

# **MINISTRY OF AGRICULTURE AND FISHERIES**

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## **Working Paper Series**

Smallholder Cash Cropping, Food Cropping, and Food Security in  
Northern Mozambique: Research Methods

By

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# **NATIONAL DIRECTORATE OF AGRICULTURAL ECONOMICS**

## **Working Paper Series**

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# Smallholder Cash Cropping, Food Cropping, and Food Security in Northern Mozambique: Research Methods

## Introduction

Mozambique in the past three years has made an impressive transition from war to peace and from a single party state to its first democratically elected government. Since adopting the Economic Rehabilitation Program (ERP) in 1987, it has moved from a centrally planned economy to liberalization and rapidly evolving private markets. The gains from this transition have been real: large numbers of displaced rural households have returned to their lands of origin, and many of those who did not leave have taken advantage of improved security to expand agricultural production and farm size; informal traders have begun to penetrate production areas previously isolated from the commercial network, providing a market and a source of cash income for farmers.

Despite this progress, perhaps a majority of households face problems distressingly similar to those that have beset them for many years. In most rural areas, smallholders depend on weak or non-existent markets for agricultural inputs, including seed, farm implements, fertilizers, insecticides and herbicides. Partly as a result, crop yields remain low and the threat of food insecurity from crop failure remains high. Rural markets for food crops, while dramatically improved over the past three years, remain relatively underdeveloped and price variability is often high. Thus, for perhaps most farmers, sales in these markets do not yet represent a reliable and stable source of cash income. The marketing system linking rural with urban areas is increasingly competitive in most areas for many commodities, but it remains small scale and suffers from high per-unit costs. As a result, consumer prices are higher than they would otherwise be, and also quite variable.

With 80 percent of its population living in rural areas, 60 percent of gross domestic product (GDP) coming from the agricultural sector, and favorable agro-ecological conditions across much of the country, improved agricultural performance is key to improved household food security, income growth and broad-based development. Further, when considering the country's recent dependence on food aid to meet basic consumption needs, improving food availability through rapid increases in cereals production is a priority. On the other hand, an important goal of ERP is to increase exports and improve the country's balance of payments deficit. Increasing smallholder production of the country's traditional export crops - cotton, cashew nut, and tobacco - is one important element in achieving this macroeconomic goal.

In this context, policymakers and the donor community are faced with a challenge: how to design a policy environment which will simultaneously contribute to:

- 1) *improved food market performance for farmer sales and repurchase;*
- 2) *improved productivity of food and cash crops, leading to increased smallholder incomes and improved food security;*

- 3) *increased employment opportunities both within and outside of agriculture;*  
*and*
- 4) *progress toward the macroeconomic goals of ERP.*

To help inform these policy issues, the Ministry of Agriculture and Fisheries/Michigan State University Food Security Project (MAP/MSU FSP) has continued its program of socioeconomic research begun with a survey of smallholders in Nampula Province in 1991. Since April 1994, the FSP has carried out data collection, analysis and outreach related to the smallholder sector in Nampula and Cabo Delgado Provinces, in cooperation with the respective Provincial Directorates of Agriculture. This research has been geographically focused on areas of those two northern provinces with agro-climatic conditions favorable for a variety of staple food crops, the most important of which are maize, manioc, sorghum, groundnuts and beans, and where cotton and cashew nut are the most important smallholder cash crops.

This report documents the methods used, and presents some initial descriptive findings from this research program. We hope that the report will be useful to those planning similar survey-based research in rural Mozambique. The report is organized into three chapters. Chapter One outlines the study objectives and gives relevant background; Chapter Two presents a brief overview of the economy and history of cash cropping in northern Mozambique; and Chapter Three details the research design.

## I. Study Objectives and Background

Since 1991, the Food Security Project in Mozambique has been located within the Directorate of Agrarian Economy in the Ministry of Agriculture and Fisheries (DEA/MAP). A core focus of the project has been the development and management of the Agricultural Market Information System (SIMA) which collects, analyzes and disseminates market information in each of the country's ten provinces. In addition to the basic price gathering and reporting functions of the SIMA, FSP and DEA have used the data base to orient a program of food security research on topics including the evolution of agricultural markets and the effects of food aid policy on both producers and consumers.

Linked to the SIMA and the research that it supports, the FSP has conducted a series of studies of the smallholder sector in rural areas in collaboration with the provincial and district Directorates of Agriculture (DPAs and DDAs). The research effort reported on here grows directly out of these studies. This section provides a brief review of the objectives of the current study, as well as relevant background.

### A. Study Objectives

This study was motivated by the desire to understand the effects of cash cropping on smallholder income and consumption levels, and thus on their food security. The debate over whether cash crops improve or threaten smallholder food security has been ongoing in many developing countries over many years and is a continuing source of controversy. This debate continues despite much evidence that cash cropping typically has a strongly positive effect on smallholder incomes, and a smaller but still positive effect on consumption (von Braun, Puetz and Webb, 1989; von Braun, de Haen and Blanken, 1991; von Braun and Pandya-Lorch, 1991; Kennedy, 1989; Kennedy and Cogill, 1987; Tschirley and Weber, 1992).

A key finding from much of the literature on smallholder cash cropping in Sub-Saharan Africa (SSA) is that its effects on participating families depend critically on the organizational details of the scheme. In other words, how input supply, production, output marketing and processing are organized are what determine, in conjunction with price policy, the impact of cash cropping on participating smallholders. In the *cotton belt* of northern Mozambique, cotton is produced under a wide range of technological and organizational approaches. Improving understanding of this diversity and its implications for smallholders is critical as the GOM attempts to identify an agricultural strategy that will generate sustainable increases in incomes and consumption in the smallholder sector.<sup>1</sup>

Agricultural intensification is an issue closely related to that of cash cropping. Given the land and labor available to a household, that household's farm income cannot be increased without combining more resources (inputs) with their land and labor in the production process. In its broadest sense, this is the meaning of intensification. A key finding from research in many SSA countries is that cash cropping has been the window through which smallholder **food**

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<sup>1</sup> See Fok (1995) for a good discussion of this institutional diversity in Mozambique and the potential that it offers for developing a dynamic cotton subsector.

production is intensified. In this context, it is instructive to note that smallholder use of chemical inputs in Mozambique is limited almost exclusively to the cotton belt zone of Nampula and Cabo Delgado (World Bank, 1994). In this region, modern inputs are used primarily on cotton, but also by some farmers on maize and tobacco. This experience raises at least two key policy issues that need to be better understood by policy makers and donors. First, how can this form of intensification benefit food crops, in addition to cotton, on a broader scale? Second, what lessons from this experience can be applied in other areas and to other cash (and food) crops?

Answering these questions will require a detailed understanding of the technological and institutional diversity in the area, and its effects on smallholders. These two factors - broad institutional diversity combined with the nearly unique (in Mozambique) intensification of smallholder agricultural production in the area - were decisive in determining the choice of the cotton belt as the location for this study.

Specific objectives of the study were to:

- Compare the socioeconomic characteristics of smallholders in the area who participate in the cash cropping schemes with those who do not;
- Describe the evolution of the relationship between smallholders and the firms supporting smallholder agriculture (especially Joint Venture Companies), with emphasis on the availability of agricultural inputs (insecticides, herbicides and fertilizers) and extension services to smallholders in the zone.
- Determine the extent to which participating and non-participating smallholders enjoy differential levels of welfare (as measured by calorie consumption and household income).
- Determine the extent to which participation in the cash-cropping schemes, as opposed to other factors unrelated to these schemes, are responsible for these differences.
- Determine the extent to which land access represents a constraint on smallholder agriculture, and what effect, if any, participation in the cash cropping schemes has on land access.
- Determine the extent to which Mozambique's comparative advantage in cotton and maize, in both a static and dynamic sense, varies based on alternative institutional arrangement and company management practices.
- Describe the recent evolution of the food marketing sector in the study zone, and the role that food markets play in smallholder income and food security strategies.
- Diagnose the key constraints to the growth of a competitive private marketing sector in the area.

- Recommend key policy changes, investments, and project initiatives designed to improve the contribution of cash cropping to smallholder food security and income.

## **B. Prior FSP Farm and Market Level Studies**

This study grows out of a series of farm and market level studies carried out by the FSP since 1991. This section provides a brief overview of each of these studies.

**Nampula Smallholder Survey, 1991<sup>2</sup>:** Prior to the ending of the civil war, the FSP conducted a survey of 343 smallholders in the districts of Angoche, Monapo, and Ribaué. This survey provided the most detailed information then available on the effects of the war and economic reform policies on smallholders. It showed:

- surprisingly large variation in land holdings across smallholder, and a very close correlation between farm size (adjusted for family size) and calorie availability; this implied that smallholder land access *may* represent a significant constraint to increasing agricultural production and improving food security for many farm families;
- a low proportion (by SSA standards) of total household income from off-farm sources throughout the surveyed districts, meaning that surveyed farmers were strongly dependent on agricultural production from their own fields for their food security;
- the existence of an emerging but still fragile informal trading sector in rural areas; as a result, cereals sales represented a small proportion of household income for most households interviewed; very few households purchased cereals and food purchases overall provided very few calories for nearly all households;
- cotton-growing had a neutral effect on smallholder incomes and consumption overall, but increased smallholder integration into the cash economy as a result of cotton cultivation provided *a potential focus* for income growth and rural food security.

Determining, in the context of the ERP and emerging cash-cropping schemes, an appropriate policy environment to promote balanced growth and improved rural food security were highlighted as subjects for prompt research attention.

**Nampula Rapid Rural Appraisal, 1993<sup>3</sup>:** Renewed rural violence made it impossible for the project to return to rural areas for two years after the 1991 survey. Shortly after the signing of the General Peace Accord in October 1992, FSP continued its rural research effort by conducting a rapid rural appraisal (RRA) in two of the villages surveyed in 1991 in Monapo District. The purpose of this effort was to increase understanding of the evolution of the post-

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<sup>2</sup> At the back of this report, see NDAE Working Papers 3E, 4E, 5E, and 6 for results from this survey.

<sup>3</sup> See NDAE Working Paper 16 (1994) for results from the RRA.

war economy in northern Mozambique and to help focus a future research agenda in the region.

The RRA found that the material and security conditions of most households re-interviewed had improved since 1991. Yet all families continued to follow a food security strategy dependent on food self-sufficiency, despite relatively greater availability of food and consumer goods in the small local markets than in 1991. Land area cultivated had increased for many households reflecting improved general security conditions, but inequality between households remained high; land conflicts were found to exist between smallholders and larger farmers and agro-enterprises. A significant group of interviewed households had expanded area planted to cotton, the region's traditional annual cash crop. Cashew sales represented another significant cash income source.<sup>4</sup>

**National Rural Market Rapid Appraisal, 1994<sup>5</sup>:** At the end of the war in late 1992, it was widely recognized that the formal marketing infrastructure in rural areas had been badly damaged and faced severe obstacles to reconstruction. Accurate data on the number and location of rural stores still operating was accessible; much less was known about the success of the informal marketing sector in penetrating rural areas. In July-September 1994, a DEA and FSP team from Maputo and Nampula, and U.S.-based MSU staff conducted a rural market rapid appraisal (MRA) in seven locations spread across the country. The MRA focused primarily on rural markets for maize, but obtained information on all grains transacted by the traders interviewed. The MRA confirmed the hypothesis that most rural cereals marketing was being conducted by informal sector traders, who were providing strong competition to the few formal sector rural store owners (*lojistas*) who continued to operate. The informal system was found to be competitive and to be continuously expanding its geographic coverage. However, the system was also found to be small-scale and high-cost, with little ability to finance many of the investments needed to reduce marketing costs.

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<sup>4</sup> Shortly after the RRA, in March 1994, Cyclone Nadia struck a broad area of Nampula Province, including Monapo District, causing many cashew trees to fall and dramatically lowering smallholder cashew production.

<sup>5</sup> See NDAE Working Paper 19 (1995) for results from this appraisal.

## II. Economic Characteristics and History of Northern Mozambique

Within the north of Mozambique (Cabo Delgado, Nampula and Niassa Provinces), agro-ecological variation from the coast inland gives rise to diversity in agricultural potential across the region. This variation is in three main zones: coastal, intermediate, and interior. Food production in the coastal areas is dominated by manioc, with rice as an important additional crop for many farmers. Moving inland, maize becomes the staple food crop for most farmers, complemented strongly by manioc and sorghum. Key cash crops in the north are cashew and cotton, and each shows a marked geographical focus. Cashew is most adapted to the coastal regions, and remains an important income source for many smallholders in the intermediate zones, but is relatively unimportant in the interior. Cotton is not found at all in the coastal zones. Its production is most intensively and widely developed in the clay soils of the intermediate zone, with significant production also taking place in selected areas of the interior.

The Portuguese colonial regime focused its smallholder cotton and cashew production strategy on the north. Following independence, this area saw production of both commodities drop dramatically. Nampula and Cabo Delgado Provinces together accounted for 59 percent of Mozambique's colonial cotton production; seed cotton production in these two provinces decreased from 83,000 metric tons in 1973 to 19,000 metric tons by 1988.<sup>6</sup> Over the same time period, marketing of food crops plummeted by over 50% and cashew production and marketing fell by a similar proportion (Kyle, 1991). As a result, smallholder cash income, their ability to purchase basic consumer goods, and in all probability their food security, all fell sharply.

In the late 1980s, as part of its dual strategy of improving smallholder food security and increasing exports, the Government signed agreements with three multi-national firms (MNFs) to rehabilitate cotton gins and associated rural infrastructure which had fallen into disrepair. With the Government as their partner, each MNF formed a *joint venture company* (JVC), and each JVC was granted monopsony rights over smallholder cotton production within a specific geographic area (its *area of influence*)<sup>7</sup>. In return for these exclusive rights to purchase smallholder cotton, the JVCs agreed to provide growers with reliable input supplies, extension advice for cotton and food crops, and timely purchase of the seed cotton<sup>8</sup>. These cotton purchases were to be made at or above minimum price levels established annually by the National Commission of Salaries and Prices. These JVC contracts stipulated that the MNF would provide the capital necessary to rehabilitate the cotton gins, provide transport vehicles, and recruit technical expertise (GOM 1990a, 1990b, 1991). Further, the Government

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<sup>6</sup> Fok, p.30.

<sup>7</sup> Chapter 2, Article 2, of the Ministry of Agriculture's *Regulamento para a cultura de algodao* defines smallholder as any economic agent growing under 20 hectares of seed cotton in a particular year. Those with larger holdings, even within a JVC area of influence, may sell their seed cotton to whomever they choose.

<sup>8</sup> The contract between Lonhro International Limited and the GOM, "Autorização do Projecto "Lomaco Montepuez" (1990) states: "Lomaco - Montepuez, in the region of Montepuez, will develop ... rural extension services for cotton and other crop production together with family sector farmers." The "Autorização do Projecto SODAN" (1990, p.1) contains nearly identical language on this issue.

established the JVCs as the mechanism through which to distribute to smallholders the insecticide donated by the Government of Japan under the KR-2 program.<sup>9</sup> In short, since 1990 the JVCs have comprised a key component of the Government's rural development strategy in the cotton belt aimed at promoting rural food security and income growth.

Table 1 provides information on each of the three JVCs in addition to two private firms operating in Nampula province.

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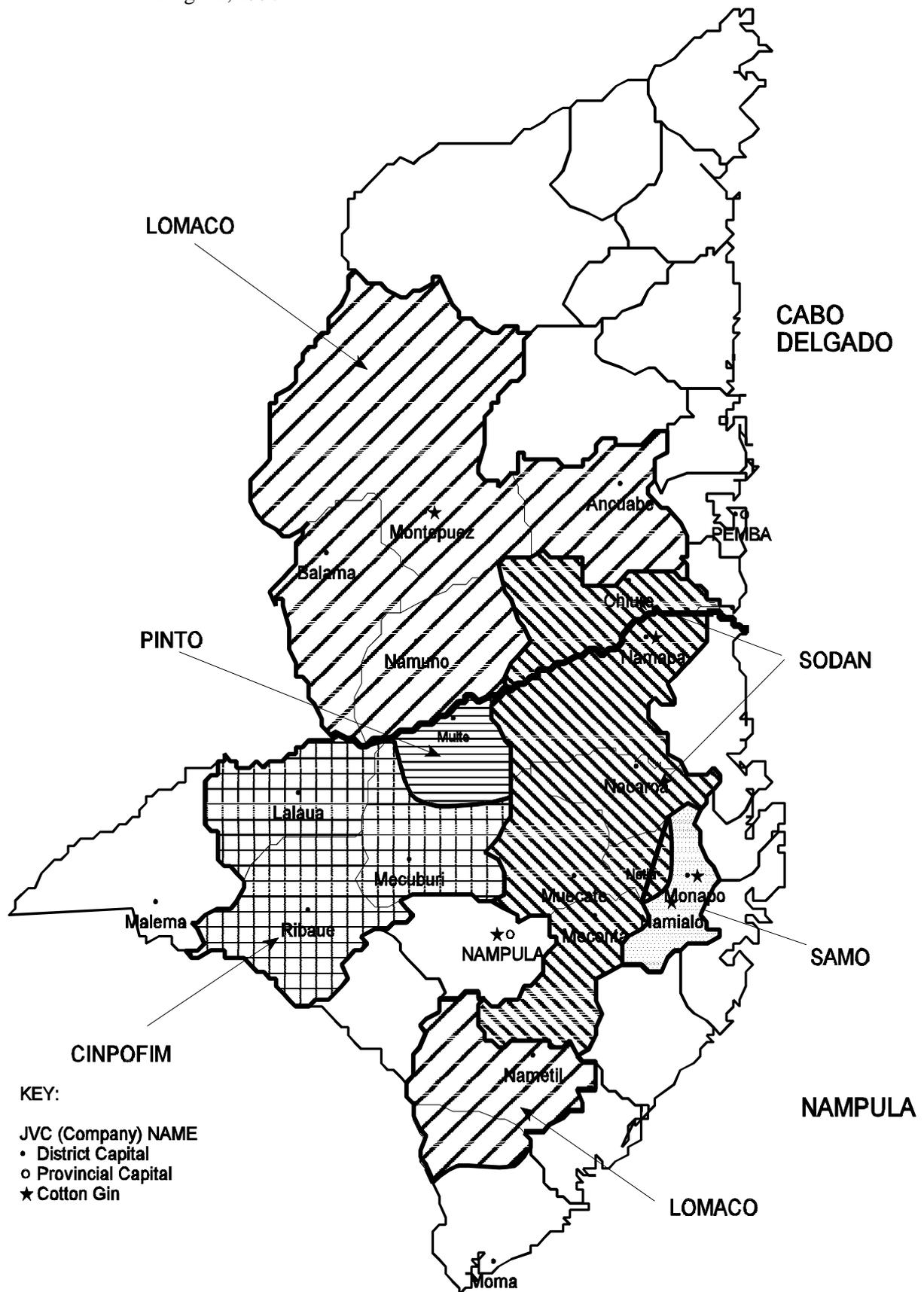
<sup>9</sup> This program terminated in late 1995. While in operation, it provided a grant of up to one billion Yen per year for the purchase of "fertilizer, agricultural chemicals and agricultural machinery; and services necessary for the transportation of (these) products ... to ... Mozambique." It also called for the GOM to deposit "in Mozambican currency at least an amount equivalent to two-thirds of the yen disbursement". A recent agreement under this program mentions increased food production as the primary goal of each fund. Cotton production is not mentioned. See Embassy of Japan, 1994.

**Table 1. Firms Supporting Smallholder Cotton Production in Nampula and Cabo Delgado Provinces, 1994/95**

	Joint Venture Companies			Private Companies	
	LOMACO-Montepuez (Lonhro Mozambique Agro-Industrial Company)	SODAN (Sociedade Algodoeira de Namialo)	SAMO (Sociedade Algodoeira de Monapo)	CINPOFIM	Eduardo Baptista Pinto
International Firm (where based)	Lonrho (United Kingdom)	Grupo Comercial João Ferreira dos Santos (Portugal)	Grupo Entrepосто (Portugal)	CINPOFIM (Portugal)	None
Date of Formation of Joint Venture Company	1990	1990	1990	NA	NA
Location of Cotton Processing Factories	Montepuez (Cabo Delgado) Nametil (Nampula)	Namialo Namapa	Monapo	Ribaue	No gin
Location of Smallholder Concessionary Area	<u>Cabo Delgado</u> districts of: Ancuabe, Balama, Montepuez, Namuno <u>Nampula</u> districts of: Angoche, Mogovolas, Moma	<u>Cabo Delgado</u> district of: Chiure <u>Nampula</u> districts of: Meconta, Monapo (Netia only), Muecate, Nacarora, Namapa	<u>Nampula</u> district of: Monapo	<u>Nampula</u> districts of: Lalaua, Mecuburi, Nampula, Ribaue	<u>Nampula</u> districts of: Mecuburi (Muite only)
Crops Supported	Cotton, Maize, small amounts of tobacco, peanuts, and beans	Cotton only	Cotton only	Cotton only	Cotton only
Participating Smallholders 1994/95	16,180	57,896	7,105		
Seed Cotton Production 1993/94 (MT)	6,117	11,543	2,423	406 <sup>1</sup>	NA

<sup>1</sup> 1992/93

**Figura 1.** Areas de Influência das Empresas Mistas e Privadas de Algodão em Nampula e Cabo Delgado, 1995



### III. Research Design

#### A. Institutional Variation and Implications for Food Security

During the 1993 RRA, the FSP learned about the activities of JVCs and other agribusiness

**Table 2.** Types of Rural Households in *The Cotton Belt*, by JVC and Cotton Production Status, 1994

JVC/Smallholder Arrangement	Joint Venture Company		
	LOMACO	SODAN	SAMO
<b>COTTON GROWERS</b>			
Dispersed cotton	X	X	X
Block cotton		X	X
Block cotton and maize	X		
<b>NON-COTTON GROWERS</b>			
Dispersed food crops	X	X	X

**X** indicates the existence of a large number of individuals in the given cell; an empty cell indicates no households are believed to be described by this combination.

firms in the cotton belt. The considerable variation that existed in the input packages and broader smallholder-JVC relationships made it possible to develop a quasi-experimental design for the research, as illustrated in Table 2. Interviews with smallholders, firm managers and key GOM officials suggested that the most important dimensions of this smallholder-JVC relationship were:

- Whether production by the smallholder takes place on their own dispersed fields or on larger contiguous areas (some of which may belong to the JVC) divided into small parcels and cultivated by individual smallholders. These two arrangements are termed **dispersed** and **block** production, respectively;
- Intensity of use of imported chemical inputs (insecticides, herbicides, and fertilizers);
- Degree of tractorization in **block** production.
- Level and quality of extension services provided.
- Degree of JVC involvement in smallholder maize cropping; in the LOMACO scheme, smallholders grow both maize and cotton on block land with LOMACO support; the other two JVCs do not deal with smallholder food production or marketing.

As a partner in the JVCs, the GOM potentially wields considerable influence in their design and management. Thus, to the extent that the management practices and institutional arrangements studied result in differential impacts on smallholders and the country, the GOM could use these insights to improve smallholder food security and income growth by understanding lessons learned in the initial years of the JVC-smallholder relationship.

We hypothesize that 1) the effects of cash crop production on the welfare of participating smallholders and 2) the competitiveness of the cash cropping from a comparative advantage standpoint both depend critically on **how** the sector is organized. Given the variation in institutional arrangements within and between JVCs, this research can serve to inform the GOM, donors and the MNFs about how the sector might be organized to improve performance at each level.

## **B. Research Collaboration with Other Institutions**

During the course of its work, FSP came to realize that it shared research and policy interests with other institutions working in northern Mozambique. This section briefly describes research collaboration between FSP and CARE International, The Land Tenure Center (LTC) of the University of Wisconsin, and The World Bank.

**CARE International:** In October 1994, CARE International in Mozambique began its Oil Press Enterprises in Nampula Project (OPEN). This project is located in districts of Nampula Province adjacent to the SAMO and SODAN areas, the original FSP study area (along with Montepuez in Cabo Delgado). The OPEN areas exhibit key similarities and key differences from the original FSP area. The similarities are in agro-ecological conditions appropriate for cotton, and the presence of private firms supporting smallholder production. The key differences are that there is much less investment by these firms than by the JVCs, a generally lower proportion of cotton growers than in the JVC areas, and a somewhat greater importance of other cash crops such as sesame and sunflower. OPEN was designed to promote smallholder production and local processing of these oilseed crops, thereby contributing to income growth and greater availability of edible oil in rural areas of the region.

CARE, as part of its project implementation strategy, had planned to conduct a baseline survey of smallholders in the OPEN districts, with a follow-up survey programmed two years hence to measure project impact on rural incomes and consumption patterns (CARE, 1996). FSP and CARE recognized a mutual interest in collaborating on the OPEN baseline; it would provide CARE with a level of technical assistance not typical of an NGO baseline survey, and it would allow FSP to obtain a broader understanding of smallholder cash cropping throughout the province.

Further, results from Round 1 in June 1994 showed a lower than expected number of non-cotton growing households in the sampled SODAN/SAMO areas. Given the study's original design, the project needed to have a significant group of non-cotton growing households in each province for comparison purposes. Thus, including the OPEN areas conferred an additional advantage: greater insight into the income and consumption status of non-cotton growing household in areas where cotton is appropriate.

**World Bank:** As part of its program to support agriculture in Mozambique, the World Bank's Mozambique mission identified four priority commodities for policy reform and investment: cotton, maize, cashew, and citrus. Aware of FSP's program of research on maize and cash crops, Bank personnel approached the project in 1994 about the possibility of collaboration on some of the studies that the Bank would need to conduct. FSP agreed to participate actively in the maize and cotton studies, and gave substantial intellectual and material support for the studies and related outreach. FSP personnel helped shape the issues to be addressed in the studies; Bank consultants worked closely with FSP personnel in conducting field visits and gathering secondary information; FSP gave extensive feedback on the draft reports, supervised their translation into Portuguese, and helped organize and conduct policy seminars financed by the Bank and based on each study. These two studies now form the basis for Bank initiatives in policy reform and investments for these two commodities (Coulter, 1996; Fok, 1995).

**Land Tenure Center, University of Wisconsin:** One of the most surprising findings that emerged from the 1991 FSP survey work in Nampula province was highly unequal land holdings within the smallholder sector of sampled areas.<sup>10</sup> Since that time, FSP had done selected additional analysis on the issue, and published a working paper in conjunction with the Department of Statistics of DEA/MAP (NDAE Working Paper 17). LTC had also been conducting research in northern Mozambique (among other locations in the country) on the issue of land access and conflict, but with a different methodological approach (case studies) and a different focus (conflicts between large agricultural enterprises and smallholders). To complement this approach, LTC decided to analyze the issue from a household perspective as well. Collaboration between FSP and LTC would mean that LTC would have access to a rich household level data base to analyze in conjunction with its own data on land access; FSP stood to benefit through greater understanding of land access issues in its area of research. As a result of these potential benefits, FSP and LTC collaborated on a final round of data collection among sampled households during January/February 1996. The questionnaire for this round included most of the sections completed during earlier FSP rounds, and added a module on land conflict, access, and security of tenure. Data analysis and publication of results will take place over the next year.

### C. Levels of Data Collection

The current research program was conceptualized to collect data among the major stakeholders in the food and cotton economy of the *cotton belt*. The centerpiece of the data collection strategy was a survey of rural households, stratified based on whether and how the family grows cotton. A more detailed description of the stratified cluster design is provided in section D.i. below.

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<sup>10</sup> These sampled areas were 5 villages each in the districts of Angoche (on the coast), Monapo (intermediate zone), and Ribaué (interior).

Likewise, the research design emphasized understanding the strategy and operating procedures of the JVCs with respect to smallholders within their respective *areas of influence*; this includes evaluating the JVC extension networks, input distribution systems, and output marketing systems. In addition to the focus on the smallholder and JVC levels, the research program was also designed to gather information from other key actors related to the questions being investigated. This includes Ministry of Agriculture and Mozambique Cotton Institute officials at the provincial and district levels, major non-government organization leaders operating in Nampula and Cabo Delgado (e.g. the collaboration with CARE International described above), formal and informal traders operating in the study zone, and community leaders in villages where smallholder interviews were conducted. Table 3 details all levels of data collection and provides a brief description of the types of research questions to be informed at each level.

**Table 3.** Data Collection Activities, Sampling Strategies and Types of Data to be Collected

DATA COLLECTION LEVEL	SAMPLING STRATEGY	TYPE OF DATA
Smallholder household	<ul style="list-style-type: none"> <li>■ Stratified random cluster sampling within purposively selected districts</li> <li>■ See Tables 4-7 for more detail</li> </ul>	<ul style="list-style-type: none"> <li>■ Family structure and history</li> <li>■ Ag practices, production and sales</li> <li>■ Costs of production of maize, cotton and manioc</li> <li>■ Land access and use</li> <li>■ Relation to JVC and history in cotton</li> <li>■ Expenditures</li> <li>■ Consumption</li> <li>■ Non-farm income (wage and valued-added)</li> </ul>
Village	<ul style="list-style-type: none"> <li>■ Purposive sampling of traditional and official (party/government) leaders</li> </ul>	<ul style="list-style-type: none"> <li>■ Population and history of village</li> <li>■ Relationship w/ JVC</li> <li>■ Infrastructure</li> <li>■ Land tenure</li> <li>■ Degree of commercialization</li> </ul>
JVC	<ul style="list-style-type: none"> <li>■ JVC managers and field level technicians</li> </ul>	<ul style="list-style-type: none"> <li>■ Management strategy and plans</li> <li>■ Relationship with smallholders in communities studied</li> <li>■ Input strategy</li> <li>■ Organization of cotton processing</li> <li>■ Cotton utilization and export</li> </ul>
Traders	<ul style="list-style-type: none"> <li>■ Census of local store owners in each village surveyed</li> <li>■ Sample survey of district and provincial level wholesalers</li> </ul>	<ul style="list-style-type: none"> <li>■ Purchase of smallholder agricultural production</li> <li>■ Supply of goods to smallholder sector</li> <li>■ Management practices</li> </ul>
Government	<ul style="list-style-type: none"> <li>■ Relevant MAP/DPA/DDA officials</li> <li>■ Cotton Institute managers</li> </ul>	<ul style="list-style-type: none"> <li>■ Role of smallholder agriculture in zone</li> <li>■ Importance of cotton and other cash crops</li> <li>■ Relationship with MNFs</li> </ul>
NGOs	<ul style="list-style-type: none"> <li>■ Officials and workers knowledgeable about agriculture in the study zone</li> </ul>	<ul style="list-style-type: none"> <li>■ Current NGO activity in study zone</li> <li>■ Observations on key economic problems and successes</li> </ul>

## D. The Smallholder Survey

The centerpiece of the research program was the survey of smallholders. This section describes the design of the sample, the interview schedule and questionnaire format.

### i. First Round Sampling Design

The overall design for the primary sample (Montepuez and Monapo/Meconta) was a stratified random cluster sample applied to purposively selected districts within JVC areas of influence. Stratification was at both the village and household levels. The following sections describe the sampling strategy followed at both levels. Readers should make reference in these sections to Figures A1 through A3 in Annex A, which detail the sampling steps taken for Round 1.

**Village Stratification:** Table 4 shows the village sampling strategy that was applied at this level. In the first step, researchers purposively selected districts within JVC areas of influence. The 1993 RRA found that three joint venture companies (Lomaco-Montepuez, SODAN, and SAMO) were the most established agricultural firms in the North working with smallholders; focusing on those firms provided the best strategy, at that time, toward understanding the key cash-crop/food-crop relationships to food security. Two of the three JVCs targeted for study have relatively large geographic areas of influence. SODAN's area stretches over five

**Table 4.** Original Sample Frame (June 1994); Village Type by JVC

	LOMACO	SODAN	SAMO
Districts included in Sample Frame	Montepuez	Monapo (Netia) Meconta	Monapo (excluding Netia)
Total Villages in Districts	30	56	39
Villages with Block			
Total	0	29	18
Selected Randomly	0	4	4
Villages with PUPI Block			
Total	5	0	0
Selected Randomly	4	0	0
Villages with Dispersed Growers and Non-Growers only			
Total	25	27	21
Selected Randomly	4	4	4
Total Villages Where Round 1 was conducted	8	8	8

Nampula districts and also includes one district in Cabo Delgado. LOMACO's area of influence is even larger in area, spread over four districts in Cabo Delgado and one (not contiguous with those in Cabo Delgado) in Nampula.

Given FSP's managerial and logistical constraints in the organization of data collection, the project decided to limit the sample frame for SODAN to the districts of Monapo and Meconta, thus excluding the other four SODAN districts. Monapo and Meconta were chosen because they were the areas of longest and most intensive SODAN presence throughout the six district area of influence. Further, a significant number of villages with and without smallholder cotton blocks, a key stratification criterion, were known to exist in those two districts. In the Lomaco-Montepuez area of influence, the project decided to limit the study zone to one of the four districts (Montepuez) where the firm was operating. In the case of SAMO, the area of influence is relatively small, so the entire area was included in the sample frame.

The next step at the village level was to limit the study to those villages with at least 20 cotton growers during the 1992/93 growing season.<sup>11</sup> This decision was made to ensure that each village would have a sufficient number of cotton growers to interview. Finally, researchers classified villages within each district into four strata according to the types of smallholders present. All villages had non-growers of cotton and dispersed growers of cotton; the stratification was thus based on whether the village **also** had cotton growers in block (SAMO and SODAN areas) or cotton/maize growers in PUPI-block (LOMACO only)<sup>12</sup>. Researchers then randomly selected four villages from each village strata in each JVC's area of influence. In total, then, Round 1 was conducted in 24 villages.

**Household Level Stratification:** The household stratification strategy followed directly from that applied at the village level: households were classified with respect to cotton growing as being non-growers, dispersed growers, block growers, or PUPI/block growers. This information as gathered through a census of each of the selected villages. Following the census, researchers randomly selected 12 households in each category present in each of the villages. Table 5 shows the desired number of households to be interviewed during Round 1 in each stratum. Total sample size was to be 720.

**Table 5.** Number of Households to be Interviewed in Each Stratum, Round 1 (6/94)

Household Category	LOMACO	SODAN	SAMO	Total
---- Number of households ----				
<b>COTTON GROWERS</b>				
Dispersed cotton	96	96	96	288
Block cotton		48	48	96
PUPI Block (cotton and maize)	48			48
<b>NON COTTON GROWERS</b>				
Dispersed food crops	96	96	96	288
Total	240	240	240	720

<sup>11</sup> This was the most recent official data available at the time of the survey design from the Nampula and Montepuez branches of the National Cotton Institute (IAM).

<sup>12</sup> PUPI is the Portuguese acronym for *Pequena Unidade de Produção Intensiva*, or "small unit of intensive production". In the PUPI **block**, several farmers have fields of 0.5 to 1.0 hectare in a contiguous block, on which they plant both cotton and maize under an intensive input package.

Figure A4 in Annex A depicts the sampling strategy in the CARE areas, which reflected CARE's need to show the impact of its OPEN project. The different sampling strategy in CARE areas means that results from these data will typically be presented separately from results out of the primary FSP sample.

ii. Lessons from Round 1 and Sampling Design for Subsequent Rounds

Insights from Round 1, including initial analysis of that data, led to selected adjustments in the sampling strategy for all succeeding rounds.

1. Non-growers of cotton in the SODAN and SAMO areas proved to be less numerous than indicated in the available official data used in designing the original sample. The original design called for interviewing 12 non-growers in each of the 16 SAMO and SODAN villages, for a total of 192. However, as Table 6 demonstrates, only 101 non-growers were actually interviewed in these villages, 52 in SODAN and 49 in SAMO areas.

**Table 6.** Households Actually Interviewed by Stratum, Round 1 (6/94)

Household Category	LOMACO	SODAN	SAMO	Total
	---- Number of households ----			
<b>COTTON GROWERS</b>				
Dispersed cotton	103	88	110	301
Block cotton		75	55	130
PUPI Block (cotton and maize)	41			41
<b>NON COTTON GROWERS</b>				
Dispersed food crops	90	52	49	191
<b>TOTAL</b>	<b>234</b>	<b>215</b>	<b>214</b>	<b>663</b>

2. SODAN and SAMO were found to be very similar to each other (and each significantly different from LOMACO) in the following dimensions:
  - **Current management and ownership structures:** The parent company of each JVC are Portuguese corporations which had strong ties to the Mozambican colonial system; many personnel in these JVCs were present in Mozambique and involved in cotton production during the colonial era. LOMACO's parent company is Lonrho, a British multinational.

■ **Input packages:** Both SAMO and SODAN followed a strategy of extensification rather than intensification, providing smallholders with seed and insecticides but no herbicides or fertilizer. LOMACO provided selected smallholders with herbicides and fertilizer in addition to seed and insecticides.

■ **Crop orientation and rural extension networks:** SAMO and SODAN each focused exclusively on cotton, providing neither inputs nor extension advice for food or other cash crops. LOMACO worked with selected smallholders to intensify maize production in combination with cotton. LOMACO also maintained an adaptive research capacity that the other two firms did not.

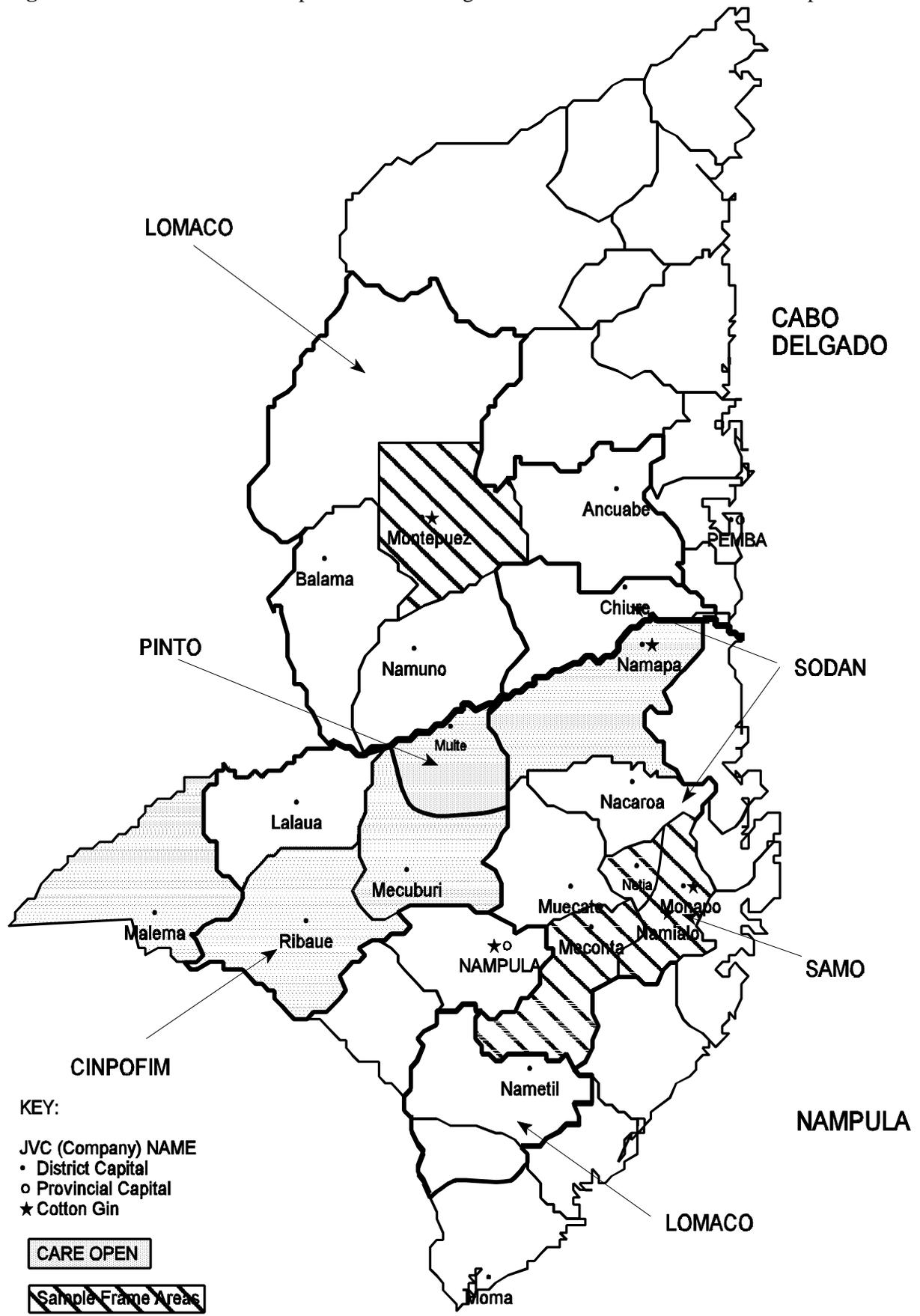
Given these similarities between SAMO and SODAN, a decision was made to group the two areas of influence for sampling purposes. A smaller sample of villages would therefore suffice to attain the same statistical properties, so the number of villages was reduced to nine overall for Rounds 2-4 in the combined SODAN/SAMO areas.

3. Project researchers learned in September 1994 that LOMACO would be working with a group of farmers, using PUPI inputs (insecticide, herbicide and fertilizer, but no tractorization) on dispersed fields. This would be the first time that such an input package had been extended to farmers on their own dispersed fields, and represented an excellent opportunity for study. Thus, a sample of these households was added to the overall sample for Rounds 2-4.
3. Project researchers learned in September 1994 that LOMACO would be working with a group of farmers, using PUPI inputs (insecticide, herbicide and fertilizer, but no tractorization) on dispersed fields. This would be the first time that such an input package had been extended to farmers on their own dispersed fields, and represented an excellent opportunity for study. Thus, a sample of these households was added to the overall sample for Rounds 2-4.

**Table 7.** Final Sample Design, Rounds 2-4 (January, May, September 1995)

Household Category as of 12/94	LOMACO	SODAN/SAMO	CARE OPEN	Total
No. of Villages	7	9	5	21
	----- No. of Households -----			
Block cotton only	0	48	0	48
PUPI Block (cotton and maize)	38	0	0	38
PUPI dispersed	29	0	0	29
Dispersed cotton	80	87	52	215
Non-Cultivators	61	45	104	214
<b>Total</b>	<b>208</b>	<b>180</b>	<b>156</b>	<b>544</b>

**Figure 2.** Districts of Nampula and Cabo Delgado Provinces in FSP and CARE Samples



Figures A5 and A6 in Annex A summarize the lessons learned and steps taken after Round 1. Table 7 below presents key characteristics of the final sample interviewed during rounds 2-4. Figure 2 below shows the districts that were included in the final combined FSP and CARE sample.

iii. Of What is the Sample Representative?

Fundamental to interpretation of forthcoming statistical results from this study is understanding:

- 1) Of what population are the sampled households *statistically representative*? and
- 2) Are there other areas with similar agro-ecologic and economic characteristics to which study results can be roughly *generalizable*, though not strictly statistically representative?

In a statistical sense, forthcoming study results will be representative of only those parts of each area of influence included in the sample frame. However, the agro-ecological similarity across the whole of the areas of influence, and the fact that the JVCs operate in similar ways throughout these areas, both suggest that lessons learned from the study will be generalizable to the non-sample areas of each area of influence.<sup>13</sup>

It is important to examine again Figure 1 in this context: these areas of influence cover well over one-third of the land area of Nampula and Cabo Delgado provinces. Adding the Cinpofim and Pinto areas (these being covered by the CARE sample), more than half the area of these two provinces is covered. This suggests that study results will be broadly generalizable to the maize- and manioc-based cropping systems of interior areas of northern Mozambique where cotton is **or can be** grown. The fact that cashew is commonly grown by smallholders in these areas means that these data can also be used to garner insights into the role of this important cash crop for smallholder incomes and food security.

iv. Interview Schedule and Questionnaire Design

The basic framework for the smallholder study was a *repeat visit survey* whereby each household would be interviewed four times between June 1994 and September 1995. The first round, conducted in June 1994, was conceived as an "entry interview". Its purpose was to provide basic information on households of each of the three JVC areas of influence. This information would be used, in part, to determine a final sample for rounds 2-4. Transactions data (expenditures, sales) and quantified production and income data would be collected during rounds 2-4.

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<sup>13</sup> Specifically those villages with greater than 20 households growing cotton during the 1992/93 year.

**Table 8.** Agricultural Calendar for Key Food and Cash Crops, and Smallholder Survey Rounds, 1994/95 MAP/MSU FSP Nampula/Cabo Delgado Socio-Economic Study Zone

Agricultural Calendar	1994												1995					1996					
	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Land Preparation					Cotton Maize																		
Planting						Cotton Maize																	
Weeding							Cotton Maize																
Harvest					Cashew					Maize					Cotton								
Commercialization							Cashew								Maize							Cotton	
<b>Study Activities</b>																							
Smallholder Survey Rounds (Monapo/Meconta/Montepuez)	1						2					3				4						5 (w/LTC)	
FSP/CARE Fieldwork Rounds (Ribau/Namapa/Mecuburi)									1							2						3 (w/LTC)	
Commercial Sector Surveys																							
World Bank Commodity Studies										Cotton					Maize								
MAP/IAM Interviews																							
JVC Official Interviews																							
Workshops with Smallholders, JVC, GOM Officials on Preliminary Findings																						Nampula	

Rounds 2 through 4 were conducted each four months during the official Mozambican agricultural year beginning September 1, 1994 and ending August 31, 1995 (Table 8).

During these rounds (January, May, and September 1995) enumerators conducted interviews while residing in the surveyed villages for periods ranging from one to two weeks. With the enumerator resident in the villages, and with frequent visits from field supervisory staff, the project was able to develop good relationships with village officials and interviewed households.

For each round, questionnaires were designed to ask households to recall information about their key economic activities over the preceding four months. The questionnaires included core sections that were common to each of these rounds, and modules which were completed during one or two of the rounds. Core sections included household demographics (including non-resident members), identification and characterization of each agricultural field, on-farm labor (land preparation, planting, weeding, chemical application, harvest), fruit and vegetable production, animal management, cereal stocks and storage techniques, all monetary and in-kind transactions (sales, purchases, remittances, gifts), off-farm income, and consumption. Key modules quantified production of cereals, cotton and cashew, while others looked at issues such as grain processing, allocation of women's time in the household, family relationship to the structure of local authority, and land tenure and conflict. Table A1 in Annex A provides further detail on questionnaire content.

A key technique used in the repeat visit strategy was to include selected data reported by the household from the previous round's questionnaire onto that family's questionnaire for the subsequent round. For example, if a household stated that they had planted 4 fields by Round 2 (January 1995), the characteristics of these fields were included on the instrument for that family during Round 3 (May 1995). This technique helped the enumerator to:

- 1) become more familiar with basic demographic and agricultural information about the family prior to the subsequent interview, thus lessening any awkwardness of the interview process; and
- 2) check key information recorded on questionnaires for that family from previous rounds; often enumerators were able to correct data from a previous round and provide qualitative insights on the new questionnaire concerning the source of the error; during data processing these changes were made in the data base from the previous round, thus improving overall data quality throughout the study.

Household food consumption was measured using a 24 hour recall technique. The enumerator asked the person who most often did the food preparation/cooking, generally the wife or an older daughter, to identify the type and quantity of each food ingredient prepared and consumed during the previous 24 hours. Two consumption interviews, separated by about one week, were conducted during each of Rounds 2-4. These interviews were always conducted at the household, which facilitated volumetric measurement of the numerous non-standard units the household used for cooking. Other modules conducted with the woman (or other individual in charge of food preparation) concerned grain processing and the seasonal management of household food stocks and income.

v. Dealing with the Effects of Cyclone Nadia

In March 1994, Cyclone Nadia reached the Mozambican coast and seriously affected agricultural production in Nampula province, including the districts of Monapo and Meconta. Cabo Delgado province was unaffected. In Monapo and Meconta, many cashew trees were knocked-down, maize was damaged just prior to harvest, and manioc (to be harvested in October) was also damaged. Due to this event, it was reasonable to assume that smallholder incomes and consumption would be lower than they would otherwise be. The effects might be especially strong during the following hungry season, approximately January-March 1995. Preliminary analysis of consumption data from Round 1 (these data refer to consumption during January 1995) appeared to confirm these suspicions, showing far lower consumption levels in the SAMO/SODAN areas than in the LOMACO area. As a result, FSP leadership decided to conduct a fifth round of data collection during January 1996. The primary objective of this round was to have hungry-season consumption data during a more "normal" year to compare with the previous year which was affected by the cyclone. To be able to draw conclusions about the effect of Nadia, it was necessary also to have data from this round from other the FSP sample areas not affected by the cyclone. Thus, the survey was conducted in all areas covered in previous rounds, and most components from previous rounds' questionnaires were included. See Table B1 for more information on questionnaire content for round 5.

vi. Organization of Fieldwork

Agreement was reached between the FSP, DEA, and the Nampula DPA during visits to Nampula and Maputo by project staff concerning the basic framework for the study. Beginning in April 1994, an MSU researcher was based in the Nampula DPA, within DEA, as FSP Coordinator within that Province and Cabo Delgado. The FSP Coordinator benefitted considerably from Nampula DPA officials who had prior experience working in collaboration with the FSP, particularly related to management of the SIMA. In addition to the specific data gathering responsibilities of the Coordinator, he and other MSU-based and Maputo-based researchers placed considerable importance on:

- Providing in-service training opportunities to DPA staff involved in the study in terms of research methods, fieldwork supervision, and computer and data base management skills; and
- Holding frequent seminars throughout the study zone involving DPA/DDA staff members, leaders from surveyed villages, JVC officials and NGO representatives knowledgeable about the area.

Twenty-one individuals with minimum education levels of 6th grade, including 6 women, worked as enumerators during the current study. To hire these key field staff members, the Coordinator requested the District Directors of Agriculture of the original study districts (Meconta, Monapo and Montepuez) to recommend candidates familiar with the local areas, who spoke the Macua dialect from that area, and who were knowledgeable about agriculture. These candidates underwent training in Nampula for one week in June 1994, at which time successful candidates were selected to participate in Round 1. Field supervision was conducted by staff members from the Nampula DPA/DEA, the Mozambique Cotton Institute, and the DDA Montepuez. Additional training was conducted with field staff prior to each of rounds 2-5.

During the conduct of the fieldwork, enumerators were resident in the villages in which they worked during each round. Furthermore, enumerators were assigned to visit the same households during each round to establish a high level of trust, thus facilitating a fruitful atmosphere in which to carry out interviews.

#### vii. Data Entry and Cleaning

Following completion of interviews by enumerators, field supervisors carefully reviewed questionnaires while still in the field for logical errors and internal consistency. Any questions were resolved in consultation with the enumerator who conducted the interview. If clarification was not possible through this process, the enumerator (and sometimes supervisor) return to the household to resolve the problem.

After this cleaning in the field, questionnaires were sent to FSP offices in Nampula. DEA staff and selected enumerators post-coded open-ended questions and carried out other steps necessary for preparing the questionnaires for data entry. At that point, all data from the household surveys were entered in Nampula by DPA staff using SPSS/PC+ 5.0 software. Following each round, the Coordinator and DEA staff carried out significant data cleaning activities; through this process, many data errors were discovered by referring back to the original questionnaires, with corrections being made to the original data files.

#### viii. Creation of a Data Archive

Following the completion of round 4, the Nampula Coordinator worked with other FSP staff to create a *data archive*. This archive consolidates data across all rounds and computes selected variables such as standard unit quantities produced, sold, and purchased (among others), and incorporates these variables into the archive's *final data files*. Data from round 5 is being added to this archive at the time of this writing.

An important feature of this archive is that the final data files can be regenerated automatically should data errors be found during the course of analysis. In this case, data corrections are made in the *original data files*, and *archive include files* of SPSS code are used to regenerate the archive. Readers interested in more details regarding the data should request from FSP a copy of the internal document "Nampula/Cabo Delgado Household Data Archive Documentation".

## **ANNEXES**

## **Annex A: Sampling Strategy**













## Annex B: Questionnaire Content

**Table B1.** Questionnaire Content

TOPIC	ROUND						
	FSP					CARE	
	1	2	3	4	5	1	2
	6/94	1/95	5/95	9/95	1/96	3/95	8/95
<b>CORE SECTIONS</b>							
ON-FARM MEMBERS DEMOGRAPHICS	X	X	X	X	X	X	X
OFF-FARM MEMBERS / REMITTANCES	X	X	X	X	X	X	X
LAND RESOURCES/ CROP MIX, FIELD HISTORY, SOIL TYPE, LOCATION	X	X	X	X	X	X	X
AGRICULTURAL SALES		X	X	X	X	X	X
CONSUMPTION		X	X	X	X		
EXPENDITURES		X	X	X	X	X	X
HH LABOR ON HH LAND	X	X	X	X			
OFF-FARM INCOME	X	X	X	X	X	X	X
LABOR HIRED	X	X	X	X			
AG INPUTS/ INSTRUMENTS	X	X	X	X			X
FRUIT AND VEGETABLE PRODUCTION		X	X	X	X	X	X
ANIMALS		X	X	X	X	X	X
<b>ADDITIONAL MODULES</b>							
FAMILY HISTORY	X			X			X
RELN W TRAD, FRELIMO AUTHORITIES	X			X			X
RELATION WITH JVC	X		X	X			X
COTTON GROWER MKTG		X		X			X
AGRICULTURAL PRODUCTION		X		X		X	X
FOOD STOCK MANAGEMENT & STORAGE METHODS			X	X	X	X	X
CASHEW MANAGEMENT				X			X
GRAIN MILLING / PROCESSING				X		X	X
WOMEN'S TIME ALLOCATION					X		
LAND TENURE AND CONFLICT					X		

## Annex C: Village Characteristics

Table C1. Sample Village Characteristics

Village Code Posto Admin District JVC Agency	Location and Transportation Infrastructure	Water Source	Education	Cashew Trees	Commercial Network (Formal and Informal)	Health	Milling Services	Large Landholdings (Direct JVC Production or Others)
<b>MONTEPEUEZ DISTRICT</b>								
Mararange 111 Mirate Montepuez Nacuaia	5 kms northeast of Nacuaia; little public transport with the exception of Lomaco vehicles	1 UDA well 2 natural wells	1 school w/2 rooms and 2 teachers until 4th grade	Few, produce very little	A store that was founded in 1968 by the father of the present owner; barracas also	No health post; nearest post in Mirate-Sede 7 kms away	One exists, founded 6/94 - owner resident in Pemba	<ul style="list-style-type: none"> <li>■ Lomaco has PUP1 blocks for maize and cotton (area xxx ha)</li> <li>■ Lomaco has direct production (area xx ha)</li> <li>■ Private land owner (xxx ha)</li> </ul>
Nacuaia 112 Mirate Montepuez Nacuaia	17 kms east of Nropa U.P. 5 kms east of Nacuaia; little public transport with the exception of Lomaco vehicles	1 natural well; Rio Montepuez - 3 kms on the road to Nicanda	1 school, 3 teachers, 2 rooms, until 4th grade	Few, produce very little	No store; closest stores in Nacuaia or Nropa	No health post; nearest in Mirate, Nropa or Montepuez	One exists, owned by large private farmer adjacent	<ul style="list-style-type: none"> <li>■ No PUP1 blocks that are referred to as Nacuaia, but the Nacuaia blocks are closely</li> <li>■ Lomaco direct production of maize and cotton</li> <li>■ Large landowner who owns mill</li> </ul>
Nacuaia 113 Mirate Montepuez Nacuaia	22 kms east of Nropa; little public transport with the exception of Lomaco vehicles	1 dam (1968) 1 UDA well 1 natural well	1 school, 4 teachers, 2 rooms, until 4th grade	None that produce	Lomaco store (since 1990) (1982-90 managed by Parastatal cotton company; Private store and Barracas)	Health post since 1984 (Parastatal) that until 1994 was under Lomaco's mgmt; does not function now; closest in Mirate, Nropa or Montepuez	None exists; closest in Mararange 5 kms away or in Nacuaia 4 kms away	<ul style="list-style-type: none"> <li>■ Lomaco has PUP1 blocks for maize and cotton</li> <li>■ Lomaco has a branch of the Nropa U.P. where supplies are kept and equipment maintenance performed</li> </ul>
Nropa / Mondiane 114 Mapupulo Montepuez Nropa	35/38 kms northwest of Montepuez, 12/15 kms north of Mapupulo Posto, site of U.P. of Lomaco; some public transport and Lomaco vehicles; Mondiane is 3 kms north of Nropa on the road to Nacuaia	Dam 500 m from Mondiane; Dam 1 km from Nropa; Nropa is connected to Lomaco U.P. water system; Natural well in Mondiane	3 schools, 4 classrooms total; 6 teachers, until 5th grade	None that produce	Lomaco store; Well-developed informal market	Health post in Nropa	2 Mills; 1st in Lomaco UP (1992); 2nd locally owned (1993)	<ul style="list-style-type: none"> <li>■ Lomaco has direct production of maize and cotton</li> <li>■ Lomaco has PUP1 blocks for maize and cotton</li> <li>■ Lomaco has Agency (Unidade de Produção) where supplies are kept and equipment maintained, and where farm management team is resident</li> </ul>
Nacimoja 121 Namanhumbiri Montepuez Nropa	48 kms east of Montepuez on the Pemba-Montepuez-Nanumo road; and 29 kms west of Nanjua U.P. of Lomaco; much public transport, and Lomaco vehicles which transport workers to/from Nanjua	UDA well (1971) 2 natural wells	1 school, 3 teachers, 2 classes, founded 1968, goes to 3rd grade	None that produce	No store or market; nearest in Nanhupo or Namanhumbiri Posto (11 kms)	Health post founded in 1968	Closest in Montepuez or Nanjua	<ul style="list-style-type: none"> <li>■ No large scale production immediately adjacent, w/exception of 1 privado</li> <li>■ Many smallholders provide labor to large Lomaco fields at Nanjua</li> </ul>
25 de Setembro 122 Massingir Montepuez Montepuez	18 kms south of Montepuez on Montepuez-Nanumo road; much Lomaco traffic on this road and some public transport	3 traditional wells 3 UDA wells (rehabilitated 1993)	2 schools, 3 classrooms, 6 teachers until 4th grade	None that produce	No store; nearest in Linde 3 kms away or in Montepuez	No health facilities; nearest in Montepuez	Closest in Montepuez	<ul style="list-style-type: none"> <li>■ No large scale cotton or maize production</li> <li>■ Cattle ranching operator</li> </ul>

Village Code Posto Admin District JVC Agency	Location and Transportation Infrastructure	Water Source	Education	Cashew Trees	Commercial Network (Formal and Informal)	Health	Milling Services	Large Landholdings (Direct JVC Production or Others)
Linde 123 Messingir Montepuez Montepuez	23 kms south of Montepuez on Montepuez-Namuno road, at the turnoff for Meloco; much Lomaco traffic on this road and some public transport	3 traditional wells 5 UDA wells (rehabilitated 1992)	1 school, 3 classrooms, 4 teachers, until 5th grade	None that produce	2 private stores and informal market, stores constructed 1968	Health post since 1992	During 1994 there was a mill; owner moved it to Montepuez; Closest now in Montepuez	<ul style="list-style-type: none"> <li>■ Lomaco had PUPJ block in 1993/94, but discontinued in 1994/95</li> <li>■ No large scale production</li> <li>■ Cattle ranching operator</li> </ul>

SODAN/SAMO AREA OF INFLUENCE IN MONAPO AND MECONTA DISTRICTS									
Village Code Posto Admin District JVC Agency	Location and Transportation Infrastructure	Water Source	Education	Cashew Trees	Commercial Network (Formal and Informal)	Health	Milling Services	Large Landholdings (Direct JVC Production or Others)	
Mepine 214 Netia Monapo Mecouma	20 kms northeast of Netia Posto; main transport services provided by SODAN or CCA (Companhia da Culturas de Angoche) Mecuco vehicles	Springs on the River Mecuco	School to 5th grade at CCA; 259 students; 8 teachers	Few and old	No store in village; closest in CCA and in Naculue 4 kms away	No health post in village; nearest at CCA, Natete and Netia	None in village; nearest in Netia Posto	<ul style="list-style-type: none"> <li>■ Companhia de Culturas de Angoche (CCA) block (11000 has) with cotton and sisal history (and a series of houses for workers and other infrastructure), currently being requested by SODAN; they are preparing part for 1995/96 year for family sector with tractors</li> <li>■ Block of 450 has that was founded in 1930 by Sr. Valentim Cardoso, then was worked by former Administrator of Monapo, and now is being requested by another privado, who has reportedly told those farming parts of that land that they must leave</li> </ul>	
Natete 215 Netia Monapo Netia	5 kms northwest of Netia Posto; transport in the village from Italian Mission operating in village; public transport available on Namapo-Namialo highway near Netia	Central well in village mission; River Natete and dam; Springs on the River Mucimete	Secondary school to 9th grade; primary school to 5th grade with 214 students and 8 teachers	Many but old	Store in village center and in Netia 5 kms away	Health Center in village; Health Post in Netia	Functioning mill in village	<ul style="list-style-type: none"> <li>■ No blocks adjacent</li> <li>■ Largely sandy soils</li> </ul>	
Napipine 221 Namialo Meconta Namialo	1 km south of the town of Namialo; no public transport in the village; however, near transport infrastructure available in Namialo	Running water from town of Namialo and springs	Primary school to 5th grade; 150 students; 6 teachers; secondary school in Namialo to 7th grade;	Many but old	None in village; stores and markets in Namialo	No facilities in village, but hospital in Namialo Town	None in village, but 5 in Namialo Town	<ul style="list-style-type: none"> <li>■ A block exists that was owned in the colonial era who left Mozambique; former employee from colonial period is currently claiming this land, where smallholders from outlying areas have been cultivating for several years.</li> </ul>	
Varnua 231 Corrane Meconta Corrane	2 kms southwest of Corrane Posto; no public transport in the village; however, near transport infrastructure available on newly rehabilitated Nampula-Liupo road	Strings along River Mutomote 1 km from village	No school, but nearest is in Corrane 1 km away	Many but old	None in village; stores and markets in Corrane Posto 1 km away	No facilities in village, but health center in Corrane	One in village near Posto	<ul style="list-style-type: none"> <li>■ A block of 500 has exists, and was founded by a Portuguese, Sr. Alexandre who had been in the colonial army</li> <li>■ Currently SODAN encourages smallholders to grow cotton on this block, though it does not hold title.</li> </ul>	
Napita 232 Corrane Meconta Corrane	7 kms south of Corrane Posto; no public transport in the village; however, near small amount of transport infrastructure available in Corrane	Springs along Nanlocoto Creek	School through 5th grade;	Many but old	None in village; stores and markets in Corrane Posto 7 kms away	No facilities in village, but health center in Corrane	None in village; nearest in Posto	<ul style="list-style-type: none"> <li>■ There exists a block that was founded by a Portuguese, XXXXX. Smallholders are currently growing cotton on parts of the block.</li> <li>■ On parts of the block where smallholders grew cotton in 1993/94, they were told by the Meconta Administrator that they would not be able to grow cotton this year, as he was using it for his direct production of 6 has.</li> </ul>	
3 de Fevereiro 312 Itoculo Monapo Murruto	13 kms southwest of Itoculo Posto; little transport aside from SAMO	Springs along Namual Creek	School through 5th grade; 125 students; 5 teachers	Few and old	None in village; closest in Netia and Itoculo	No facilities in village, but health post in Centro da Reeducação	None in village; closest in Centro da Reeducação	<ul style="list-style-type: none"> <li>■ No block</li> </ul>	
Namacoapa 313 Itoculo Monapo Murruto	18 kms northwest of Itoculo Posto; little transport aside from SAMO	Springs along Muzope Creek	School through 5th grade; 128 students; 4 teachers	Many but old	Informal market stand owned by store owner in Netia	No facilities in village, but Health Center in Natete and Netia 50 kms away	None in village; closest in Centro da Reeducação 13 kms away	<ul style="list-style-type: none"> <li>■ Large block that had been owned by Lazaro Joao, Joaquim and Manuel Logrado, and Diamantino Pereira until independence; they had forcibly had people leave their land so they could occupy this land circa 1965.</li> </ul>	

Village Code Posto Admin District JVC Agency	Location and Transportation Infrastructure	Water Source	Education	Cashew Trees	Commercial Network (Formal and Informal)	Health	Milling Services	Large Landholdings (Direct JVC Production or Others)
Nacololo 321 Monapo-Sede Monapo Monapo	12 kms west of Monapo; on main Nampula-Nacala highway with much public transport and a railroad stop at Metocheria	Man-made well out of order; natural springs in low-lying areas	School through 5th grade; 135 students; 5 teachers	Many but old	No store, but informal stands and market. Otherwise, most accessible stores are in Namialo or Monapo on main road	No facilities in village, but Health Post in Carapira 5 kms away	None in village; closest in Mecutine x kms away	<ul style="list-style-type: none"> <li>■ Adjacent to SAMO property of Metocheria (and 5 kms from FSP surveyed village of Mecutine (1991 and 1993))</li> </ul>
Picatane 332 Canacue Monapo-Sede Monapo	20 kms southwest of Monapo town; little public transport aside from SODAN's Meserpane farm which is adjacent	Springs along Meserpane Creek	No school in village; nearest school in Meserpane; 195 students; 7 teachers	Many but old	No store; local market and also in Nacololo (15 kms) or Namialo.	No facilities in village; Health Post on Meserpane does not function; nearest functioning facilities in Nacololo.	None in village; closest in Nacololo, Mecutine or Namialo	Adjacent to Meserpane property, formerly owned and managed by German owner, now owned by SODAN, 8500 hectares with cotton and sisal (and sisal processing facilities)

CARE OPEN PROJECT IN RIBAUE, MECUBURI, AND NAMAPA DISTRICTS									
Village Code Posto Admin District JVC Agency	Location and Transportation Infrastructure	Water Source	Education	Cashew Trees	Commercial Network (Formal and Informal)	Health	Milling Services	Large Landholdings (Direct JVC Production or Others)	
Namwali 501 Iapala Ribaue Nampula	9 kms west of Iapala Posto; the train stops at Iapala Sede; no regular vehicle traffic to Iapala; often bicycle or foot traffic to Iapala; Iapala->Nampula = 10,000 Mt by train one way	2 creeks with sources in rock formations; Man-made well out of order (built by colonial tobacco farmer)	School through 5th grade; 300 students and 6 teachers	Many but old and unproductive	No store in village; stands exist in village but with little goods; ambulante came to village by car in 6/95 from Iapala to purchase maize; closest commercial center in Iapala adjacent to train line	No facilities in village; Health Post in mission in Iapala	None in village; closest in Iapala Sede (300 mt/kg)	???	
Namina 601 Namina Mecuburi Nampula	3 kms east of Namina Posto; the train stops at Namina Town, and the main Namina-Ribaue highway passes through Namina Namina->Nampula=8,000 mt by train one way	Natural springs + ???	School through 5th grade; 400 students; 9 teachers	Many, but unproductive	No store in regulado, but Namina Posto is located 3 kms away with Gani shop and others and market; Gani was buying maize at 850 mt/kg there in 7/95	No facilities in village; Health Center in Namina	None in village; closest in Namina Posto, but broken as of 8/95; common to take maize by train to Nampula City or by bicycle 20 kms to ???	Some wage employment in stores in town and in artisanal activities; Few privados	
Ratane 602 Muite Mecuburi Muite	48 kms north of Mecuburi Town on the Mecuburi-Muite road (that is currently undergoing major rehabilitation) Very little public transport	???????	Has school;	Many but unproductive	Closest informal market and stores are 48 away in Mecuburi-Sede	No facilities in village; Health Center in Mecuburi Town 48 kms away	None in village; closest in Mecuburi (300 mt/kg)	1955 (estimate) - 1975 large scale fields operated by Portuguese firm "Lazarte Joao"; later these fields were operated by the State Cotton Company, known as Block A, B, and C of 755, 250, and 100 ha respectively. One is currently being operated by a private owner.	
Namatumula 701 Alua Namapa Namapa	11 kms east of Alua Posto on the Alua-Memba road (very little traffic), which sits on the Namapa-Namialo highway; from the village to Alua, no public transport; common to use bicycle	x natural wells	Has school, but as of 8/95 the school was not functioning because the teachers said they had not been paid in 5 months	Many but old and unproductive	No market or store in village, but Alua Posto 11 kms away has market and store, and a ICM maize purchasing point as of 8/95	No facilities in village; Alua Posto has Health Center financed by Netherlands PVO Memisa	None in village; closest in Namapa 45 kms away (400 mt/kg)	No large blocks in operation; little cotton currently produced in this village due to negative experiences with State Cotton Company during 1980s;	
Jakoko 702 Alua Namapa Namapa	15 kms east of Namatumula on the Alua-Memba road (very little traffic); very little (if any) public transport	x natural wells	Has school	Many but old	No market or store in village; closest commercial outlets in Alua Posto 25 kms away	No facilities in village; Alua Posto has Health Center financed by Netherlands PVO Memisa	None in village; closest in Namapa 60 kms away (400 mt/kg)	No large blocks in operation; little cotton currently produced in this village due to negative experiences with the State Cotton Company during 1980s;	

Table C2. Population (households) and sample, by company area/study zone and village successfully interviewed in each of rounds 2 - 5

Village	POPULATI ON	SAMPLED HOUSEHO LDS	POP BLOCK	INT BLOCK	POP PUPI BLOCK	INT PUPI BLOCK	POP PUPI DISP	INT PUPI DISP	POP DISP	INT DISP	POP NON- CULT	INT NON- CULT
<b>MONTEPUEZ DISTRICT</b>												
Mararange	1200	44	0	0	25	12	14	9	443	15	757	8
Nacuaia	208	21	0	0	0	0	3	3	160	11	45	7
Nacua	1081	46	0	0	63	13	24	17	610	11	384	5
Nropa	534	32	0	0	63	13	0	0	77	12	394	7
Nacimoja	610	23	0	0	0	0	0	0	40	10	570	13
25 Setembro	420	19	0	0	0	0	0	0	25	9	395	10
Linde	908	23	0	0	0	0	0	0	217	12	691	11
<b>TOTAL</b>	<b>5000</b>	<b>208</b>	<b>0</b>	<b>0</b>	<b>151</b>	<b>38</b>	<b>41</b>	<b>29</b>	<b>1572</b>	<b>80</b>	<b>3236</b>	<b>61</b>
<b>SODAN/SAMO AREA OF INFLUENCE IN MONAPO AND MECONTA DISTRICTS</b>												
Mepine	163	20	93	12	0	0	0	0	64	5	6	3
Natete	83	19	0	0	0	0	0	0	63	10	20	9
Napipine	100	14	0	0	0	0	0	0	30	5	70	9
Varrua	133	23	117	15	0	0	0	0	13	7	3	1
Napita	132	21	113	10	0	0	0	0	10	7	9	4
3 de Fevereiro	225	26	0	0	0	0	0	0	215	22	10	4
Namacopa	251	23	142	7	0	0	0	0	96	11	13	5
Nacololo	285	19	216	4	0	0	0	0	18	9	51	6
Picadane	136	15	0	0	0	0	0	0	113	12	23	3
<b>TOTAL</b>	<b>1508</b>	<b>180</b>	<b>681</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>622</b>	<b>88</b>	<b>205</b>	<b>44</b>
<b>CARE-OPEN PROJECT DISTRICTS: RIBAUE, MECUBURI, AND NAMAPA</b>												
Namwali	503	34	0	0	0	0	0	0	150	10	353	24
Namina	1000	32	0	0	0	0	0	0	333	9	667	23
Ratane	123	31	0	0	0	0	0	0	110	29	13	2
Nametumula	600	27	0	0	0	0	0	0	70	4	530	23
Jakoko	437	32	0	0	0	0	0	0	0	0	437	32
<b>TOTAL</b>	<b>2663</b>	<b>156</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>663</b>	<b>52</b>	<b>2000</b>	<b>104</b>

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