane production is limited to those growers with ready access to distilleries. Distilleries operate in only a few selected areas of the country. After sugarcane, the most profitable crop is cashew, and this is by far the most widespread crop grown by ponteiros. The other perennial crops (citrus, mangoes, and bananas) exhibit lower average profits as well as a greater price risk, and ponteiros grow these crops nearly as extensively as cashews. Thus, the ponteiro sector is effectively using pricing signals to maximize the economic benefits from available resources. On the other hand, poorly integrated markets appear to hinder the effectiveness with which price signals are transferred to ponteiros.

3. Lack of credit is a serious problem for the vast majority of ponteiros. However, many previous investments, particularly by larger ponteiros, in machinery, fertilizers, and pesticides have not resulted in demonstratably higher productivity levels than those achieved by ponteiros without the benefits of these modern inputs. These results have important implications for designing and implementing a new agricultural credit program in the country. Care must be taken to ensure that credit is directed toward the most profitable investments, and the best opportunities may not necessarily be the large, capital-intensive operations. The economic analysis indicates that small operations can also be quite profitable, if properly managed. Thus, a credit program which can offer loans to both large and small ponteiros and which has effective procedures for evaluating the economic viability of alternative proposals would promote a more rapid and widespread growth in the ponteiro sector.

## SECTION I

## INTRODUCTION

This report describes and presents the results of a census of ponteiros undertaken in the winter and spring of 1992. Agriculture in Guinea-Bissau is commonly divided into two distinct sectors, the village, or *tabanca* sector, and the *ponteiro* sector. Conceptually, the tabanca sector is quite clearly defined as the individuals who are members of the interconnected network of family and social relationship within villages. Rural households are clearly within or outside the social structure of the tabancas. Eighty-five percent of the national population resides in tabancas. Furthermore, the agricultural activities of tabanca households fall within the limited range of traditional practices--*bolanha* (irrigated rice), upland rice, sorghum, millet, cassava, all produced with local seeds and labor-intensive technologies. On the other hand, the characteristics of the ponteiro sector are less well known. There is a great range of variation in size, cropping patterns, and production technologies among ponteiros. These variations are explained in part by the historical patterns of establishment of ponteiros. During colonial times, individuals from Portugal, Cape Verde, and elsewhere within the region, would open up farms, known as *pontas*, in unclaimed forest lands. These individuals and their families were not members of local tabancas. The scale of operations of these colonial-era pontas varied, ranging from large holdings of some Portuguese families, to modest family operations of a few hectares. In the years since independence, the government has implemented policies to provide large land concessions and credit to foster large, commercially-oriented production units using modern capital-intensive techniques.

Until now, there has been no systematic collection of information about ponteiros which could be used to provide an aggregate overview of the ponteiro sector and reveal the relative shares of different farm types within the sector. One source of information which sheds some light on the ponteiro sector is the official registration of land in the cadastral service. The properties in the cadastral land records are not the tabanca lands, and therefore commonly identified with the ponteiro sector. These records indicate a very large total land area in the hands of individuals and other entities, such as companies and the church. However, many of the properties in the cadastral register are not currently being actively used for agricultural purposes; either they have been abandoned or have never been developed. One of the purposes of the present survey is to obtain descriptive information about those ponteiros actively involved in agricultural activities. Specifically, the census was designed to provide information about i) the aggregate size of the ponteiro sector, in terms of number of operations and area farmed, ii) the distribution by size of holdings, iii) cropping patterns, and iv) aggregate output and sales of the major crops produced in the sector.

Interest in the ponteiro sector has increased substantially in recent years as a result of major changes in the orientation of economic and agricultural policy in the country. Most fundamental has been the major shift in the government's conception of its role in the organization of economic activities. After independence in 1975, the socialist government adopted economic policies which

attempted to centralize control and management of economic activities throughout the economy. Agricultural policy was directed toward increasing national self-sufficiency in foodstuffs, particularly rice. Marketing of major food products was undertaken by a public agency (*Armezens do Povo*). Large colonial landholdings were taken over by the state (*granjas do estado*). Prices for rice and other essential foodstuffs were set by the government. The government distributed agricultural tools and seeds which were provided by international donors. Large-scale agricultural projects were implemented toward rehabilitating rice production areas which had been disrupted during the war for independence. Agricultural research was heavily oriented toward food crops. However, by the early 1980s, macroeconomic imbalances and market shortages became increasingly acute in the years after independence, and in 1983, the government began to reorient the national economy under the auspices of the first structural adjustment program directed by the World Bank. In 1986, the World Bank outlined a "Prescription for Comprehensive Adjustment" which emphasized the role of the agricultural sector in promoting economic growth in the country. This general reorientation in economic policy still guides national and internally-funded programs in the country.

This new policy orientation emphasizes the role of private markets in allocating resources to their most productive uses. With respect to agriculture, the emphasis moved from self-sufficiency toward promoting activities in which the country has a comparative advantage as indicated by market signals. A related policy goal toward agriculture is to promote foreign exchange earnings through agricultural exports as a way to offset the large external imbalances facing the economy. Until now, the main policy actions directed toward meeting these new goals have been moves to liberalize the market prices of all agricultural commodities. Now, the Ministry of Rural Development and Agriculture (MRDA) is interested in identifying more specific policy actions which will benefit commercially-oriented farming. In order to identify appropriate policies, information is needed about the current realities of the ponteiro sector, what kinds of activities ponteiros are engaged in, their economic returns, and what kinds of problems ponteiros encounter in undertaking or expanding these activities. One of the objectives of the ponteiro census is to address this need for general background information about the current status of the ponteiro sector.

In order to shed light on these policy concerns, this report will present analyses of the economic performance within the ponteiro sector. Two factors are important in evaluating the economic performance of ponteiros. First is the level of physical productivity of the resources--the amount of output derived from a given level of inputs. Attaining the highest possible level of physical productivity is of interest from the national policy perspective, in order to attain the greatest possible amount of agricultural output from the given resource base, and also because productivity strongly affects the level of income derived from agricultural activities. In this report, yields of output per unit of land will be used to evaluate the physical productivity of ponteiros.

The second factor is the degree to which ponteiros respond to relative prices of inputs and outputs in their production decisions. Resources are used most efficiently and incomes are maximized when ponteiros produce the commodities with the highest values, and minimize the use of the most expensive inputs. The

extent to which production decisions are influenced by prices will be examined by comparing the relative profitabilities of alternative crops with the aggregate production patterns. If prices of inputs and outputs do strongly affect production decisions, and there are no other factors which restrict producers choices, the most profitable crops should be the most widely grown.

A related issue, and one for which the census can provide some information, is the degree to which the marketing channels transmit price information to the farm level. If markets work well, all farmers will face similar prices, and price-responsive producers would exhibit similar production patterns. On the other hand, with large price variations across producers, no overall production pattern can be expected to prevail. Economic theory suggests that regional price patterns reveal the extent to which price information is transmitted through the marketing channels. If markets function well, then prices should be very highly correlated across regions, and should differ only by the costs of transportation. On the other hand, with weak market links, there is no reason to expect prices to be similar across regions. The census provides price information at the farm level. These prices can be compared across regions to examine the degree of market integration.

In addition to the general interest in the dimensions of the ponteiro sector and the patterns of economic performance of ponteiros, two specific policy issues are presently being debated which have direct relevance for the ponteiro sector. The first issue is the need for a new agricultural credit program in the country. The institution which previously provided agricultural credit, the *Banco Nacional de Credito* (BNC) has been shut down because of administrative problems stemming in part from poor management of agricultural loans. Presently, no institution exists for providing credit to agriculture, a serious problem expressed by almost all farmers throughout the country. In order to avoid the previous problems, any new agricultural credit program must have a more detailed understanding of the economic viability of the various activities undertaken by farmers, ponteiros in particular, since they will presumably be major demanders for credit.

The second policy issue concerns land rights and the potential for conflicts between individuals and groups, in particular between ponteiros and tabancas. The country is in the process of enacting a new land law which will more clearly delineate land ownership. Disputes over land may occur between, on the one hand, individuals and entities that already have properties registered in the land records, and on the other hand, the traditional claims to land of the tabancas. In analyzing the competing claims for land rights, a better understanding is needed of the relationship between i) registered land concessions, ii) land being actively used by ponteiros, and iii) land use patterns of the tabancas. A previous USAID Report (Tanner) addresses the first and third of these issues. One of the objectives of this report is to provide some empirical information about actual land-use patterns in the ponteiro sector.

A description of the methodology utilized in the design and implementation of the census is followed by a description of some of the characteristics and patterns of variation found in the ponteiro sector of Guinea-Bissau. Finally, an analysis of the economic performance of the sector is presented. This analysis compares actual behavior, as recorded in the census, with independent estimates of results which could be expected to obtain given the agro-climatic conditions of the

country. Also, a statistical analysis of variables associated with variations in observed profits attempts to identify factors which influence or constrain the returns to farming in the ponteiro sector.

## SECTION II

## METHODOLOGY

In order to establish an empirical basis of information on which to analyze the issues outlined above, a census of all ponteiros in Guinea-Bissau was organized and conducted during the winter of 1992, in conjunction with the Division of Agricultural Statistics (DEA) in the MRDA. Field work began in January and continued through May of 1992. The DEA had made plans to conduct an exhaustive census of ponteiros as early as 1990. Their objective at that time was to compile a complete inventory of areas planted in crop from which to draw representative samples annually to estimate national production. In 1991, USAID became increasingly interested in the ponteiro sector, in particular the extent to which ponteiros had responded to market liberalization and the potential conflicts between ponteiros and the tabancas over legal access to land, and agreed to provide technical and financial assistance for the implementation of the ponteiro census.

The first issue to be addressed in designing the census was to specify which agricultural producers would fall within the scope of the census, namely a working definition of ponteiros. There has been a great deal of discussion of what is the correct or appropriate definition of "ponteiro." Tanner (pp. 30-34) provides a detailed description of the various definitions and categorizations which have been proposed. For the purposes of this report, the ponteiro sector is defined to include all active farming operations which are not within the tabanca sector. This definition is quite broad in one aspect, including all sizes and types of agricultural operations which do not fall into the tabanca sector, but restrictive in another aspect, being confined to those properties which are currently being farmed. Operationally, interviewers attempted to identify all individuals (or associations) who consider themselves, or are considered by the local community to be "ponteiros" and are presently engaged in farming. These individuals will be referred to in this report as *active ponteiros*, and they comprise the domain of the census. This broad definition of ponteiro was used so that the data could provide information about the number of farms that fall into the various definitions of "ponteiro."

After specifying the definition of ponteiro that would be used to delimit the universe of the census, a questionnaire was prepared. The questionnaire was designed to elicit information about the land in the possession of the ponteiro and the agricultural activities undertaken on this land. Purchases of agricultural inputs and sales of outputs were also recorded in order to evaluate the economic performance of the respondents. Accurate information about the amount of land farmed by ponteiros was of particular importance, so in addition to administering the questionnaire, the interviewers were also instructed to measure the areas of the ponteiros' fields. The questionnaire is presented in Appendix I.

Field staff of the DEA in the regions were used to conduct the survey. These interviewers have had considerable experience in conducting agricultural production surveys in the tabancas, but they had not had any previous contact with ponteiros and had not administered questionnaires which solicited detailed

recall information from respondents. In order to provide necessary background for the interviewers, intensive field training workshops were conducted in which each part of the questionnaire was described in detail--the objectives of the questions, likely responses, how to record particular responses, etc. Part of the training included group interviews with ponteiros conducted by the principal investigators. These interviews provided experience to the interviewers and also served as a field test for the questionnaire.

In addition to the formal survey, a number of informal interviews were conducted with ponteiros throughout the country. The purpose of these interviews was to obtain more detailed descriptions of production activities which could not be obtained in a formal questionnaire format. Also, in-depth conversations about ponteiros' goals, with respect to their agricultural activities and the problems they encountered, provided insights into the factors which affect their production, investment, and marketing decisions and a context in which to evaluate and interpret the survey information.

The remainder of the report presents results from the ponteiro census. First, descriptive information will be provided about the aggregate dimensions of the sector in terms of number of active ponteiros, total area farmed, and aggregate production of the major crops. These results will be compared with the available information from the cadastral records on registered lands. Variations in several characteristics of pontas will be presented, including geographical distribution of pontas throughout the country, size of holdings, and cropping patterns. Next, the economic performance of ponteiros will be analyzed. Profits of agricultural activities will be used to measure economic performance. Profits are determined by prices obtained for outputs, yields, and costs of inputs. Variations in each of these factors will be examined across pontas for the six most important crops produced within the sector. Finally, the implications of these results with regard to the issues outlined above will be reviewed.

## SECTION III

## THE PONTEIRO SECTOR

The census provides a wide range of descriptive information about the characteristics of ponteiros. Table 1 reports the number of pontas and total area farmed in the sector, by region. Two categories of land area are identified in the table. **Cultivated Area** includes all area currently planted with crops and land in permanent pasture. This includes area planted with tree crops which are not yet producing. Census interviewers physically measured these areas. **Total Agricultural Area** is a more subjective notion. This category includes cultivated area, plus the ponteiros' estimation of the amount of land they consider available or appropriate for cultivation within their ponta. Total agricultural area includes, in addition to agricultural area, fallow land and "agricultural land, not cultivated." In many instances, the interviewers were not able to measure these areas because the ponteiros were unsure of the exact boundaries, and dense vegetation prevented surveying. Thus, the category of **Cultivated Area** can be interpreted as an objective measure of land currently under cultivation, while the **Total Agricultural Area** is a more subjective measure of the ponteiros' judgment of the amount of land they currently farm or have available to farm. It should be emphasized that the category of **Total Agricultural Area** does not correspond to the registered land area. Comparison of census responses with cadastral registration records reveals cases of individuals with very large registered land concessions (often thousands of hectares) declaring much smaller areas of total agricultural land (often less than 100 hectares).

One of the most salient features of Table 1 is the small total number of ponteiros in Guinea-Bissau and the small amount of area farmed in the ponteiro sector. Under the broad definition of "active ponteiro" used in the survey, namely all individuals currently undertaking some agricultural activities and considered by themselves or by the local community to be ponteiros, only 1,098 individuals fall into this category. These ponteiros currently farm approximately 8,400 hectares and declare 11,200 hectares of total agricultural land. Both the number of ponteiros and the amount of land they farm is very small in comparison with the cadastral records on land registration. Table 2 compares results of a study of cadastral records, reported in Tanner (p. 26) with the ponteiro census results. The total number of active ponteiros in the census represents only 40% of the individuals with registered land concessions. The percentage of land area farmed relative to registered land is even lower. The total area of cultivated land reported in the ponteiro census is less than 1.5% of the land registered in the cadastral records. The results in Table 2 also reveal that the majority of active ponteiros do not have their land registered. Of the 1,098 ponteiros in the census, only 269, or 13% are registered in the cadastral records. However, registered pontas tend to be larger, with 19 hectares of total agricultural land on average, as opposed to an average of 8 hectares for unregistered pontas. As a result, almost half of all agricultural land recorded in the ponteiro census is reported as registered in the cadastral records.

Comparison of the cadastral land registration information with the ponteiros census results shows that there is very little correspondence between official land concessions and actual operations of functioning pontas. On the one hand, the vast majority of registered land is not currently being farmed. Only 11% of those individuals with registered land are actively farming any part of their concession. Furthermore, these individuals are only farming a small portion of their concessions--the total agricultural area reported in the ponteiro census as registered corresponds to only 2% of all registered land in the country. On the other hand, over 70% of all active ponteiros included in the census do not have their land registered in the cadastral records. These unregistered pontas tend to be significantly smaller operations. In other words, the vast majority of land concessions reported in the cadastral service are not presently being farmed, while most active pontas are not in the cadastral records.

Examination of cadastral records and census information on land registration over time further highlights the lack of correspondence between land concessions and farming activity. The proportion of active ponteiros with registered land has remained quite low over time, falling from 32% of pontas established before independence, to under 20% in the last two years. Historically, most ponteiros have not registered their land, a trend that continues to the present. Secondly, the numbers of land concessions issued and active pontas established have followed very different patterns over time. While the number of land concessions has fluctuated greatly since independence, in large part in response to agricultural credit programs (Tanner), the growth in the number of active ponteiros has been much more constant since 1975, presumably reflecting a continuing response to positive economic incentives to grow cash crops.

Table 1 provides a summary of the geographic distribution of pontas throughout the country. The regions with the greatest concentrations of pontas are Oio (with 17% of all pontas) and Bafata (16%). However all regions of the country have a significant number of pontas. The autonomous sector of Bissau (SAB) has only 4%, but this sector is physically small, and a large portion of the land area is in urban development. In terms of area, Bafata dominates, with 41% of total agricultural area and 27% of cultivated area. Average farm size is largest in Bafata, at almost 11 hectares, over 40% larger than for the country as a whole

The geographic dispersion of pontas has increased since independence, as shown in Figures 1 and 2. Of the active ponteiros which began operations before independence, two-thirds were located in SAB/Biombo, Bafata, and Bolama. During colonial times, the only major road in the country connected Bissau and Bafata. Both Bafata and Bolama had river access to Bissau. The other regions were quite isolated from Bissau, which then as now, was the principal local market for agricultural products as well as the main port for exports. While the total number of pontas has increased in all regions since independence, the rate of increase has been much greater in the outlying regions, particularly in Oio, Gabu, Quinara, and Tombali. This pattern of growth can be explained in part by improved transportation access throughout the country in recent years. Since independence, road construction has provided improved access for the other regions. (Given its geography, Bolama has not been able to benefit from improved road access, and the number of pontas in this region has not increased much in recent years.) Current road construction activities can be expected to continue

the general trend of increasing numbers of pontas in outlying regions, particularly in Quinara and Tombali.

Active pontas vary greatly in terms of area farmed. The average cultivated area per ponta is 7.6 hectares, but there is a large degree of variation around this mean. Table 3 provides summary information about pontas by category of area farmed. The vast majority of ponteiros are very small in scale. Almost 60% of all ponteiros farm five hectares or less and only 7% have over 20 hectares under cultivation.[1] Two pontas have cultivated areas exceeding 100 hectares. The final column of Table 3 reveals that large pontas are more likely to have their land registered in the cadastral records. Sixty percent of pontas with 50 hectares or more are registered, as opposed to only 18% of pontas under five hectares. In terms of scale of operations, the distinction between the tabanca sector and the ponteiro sector is not sharply defined, but is better defined as a continuum from traditional tabanca agriculture to the large plantations. Most active ponteiros are quite similar in scale to family agricultural operations within the tabanca structure. In fact, many of the smaller "ponteiros" are actually members of tabancas who have opened up a piece of land which on which they grow crops for sale. These individuals are members of a tabanca participating in the traditional tabanca institutions for production and allocation of staple crops, and at the same time considered to be "ponteiros" because they have a plot with cashews and citrus trees which they manage individually and market the output.

A wide range of crops are grown in the ponteiro sector. An important distinction is made in Guinean agriculture between perennial crops (*culturas permanentes*) and annual crops (*culturas anuais*). This distinction is significant because, to a large extent the perennials are cash crops, while annual crops are staple crops directed primarily for home consumption. Thus, the tabanca sector is traditionally considered to be oriented toward annual food crops whereas ponteiros are commonly associated with production of perennial crops. The census information confirms that ponteiros do indeed specialize in perennial crops; 87% of all cultivated land is in perennial crops. Table 4 reports the areas planted in perennial and annual crops in the ponteiro sector. Overall, annual crops account for slightly less than 10% of all cultivated land. This high degree of concentration is observed in all regions. With the exceptions of Quinara and Bolama, traditionally important rice producing regions, where annual crops make up 20% of land farmed by ponteiros, perennial crops account for 90% or more of all cultivated land. Furthermore, most of the production from perennial crops is marketed (see Table 5). The major annual crops are rice, sorghum, millet, cassava, and sweet potatoes. These crops are primarily destined for on-farm consumption. Overall, three-quarters of all agricultural production in the ponteiro sector is marketed.

Table 6 reports the distribution of area planted in the major perennial crops, by region. Ponteiros often grow a combination of tree crops within a single field; often a few citrus trees and mangoes are planted among a field of cashews. In these situations, the census reports the total area of a field for all types of crops found on the field. Cashews are by far the predominant crop throughout

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1 Farms with less than one hectare were excluded from the census.

the country, accounting for three-quarters of all cultivated area in the ponteiro sector. In terms of the share of total agricultural land, cashews are particularly predominant in Biombo, Cacheu, Oio, and Gabu. Sugarcane production is important in a few regions, particularly near Bissau (SAB & Biombo), Bafata, and to a lesser degree, Quinara and Oio. Citrus and mangoes represent an important share of cultivated land in Bafata, Quinara, and Tombali.

Although the ponteiro sector is considered to dominate the production of perennial crops, particularly cashews and sugarcane, the total production figures for these crops (Table 7) are quite small in comparison to the estimates of national production. Government figures report the export of 16,000 tons of cashew nuts in 1991. The reported total production of the ponteiro sector, less than 2,000 tons, represents only 12% of the total exports. Total production of sugarcane may be conservatively estimated at 50,000 tons.[2] Total production of sugarcane reported in the ponteiro census is less than 10% of this estimate of national production. Thus, even for the two major cash crops traditionally associated with the ponteiro sector, the share of this sector in the total production is quite small.

In conclusion, the ponteiro sector is small in several important dimensions. The number of active ponteiros and their total agricultural area are minuscule in relation to the agricultural sector as a whole, and in comparison to cadastral registrations. Most pontas are quite small in dimension. The reported sales of the major cash crops--cashews and sugarcane--from the ponteiro sector are also small proportions of the national production of these commodities. These findings regarding the small aggregate scale of the active ponteiro sector have several important implications with respect to land law. First, the degree of competition for agricultural land between active ponteiros and tabancas is not nearly as extreme as would be inferred on the basis of cadastral registration records. Tanner estimates that the total land requirements for the tabanca sector (for agricultural production plus fallow plus forestry) are approximately 2.6 million hectares, or 72% of all land in the country.[3] The amount of land in registered concessions, approximately 436,000 hectares, represents another 12% of the total land area of the country. If all land concessions were being actively utilized, the potential for conflict between the two sectors over limited land resources would be great. However, current utilization of land concessions in agricultural activities, 6,030 hectares, represents a minuscule fraction of total land and only two tenths of 1% of land requirements of the tabanca sector. This very low level of land utilization for agriculture by the ponteiro sector suggests that there is not currently significant competition for

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2 Assuming 20 kg of cane to produce one liter of aquardiente, this corresponds to a total production 2,500,000 liters only 2.5 liters per capita.

3 Tanner's estimates of land requirements for the tabanca sector are quite high. Upland plots are often used continuously for 3 - 4 years rather than only two as in his calculations, and livestock grazing and forest product extraction can (and usually do) take place on fallow land. In addition, the tabancas have a significant (and probably growing) portion of their land in tree crops. These crops do not require long periods of fallow relative to their years in production. If, for these reasons, the land requirements per family are 20 hectares, rather than 30, the total land requirements for the tabanca sector are one-half of total land in the country.

land for agricultural purposes between the tabanca and ponteiro sectors at the national level.[4]

However, two important considerations must be emphasized in relation to possible land conflicts. First, the way in which the new land law will be legislated and, more importantly, enforced, will strongly influence the future level of conflicts between concession holders and other land users. If the law specifies conditions under which individual rights can be withdrawn from titled land which is not being used (and if this provision is actually enforced), then current concession holders do not have a strong claim to the vast majority (98%) of current holdings, based on agricultural use. On the other hand, if active use requirements are not enforced, current concession holders have priority claims on their registered land, and the potential for conflict between these concession holders and non-registered land users is considerable.

Second, agriculture is not the only use for land. In particular, extraction of forestry products is a very important economic activity in Guinea-Bissau. Many concession holders are currently using or expect to use their land for forestry activities. In order to better understand the aggregated land requirements, a national study of current and projected forestry activities is necessary. Land law will need to include provisions for defining ownership conditions and use rights for forestry as well as agricultural use. From a policy perspective, the relative merits and costs of agriculture *versus* forestry as competing means of utilization of national land resources should be evaluated. While this report examines the economic potential of commercial farming, similar analyses for traditional (tabanca) agriculture and forestry activities are needed for a complete analysis of alternative land-use strategies.

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4 Clearly conflicts can and do occur in specific locations. At the national level however, the very small land area being farmed by the ponteiro sector places an insignificant burden on the land requirements of the tabanca sector.

## SECTION IV

## ECONOMIC PERFORMANCE OF THE PONTEIRO SECTOR

Measurements of profitability are useful for two different types of analysis. First, profits generated from agricultural activities are the incomes that farmers generate from undertaking these activities. Estimates of profits from production activities thus shed light on the farmers' incomes. Secondly, farmers make production decisions in part on the differences in relative profitabilities of different crops. Information about the relative profitability of different crops indicates the economic incentives which guide farmers in their production decisions. The profitability of activities undertaken by ponteiros is calculated as the difference between the value of all outputs and the costs of all inputs associated with a particular production activity. Two different measures of economic returns will be analyzed in this report. Net revenue is calculated as gross revenue from the sales of all agricultural products minus annual cash outlays (for hired labor and current inputs such as fertilizers and pesticides). This measure represents the cash revenues received by the ponteiros. The second measure, profit, also nets out the imputed capital costs of machinery and land clearing. These costs are not incurred every year, but must be met either from savings from previous earnings or financed by borrowing. An economically viable activity is one that is profitable, revenues generated are greater than all cash and imput costs. Profitability estimates must be reported on a common basis in order to permit comparisons across activities. Profitabilities for agricultural activities are usually reported per unit of land. This corresponds with the normal decision-making process of most farmers, namely selection of the activity which will generate the greatest return on the land available to the farmer.

In order to calculate profits per hectare of land, three different types of information are needed: 1) farm level prices of all outputs, 2) yields of outputs per hectare, and 3) application rates per hectare and unit costs of all inputs. Revenues are calculated by multiplying the outputs times their respective prices. Profits equal revenues minus all production costs. The following sections will discuss each of these components in turn. The analysis will focus only on the six major perennial crops grown by ponteiros. Currently, perennial crops, and in particular cashews, account for the vast majority of marketed output of the ponteiro sector. It should be noted that there are a small number of ponteiros experimenting with annual crops. In particular, there are several large farms in Bafata with mechanized rice operations, and a new operation near Bissau growing fruits and vegetables for export to Europe. These activities may become more widespread throughout the country in the future, but they are still in the process of field experiments. If they do prove to be profitable in practice, other farmers may become interested in these undertakings. However, both these activities are very capital and management intensive, factors which could severely restrict their widespread adoption. However, the economic viability of these operations under field conditions is still not well known, and further monitoring of these activities in the field will be important to evaluate their potential for more widespread adoption.



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## 1. Prices

The census provides information about prices received by ponteiros and for all products sold in the previous marketing year and also the types of buyer to whom the products were sold. Farm-gate prices are strongly influenced by the structure of the marketing channels that distribute commodities from farmers to final consumers. Highly integrated marketing channels, with many competing marketing agents, provide all producers of a commodity with similar prices, whereas poorly developed or thin marketing channels are characterized by a greater variation in prices across producers. In general, ponteiros sell to three categories of buyers. They sell directly to consumers, to small-scale local traders (*djilas*, *bideiros*), and larger traders who have ready access to transportation and have the means to move products to distant market centers. There are distinct patterns of buyers for different products, as shown in Table 8. On the one hand are cashew nuts and sugarcane, which are sold primarily to large-scale buyers. Cashew nuts are predominantly destined for the international market. There exists a network of traders who buy throughout the country and transport the nuts to Bissau to be processed and exported. Sufficient quantities of cashews are traded to permit a differentiated marketing channel, with large and small traders. As a result, cashew growers throughout the country are assured of being able to find a buyer for their nuts. Sugarcane is processed in stills to make *cana*, a distilled drink. Farmers only grow sugarcane if they are near a still which will buy their crop, or if they themselves operate a still. Thus, cane growers also have an assured outlet for their production. The marketing of both these products is relatively secure, and these are the crops in which yields most closely approach the reference levels. The most productive growers of these two crops (the top quintiles) report average yields near or above the reference yields. The marketing opportunities for remaining perennial crops, citrus, mangoes, and bananas, are less dependable. These products are sold primarily either directly to local consumers or to small-scale traders. The marketing activities of the small local traders are generally much more erratic then their larger counterparts. Their operations are governed by the vagaries of local market conditions, and they have tighter credit constraints which may restrict their operations over time.

Table 9 reports average prices for the major perennial crops by region. The prices for cashews are all clustered around PG 1,000 per kilo. Similarly, the prices for sugarcane are all near PG 100 per kilo. These are price patterns of markets that are relatively highly integrated spatially. The prices of the other fruits exhibit much more variation across the regions. For example, the prices of limes range from PG 100/lt in Gabu to PG 3,000/lt in Bissau. Oranges range from PG 400/kg in Bafata to PG 4,000/kg in Bissau. The coefficients of variation (standard deviation divided by the mean) are much higher for citrus, mangoes, and bananas, than they are for cashews and sugarcane. These results provide further indication that the marketing channels are less well developed for the fruit crops than for cashews and sugarcane. The markets for the latter two crops are more closely integrated in the sense that prices are more closely linked across geographical regions.

Guinea-Bissau, the capital, is the major urban center which brings in agricultural products from throughout the country and serves as the port for international exports. Figure 4 shows the average prices for regions ranked according to their isolation from Bissau. The ranking takes into consideration not only distance but transportation costs. Thus, Quinara is ranked as more distant than Bafata, because Bafata has good road links, while access to Quinara is hindered by the Ceba river. Bolama is not included in these figures. Although this region is quite isolated from Bissau, prices are high. Prices in Bolama appear to be determined by the local demand conditions rather than derived from the demand in Bissau. The figures show significant differences in regional price patterns between cashews and fresh fruits (citrus, mangoes, and bananas). Prices of cashews are very similar across regions, indicating a high degree of market integration. Citrus prices show very strong and nonlinear relationships with the distance from Bissau. The distance from Bissau explains 62% of the regional variation of prices for limes and 45% of the variation for oranges. Thus, for these products, there is evidence for some degree of market integration in the country, but there is a high price discount for the growers more distant from Bissau. The association of price with the distance from Bissau is much weaker for mangoes and bananas, although there is a general negative relationship. The degree of spatial correlation for these products is likely to be lower because of their perishability. Prices of perishable products generally fluctuate greatly even within relatively short time intervals. The prices reported in the census cover the whole span of the previous marketing year and therefore are not directly comparable with respect to the date of transaction. There is no reason to expect that the price of bananas in Bafata in February should have any strong relationship with the price in Bissau in May, but the census information does not permit distinction by date of sale.

The price information from the ponteiro census reveals that the degree of market integration for cashews and sugarcane is quite high and less for the other major perennial crops. Cashews are destined for the international market, and a well-developed marketing structure ensures that producers throughout the country are able to sell their product at approximately identical prices. Sugarcane is also marketed through the distilleries, and all producers of cane face similar prices. The other fruits exhibit much more variable prices. This is, in part, due to the fact that they are perishable, so storage is not a feasible strategy to stabilize prices over time. The variability in prices in conjunction with the large deviations in yields has direct implications for differences in revenues among ponteiros.

## 2. Yields

Yield, production per hectare, provides an indicator of physical productivity. It is important to make a distinction between the two different measures of yield of agricultural production. The first measure, which will be referred to as the **biological yield** represents the total amount of the crop produced by the plants on a given area. The

**harvested yield** is the portion of the biological yield actually collected and utilized for human consumption. The distinction between these two types of yield is particularly important for tree crops because the growers may adjust the amount of effort expended on harvesting, and the resulting harvested yield, in response to a number of factors. Figure 3 shows the relation between i) biological yield, ii) effort expended on harvesting, and iii) harvested yield. This diagram is drawn to show that the level of effort per unit of harvested output increases as the harvested approaches the biological yield. Assuming that growers maximize utility (or profits, if they use hired labor to harvest), they will equate the marginal revenues derived from the harvested yield with the marginal cost of harvesting. Under this assumption, a higher price of the output will elicit a greater effort in harvest, and the harvested yield will be closer to the biological yield.

Yields of agricultural products per hectare depend on two general categories of conditions. The first category comprises all physical and climatic conditions which are beyond the capacity of farmers to influence, at least in the short run. General rainfall patterns, soil conditions, topography, local populations of pests and disease vectors fall into this category. These factors determine the biological yields which can be expected for a particular crop in a given region. The second type of variable which influences both biological and harvested yields encompasses those factors which the farmer can influence through the type of production technology applied. Control over the yield characteristics of the cultivar through seed selection is one such factor. Production technologies may also influence, to some degree, the agro-climatic conditions in which the crops grow. Irrigation controls and augments the amount of water delivered to plants, application of fertilizers corrects deficiencies in soil characteristics, and pesticides control the effects of pests and disease on plant development.

The first category of exogenous variables, agro-climatic and topographic conditions, determines the types of crops which can be grown in a particular region and the expected level of biological yields for specific technologies and farm management practices. For each of the major perennial crops grown in Guinea-Bissau, estimates for expected, or "reference" yields, are reported in Table 10. These reference yields represent levels of biological yields that could be obtained under favorable growing conditions in Guinea-Bissau (i.e. with good rainfall), utilizing common production practices, and appropriate management of production activities. They represent the upper limit of the expected harvested yields for the respective crops. The reference yields reported in Table 10 were derived from several sources: ponteiros, technicians in MRDR (DEA, DEPA), and agricultural handbooks on tropical crops.[5]

Table 10 also reports the distribution of reported yields form the census. These reported yields are the respondents' declarations of harvested

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5 CRC Handbook of Tropical Food Crops.

yields and were not independently measured, so the degree of accuracy of these figures is open to question. For all crops, the majority of reported yields are substantially below the reference values. The average yields range from less than 10% of the reference yield, in the case of limes, to 40% for cashews. The average yields of the highest quintile (the 20% of producers with the highest yields for each crop) provides an indication of the highest level of productivity attained by ponteiros for each of the six crops. In the case of cashews, the highest quintile actually had an average yield 20% higher than the reference yield. The most productive sugarcane growers attained an average yield very close to the reference value. For the other crops, however, even the most productive growers did not approach the reference yield levels. The average yields of the highest quintiles for these other crops ranged from 40% to 60% of the reference yields.

The generally low harvested yields reported by the ponteiros has a very strong negative impact on the economic performance of the sector. Thus, an understanding of the factors affecting yields is crucial in identify policies or other actions to improve the performance of the sector. The 1990-91 growing season was not considered to be a bad agricultural year, so agro-climatic conditions do not explain the low yields reported in the census. Rather, the poor results must be explained by the farmers' management practices. One factor which appears to be an important influence on realized yields is the ease with which the product can be marketed at harvest time. With tree crops, yield is strongly influenced by the level of effort exerted in the harvest. Furthermore, many of the products are perishable, so they cannot be picked and stored for later sale, but must be marketed immediately after being harvested. In this situation, producers will only pick (or contract others to pick) the amount of the crop that they can sell. In the extreme, if there are no interested buyers or if the grower has no way of getting the product to market, the grower will simply not harvest. In Figure 3, a restriction on the quantity of output that may be marketed is represented by the vertical line LL. With this quantitative restriction, growers will not be given incentives to increase the level of harvested yield above LL, even if the market price is above $P_1$, because they will not be able to sell any additional harvested output. Thus, commodities with poorly functioning marketing channels are expected to exhibit relatively low harvested yields in comparison with commodities having more highly integrated markets. In fact, citrus, bananas, and mangoes, which are most severely burdened with marketing constraints, as evidenced by the high degree of variability in farm-gate prices, are the crops with the greatest divergence between harvested yields and reference yields. Cashews and sugarcane have more integrated markets, less variation in prices, and harvested yields, especially those of the most productive growers, more closely approximating the reference levels.

One factor which is negatively related to the harvested yields is the area farmed by the ponteiro. Figure 3 shows that for all the major perennial crops the relationship between harvested yield and total area farmed is very nonlinear. The highest yields are found on the very smallest pontas and fall quickly with size of operation increases, but then the rate of

decrease of yield flattens out with larger farm sizes. This relationship between yield and farm size has been observed in agricultural surveys throughout the world. Berry and Cline provide a number of economic arguments to explain this observed relationship. They argue that smaller farms have low opportunity costs for labor and high opportunity costs for capital so they adopt more labor-intensive technologies which exhibit high yields per unit of land rather than capital-intensive technologies which usually do not provide such high yields. Also, small farms can be more closely managed than larger operations. These arguments are also valid for ponteiros in Guinea-Bissau. The marketing constraints discussed above are another possible explanation for the inverse relationship between yield and farm size. Marketing constraints are more likely to be binding for larger farms with a greater total production relative to the marketing capacity of local traders, and thus more likely to have a smaller harvested yield in relation to the biological yield.

Another factor which can be expected to influence yields is the extent to which modern yield-augmenting inputs--fertilizers and pesticides--are utilized. The impact of these inputs on yields will be analyzed in more detail below. It should be noted, however, that only a very small percentage of ponteiros use these inputs. Only 12 ponteiros reported using pesticides and 60 used chemical fertilizers. The ponteiros using these inputs did report higher yields on their major perennial crops. However, the differences were statistically significant only in the case of fertilizers.

3. Revenues

Total revenues received by a ponteiro are directly influenced by yields, total amount of land in production, and prices received for each crop sold from the ponta. The variability in these components implies a high degree of variability in the revenues across pontas as well. Table 11 reports the average revenues from sales of agricultural products per farm by region. The average value of agricultural sales ranges from slightly over PG 200,000 in Gabu to almost PG 14,000,000 in Bissau. However, the variation in revenues is also quite substantial within regions, as demonstrated by the large coefficients of variation within each of the regions. (All are significantly greater than one, implying that the average deviation from the mean is greater than the mean itself.)

Revenues per hectare range from zero to over PG 11,000,000 (US $2,000) and the average for the entire sample is PG 563,000 per hectare (US $100). Bissau and Biombo have the highest revenues per hectare. As discussed above, prices of most products are slightly higher in these regions, because of the proximity to the urban market. However, even more important is the fact that production of sugarcane, a very valuable crop, is widespread in these regions. Bafata, Tombali, Quinara, and Cacheu have per-hectare revenues in the PG 500,000 to 600,000 range. The regions with the lowest average revenues per hectare are Oio, Bolama, and Gabu. The variation in revenues per hectare is somewhat less than total revenues per farm, but the coefficients of variation are extremely large in all regions except Biombo. Total revenues increase with the size of the farm, as

shown in Table 12. However, revenues per hectare do not have any significant correlation with the area farmed, either positive or negative.

Figure 5 shows graphically the shares of the major crops in total sales of the ponteiro sector. Figure 5 highlights the importance of cashews as the major source of revenue for the ponteiro sector. Nuts and wine together account for almost 60% of all sales. Cashew wine is a very important source of revenue. Producers reported that every kilogram of nuts will provide sufficient fruit to make four liters of wine. One kilogram of nuts has a value of PG 1,000 and one liter of wine can be sold for PG 500. Thus the value of the cashew wine as a "by-product" is actually twice the value of the nuts. Most farmers pay for the harvest of the cashews with wine. Typically, the work crews that harvest the cashews extract the juice from the fruit in the field, and they are permitted to keep half the juice, but most landowners do not control the total amount of juice extracted, and several ponteiros indicated that the harvesting crews actually kept more than half of the wine produced. Thus, the realized value of the juice to the ponteiros is actually somewhat less than the value of the nuts. The other significant fact revealed by Figure 5 is the large share of total value represented by sugarcane and *cana*, at 17% of the total value of sales. Since less than 5% of the ponteiros grow sugarcane, they receive a disproportionate share of the total revenues of the sector. Sales of annual crops account for less than 10% of all sales.

4. Input Costs

By far the most important agricultural input in the ponteiro sector is labor. Labor is used to clear and prepare land and planting. This is an investment expense because the cost must be incurred only once during the life of a plantation. For tree crops, the major annual activities are cleaning the underbrush from around the trees (done at the end of the rainy season), clearing and maintaining fire breaks, and harvesting. If the crops are irrigated, labor is needed to distribute water through the fields. Sugarcane requires large amounts of labor for harvesting. Before cutting the stalks, the leaves must be trimmed away. Representative labor budgets were constructed for the major tree crops on the basis of discussions with farmers. The amount of labor needed to clear land varies considerably, depending on the type of vegetation that must be removed. An estimated 300 person/days per hectare is based on the assumption that a mature forest stand is being cleared with no power equipment, such as chain saws or tractors, being used. The cost of hired labor is quite uniform around the country at approximately PG 5,000 per day. The cost of land clearing is annualized by spreading the total cost over 20 years. Annual labor requirements for tree crops are estimated at 50 person/days per hectare for cleaning undergrowth and maintaining paths and firebreaks, and 50 days per hectare for harvesting. Bananas are assumed to require slightly more labor for harvesting and cleaning the old stalks out of the fields; total labor requirements are 150 days per hectare. Sugarcane is assumed to require 200 days per hectare for all annual operations. Table 13 provides a summary of the labor requirements for land clearing and annual operations for the six major perennial crops.

Access to modern agricultural inputs in the ponteiro sector is extremely limited. Only 16% of the ponteiros (174) reported having modern machinery (tractors, garden tractors, plows, wagons, sprayers, seeders, generators, hullers, pumps, etc.), and of this group, only 15 reported having tractors (Table 14). Just over 10% reported having pumps for irrigation. These numbers emphasize the extremely low degree of mechanization in the ponteiro sector. Utilization of chemical fertilizers and pesticides is also very low, with only 5% reporting applying fertilizers and less than 1% using pesticides. Machinery usually acts as a substitute or augments the productivity of labor in the agricultural production activities. Higher revenues per hectare for those pontas with modern machinery provides evidence for the increased productivity afforded by these inputs. Larger machinery also embodies significant economies of scale. The total cost of a tractor is the same whether it is used one or thirty hectares, but the costs per hectare decreases as the area farmed increases. A single tractor can effectively operate 20-30 hectares. The average size of operations with tractors is over 26 hectares, substantially larger than the average for the entire sector of seven hectares. Farms with tractors also report substantially higher revenues per hectare. Pumps for irrigation also embody some economies of scale, although small-capacity pumps are available which provide water for a relatively small area. The possible economic benefits of pumps are to i) increase the total availability of water on a field, or ii) reduce the variability of water access over time, either within a single growing season or from year to year. The average size of pontas with pumps is somewhat larger than those without pumps, and net revenues are also higher. Fertilizers and pesticides are considered to be scale-neutral inputs because they are quite divisible--the unit cost to buy fertilizer for one hectare is the same as for 100 hectares. In fact, the farms that use these inputs are on average significantly larger than those which do not apply chemicals. Farmers who apply fertilizers and/or pesticides realize significantly higher per-hectare revenues.

Table 15 reports estimated annual costs of machinery and purchased inputs. The cost of a tractor and auxiliary equipment is estimated at PG 200,000,000 (US $40,000), and is assumed to last for ten years. The initial cost is depreciated over the ten years at 5% interest using the capital recovery method. Pumps are assumed to cost PG 2,000,000 (US $4,000) and are also depreciated over ten years. Fertilizers and pesticides are each assume to cost PG 250,000 per hectare. If the tractor is used to farm 30 hectares, the per-hectare cost is PG 860,000. If the pump is used to irrigate ten hectares, the per-hectare cost is PG 260,000. Comparison of these costs (Table 14) reveals that with the exception of pumps, the average increases in per-hectare revenues associated with the modern inputs is greater than their costs.

Representative Crop Budgets. Representative budgets were constructed for the six major perennial crops which incorporate the yield, price, and cost information discussed above. The results are given in Table 16. Three scenarios with different yield assumptions are presented: i) reference yields, ii) sample mean yields, and iii) the mean yields of the highest quintile for each crop.

Representative prices for each product are multiplied by these yields to derive per-hectare revenues. From these revenues are netted out the annualized costs of land preparation and the annual operations reported in Table 13. Several results stand out. First, with the reference yields, all six products are quite profitable, but with a wide range of results, from PG 1.6 million (US $320) per hectare for cashews to PG 7.4 million (US $1,480) for limes. In between these extremes are sugarcane, mangoes, oranges, and bananas, all in the PG 4,000,000 to 6,000,000 range. Sugarcane and fruits are all significantly more profitable than cashews when evaluated at the reference yield levels.

Profits calculated with observed yield levels show a very different pattern. In all cases, the profits per hectare are substantially below those which can be obtained with the reference yield levels. The average profits of citrus, mangoes, and bananas are all less than 10% of the reverence levels. Cashews come closest to attaining the reference profit levels at 27%. The most productive growers of cashew and sugarcane (the highest yield quintiles for each of the six crops) attain profits comparable to the reference levels in the case of cashew and sugarcane. However, growers of the fruit crops (citrus, mangoes, and bananas) in the highest yield quintiles attain only 30% to 60% of the profits derived at the reference yields.

At the sample average yield levels, sugarcane is by far the most profitable crop at PG 730,000 (US $146). Cashews and oranges follow in the PG 350,000 to 450,000 range. Mangoes, bananas, and limes show very low or negative profits at the average yields. These results accord with field observations and statements of ponteiros. Sugarcane is generally agreed to be the most profitable crop, and all growers with appropriate land and access to a buyer (a distiller) appear to grow some sugarcane. The factor which limits increased cane production is the geographical distribution of existing distillers and the high cost of transporting cane to distilleries. After sugarcane, which is geographically limited to the vicinity of distilleries, cashews are the most profitable of the perennial crops at the average yields obtained in the country. The positive economic incentives of cashews in relation to alternative crops thus explains the large proportion of land planted in this crop. New pontas area predominantly planted in cashews--of the pontas established since 1990, 84% of the land have cashews. Ninety-five percent of the ponteiros interviewed responded that if possible they would like to expand their operations, and the majority of these indicated that they would plant at least part of this additional land in cashews. Oranges are comparable with cashews in terms of average profit levels. However, the marketing risks associated with oranges are much higher than for cashews, not only because of the variability of market price, but because of physical bottlenecks in the marketing channels. Thus the average profit of oranges must be heavily discounted for risk in relation to cashews.

Table 16 also reports the break-even yields for the six perennial crops. The break-even yield is defined for a given output price and per-hectare production costs to be the yield at which revenues just equal costs. In particular, the break-even yield is calculated from the following formula:

Break-even yield = (per-hectare production costs) / (output price)

The break-even yield is less than 20% of the reference yield for all six products. The average yields are above the break-even level for all products except bananas. Over 60% of the farmers with cashews and almost 50% of sugarcane producers have yields above the break-even level, implying that they earn positive profits from their production of these crops. However a much higher proportion of producers of the remaining fruit products have yields below the break-even levels. Seventy percent of producers of mangoes and limes and 85% of orange and banana growers do not have sufficiently high yields to meet their costs as specified in the representative budgets. The large differences between the break-even yields and reference yields indicate significant scope for economically viable production of these crops in Guinea-Bissau.

Farm-level Economic Performance. The previous section analyzed the profitability of individual crop production activities. Most ponteiros grow several different crops. This section will examine the factors which influence the overall economic performance of ponteiros--their income from all agricultural activities. Statistical techniques will be used to attempt to explain variations in profitability across pontas and to isolate the individual impacts of the several factors which affect profitability discussed in the sections above. Two measures of economic returns will be evaluated. Net revenue is total revenue from all agricultural sales minus actual cash outlays for hired labor and purchased inputs (fertilizers and pesticides). The second measure, profit, nets out the imputed annual cost of capital expenditures for land clearing and machinery at an assumed price of capital of 5%. It should be noted that some ponteiros receive preferential access to credit, and their real cost of some types of capital may be significantly below the market cost

Table 17 provides an indication of the wide variation in net revenues and profits across the ponteiros in Guinea-Bissau. The average net returns for the lowest quintile (20% of the ponteiros with the lowest net revenues) are negative. In fact, 23% of the pontas had negative net returns. At the other extreme, the top quintile had an average of over PG 14,000,000. In absolute terms, the net revenues of even the highest quintile are not very high, slightly less than US $3,000. Net revenues per hectare also exhibit great variation, with the lowest quintile losing an average of almost PG 150,000 per hectare, and the highest quintile earning nearly PG 12,000,000. Profits are of course lower than net revenues. For the sample as a whole, profits per ponta are only slightly greater than half the level of net revenues. The large differences between these two measures are found in all cases except the highest quintile, where profits are 86% of net revenues.

Are there factors which correlate with the observed variations in net revenues and profits? The remainder of this section will address this question, first by examining patterns of variation across ponteiros divided into categories of total profits, and then by applying regression analysis to estimate the simultaneous impacts of variations in several correlates on net revenues and profits per unit of land. In particular, variables relating to i) farm size, ii) market access, iii) level of technology, and iv) crop mix will be incorporated into the analysis.

Table 18 reports several characteristics of ponteiros by quintile of profits per farm. A very clear pattern of variation across categories emerges from this

table. First, the most unprofitable group of ponteiros (those in the first quintile) and the most profitable (the fifth quintile) both have significantly larger average cultivated areas than the intermediate groups, suggesting that large farms tend to be either very profitable or very unprofitable. This is in part due to the scale effect--larger farms will have larger total profits even if their profits per unit of land are identical to their smaller neighbors. However, the second column of the table shows that per-unit profits are also highly correlated with total profits per ponta, tending to magnify the scale effect on total profits.

Use of machinery may influence profits in two ways. On the one hand, the capital costs of machinery will reduce profit. On the other hand, machinery may increase revenues either by increasing yields or by permitting a larger total area to be farmed. The groups which use most machinery are the most unprofitable group, in which 46% use some type of machinery, and the two groups with the highest profits, in which 10% to 11% use machinery. The intensity of machinery use (cost per hectare) is also highest in the most unprofitable group and the two most profitable groups. The pattern is repeated in the percentage of ponteiros that use fertilizers. Thus, users of modern inputs are either among the most profitable or the most unprofitable farmers. The majority of modern input users must bear the high costs of these inputs but to not have offsetting increases in revenues. The lowest quintile has extremely high machinery costs per unit of land and no corresponding yield increases to generate higher yields per unit of land. However, the most profitable farms also use machinery more than those with relatively low profits. These farmers benefit from higher revenues which more than offset their machinery costs. Their level of machinery use, measured as cost per hectare of cultivated land, is much lower than the most unprofitable group. Thus, it appears that machinery, if used properly, can increase profit, but in actuality most machinery users are not able to use their equipment effectively to generate increases in revenues to offset their higher production costs. With respect to crop mix, there are not significant differences across the groups in the share of area planted in cashews. The over all average is 76%, and the shares of all groups range between three-quarters and four-fifths. Sugarcane growers tend to fall into either the highest or lowest categories. In summary, several distinct patterns emerge when ponteiros are stratified by profits. In particular, there are strong similarities between those with the highest and the lowest profits, namely relatively large land holdings, high utilization of modern inputs, and a higher proportion of land in sugarcane. From a different perspective, large pontas tend to be either very profitable or very unprofitable. Of the farms with 20 hectares or more, 50% fall into the lowest quintile of profits, while 40% are in the highest quintile.

Several factors have been identified which may be expected to influence net revenues and profits, namely cultivated area, level of technology (as measured by use of machinery and chemical inputs), crop mix, and access to markets. These variables do in fact demonstrate strong relationships with economic performance. However, the observed economic performance of any individual ponteiro is affected simultaneously by all these variables, and many others, and sorting out the effect of a single factor requires a more sophisticated analysis of the data. Simple correlations between variables cannot measure the impact of one factor, holding all others constant. Regression analysis permits sorting out the impacts of a single variable on net revenues or profits by statistically controlling the

variation of other variables. Linear regression models were run on net revenues and profits per hectare. The variables included in the model are given in Table 19. Detailed descriptions of the regression models and the results are given in Appendix II. The results can be summarized as follows:

1. Net revenues and profits are negatively correlated with area farmed. This result can be explained by the negative correlations between yield and area farmed, described above.

2. Pontas closer to Bissau have higher profits, all else equal. This relationship is highly statistically significant, and it suggests that proximity to Bissau affords greater marketing opportunities and correspondingly higher profits than can be attained in more distant regions.

3. Use of modern inputs (machinery, fertilizers, and pesticides) is not associated with higher levels of profit.

4. The degree of diversification, the number of different crops grown, is positively associated with profits. More diversified pontas generate higher profits.

5. On the other hand, higher concentration in cashew production is also associated with higher profits.

The multiple regression results, therefore, do not indicate that there are significant economies of scale in the Guinean agriculture; in fact, just the opposite, the smaller operations have higher per-unit profits. Furthermore, the use of modern inputs does not generate higher profit levels, implying that these inputs are not being effectively utilized by ponteiros. The regression results also suggest that two alternative strategies are associated with higher profit levels, diversification of production, or concentration in cashew production.

Ponteiros' Stated Goals and Constraints. The survey questionnaire included several questions designed to elicit the future plans of the ponteiros problems they currently face in their agricultural activities. The first such question asked what kinds of changes in agricultural activities the ponteiros would like to undertake in the future. Ninety-nine percent of all respondents indicated that they were interested in increasing the level of their agricultural operations. This level of response suggests that ponteiros presently perceive positive economic incentives for commercially oriented agriculture in Guinea-Bissau. In response to this question, the vast majority (96%) indicated that they would like to increase the amount of cultivated land. Most of these respondents stated that they would like to put some or all of this additional land in cashews. At the moment, the general consensus among farmers is that cashews represent the most attractive alternative. However, some ponteiros are beginning to explore other possibilities. Several large pontas near Bafata have been growing rice using mechanized technologies for several years. Some new operations around Bissau are setting up production of fruits and vegetables destined for Europe. At a demonstration day held at the MRDA fruiticulture center in Quebo, a number of ponteiros expressed interest in growing fruits, particularly mangoes, citrus, pineapples, and bananas, for export markets. There was agreement amoung the ponteiros that in order to develop these opportunities,

great improvements would be needed in marketing infrastructures, and growers would need to undertake substantial investments in establishing improved (crossed) varieties.

A second question directed to ponteiros referred to the types of investments they would like to make if they had access to credit. Almost three-quarters of the responses referred to acquiring equipment, machinery and materials. Specific items mentioned ranged from hand tools and sacks, to larger equipment, such as sprayers, pumps, chain saws, and cashew presses, to large-scale machinery, tractors, and implements. A further 8% identified the construction of buildings--warehouses, machinery sheds, and processing facilities. Less than 20% specifically mentioned increasing land area, which is somewhat surprising, given that practically all ponteiros indicated interest in augmenting the scale of their operations. It should be noted that much of the demand for equipment (machetes and axes, chain saws, tractors), is to clear land.

A final question asked ponteiros to identify the problems they faced in the operation of their farms. Almost half responded that the lack of access to finance represented their major constraint. An additional 40% cited the lack of equipment. This response can indicate two possible problems, either the inability of the ponteiro to find the necessary equipment in local or national markets, or financial restrictions which hinder the acquisition of the materials. Natural problems--pests (particularly monkeys), theft, lack of water, and fires account for 10% of the responses. Lack of labor is a very rare problem. Land disputes are hardly perceived to be a problem--at least from the perspective of the ponteiros.

Conclusions

The results of the ponteiro survey provides much information about the sector. Perhaps most striking is the small dimension of the sector, both in aggregate terms and in terms of the size of most operations within the sector. The total amount of land farmed by active ponteiros, approximately 8,500 hectares is less than 2% of the land registered in the cadastral records, and only one-third of 1% of the estimated land requirements of the tabanca sector. Pontas are found throughout the country, but the highest concentration is near Bissau, and in regions with good transportation links to the capital, especially Bafata, Oio, Quinara, and Cacheu.

The great majority of ponteiros are small. The average cultivated area for the sector is less than eight hectares, and 60% have less than five hectares. Most of these smaller ponteiros do not use modern inputs--machinery, chemical fertilizers, or pesticides. In fact, the distinction between ponteiros is not clearly delineated; there exists a continuum of farm types from the tabanca sector to the largest capital intensive operations. Many so-called ponteiros are also members of tabancas. They farm tabanca lands, but at the same time have individual plots (or "pontas"), which they cultivate with a view to sell the products. Only 7% of the ponteiros farm more than 20 hectares, although they account for over one-third of all land farmed by ponteiros.

As a group, ponteiros are extremely market-oriented. Three-quarters of all agricultural production of the sector is sold. Ninety percent of all cultivated

land is in perennial cash crops. Cashews alone account for over 70% of all cultivated land in the sector. However, the sales by the ponteiro sector of the two major cash crops, cashews and sugarcane, represent only a small portion of national markets for these two commodities. The tabanca sector provides most of the marketed output of these products. The great majority of the market output of agricultural products in Guinea-Bissau is provided from the tabanca sector.

Economic analysis provides evidence that ponteiros are responsive to price signals. When calculated with the average yields obtained by ponteiros, the profits from sugarcane and cashews are much higher than for the alternative perennial crops. However, only those producers with ready access to distilleries are able to grow sugarcane. Cashews thus represent the most profitable alternative for the majority of ponteiros in the country who cannot market sugarcane. The large share of cultivated land currently planted in cashews and the stated desire of many ponteiros to increase cashew production are consistent with the existing structure of price incentives. Information from the census also indicates that marketing constraints limit the effectiveness with which price signals are transmitted to ponteiros throughout the country. In particular, prices for citrus, bananas, and mangoes, are extremely variable, so producers of these products are exposed to significant marketing risks.

Economic performance of the ponteiro sector is extremely variable, but generally quite poor given the level of natural agricultural potential in the country. The major explanation for the poor performance is low yields. If producers can in fact obtain yields which are considered to be technically feasible in Guinea-Bissau, they are able to realize significant profits. A number of factors help to explain the generally low observed yields in the ponteiro sector. First is the extremely low level of utilization of yield-enhancing modern inputs.

Furthermore most of the ponteiros which do use machinery and chemical inputs do not generate sufficient increases in yields to offset the additional costs of these inputs. Second, indirect evidence suggests that many farmers realize low harvested yields because of severe marketing constraints, either low prices, or actual lack of opportunities to sell products. Poor marketing opportunities also appear to restrict the overall level activities in the ponteiro sector. The general trend of increases in number of ponteiros following the pattern of transportation development since independence supports this hypothesis. Current investments in the road network, particularly in the south, can be expected to further bolster the growth of the ponteiro sector.

Several policy implications can be drawn from the results presented in this report. First, the economic analyses indicate that most ponteiros are not close to realizing their potential returns from the agricultural activities they undertake. The reasons for the low levels of productivity appear to be i) lack of understanding (or motivation) on the part of ponteiros to most efficiently use their resources and inputs, and ii) constraints on the marketing of outputs. Research and extension activities of the MDRA should therefore be directed at least in part to addressing these problems of the ponteiro sector. Ponteiros need information about how to effectively utilize inputs, particularly machinery and chemical inputs. Investments in marketing services and infrastructure would also greatly increase the economic performance of ponteiros, in part by

increasing farm-gate price levels, but in many instances by reducing physical constraints on marketing outputs.

Competition between the ponteiro sector and the tabancas for agricultural land is not currently a major problem at the national level. However, expectations for future growth in the ponteiro sector imply that competition for good agricultural land will increase over time. Two areas for further research on competing land uses can be identified. First, an inventory of the current use of lands for forestry and projections of future changes would provide a more complete picture of the national demand for land resources. Secondly, a more detailed study of land use patterns by tabancas is extremely important. One of the findings of this study is the relatively small share of the ponteiro sector in the production of cash crops. Is the remaining production dispersed in tabancas throughout the country, or are these areas of concentrated production? What have been the recent trends in production in the tabancas, and what are the perspectives for the future? These questions are of interest not only with respect to evaluating the production trends of these crops, but also to better understand the economic performance of the tabancas, where the majority of the Guinean population resides and earns its livelihood.

Lack of credit is a serious problem for ponteiros. Almost all ponteiros reported significant unmet demands for credit. However, many past investments made by ponteiros in machinery and other modern inputs do not appear to have resulted in increased productivity. Therefore, care must be taken that credit is directed toward profitable investments. There is no evidence that large, capital-intensive pontas are more profitable than the more modest operations, so credit should not be allocated only to large ponteiros. The economic analysis indicates that most agricultural activities can be quite profitable if properly managed, so there is not strong argument for subsidized credit programs. Rather, a program in which large and small ponteiros alike can obtain credit for a wide range of different investments and which has effective procedures for evaluating credit proposals and monitoring outstanding loans would promote more rapid and widespread growth in the ponteiro sector.

SECTION VI

TABLES AND FIGURES

TABLE 1

NUMBER OF PONTEIROS, AREA, BY REGION

| Region | Number of Ponteiros | (%) | Total Agricultural Area (ha) | (%) | Cultivated Area (ha) | (%) | Cultivated Area per Farm (ha) | % Established before '75 |
|---|---|---|---|---|---|---|---|---|
| Bissau | 47 | 4 | 521 | 5 | 447 | 5 | 9.5 | 61 |
| Biombo | 104 | 9 | 1,171 | 13 | 1,076 | 10 | 10.3 | 62 |
| Cacheu | 136 | 12 | 1,072 | 12 | 987 | 10 | 7.3 | 18 |
| Oio | 188 | 17 | 1,391 | 12 | 1,044 | 12 | 5.6 | 8 |
| Bafata | 172 | 16 | 3,730 | 22 | 1,848 | 33 | 10.7 | 25 |
| Gabu | 70 | 6 | 222 | 3 | 222 | 2 | 3.2 | 9 |
| Quinara | 143 | 13 | 1,644 | 16 | 1,359 | 15 | 9.5 | 15 |
| Tombali | 124 | 11 | 724 | 8 | 669 | 6 | 5.4 | 11 |
| Bolama | 114 | 10 | 710 | 8 | 708 | 6 | 6.2 | 33 |
| TOTAL | 1,098 | 100 | 11,185 | 100 | 8,360 | 100 | 7.6 | 23 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 2

NUMBER OF PONTEIROS, AREA, BY YEAR ESTABLISHED

| Year Established | Cadastral Register | | Ponteiro Census | | | Ponteiro Census Declared As Registered | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Area | Number | Cultivate Area | Total Agric. Area | Number | Cultivate Area | Total Agric. Area |
| Pre-75 | 422 | 103,500 | 220 | 2,052 | 2,276 | 70 | 917 | 1,024 |
| | | | 52.1 | 2.1 | 2.2 | 16.6 | 0.9 | 1.0 |
| 75-80 | 30 | 1,000 | 224 | 1,975 | 2,595 | 65 | 555 | 1,029 |
| | | | 746.7 | 197.5 | 259.5 | 216.7 | 55.5 | 102.9 |
| 81-85 | 286 | 20,530 | 215 | 1,524 | 2,051 | 42 | 233 | 343 |
| | | | 75.2 | 7.4 | 10.0 | 14.7 | 1.1 | 1.7 |
| 86-90 | 1,335 | 310,900 | 283 | 1,686 | 2,267 | 67 | 1,008 | 1,354 |
| | | | 21.2 | 0.5 | 0.7 | 5.0 | 0.3 | 0.4 |
| 90-92 | n.a | n.a | 16 | 73 | 73 | 3 | 6 | 6 |
| n.a | n.a | n.a | 140 | 1,050 | 1,922 | 22 | 226 | 778 |
| TOTAL | 2,073 | 435,930 | 1,098 | 8,360 | 11,184 | 269 | 2,945 | 4,534 |
| | | | 53.0 | 1.9 | 2.6 | 13.0 | 0.7 | 1.0 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 3

NUMBER OF PONTEIROS, AREA, BY SIZE CATEGORY

| Size Category (ha) | Number of Ponteiros | (%) | Total Agricultural Area (ha) | (%) | Cultivated Area (ha) | (%) | Cultivated Area per Farm (ha) | % Registered |
|---|---|---|---|---|---|---|---|---|
| 1 - 5 | 646 | 59 | 2,246 | 21 | 1,766 | 79 | 2.7 | 18 |
| 5 - 10 | 229 | 21 | 1,989 | 19 | 1,615 | 81 | 7.1 | 26 |
| 10 - 20 | 148 | 13 | 3,204 | 25 | 2,073 | 65 | 14.0 | 43 |
| 20 - 50 | 63 | 6 | 2,424 | 23 | 1,951 | 80 | 31.0 | 65 |
| 50 - 100 | 10 | 1 | 1,050 | 8 | 704 | 67 | 70.4 | 50 |
| > 100 | 2 | 0 | 271 | 3 | 250 | 92 | 125.0 | 100 |
| TOTAL | 1,098 | 100 | 11,184 | 100 | 8,359 | 75 | 7.6 | 30 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 4

AREAS IN PERENNIAL AND ANNUAL CROPS, BY REGION

| Region | Perennial (ha) | % | Annual (ha) | % |
|---|---|---|---|---|
| Bissau | 411 | 92 | 34 | 8 |
| Biombo | 1,061 | 99 | 15 | 1 |
| Cacheu | 941 | 95 | 44 | 4 |
| Oio | 974 | 93 | 70 | 7 |
| Bafata | 1,659 | 90 | 168 | 9 |
| Gabu | 222 | 100 | 1 | 0 |
| Quinara | 1,039 | 76 | 318 | 23 |
| Tombali | 624 | 93 | 44 | 7 |
| Bolama | 555 | 78 | 150 | 21 |
| TOTAL | 7,486 | 90 | 844 | 10 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 5

MARKET VALUE OF PRODUCTION AND SALES,
PERENNIAL AND PERMANENT CROPS

| Type of crop | Value of Production ('000 PG) | Value of Sales ('000 PG) | Sales as Percent of Production |
|---|---|---|---|
| Perennial | 3,049,614 | 2,632,236 | 86 |
| Annual | 951,620 | 277,714 | 29 |
| Total | 4,001,234 | 2,909,950 | 73 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 6

AREA IN PRINCIPAL PERENNIAL CROPS, BY REGION (HECTARES)

| Region | Cashews | Oranges | Limes | Mangoes | Bananas | Sugarcane |
|---|---|---|---|---|---|---|
| Bissau | 271 | 3 | 6 | 12 | 24 | 96 |
| Biombo | 1,037 | 62 | 13 | 3 | 2 | 18 |
| Cacheu | 893 | 4 | 9 | 37 | 0 | 0 |
| Oio | 845 | 32 | 31 | 46 | 3 | 20 |
| Bafata | 1,158 | 476 | 443 | 564 | 321 | 72 |
| Gabu | 216 | 11 | 4 | 20 | 7 | 0 |
| Quinara | 750 | 252 | 277 | 254 | 145 | 42 |
| Tombali | 296 | 176 | 256 | 111 | 246 | 0 |
| Bolama | 498 | 31 | 27 | 49 | 44 | 0 |
| TOTAL | 5,964 | 1,047 | 1,066 | 1,096 | 792 | 248 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 6 (Continued)

AREA IN PRINCIPAL PERENNIAL CROPS, BY REGION (HECTARES)

| Region | Cashews | Oranges | Limes | Mangoes | Bananas | Sugarcane |
|---|---|---|---|---|---|---|
| Bissau | 61 | 1 | 1 | 3 | 5 | 21 |
| Biombo | 96 | 6 | 1 | 0 | 0 | 2 |
| Cacheu | 90 | 0 | 1 | 4 | 0 | 0 |
| Oio | 81 | 3 | 3 | 4 | 0 | 2 |
| Bafata | 63 | 26 | 24 | 31 | 17 | 4 |
| Gabu | 97 | 5 | 2 | 9 | 3 | 0 |
| Quinara | 55 | 19 | 20 | 19 | 11 | 3 |
| Tombali | 44 | 26 | 38 | 17 | 37 | 0 |
| Bolama | 70 | 4 | 4 | 7 | 6 | 0 |
| TOTAL | 71 | 13 | 13 | 13 | 9 | 3 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 7

PRODUCTION OF MAJOR PERENNIAL CROPS, BY REGION (TONS)

| Region | Cashews | Oranges | Limes | Mangoes | Bananas | Sugarcane |
|---|---|---|---|---|---|---|
| Bissau | 225 | 46 | 3 | 22 | 14 | 2,107 |
| Biombo | 271 | 4 | 1 | 3 | 15 | 185 |
| Cacheu | 294 | 2 | 3 | 15 | 0 | 12 |
| Oio | 208 | 6 | 3 | 9 | 4 | 92 |
| Bafata | 158 | 112 | 78 | 400 | 82 | 1,602 |
| Gabu | 14 | 1 | 1 | 3 | 1 | 0 |
| Quinara | 383 | 62 | 68 | 46 | 19 | 385 |
| Tombali | 65 | 78 | 8 | 102 | 100 | 5 |
| Bolama | 234 | 10 | 3 | 13 | 5 | 48 |
| TOTAL | 1,852 | 321 | 168 | 613 | 240 | 4,436 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 8

SALES BY TYPE OF BUYER BY PRODUCT

| Product | Consumers | Small-Scale Traders | Large-Scale Traders |
|---|---|---|---|
| Cashews | 4 | 11 | 85 |
| Limes | 48 | 49 | 3 |
| Oranges | 18 | 77 | 5 |
| Mangoes | 28 | 73 | 2 |
| Bananas | 23 | 74 | 3 |
| Sugarcane | 11 | 8 | 81 |
| "Cana" | 77 | 15 | 8 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 9

PRICES OF SELECTED PRODUCTS, BY REGION

| Region | Cashews | Limes | Oranges | Bananas | Mangoes | Sugarcane |
|---|---|---|---|---|---|---|
| Bissau | 1,150 | 3,000 | 4,000 | 1,000 | 1,083 | 109 |
| Biombo | 1,015 | 2,100 | 1,167 | 750 | 625 | 74 |
| Cacheu | 999 | 1,157 | 250 | | 1,209 | |
| Oio | 921 | 1,071 | 1,540 | 1,508 | 2,037 | 80 |
| Bafata | 1,035 | 1,119 | 378 | 987 | 462 | 83 |
| Gabu | 1,031 | 100 | 1,080 | 1,000 | 200 | |
| Quinara | 1,042 | 1,141 | 586 | 523 | 529 | |
| Tombali | 990 | 921 | 473 | 710 | 476 | |
| Bolama | 955 | 1,815 | 1,004 | 2,844 | 1,375 | |
| Mean | 1,004 | 1,192 | 584 | 1,029 | 748 | 93 |
| St. Dev. | 229 | 755 | 610 | 1,012 | 910 | 41 |
| C.V. | 0.23 | 0.63 | 1.04 | 0.98 | 1.22 | 0.44 |

Source: MDRA/GAPLA/DEA Ponteirc Census, 1992

TABLE 10

DISTRIBUTION OF YIELDS OF SELECTED PERENNIAL CROPS (KG/HA)

| | Cashew | Limes | Oranges | Mangoes | Bananas | Sugarcane |
|---|---|---|---|---|---|---|
| Reference Yield | 1,000 | 8,000 | 10,000 | 10,000 | 10,000 | 70,000 |
| Quintiles | | | | | | |
| 1 | 50 | 7 | 37 | 57 | 39 | 490 |
| 2 | 142 | 25 | 281 | 197 | 189 | 3,145 |
| 3 | 255 | 81 | 684 | 512 | 448 | 8,950 |
| 4 | 425 | 283 | 1,824 | 1,411 | 892 | 17,836 |
| 5 | 1,191 | 3,016 | 6,800 | 5,461 | 6,129 | 64,025 |
| TOTAL | 412 | 666 | 1,951 | 1,505 | 1,539 | 18,490 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992

TABLE 11

REVENUES BY REGION

| Region | Revenues per ponta (PG '000) | C.V. | Revenues per hectare (PG '000) | C.V. |
|---|---|---|---|---|
| SAB | 13,903 | 2.23 | 1,798 | 1.44 |
| Biombo | 7,297 | 1.73 | 1,165 | 0.71 |
| Cacheu | 3,999 | 3.16 | 597 | 1.24 |
| Oio | 1,030 | 2.48 | 228 | 2.03 |
| Bafata | 6,085 | 3.41 | 515 | 1.70 |
| Gabu | 232 | 2.09 | 87 | 1.92 |
| Quinara | 4,168 | 1.57 | 557 | 1.40 |
| Tombali | 1,868 | 1.87 | 530 | 2.10 |
| Bolama | 2,311 | 1.42 | 437 | 1.71 |
| TOTAL | 3,920 | 3.23 | 563 | 1.76 |
| F | 8.23 | | 21.78 | |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992.

TABLE 12

REVENUES BY FARM SIZE CATEGORY

| Farm Size Category | Total Revenues per ponta (PG '000) | C.V. | Total Revenues per hectare (PG '000) | C.V. |
|---|---|---|---|---|
| 1 - 5 | 1,553 | 1.86 | 602 | 1.64 |
| 5 - 10 | 3,238 | 1.71 | 467 | 1.69 |
| 10 - 20 | 8,575 | 2.23 | 605 | 2.11 |
| 20 - 50 | 14,002 | 2.33 | 464 | 1.96 |
| 50 - 100 | 25,648 | 1.64 | 318 | 1.48 |
| > 100 | 66,900 | 0.54 | 514 | 0.30 |
| TOTAL | 3,920 | 3.23 | 563 | 1.76 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992



41'

TABLE 13

LABOR REQUIREMENTS AND COSTS, BY CROP

| Crop | Annual Labor Requirements (days/Ha) | Cost (PG '000) |
|---|---|---|
| Cashews | 50 | 500 |
| Limes | 100 | 500 |
| Oranges | 100 | 500 |
| Mangoes | 100 | 500 |
| Bananas | 150 | 750 |
| Sugarcane | 200 | 1,000 |
| Land Clearing (all crops)<br>Annual cost per ha:<br>(300 days @ PG 5,000, 5% interest over 20 years) | | 120 |

Source: Author's calculations

TABLE 14

CHARACTERISTICS OF USERS OF MODERN INPUTS

| Type of Input | | Number | % | Average Cultivated Area (ha) | Revenues per ha (PG '000) |
|---|---|---|---|---|---|
| Machinery | with | 174 | 16 | 6.7 | 614 |
| | without | 924 | 84 | 7.8 | 554 |
| Tractors | with | 15 | 1 | 26.8 | 1503 |
| | without | 1083 | 99 | 7.3 | 550 |
| Pumps | with | 119 | 11 | 11.3 | 748 |
| | without | 979 | 89 | 7.2 | 541 |
| Fertilizer | with | 60 | 5 | 17.9 | 1,308 |
| | without | 1,038 | 95 | 7 | 536 |
| Pesticides | with | 12 | 1 | 23.2 | 1,736 |
| | without | 1,086 | 99 | 7.4 | 550 |
| TOTAL SAMPLE | | 1,098 | 100 | 7.6 | 563 |

Source: MDRA/GAPLA/DEA Ponteiro Census

TABLE 15

ANNUAL COSTS OF MACHINERY AND CHEMICAL INPUTS

| Item | Annual Cost (PG 000) |
|---|---|
| Tractor | 25,900 |
| Pump | 2,590 |
| Fertilizers (per ha) | 250 |
| Pesticides (per ha) | 250 |

Source: Author's estimates

TABLE 16

SELECTED CROP BUDGETS

| Product | Yields (kg/ha) Reference 1 | Yields (kg/ha) Mean 2 | Yields (kg/ha) Top 20% 3 | Price (PG/kg) | Labor Costs per ha (PG '000) | Profits (PG '000/ha) 1 | Profits (PG '000/ha) 2 | Profits (PG '000/ha) 3 | Breakeven Yield (kg/ha) | Yield > Breakeven (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Cashew | | | | | 370 | 1,630 | 454 | 2,012 | 185 | 61 |
| nut | 1,000 | 412 | 1,191 | 1000 | | | | | | |
| wine | 2,000 | 824 | 2,382 | 500 | | | | | | |
| Sugarcane | 70,000 | 18,489 | 64,026 | 100 | 1,120 | 5,880 | 729 | 5,283 | 11,200 | 47 |
| Mango | 10,000 | 1,583 | 5,461 | 500 | 620 | 4,380 | 172 | 2,111 | 1,240 | 31 |
| Banana | 10,000 | 1,504 | 5,469 | 500 | 870 | 4,130 | (118) | 1,865 | 1,740 | 15 |
| Lime | 8,000 | 666 | 3,016 | 1000 | 620 | 7,380 | 46 | 2,396 | 620 | 16 |
| Orange | 10,000 | 1,951 | 6,800 | 500 | 620 | 4,380 | 356 | 2,780 | 1,240 | 33 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992; Author's estimates

TABLE 17

DISTRIBUTION OF NET REVENUES,
PROFIT IN THE PONTEIRO SECTOR,
BY QUINTILES (PG '000)

| | Net Revenues | | Profits | |
|---|---|---|---|---|
| Quintiles | per ponta | per ha | per ponta | per ha |
| 1 | - 1,277 | - 145 | - 5,066 | - 971 |
| 2 | 250 | 62 | - 384 | - 97 |
| 3 | 943 | 201 | 211 | 49 |
| 4 | 2,297 | 491 | 1,376 | 328 |
| 5 | 14,282 | 1,857 | 12,322 | 1,676 |
| Sample | 3,265 | 488 | 1,688 | 198 |
| Sample C.V. | 3.80 | 2.04 | 7.20 | 8.31 |

Source: MDRA/GAPLA/DEA Ponteiro Census, 1992; Author's calculations

TABLE 18

CHARACTERISTICS OF PONTEIROS, BY PROFIT QUINTILE

| Profit Quintile | Profit Per Ha (PG '000) | Cropped Area (ha) | Use Machinery (%) | Machinery Per Ha (PG '000) | Use Fertilizer (%) | Area In Cashew (%) | Grow Sugarcane (%) |
|---|---|---|---|---|---|---|---|
| 1 | -944 | 12.5 | 46 | 782 | 15 | 76 | 8 |
| 2 | -117 | 4.2 | 6 | 4 | 1 | 81 | 1 |
| 3 | 84 | 4.2 | 6 | 6 | 1 | 73 | 2 |
| 4 | 462 | 5.4 | 10 | 24 | 16 | 75 | 4 |
| 5 | 1,509 | 11.7 | 11 | 32 | 32 | 77 | 9 |
| Sample | 198 | 7.6 | 16 | 170 | 5 | 76 | 5 |
| F value | 84.405 | 34.816 | 55.447 | 15.640 | 15.720 | 1.741 | 5.865 |

Sources: MDRA/GAPLA/DEA Ponteiro Census, 1992; Author's calculations

TABLE 19

RESULTS OF REGRESSION MODELS ON NET REVENUES AND PROFITS

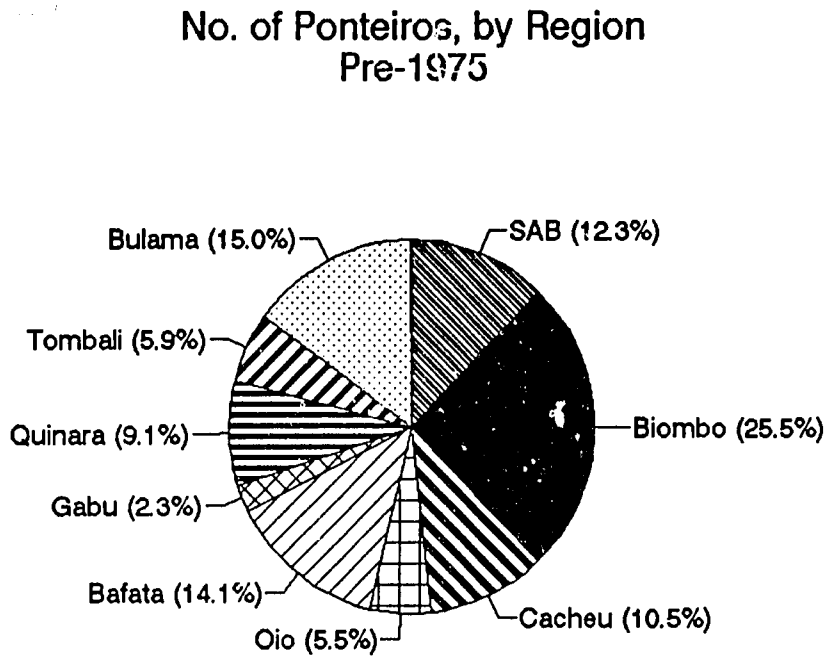
| | Dependent Variable: NET REVENUE | | | Dependent Variable: PROFITS | | |
|---|---|---|---|---|---|---|
| Variable | Coefficient | T-value | Elasticity | Coefficient | T-value | Elasticity |
| 1/AREA | 590,844 | 5.046*** | 0.39 | 104,713 | 0.473 | 0.19 |
| DBISSAU | 782,031 | 9.755*** | 1.73 | 470,374 | 3.102** | 2.89 |
| NOPERENN | 121,148 | 7.340** | 0.56 | 174,619 | 5.592** 3.332** | 2.24 |
| SHCASHEW | 94,135 | 1.130 | 0.16 | 524,987 | -3.321** | 2.47 |
| DCANE | 57,908 | 0.411 | 0.13 | -885,384 | | -5.45 |
| DTRACTOR | 483,598 | 2.099* | 1.07 | 462,009 | 1.015 -0.812 | 2.84 |
| DPUMP | -67,446 | -0.773 | -0.15 | -133,925 | 0.763 | -0.82 |
| DFERT | -85,825 | -0.707 | -0.19 | 175,332 | 1.333 | 1.08 |
| DPEST | 745,430 | 2.939** | 1.65 | 639,520 | | 3.94 |
| DNEW | -302,877 | 4.644** | -0.67 | -370,110 | -3.000** | -2.28 |
| Adj. R-square: | 0.175 | | | 0.056 | | |
| F: | 23.591*** | | | | | |

Significance levels: *** -0.001; ** -0.01; * -0.05

Sources: MDRA/GAPLA/DEA Ponteiro Census, 1992; Author's estimates

KEY

| | | | |
|---|---|---|---|
| 1/AREA | Inverse of cultivated area | DTRACTO | Dummy variable, 1 if have tractor |
| DBISSAU | Dummy variable, 1 if in SAB of Biombo | DPUMP | Dummy variable, 1 if have pump |
| NOPERENN | Number of perennial crops | DFERT | Dummy variable, 1 if use fertilizer |
| SHCASHEW | Share of cultivated area in cashew | DPEST | Dummy variable, 1 if use pesticides |
| DCANE | Dummy variable, 1 if have sugarcane | DNEW | Dummy variable, 1 if ponta started after '87 |



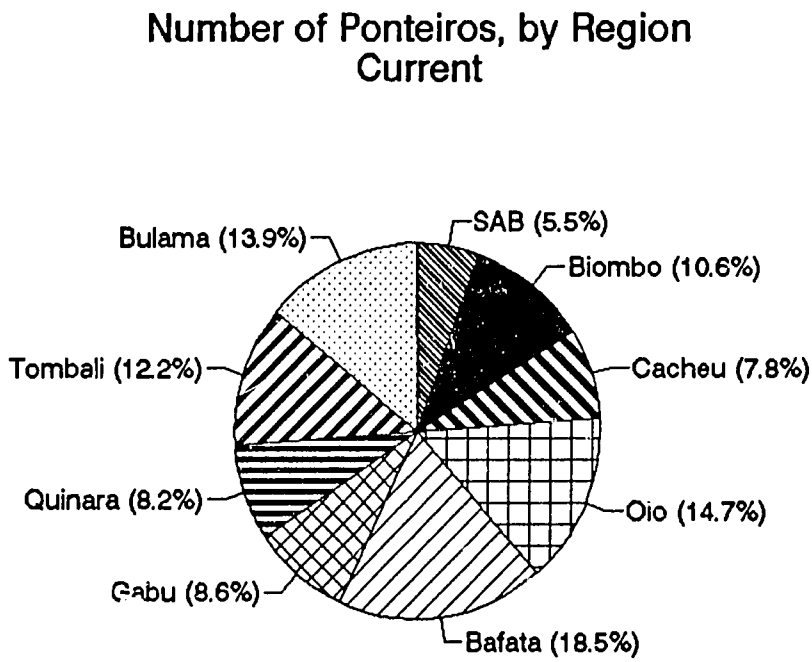




Figure 1. Number of Ponteiros, by Region.



-49

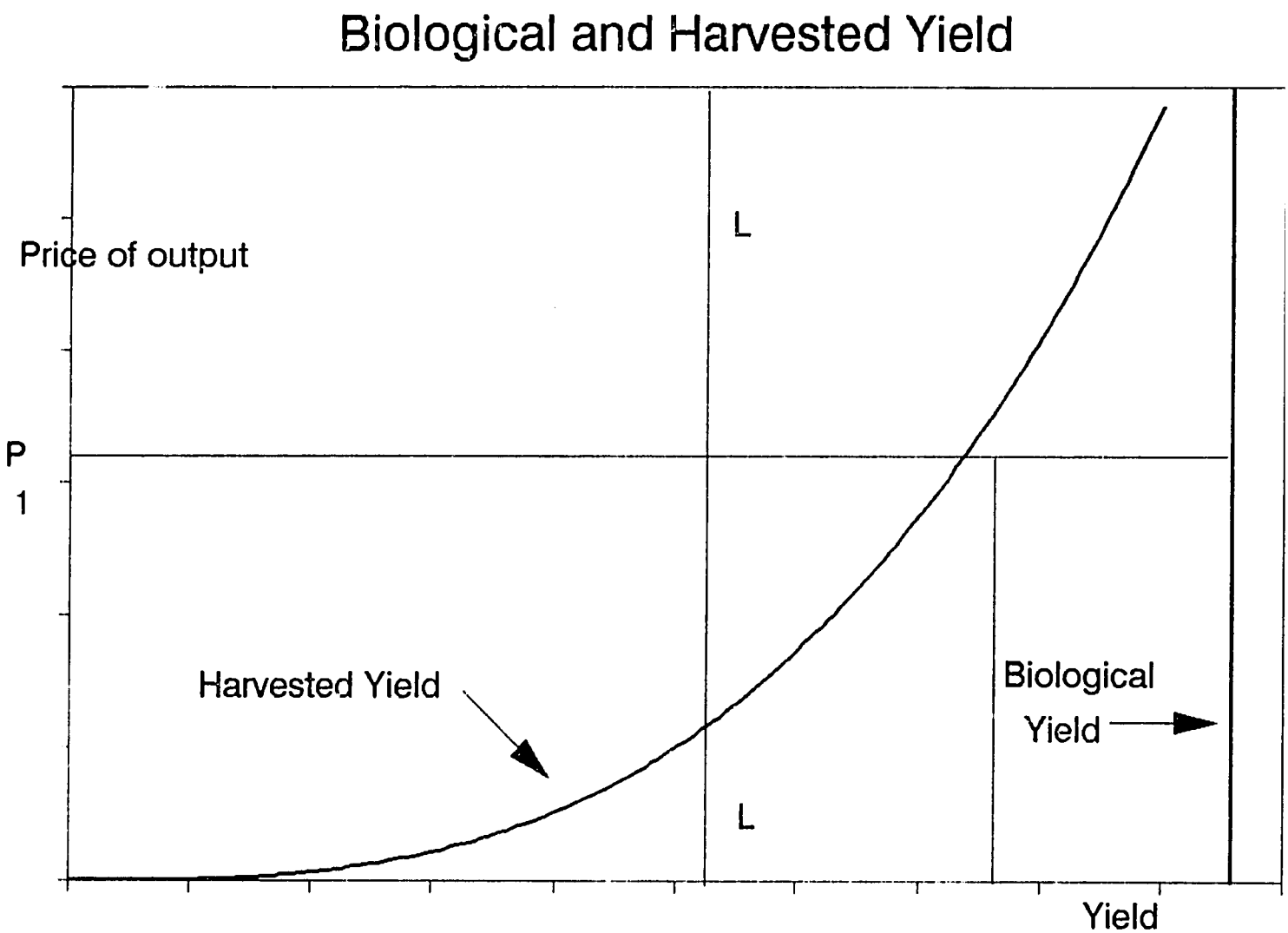



Figure 2. Biological and Harvested Yield



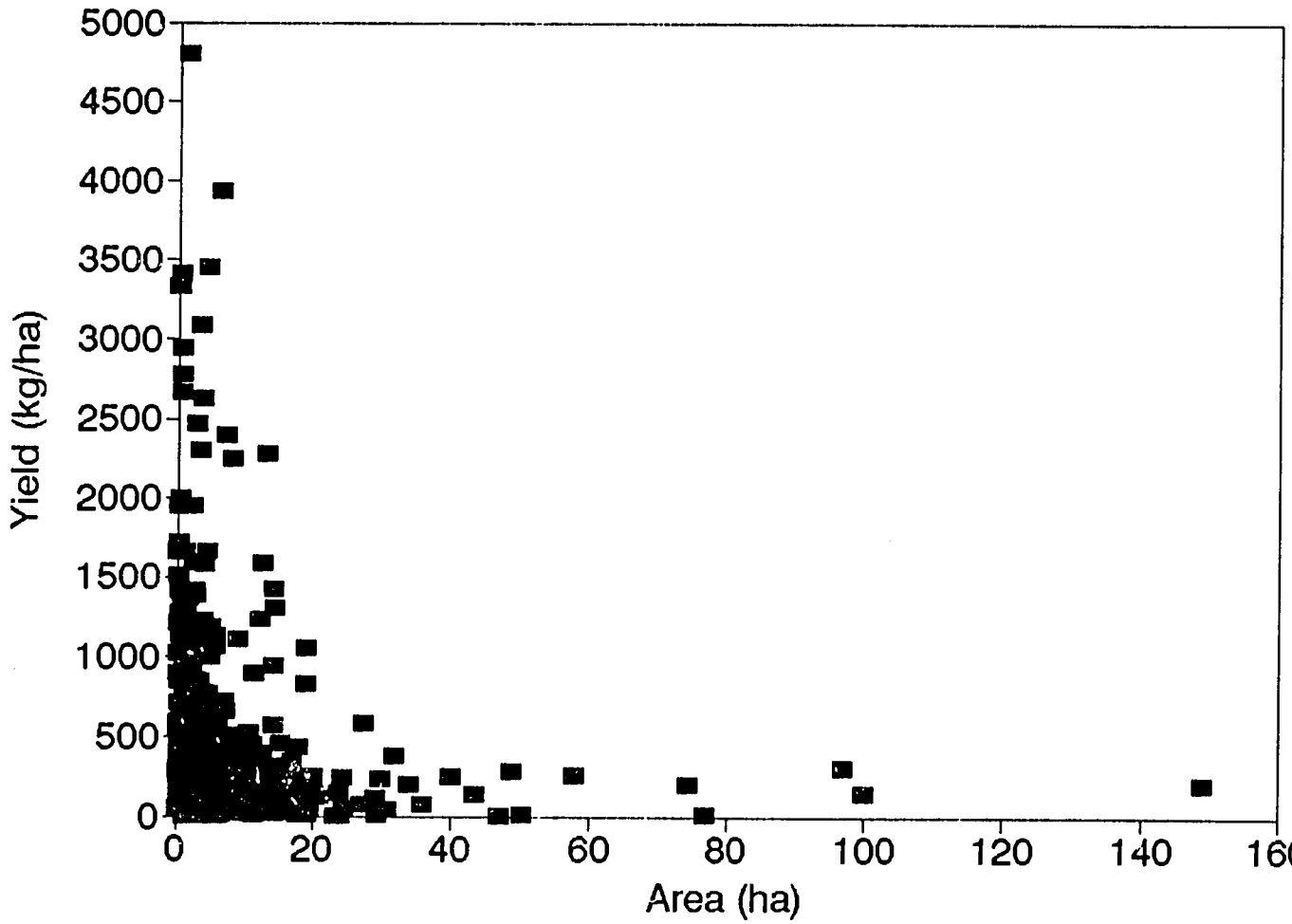
50

Figure 3

Yields by Size of Ponta

A: Cashews
B: Limes
C: Oranges
D: Mangoes
E: Bananas
F: Sugar Cane

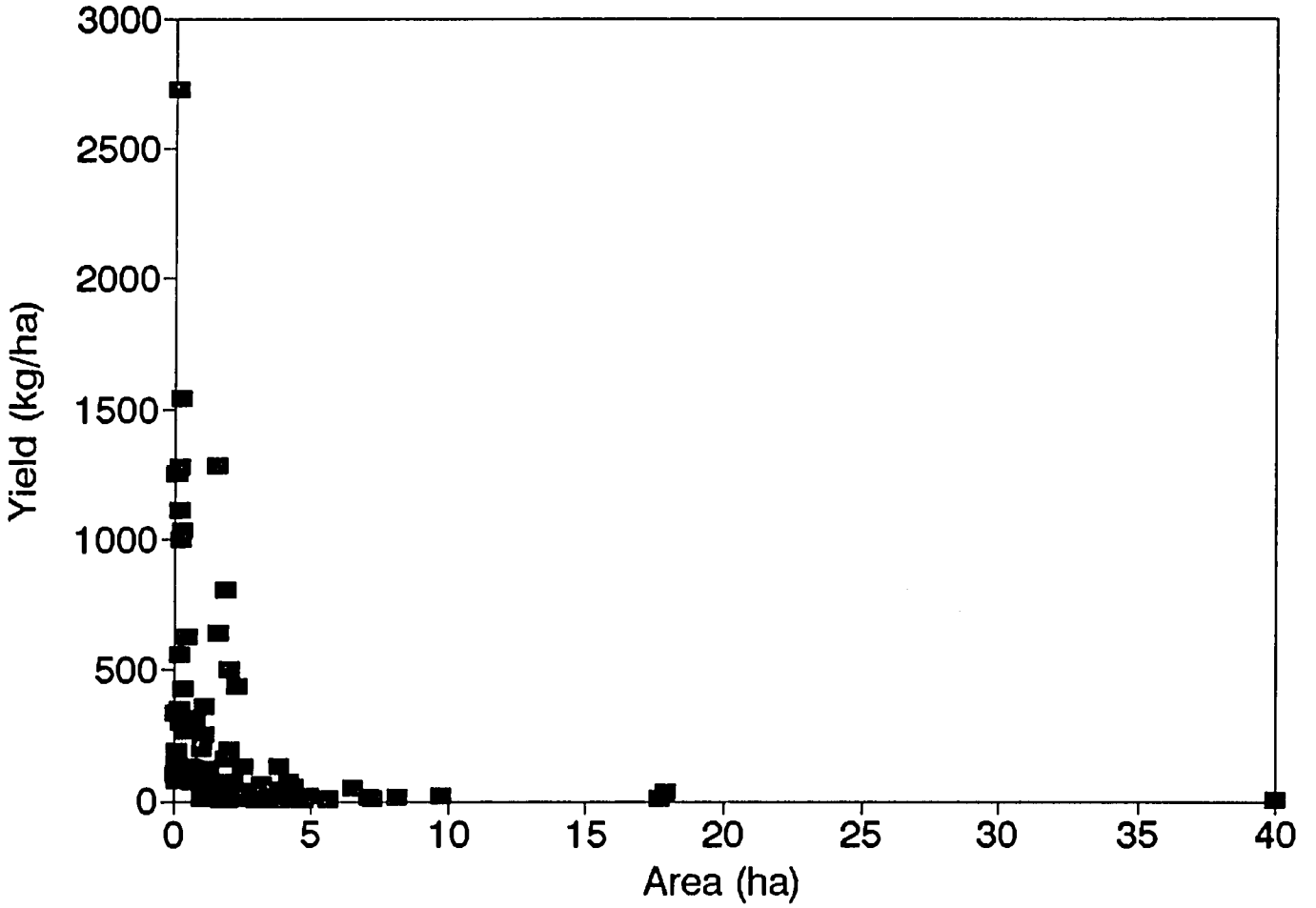
# Cashews


5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Yield (kg/ha)
0
20
40
60
80
100
120
140
160
Area (ha)

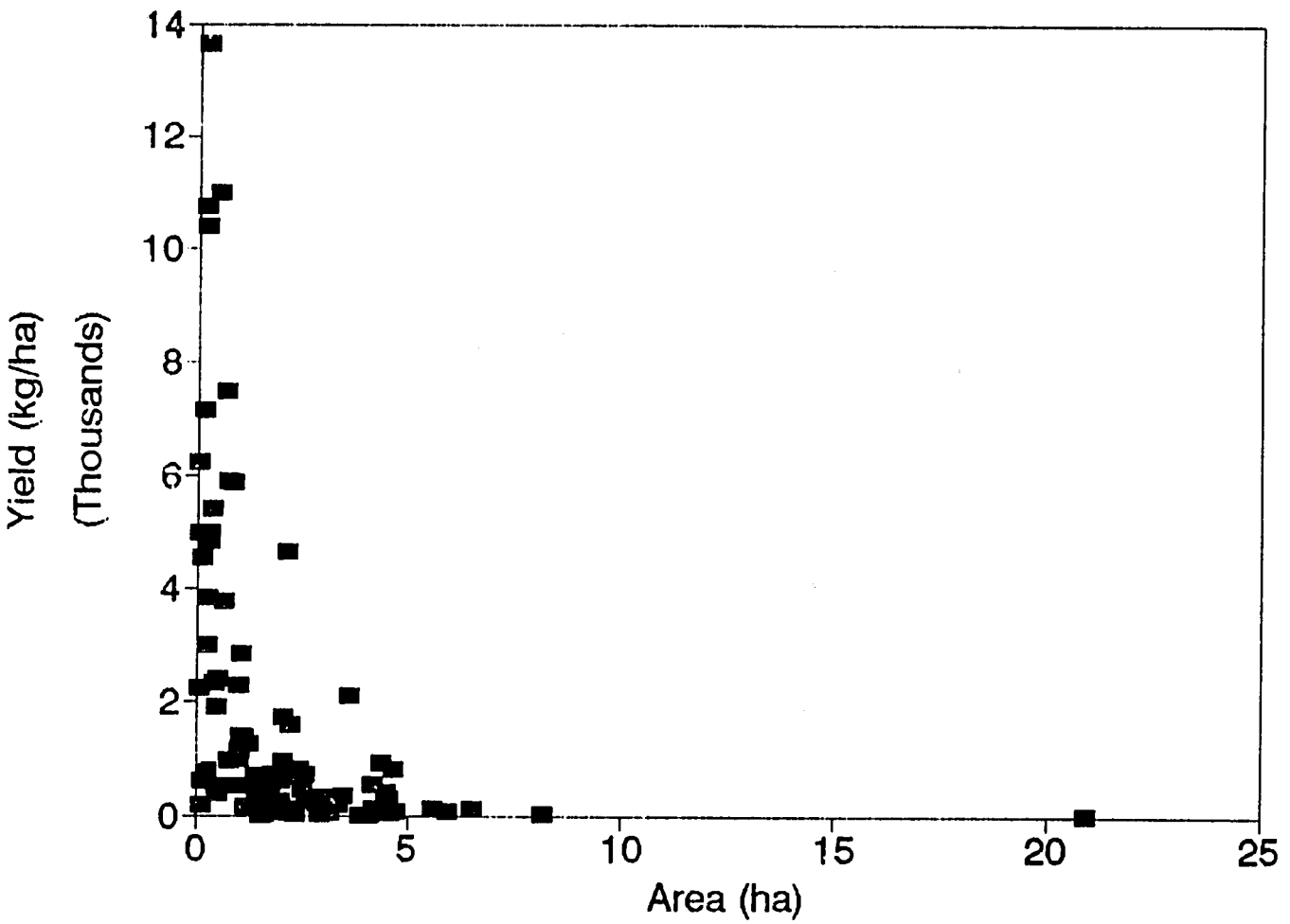


.52

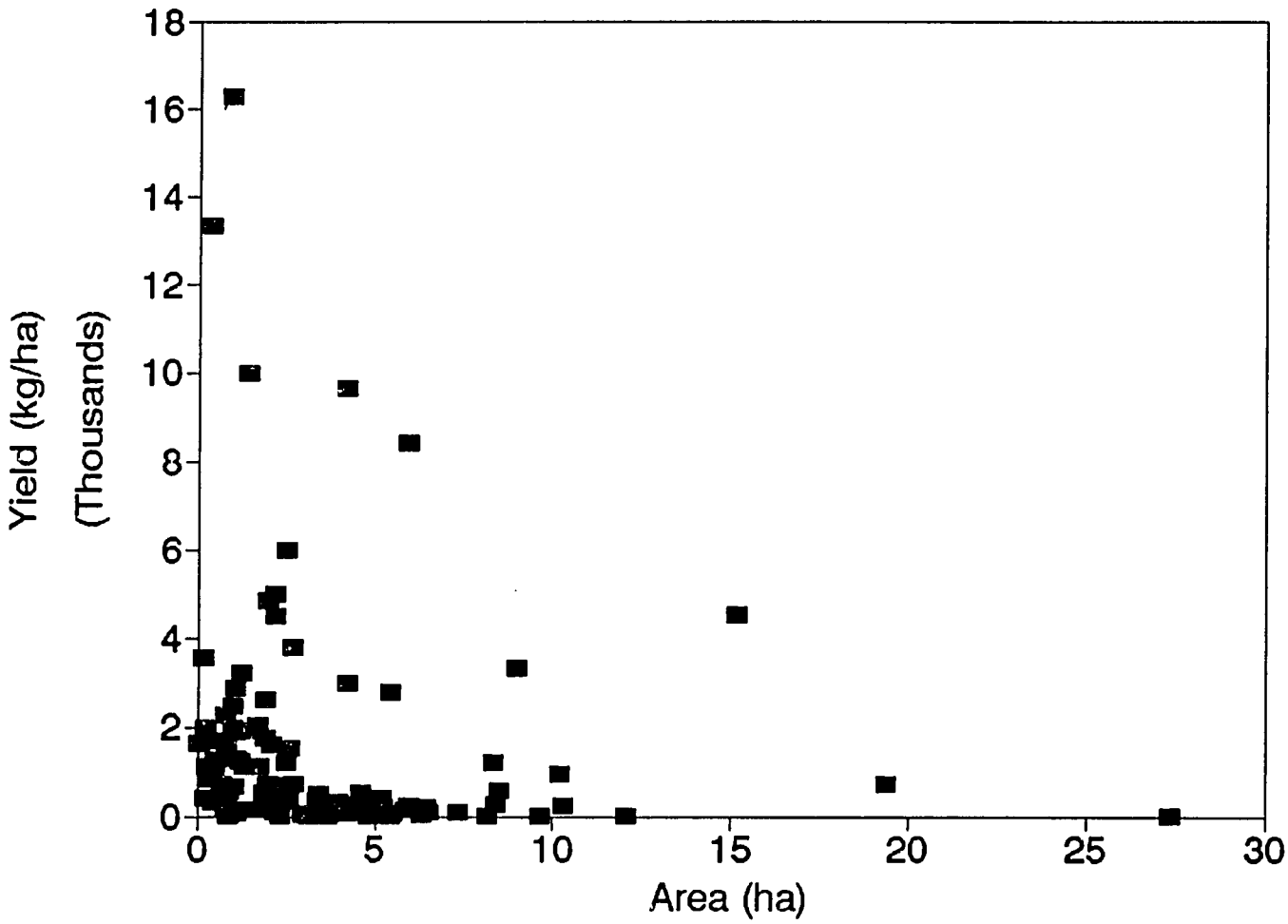
# Limes


3000
2500
2000
1500
1000
500
0
Yield (kg/ha)
0
5
10
15
20
25
30
35
40
Area (ha)

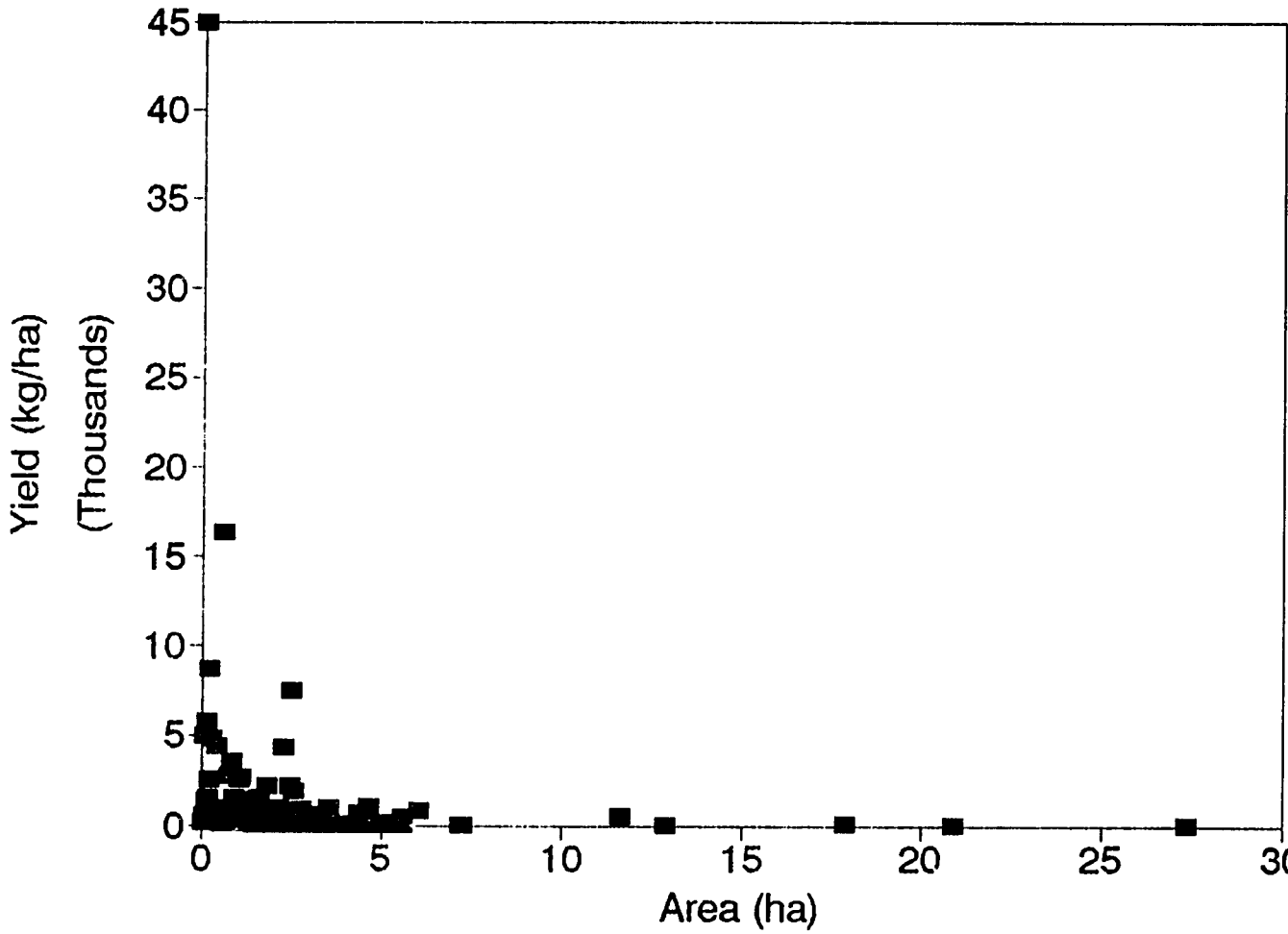
# Oranges



# Mangoes


Yield (kg/ha)
(Thousands)
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
Area (ha)

# Bananas


Yield (kg/ha)
(Thousands)
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
Area (ha)

# Sugarcane

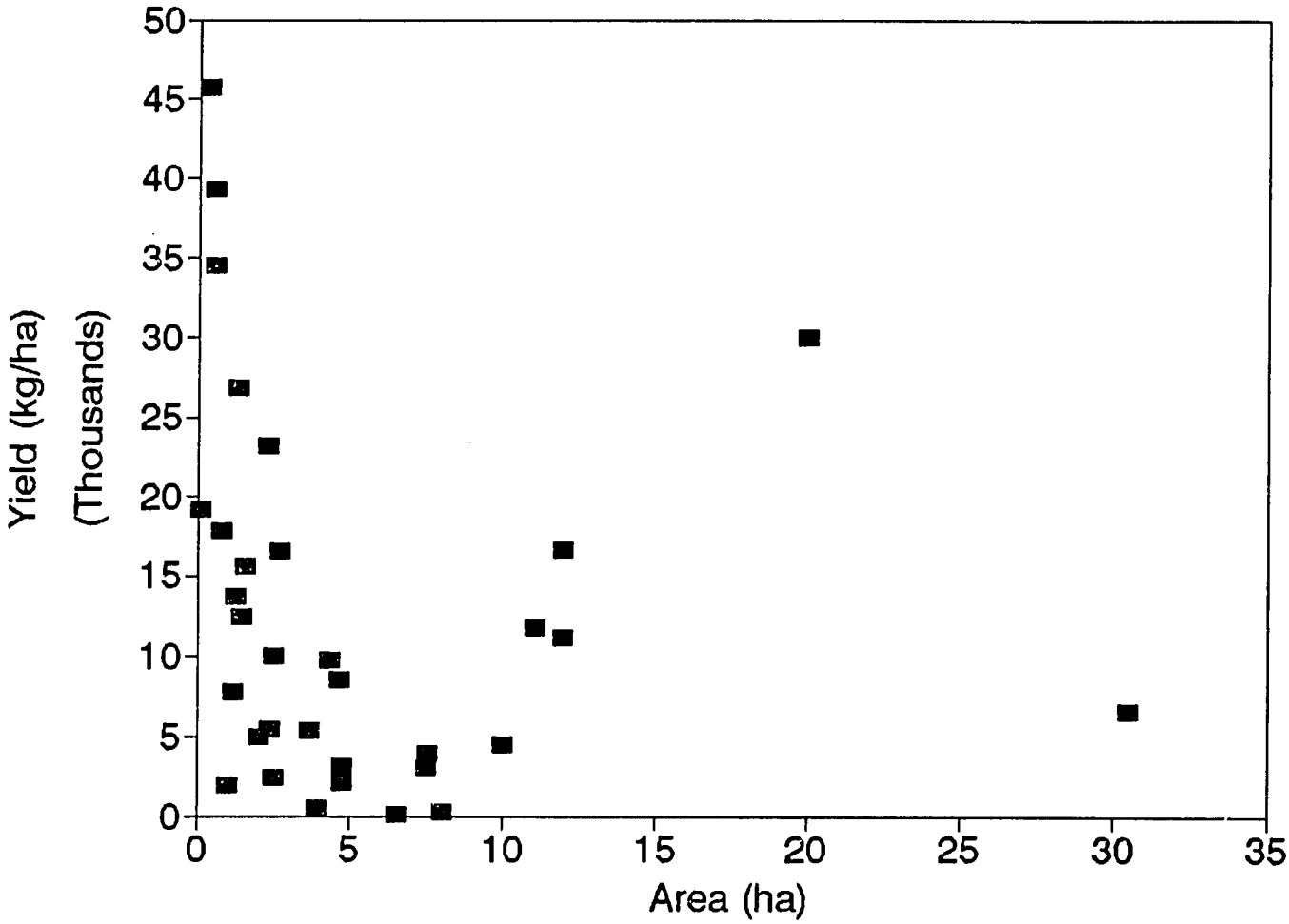

Yield (kg/ha)
(Thousands)
50
45
40
35
30
25
20
15
10
5
0
0
5
10
15
20
25
30
35
Area (ha)

Figure 4

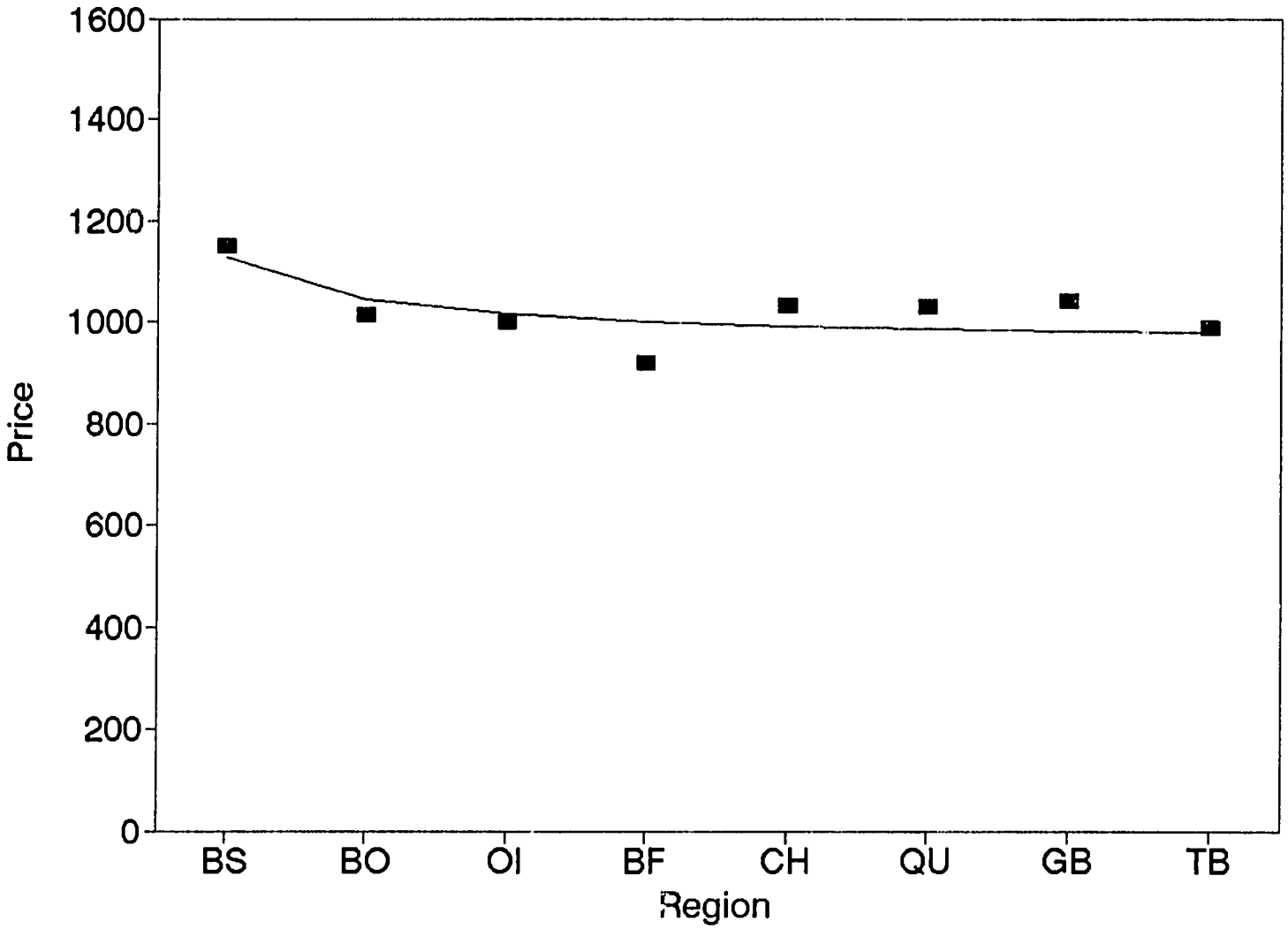
Product Prices by Distance from Bissau

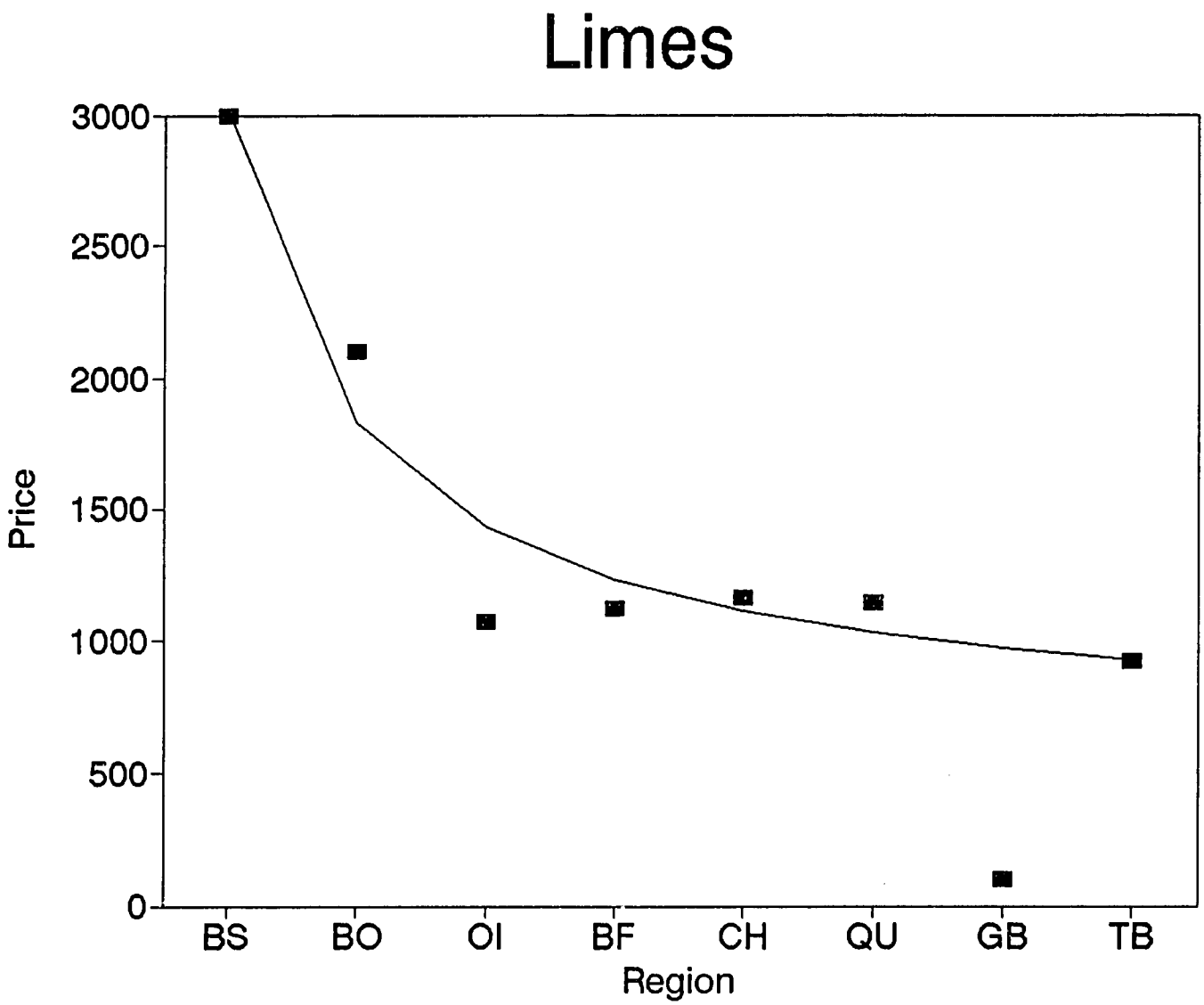
A: Cashews
B: Limes
C: Oranges
D: Mangoes
E: Bananas

Key:

BS: Bissau (SAB)
BO: Biombo
OI: Oio
BF: Bafata
CH: Cacheu
QU: Quinara
GB: Gabu
TB: Tombali & Bijagos

# Cashews

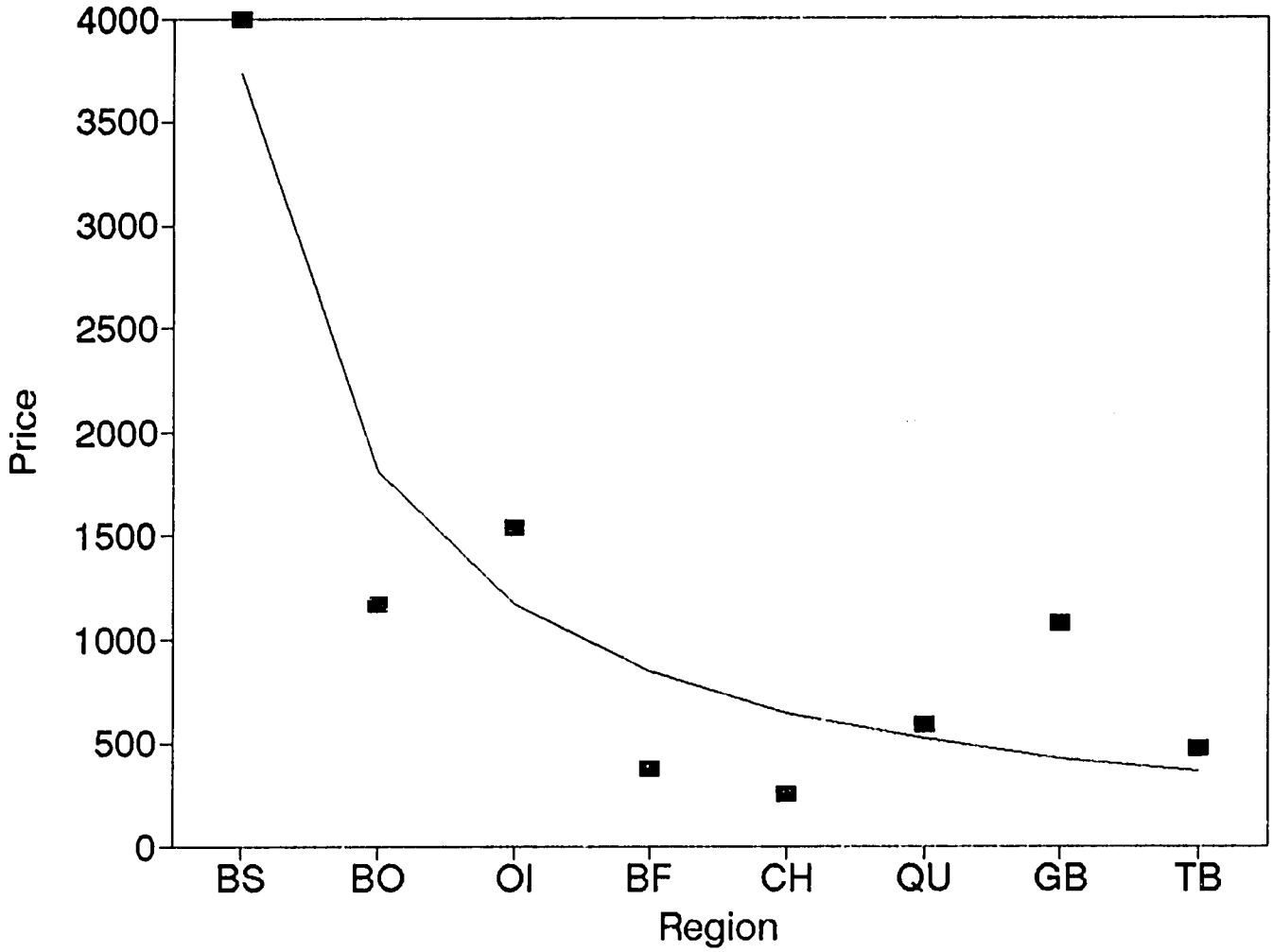

1600
1400
1200
1000
800
600
400
200
0
Price
BS
BO
OI
BF
CH
QU
GB
TB
Region

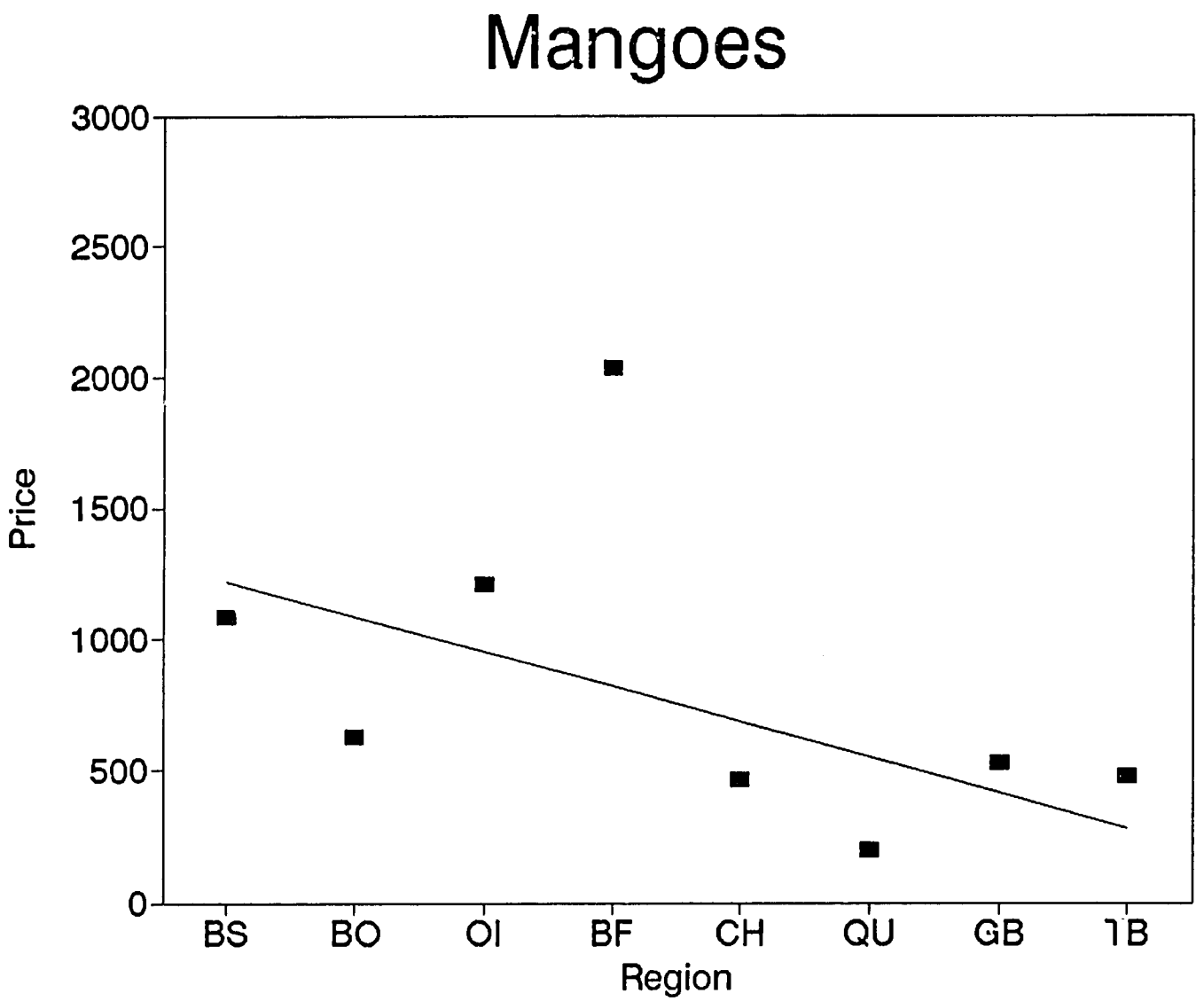

Limes
3000
2500
2000
1500
1000
500
0
Price
BS
BO
OI
BF
CH
QU
GB
TB
Region



60

# Oranges

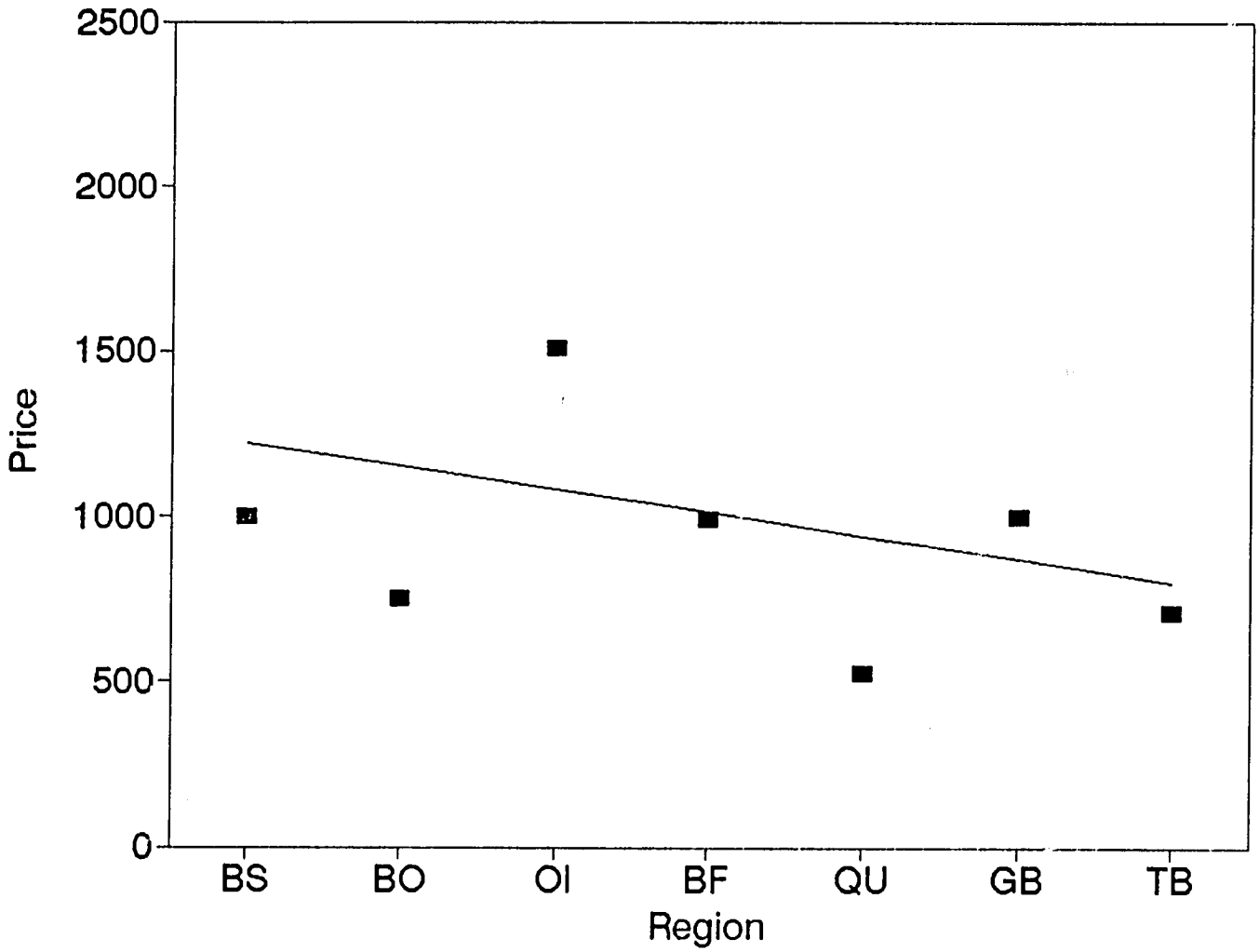

4000
3500
3000
2500
2000
1500
1000
500
0
Price
BS
BO
OI
BF
CH
QU
GB
TB
Region


Mangoes
3000
2500
2000
1500
1000
500
0
Price
BS
BO
OI
BF
CH
QU
GB
TB
Region



62

# Bananas



# Value of Sales by Product

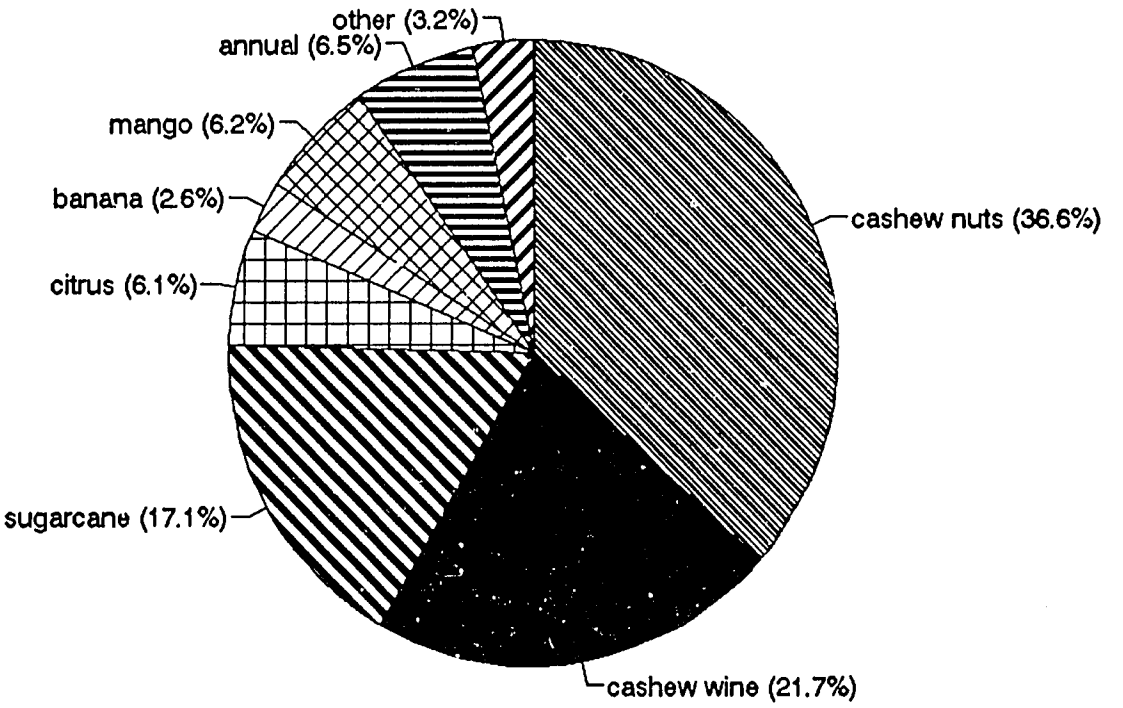



Figure 5. Value of Sales by Product.

SECTION VI

REFERENCES

Berry, A.R. and W.R. Cline. 1979. *Agrarian Structure and Productivity in Developing Countries*. The Johns Hopkins University Press, Baltimore.

Martin, F.W. ed. 1984. *The CRC Handbook of Tropical Food Crops*. CRC Press, Boca Raton.

Tanner, C. 1991. *Relations Between Ponteiros and Tabancas: Implications for a New Land Law in Guinea-Bissau*. Report prepared for USAID/Guinea-Bissau.

# APPENDIX I

## PONTEIRO CENSUS QUESTIONNAIRE

REPUBLICA DA GUINEA-BISSAU
MINISTERIO DE DESENVOLVIMENTO RURAL E AGRICULTURA

DIVISAO DE ESTATISTICAS AGRICOLAS

RECENSEAMENTO NACIONAL DOS PONTEIROS

**1. IDENTIFICACAO** **Numero Identificacao:** _____

1.1 Regiao _____

1.2 Sector _____

1.3 Seccao _____

1,4 Tabanca _____

1.5 Distancia entre a ponta e a sede da regiao
(em Km) _____

1.6 Distancia entra a ponta a a sede da seccao
(em Km) _____

1.7 Nome do(s) Proprietario(s)
_____

1.8 Endereco Completo _____
_____
Tel _____

1.9 Pessoa fisica _____ Sociedade _____
Cooperativa _____ Granja do Estado _____
Outro _____

1.10 Nacionalidade do proprietario _____

1.11 Data da ocupacao da propriedade _____

1.12 Forma de aquisicao da propriedade
Concedida pelo estado _____ Concedida pela tabanca _____
Herdada _____ Comprada _____ Outro _____

1.13 A Propriedade esta registrada no cadastro? _____

1.14 Acesso principal a propriedade
Rodoviario _____ Fluvial _____

1.15 Superficie Total da Exploracao (Ha) _____

## 2. CULTURAS PERMANENTES

| Culturas | Variedade | Superficie | | | Producao (ultima campanha) | |
|---|---|---|---|---|---|---|
| | | Em idade de producao | Nao tem ainda a idade de producao | Total | | |
| | | Ha | Ha | Ha | | |
| 2.1 Limoeiros | | | | | | |
| 2.2 Larangeiras | | | | | | |
| 2.3 Tanjarineras | | | | | | |
| 2.4 Bananeiras | | | | | | |
| 2.5 Palmeiras | | | | | | |
| 2.6 Ananas | | | | | | |
| 2.7 Cajueiros | | | | | | |
| 2.8 Mangueiros | | | | | | |
| 2.9 Cana/Acucar | | | | | | |
| 2.10 Coqueiros | | | | | | |
| 2.11 Coleiras | | | | | | |
| 2.12 | | | | | | |
| 2.13 | | | | | | |
| 2.14 | | | | | | |

## 3. CULTURAS ANUAIS

| Culturas | Superficie | | | Producao Total (Ultima campanha) | | Observacoes (1) |
|---|---|---|---|---|---|---|
| | Em pura | Em Associada | Total | | | |
| | Ha | Ha | Ha | Quantidade | Unidade | |
| 3.1 Milho Preto | | | | | | |
| 3.2 Milho Bassil | | | | | | |
| 3.3 Milho Cavalo | | | | | | |
| 3.4 Arroz de Dequeiro (Pam-Pam) | | | | | | |
| 3.5 Arroz de Bolanha Doce | | | | | | |
| 3.6 Arroz de Bolanha Salgada | | | | | | |
| 3.7 Mancarra (2) | | | | | | |
| 3.8 Fundo | | | | | | |
| 3.9 Batata Inglesa | | | | | | |
| 3.10 Batata Doce | | | | | | |
| 3.11 Mandioca | | | | | | |
| 3.12 Feijao | | | | | | |
| 3.13 Algodao | | | | | | |
| 3.14 | | | | | | |
| 3.15 | | | | | | |
| 3.16 | | | | | | |

(1) Indicar as associacoes utilizando os codigos apropriados: ex. 4.1 + 4.11.
(2) Indicar se a producao e em casca ou descascada..

## 4. HORTALICAS

| Culturas | Superficie | | | Producao Total (Ultima campanha) | | Observacoes |
|---|---|---|---|---|---|---|
| | Em pura | Em Associada | Total | | | |
| | Ha | Ha | Ha | Quantidade | Unidade | |
| 4.1 Tomates | | | | | | |
| 4.2 Pimentos | | | | | | |
| 4.3 Repolhos | | | | | | |
| 4.4 Cebolas | | | | | | |
| 4.5 Alfaces | | | | | | |
| 4.6 Cenouras | | | | | | |
| 4.7 Nabos | | | | | | |
| 4.8 Beringelas | | | | | | |
| 4.9 Pepinos | | | | | | |
| 4.10 Pimentoes | | | | | | |
| 4.11 Salsas | | | | | | |
| 4.12 Couves | | | | | | |
| 4.13 | | | | | | |
| 4.14 | | | | | | |

(1) Indicar a superficie cultivada.

## 5. UTILIZACAO DA TERRA

Data:_____ /_____ /_____

| | Ha |
|---|---|
| 5.1 Superficie Explorada | |
| 5.1.1 Culturas Permantentes | |
| 5.1.2 Culturas Anuais | |
| 5.1.3 Hortalicas | |
| 5.1.4 Prados/Pastos Permanentes | |
| 5.1.5 Alqueive (Pousio) | |
| 5.1.6 Superficie com Construcoes | |
| 5.2 Superficie nao Explorada | |
| 5.3 Superficie Total (5.1 + 5.2) | |
| 5.4 Superficie de Regadio | |

## 6. COMERCIALIZACAO DURANTE O ANO PASSADO

| Produto | Vendas | | Preco | | Local da Venda | Tipo de Comprador | Compras da fora da Exploracao | |
|---|---|---|---|---|---|---|---|---|
| | Quantidade | Unidade | Quantidade | Unidade | | | Quantidade | Unidade |
| 6.1 Castanha de Caju | | | | | | | | |
| 6.2 Vinho de Caju | | | | | | | | |
| 6.3 Cana de Acucar | | | | | | | | |
| 6.4 Aguardiente de cana | | | | | | | | |
| 6.5 Limao | | | | | | | | |
| 6.6 Laranja | | | | | | | | |
| 6.7 Tanjerina | | | | | | | | |
| 6.8 Banana | | | | | | | | |
| 6.9 Ananas | | | | | | | | |
| 6.10 Mango | | | | | | | | |
| 6.11 Coco | | | | | | | | |
| 6.12 Oleo de palma | | | | | | | | |
| 6.13 Coconote | | | | | | | | |
| 6.14 Arroz | | | | | | | | |
| 6.14 Mancarra | | | | | | | | |
| 6.15 Batata inglesa | | | | | | | | |
| 6.16 Batata doce | | | | | | | | |

2

## 6. COMERCIALIZACAO DURANTE O ANO PASSADO (continued)

| Produto | Vendas | | Preco | | Local da Venda | Tipo de Comprador | Compras da fora da Exploracao | |
|---|---|---|---|---|---|---|---|---|
| | Quantidade | Unidade | Quantidade | Unidade | | | Quantidade | Unidade |
| 6.17 Mandioca | | | | | | | | |
| 6.18 Algodao | | | | | | | | |
| 6.19 Feijao | | | | | | | | |
| 6.20 Tomate | | | | | | | | |
| 6.21 Pimento | | | | | | | | |
| 6.22 Repolho | | | | | | | | |
| 6.23 Cebola | | | | | | | | |
| 6.24 Alface | | | | | | | | |
| 6.25 Cenoura | | | | | | | | |
| 6.26 Nabo | | | | | | | | |
| 6.27 Beringela | | | | | | | | |
| 6.28 Pepino | | | | | | | | |
| 6.29 Couve | | | | | | | | |
| 6.30 | | | | | | | | |
| 6.31 | | | | | | | | |
| 6.32 | | | | | | | | |
| 6.33 | | | | | | | | |
| 6.34 | | | | | | | | |

## 7. GADO

| Categoria | No. de Cabeca em 1/01/91 | No. de Cabeca actual | Estimativo do Valor por Animal |
|---|---|---|---|
| **7.1 Bovinos** | | | |
| 7.1.1 Bois menos 2 anos | | | |
| 7.1.2 Vacas menos 2 anos | | | |
| 7.1.3 Outras Femeas mais 2 anos | | | |
| 7.1.4 Bois de Traccao | | | |
| 7.1.5 Outros Bois mais 2 anos | | | |
| **7.2 Ovinos** | | | |
| 7.2.1 Menos de 1 ano | | | |
| 7.2.2 Mais de 1 ano | | | |
| 7.2.3 Machos | | | |
| 7.2.4 Femeas | | | |
| **7.3 Caprinos** | | | |
| **7.4 Suinos** | | | |
| **7.5 Burros** | | | |
| **7.6 Cavalos** | | | |
| **7.7 Aves Domesticas** | | | |

Estimativo do valor total das vendas
de produtos pecuarios no ano passado_____

## 8. MAO-DE-OBRA

| Categoria | Numero | Salario Total (mensal) |
|---|---|---|
| 8.1 Mao-de-Obra Permanente | | |
| 8.1.1 Mecanicos | | |
| 8.1.2 Condutores | | |
| 8.1.3 Operarios agricolas | | |
| 8.1.4 Outros | | |

| 8.2 Mao-de-Obra Nao Permanente | | | | |
|---|---|---|---|---|
| Operacao | Numero de pessoas | Numero de dias | Pagamento Total Dinheiro | Especie |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Houve Problemas de acesso a mao-de-obra?(especificar)_____

_____

## 9. FERRAMENTAS E MEIOS DE TRANSPORTE

| Designacao | Numero | Designacao | Numero |
|---|---|---|---|
| **9.1 Materiais** | | **9.2. Meios/Transp.** | |
| 9.1.1 Charrua | | 9.2.1 Camioneta | |
| 9.1.2 Pulverizador | | 9.2.2 Camiao | |
| 9.1.3 Descascador | | 9.2.3 Reboque | |
| 9.1.4 Furo | | 9.2.4 | |
| 9.1.5 Motobomba | | **9.3 Ferramentas** | |
| 9.1.6 Tractor/roda | | 9.3.1 Catana | |
| 9.1.7 Tractor/cadeias | | 9.3.2 Enxhada | |
| 9.1.8 | | 9.3.3 Machado | |
| 9.1.9 | | 9.3.4 Arado | |
| 9.1.10 | | 9.3.5 | |
| 9.1.11 | | 9.3.6 | |
| 9.1.12 | | 9.3.7 | |
| 9.1.13 | | 9.3.8 | |

Obs. Indicar a potencia de Tractores (em CV).

Houve problemas de acesso a materiais?(especificar)_____

_____

## 10. ADUBOS E PRODUTOS FITOSANITARIOS

| | Quantidade | Unidade |
|---|---|---|
| **10.1 Adubos Quimicos** | | |
| 10.1.1 Azotados | | |
| 10.1.2 Fosfatados | | |
| 10.1.2 Potassicos | | |
| 10.1.3 Compostos NPK | | |
| 10.1.4 | | |
| **10.2 Adubos Organicos** | | |
| 10.2 Estrume | | |
| **10.3 Fitofarmicos** | | |
| 10.3.1 DDT | | |
| 10.3.2 HGH | | |
| 10.3.3 Ensofre | | |
| 10.3.4 Aldrin | | |
| 10.3.5 Parathion | | |
| 10.3.6 Malathion | | |
| 10.3.7 | | |
| 10.3.8 | | |

Houve problemas de acesso a insumos? (especificar)

_____

_____

## 11. IMOVEIS

| | Ano de Construcao | Custo de Construcao | Area (m2) |
|---|---|---|---|
| Casa | | | |
| Armazem | | | |
| Instalacao de t ransformacao | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Estradas/caminhos (km) _____

## 12. PERGUNTAS GERAIS

12.1. O proprietario esta a pensar em aumentar as operacoes da ponta no futuro?
[ Sim / Nao ]

12.2 Se a resposta de 12.1 e "sim", descreve as alteracoes que o proprietario queria fazer (por ex. area que vai aumentar, culturas que vai plantar, tipo instalacoes que vai construir, maquinaria que vai comprar, etc.)

_____

_____

_____

_____

_____

12.3 Se for possivel de ter acesso a credito, que tipo(s) de investemento(s) estaria interessado em fazer?

_____

_____

_____

_____

12.4 Que sao os principais problemas que o senhor sofre na exploracacao da sua ponta?

_____

_____

_____

# APPENDIX II

## DESCRIPTION OF REGRESSION RESULTS

Table 19 reports the results of regressions of several independent variables on i) net revenues per hectare, and ii) profits per hectare of pontas. The independent variables included in the regression models are intended to measure four general categories of factors which may influence economic performance. First, the inverse of cultivated area is included to pick up the negative and nonlinear relationship between yield and area, as shown in Figure 3. A dummy variable for Bissau and Biombo is included to pick up the improved market access and generally higher prices that these regions enjoy because of their proximity to the major urban market center. Three variables measure different dimensions of cropping patterns. The number of perennial crops is used as a measure of cropping diversity. Two crops are given particular attention. Cashews are grown by almost all ponteiros, and represent a very large share of total sales by the sector. However, there is substantial variation in the degree of specialization in cashews, ranging from farms with only cashews to those with a more balanced mix of crops to a small number with no cashews at all. Cashew production is estimated to be relatively profitable in relation to most alternatives, so the degree of specialization should influence overall profits. The share of areas planted in cashews measures the degree of specialization in this crop. Sugarcane is included because it is expected to have a significant positive impact on yields. However there exist climatic and marketing constraints which restrict the number of producers who may grow this crop. A dummy variable for sugarcane is included as a proxy for these exogenous restrictions on production of this crop. The third category of variables are intended to capture the level of technology applied. These are dummy variables for the use of tractors, pumps, fertilizers, and pesticides. Finally, a dummy variable is included for pontas established since 1987. It is hypothesized that these newer pontas will have lower net revenues and profits because they will be incurring production costs, but the production of perennial crops will not yet be at maximum levels of mature plantations.

Looking first at the model with net revenues as a dependent variable, the adjusted R-squared shows that the variables account for less than 20% of the variation in net revenues per hectare. However the high F value, significant at the 0.001 level, does not reject the hypothesis that this model "explains," in a statistical sense, the variation in the dependent variable. In other words, there are high levels of correlation between the independent variables and the dependent variable of the model, but other factors not specified in the model explain a large part of the variation in net revenues per hectare. The t-values test the hypotheses that the coefficients on the individual variables are different from zero. The elasticities provide a unit-free measure of the quantitative relationship between the given variable and the dependent variable.[6]

The coefficient on the inverse of cultivated area is highly significant, indicating a negative nonlinear relationship between area and net revenues per hectare. A 10% increase in the amount of cultivated land leads to a 4% decrease in net revenues per hectare, all else equal. The vicinity to Bissau has a very

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6 The elasticities of continuous variables are evaluated at the mean values. For dummy variables the elasticity measures the percentage change in the dependent variable relative to its mean value associated with a "1" value in the dummy variable.

strong positive impact on net revenues, and the relationship is statistically very significant. Being close to Bissau increases net revenues per hectare by almost PG 800,000, providing support for the hypothesis that marketing constraints restrict the economic performance of more isolated areas. As expected, pontas established since 1987, show significantly lower net revenues on average than the older operations which are in full production.

With respect to the impacts of cropping patterns, the number of perennial crops grown is strongly and positively correlated with net revenues per hectare. The coefficients on share of area planted in cashew and the sugarcane dummy are positive, but not significantly different from zero at the 0.10 level. The share of cashews in total area and production of sugarcane do not strongly influence net revenues. These results indicate that farmers with diversified cropping patterns tend to have higher net revenues per hectare. This tendency is corroborated by field observation. Those ponteiros who manage their operations more actively tend to have a diversified mix of outputs. Those who tend to minimize their management inputs, such as absentee owners, will often have only a single crop, usually cashews. This crop has low management requirements, both for production and marketing activities. More active managers will have several crops, not only as a risk management strategy, but as a means of generating income over a larger portion of the year by growing crops with different harvest seasons.

The impacts of modern inputs on economic performance are mixed. Tractors and pesticides are positively correlated with net revenues, while pumps and fertilizers exhibit negligible association. The strong correlation with tractors on net revenues is somewhat surprising. Tractors are usually considered to substitute for other means of traction and transportation, but are not associated directly with yield-increasing technologies. However, some have argued that in Guinea-Bissau, access to tractors permits adoption of different production practices. In particular, mechanical traction greatly facilitates the adoption of the recommended practice of planting cashews with wider spacings. Traditional practice in Guinea-Bissau is to plant cashews close together so they completely shade out the land they grow on, and undergrowth is minimized. Wider spacing of the plants requires much more effort to control the undergrowth, a task handled much more easily and quickly with tractors than with manual labor, since machinery can pass between the trees.

Turning to the equation for profits per hectare, the first point to note is the low value of the adjusted R-squared for this equation. The independent variables explain only about 5% of the variation in profits per hectare. The lower explanatory power of the model with respect to profits than net revenues supports several different (but not mutually exclusive) hypotheses. One interpretation could be that the farmers' production decisions are based on net revenues rather than profits; they do not consider the imputed costs of land preparation and fixed inputs. An alternative interpretation is that the imputed costs attributed to these fixed inputs are not those which the ponteiros actually face. In particular, those individuals able to gain access to official credit on favorable terms would face very low opportunity costs for capital equipment. On the other hand, most ponteiros, particularly those with smaller operations and without political connections, do not have access to formal credit. In either case, the

opportunity cost of investment is likely to be very different from the 5% rate used in the calculations.

In the equation of profits per hectare, the coefficient on cultivated area is not significantly different from zero, indicating that there is no strong relationship, positive or negative, between farm size and profitability per hectare. Proximity to Bissau is again strongly related to profits per hectare. All of the variables relating to cropping pattern are highly significant. Both increased diversification and concentration are positively correlated with profits. Sugarcane production has a negative relationship with profits. These surprising results may be accounted for by the fact that the sugarcane producers have high machinery costs in comparison with other ponteiros which tend to decrease their profits. Conversely, ponteiros who specialize in cashew production have comparatively low machinery costs. None of the coefficients on modern inputs are statistically significant, even at the 0.10 level. These inputs do not appear to generate higher profits, when all costs are taken into consideration.