POTATOES IN CENTRAL AFRICA: A Study of Burundi, Rwanda and Zaire

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COVER

Cover photo depicts rural market in the Zaire/Nile Divide.
Photo by Michael Potts.

The purpose of this study is to encourage debate and advancement of knowledge about production, distribution, and utilization of potatoes in developing countries. The views expressed in the study are those of the author and do not necessarily reflect the official position of the International Potato Center.

Comments are invited.

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Abstract

This study examines the technical and socio-economic factors that account for the potato's growing importance as a food commodity in the Highlands of Central Africa. The report utilizes a food systems approach. Hence, for each country, it offers a brief review of development trends and policies, followed by a descriptive analysis of potato production, consumption, and marketing. A synthesis of the findings serves as a basis for presenting the policy implications. Research methods for carrying out this survey include a review of the available literature; informal interviews with producers, consumers, traders, and policymakers; and, participant observation of potato production, consumption, and marketing activities. Results refute the common belief that potatoes are strictly a cash crop. Although peasant growers sell some potatoes, most of what they harvest goes for household consumption and seed. Such findings are likely to be of interest to other countries in sub-Saharan Africa, particularly those with highland growing areas, that are seeking new strategies to accelarate domestic food production.

Résumé

Cette étude examine les facteurs techniques et socio-économiques qui explique l'importance croissante des pommes de terre en tant que produit alimentaire dans les régions montagneuses d'Afrique Centrale. Ce document utilise une approche des systèmes alimentaires. Il contient donc, pour chaque pays, un résumé sur les tendances et politiques de développement, suivi d'une analyse descriptive sur la production, consommation et commercialisation des pommes de terre. La synthèse des résultats sert de base à la présentation des implications des politiques. Les méthodes de recherche utilisées pour mener à bien cette étude incluent une révision d'ouvrages disponibles, des entrevues informelles avec les producteurs, consommateurs, commerçants et hommes politiques puis des observations sur la production de pommes de terre, leur consommation et commercialisation. Les résultats démontrent -contrairement à l'opinion courante- que les pommes de terre ne sont pas des produits exclusivement commerciaux. Bien que les agriculteurs vendent quelques pommes de terre, la plupart de la récolte est réservée à la consommation familiale et aux semences. Les résultats pourraient être bénéfiques à d'autres pays d'Afrique subsaharienne -surtout ceux qui possèdent des terres cultivables en altitude- qui sont en train de chercher de nouvelles stratégies pour accélérer la production vivrière nationale.

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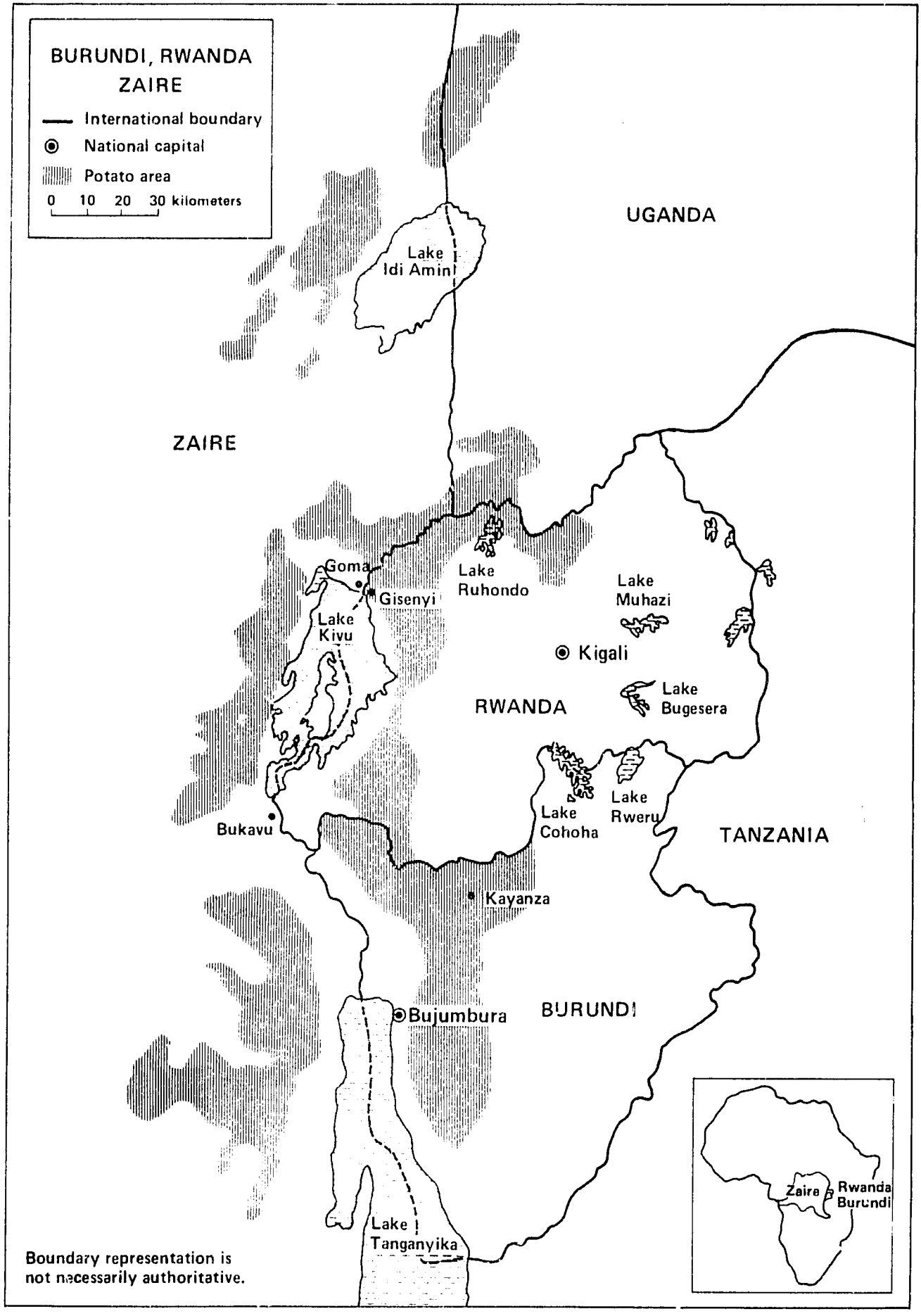

Source: Elaborated for this study after Haverkort (1985).

Accelerating food production in sub-Saharan Africa has received increasing attention in the last decade as the gap between the growth in domestic output and population has become more persistent and more pronounced (see, e.g. Christensen and Witucki 1982; Eicher 1984; Mellor et al. 1987). During the past twenty years, sub-Saharan Africa has witnessed the most rapid growth of population and the slowest growth in food production of all the major regions of the developing world (Paulino 1987). In fact, population growth has speeded up while the expansion in food output has slowed down (Ibid.). Furthermore, the export sectors of most economies have suffered setbacks in production, the terms of trade or both. Hence, many African countries not only grow less food per capita but also are less capable of financing additional food imports to cover the shortfall in local supplies.

The food crisis in sub-Saharan Africa is the result of a complex set of factors foremost of which has been the prolonged neglect of the small farmer (Lele 1984). Governments have devoted more resources to industrialization, shown more interest in export crops and have been less inclined to recognize the importance of agricultural research, extension and human resource development aimed at developing small farms (Eicher 1984). Policymakers have tended at best to tolerate — rather than sought to improve -- informal, traditional marketing systems that serve small growers. The disastrous consequences of these policies for food supplies, per capita incomes and nutrition levels have highlighted the need for new development strategies focusing on food production and marketing by small farmers.

This study analyses production, distribution and use of potatoes in Burundi, Rwanda and (North Kivu) Zaire. The study examines potatoes, a crop not normally associated with sub-Saharan agriculture, for several reasons. First, knowledgable observers agree that for the African Highlands potatoes are a crop with considerable unrealized potential (Collinson 1987). Second, potatoes are a crop grown by small farmers in these countries (Haverkort 1987). Third, due to the potato's bulkiness and perishability, knowledge about its distribution can help provide a better understanding of how traditional marketing systems work. Fourth, information about potato consumption would indicate the degree eating habits, tastes and preferences evolve in response to changing socio-economic conditions. Fifth, area planted in potatoes expanded more rapidly in Africa than in any other region in the Third World during the period 1966-82 (Horton and Fano 1985:67). This expansion has been especially rapid in the case of the Highlands of Central Africa.

Burundi, Rwanda and (North Kivu) Zaire are countries with common agro-ecological conditions: relatively high altitude, hilly to mountainous terrain, and abundant rainfall (Jones and Egli 1984). They also share problems of rising population density in Highland areas and geographic isolation from world markets. Food production constitutes the backbone of the local economy. This study allows an examination of how and to what extent these common factors influence production, distribution and use of a particular food crop. By focusing on neighboring countries with notable differences in size, settlement patterns, and the relative importance of potatoes in local cropping and

consumption patterns, the study also facilitates a comparison of the particular experiences of each nation in the development of a given food crop.

The evidence presented also aims to document not only the challenges facing potato producers consumers, traders, and policymakers but also recognize their achievements. African agriculture has not been without its successes and these perhaps offer greater potential for transfer within the region than lessons learned in other parts of the developing world.

Questions Considered

Among the questions about potatoes of concern to policymakers in the three countries are the following:[1]

- What types of farmers produce potatoes?
- What is the relative importance (by volume) of existing marketing channels?
- What are the reasons for prevailing producer-consumer price differentials?
- What are the prospects for increased potato consumption?
- What factors influence urban demand for potatoes?

In addition to addressing the aforementioned questions, this report presents a descriptive analysis of prevailing production, consumption, and marketing patterns for potatoes. For each of the countries, it also identifies the principal constraints to improving performance in these areas. Particular attention is given to the policy implications of these findings.

Food Systems Approach

This study utilizes a food systems approach to consider the questions and topics indicated above. This approach refers to not only the scope of the analysis but also the disciplines called on and the procedures utilized in the process.

The scope of the study includes potato production, consumption and marketing. Furthermore, it examines these activities in the context of national economic development goals and strategies. The justification is simply that a genuine understanding of any one of these activities is unlikely without consideration of the influence of and impacts on the others. Similarly, a basic familiarity with the wider economic, demographic and policy developments is essential to appreciate why

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1 See Appendix I for a more extensive list of the questions considered.

production, consumption and marketing are linked in such a fashion and how they are likely to evolve.

The food systems apprach is interdisciplinary. While previous studies have emphasized potatoes from largely a technical point of view (IRAZ 1986: 40-51), this study integrates biological and socio-economic findings. The interdisciplinary approach is essential in order to capture the complexity of behavior by producers, traders and consumers.

In utilizing the food systems approach, this study employed an eclectic set of research procedures. They include a review of secondary data on production, consumption and trade; a gleaning of the available literature, e.g. government reports, student theses; and, informal interviews with producers, marketing agents, consumers, technicians and policymakers. It also involved participant observation of potato production and consumption. Another essential component was visits to rural markets, provincial assembly centers and urban wholesale and retail markets so as to follow the potatoes through all stages of the marketing chain.

Chapter Outline

The study is divided into four chapters. In Chapter One, a brief review the Burundese economy is followed by an analysis of potato production, consumption and marketing. In Chapters Two and Three, similar topics are treated in the case of Rwanda and Zaire respectively. Chapter Four provides a synthesis of the results from the individual countries and presents the policy implications of the findings. A brief appendix on issues and methods appears at the end of the study.

The country chapters each begin with a statement of the specific research questions to be examined. Primary and secondary statistics are then presented in a textual review of existing potato production, consumption and marketing patterns. Each chapter then offers an assessment of the research questions for that country in light of the evidence presented. The chapter concludes with a detailed bibliography.

This study does not present any formal quantitative models of potato production, consumption or marketing. Instead, it offers largely a descriptive analysis of these activities. As this study represents the first attempt to pull together information on the various subjects discussed for the three countries, considerable time and effort were required simply to collect, analyze and present the basic findings. Hopefully, subsequent studies can build on these results.

A second weakness of the study is the uneven coverage and variable amount of evidence presented. For instance, the study does not include estimates of the costs of potato production. Moreover, in discussing specific topics, the data employed are not always as numerous and detailed as one perhaps might like. Still, the information presented reflects the knowledge available on a particular subject. Moreover, the study repeatedly refers to the results of different existing studies to support or to qualify the findings presented.

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BURUNDI

Chapter 1

Currency Equivalents
(September-October 1983)

Currency Unit	Burundese Franc (FBU)
FBU 90.00	US$ 1
FBU 900.00	US$ 10

Weights and Measures

Burundese System	Equivalent
1 kilometer (km)	.62 mile (mi)
1 are (a)	.01 hectare (ha)
1 kilo (kg)	2.205 pounds (lb)
1 ton (t)	1,000 kg/2,205 (lb)

Abbreviations

CIP = Centre International de la Pomme de Terre (International Potato Center)

COMABU = Coopérative Maraîchère de Bugarama (Bugarama Vegetable Growers' Co-operative)

INEAC = Institut National d'Etudes Agronomiques au Congo (National Institute of Agricultural Research of the Belgian Congo)

ISABU = Institut des Sciences Agronomiques du Burundi (Burundese Institute of Agricultural Sciences)

MinAgri = Ministère de l'Agriculture (Ministry of Agriculture)

MiniPlan = Ministère du Plan (Ministry of Planning)

SNES = Service National des Etudes et Statistiques (National Service for Research and Statistics)

SSS = Service des Semences Sélectionnées (Selected Seed Service)

USAID = United States Agency for International Development

The Republic of Burundi is a small, densely populated, Central African country (Map 1.1) threatened by a potential food crisis. With per capita food production subject to sharp fluctuations and population projected to double every 20 years, the prospect of meeting future food requirements is an issue of growing local and international concern.

Two recent events have aggravated this situation. The sharp decline in the terms of trade since 1980 continues to dampen Burundi's export earnings (World Bank 1985:190). Hostilities in nearby countries periodically disrupt overland transportation links with the international trading community. As a result, Burundese are increasingly aware of the need to promote greater food production within their country (see Muyuku and Nimbona 1974; Ruyogora 1980).

Interest in the actual and potential role of potatoes arise in this context. Marketing issues are an area of particular concern. The following questions are the subject of considerable debate among local policy makers and foreign technical assistance personnel:

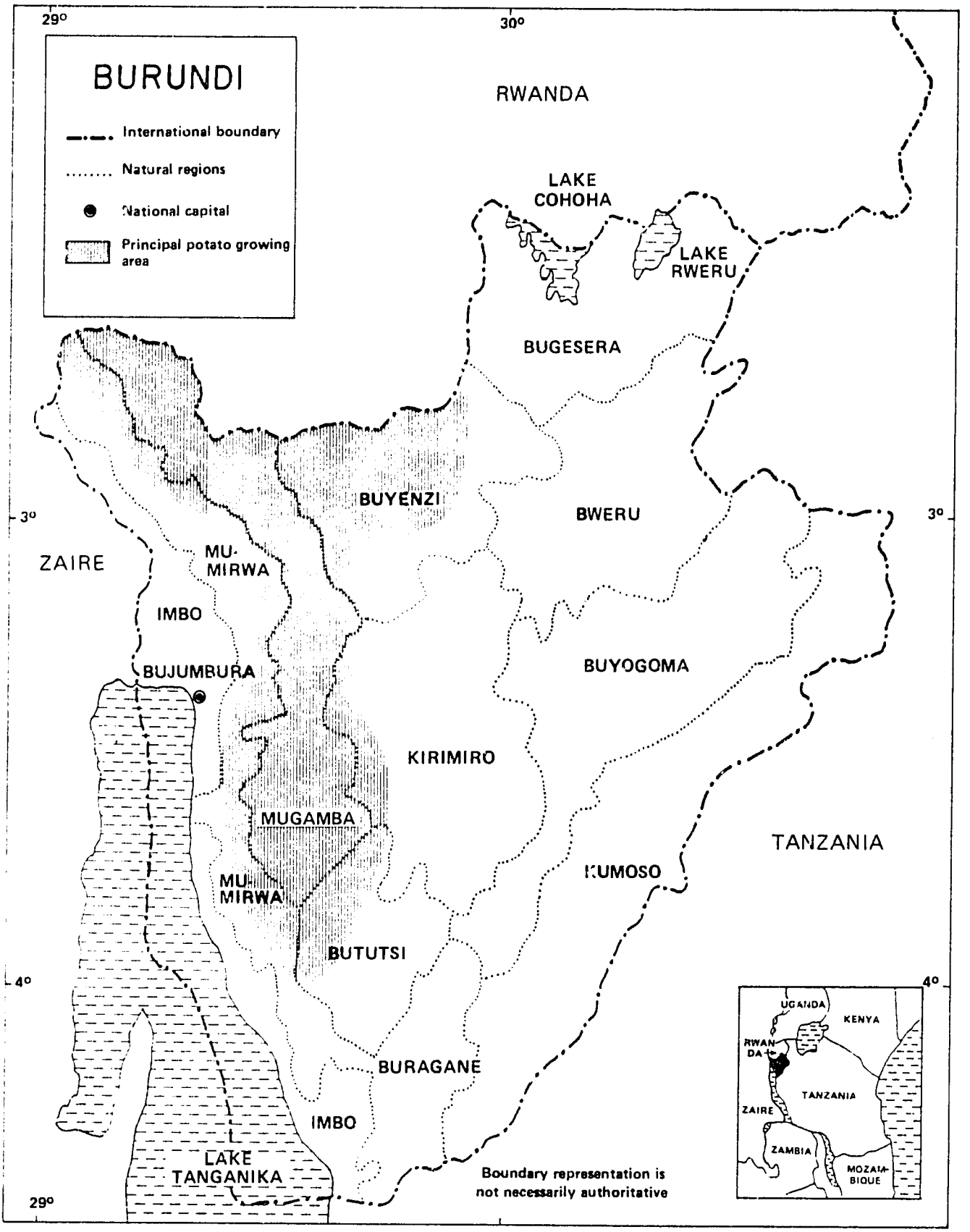
- Are marketing problems the fundamental constraint to increased potato production in Burundi?
- What are the reasons for prevailing producer-consumer price differentials for potatoes?
- What factors restrict increased potato consumption by Burundese consumers?

Answers to these questions are essential to the successful implementation of a government potato program, particularly given the limited knowledge in Burundi about potato production, marketing, and consumption. This chapter draws on the results of field work carried out specially for this study, official statistics, and previously published research, in particular, Ndimira and Christensen (1983).

1.1 MACROECONOMIC SETTING

Interest in the potato's potential in Burundi has emerged as part of a broader discussion aimed at fostering economic development in the Republic. Currently, Burundi ranks as one of the world's 15 least developed countries (World Bank 1987). Gross National Product (GNP) per capita is estimated at US$230 (1985). Daily caloric supply (2,378) represents 102% of estimated requirements. Life expectancy averages 47 years (Ibid.). With a population of nearly five million in a land area less than 28,000 sq km, population density is 285 inhabitants per square kilometer of arable land (TFG 1982:1). Furthermore, recent estimates indicate that the population growth rate is 2.8% per annum or higher. Since over 95% of Burundi's population resides in rural areas, any economic development plan must give top priority to improving rural food supplies and income levels.

Map 1.1. Burundi: Principal potato growing areas.



Source: Elaborated for this study.

(i) Agricultural Performance, Goals, and Strategy

Performance

Burundi's economy is dominated by the agricultural sector. Although food and livestock production currently constitute some 55% of total economic output (République du Burundi 1982a), an assessment of the past performance of Burundese agriculture is hampered by the inconsistencies in yearly production figures reported by different government offices. Based on available information, over 95% of agricultural output consists of food crops. Bananas (both for beer and direct consumption), beans, manioc, and sweet potatoes are the principal crops (Table 1.1). Growth in food production has been modest during the last decade; thus per capita availability of food appears to have remained stable.

Goals and Strategies

The Burundi government's present Five-Year-Plan of national development (1982-87) lists general goals and specific strategies including:

- maintaining per capita calorie consumption at current levels and, increasing average intake of animal protein and lipids;
- improving the agricultural balance of trade;
- increasing the local value added in agricultural processing; and
- augmenting soil fertility.

Regional specialization and improved internal trade are two key factors in promoting agricultural development (see also Muhitira 1981, Bergen 1983a). Each agricultural region is to produce more of those crops in which it has a comparative agro-ecological advantage. The strategy is intended to raise overall agricultural productivity. Marketable surpluses are expected to increase as a result. The Plan envisions that expanded food marketing will serve as a means of raising peasant incomes, thereby stimulating an increase in the demand for manufactured goods.

(ii) Potatoes in Burundese Agriculture

Potatoes are considered to have great potential as a food crop in Burundi for several reasons.

At the production level, potatoes are highly labor intensive, therefore greater potato production might well be suited to Burundi's increasingly land scarce, but labor abundant, farm families. Potatoes also produce a remarkable quantity of carbohydrates and proteins in a short period of time (Horton 1981). Potatoes are a crop many Burundese farmers, especially those living at higher altitudes, are already familiar with. In fact, potatoes are already integrated into local

Table 1.1. Burundi: Past, present, and planned food crop production (000 t): selected years.

	Actual		Projected
	1971/72[1]	1982	1987
Roots and Tubers	862	1,033	1,112
Manioc	360	410	447
Sweet Potatoes	370	490	523
Colocase	93	98	102
Potatoes	33	35	40
Others	6	n.a.	n.a.
Cereals	164	221	271
Maize	126	144	167
Others	38	77	104
Legumes	300	319	332
Beans	271	290	300
Others	29	29	32
Oil seed	17	23	27
Fruits and Vegetables	1,257	1,374	1,499
Bananas	1,163	1,220	1,264
(For beer)	(735)	n.a.	n.a.
(Edible bananas)	(428)	n.a.	n.a.
Others[2]	94	154	235
Total	2,600	2,970	3,241

n.a. = not available.

Source: 1971/72, World Bank; 1982, 1987, Republique du Burundi (1982b).

1 Based on national accounts data.

2 Includes sugar cane.

cropping patterns and some potatoes are harvested in those seasons when basic staples are still maturing in the field.

At the consumer level, Burundese like the taste of potatoes. There also is a growing awareness in the general population of the crop's nutritional attributes and increasing urbanization promises to stimulate domestic demand. More important, Burundi has a large and expanding rural population whose present food requirements are scarcely satisfied. The two rural regions ideally suited to potato production are those that currently suffer the greatest food deficits (Republique du Burundi 1982b: 2.42).

The current Plan calls for a modest growth in potato production between 1982 and 1987 (Table 1.1). Output is to increase from 35,000 to nearly 40,000 t (Rèpublique du Burundi 1982b) The projected rate of potato increase (2.6%) is slightly higher than the projected rate of population (2.1%) and general food output (2.0%).[1]

The Plan envisions that increased potato production will occur entirely in the traditional production areas. No changes are foreseen in aggregate utilization patterns. Eighty percent of annual potato output will continue to be available for consumption, 15% for seed, and 5% lost in post-harvest operations.[2]

1.2 PRODUCTION

Potatoes have been produced in the territory that now constitutes the Republic of Burundi for roughly a century. European missionaries first introduced the crop into the area in the 1880s (Ndimira and Christensen 1983:1). Potato cultivation has spread to various parts of the country since that time.

(i) Production, Area, and Yields

Official statistics differ considerably on the level and evolution of potato production between 1967 and 1982 (Table 1.2), however, the figures reported by Burundi's Institut des Sciences Agronomiques (ISABU) are considered reliable. These figures indicate production reached 238,000 t in 1974 and fell to 19,000 t in 1979. Informed sources within ISABU maintain that production probably never exceeded 100,000 t during this period. In contrast, Ministry of Planning (MiniPlan) figures show production fluctuated between 28,000 t and 38,000 t. Therefore Miniplan data must be interpreted with caution.

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1 It should be noted that this projected population growth rate is considerably lower than the more recent estimates referred to earlier in the chapter.

2 According to potato program personnel, Ministry estimates of losses in post-harvest operations are considerably higher for particular regions.

Table 1.2. Burundi: Potato production, area, and yield according to different sources, 1961/65-1984.

Year	Production (000 t)			Area (000 ha)		Yield (t/ha)	
	A	B[1]	C[2]	A	B[1]	A	B[1]
1961/65	37.2	n.a.	n.a.	9.1	n.a.	4.1	n.a.
1966	44.0	n.a.	n.a.	11.1	n.a.	4.0	n.a.
1967	45.0	95.0	n.a.	11.4	11.0	3.9	8.6
1968	45.0	99.0	n.a.	11.6	11.6	3.9	8.5
1969	41.2	41.2	n.a.	11.6	11.6	3.5	3.6
1970	45.0	101.1	34.0	11.0	15.1	4.1	6.7
1971	45.0	183.6	34.7	11.0	29.5	4.1	6.2
1972	47.0	83.3	31.3	11.0	n.a.	4.3	n.a.
1973	47.0	235.0	35.5	11.0	21.8	4.3	10.8
1974	35.5	238.3	28.4	10.0	23.8	3.6	10.0
1975	45.0	146.1	35.9	11.0	27.2	4.1	5.4
1976	46.0	146.3	36.6	11.0	17.0	4.2	8.6
1977	47.5	109.8	38.0	11.1	16.3	4.3	6.7
78	37.5	23.3	30.0	8.4	8.4	4.5	2.8
1979	42.0	18.9	34.0	10.6	10.6	4.0	1.8
1980	20.0	24.0	20.0	8.0	11.8	2.5	2.0
1981	23.5	80.5	36.0	8.5	13.6	2.8	5.9
1982	35.0	178.6	35.0	10.0	12.4	3.5	14.4
1983	36.0	n.a.	n.a.	10.0	n.a.	3.6	n.a.
1984	36.3	n.a.	n.a.	10.0	n.a.	3.6	n.a.

n.a. = not available.

Source: (A) FAO;
(B) 1967-79, ISABU (1981) and 1980-82 (MinAgri) cited in Ndimira and Christensen (1983);
(C) 1970-77, MiniPlan and Multinational Agribusiness Systems, Inc. 1978-82 République du Burundi (1982b).

1 Data from MinAgri listed above are for 1979/80, 1980/81, and 1981/82, respectively.

2 These figures are also used by the National Service for Studies and Statistics (SNES).

While previous assessments of potato production trends are scarce, three observations are in order. First, reasons for discrepancies between production figures are not explained in official publications. According to World Bank sources, this reflects a general problem of collecting and organizing agricultural statistics.

Second, yields have been particularly variable. For example, area planted remained the same in 1968 and 1969, but yields fell over 50% as did production. Although inaccurate statistics might account for some of these discrepancies, potato varieties introduced in Burundi are considered vulnerable to late blight and bacterial wilt, with the severity of attack and consequent yield reductions varying considerably from year to year. Variable rainfall patterns and difficulties in obtaining quality seed also have been problems.

Third, little mention is made of marketing problems like low prices received by producers and local gluts due to transportation bottlenecks in either oral or written accounts of potato production trends. Such phenomena are often cited in analyzing trends in potato production in other developing countries. Therefore, while marketing issues are raised frequently in discussions about the potato's future in Burundi, they figure less prominently in explanations of the potato's past performance.

Location of Production

Potato cultivation in Burundi is most often associated with the higher altitudes of the Zaire/Nile Divide (Map 1.1, Table 1.3). MiniPlan estimates indicate that in 1982 approximately 80,000 potato producers were located in the Mugamba region and another 37,000 growers in the Bututsi region (République du Burundi 1982b). Agro-ecological conditions are particularly favorable to potatoes in Bukinanyana commune in the province of Bubanza, in the northwestern part of the country adjacent to the border with Rwanda. This area is among the highest and coolest in the Republic and its deep, volcanic soils are ideal for growing potatoes.

Knowledge is limited concerning the location and extent of current potato production outside the prime growing areas. A recent survey found potato production in the Ngozi region (République du Burundi 1983b). In fact, an accumulation of evidence suggests potatoes are produced over a much wider geographical area in Burundi than is commonly believed.

Growing Seasons

Potatoes are grown in Burundi at all times of the year. The location and importance of potato production does vary, however, from season to season (Table 1.4).

Table 1.3. Burundi: Major ecological zones, locations and crops.

Ecological Zone	Provinces, Physical Territory	Physical Characteristics	Food Crops Average yield/ha	Cash Crops Average yield/ha
Imbo	Lake Tanganyika Shore and Razizi River plains	800-1000 m altitude 22.5 -25 C (average daytime temperature) 800-1,000 mm rainfall	Beans - 800 kg/a Maize - 800 kg/ha Sorghum - 700 kg/ha Cassava - 6,000 - 8,000 kg/ha Bananas - 7,000 kg/ha	Robusta coffee (parchment) Cotton (seed) -800 kg/ha Oil Palm Rice (irrigated) - 4,000 kg/h
Medium Altitude Western and Eastern Zones	Lower edges of rift escarpment Muhinga, Mosso	1,000-1,500 m altitude 20 -23 C (average daytime temperature) 900-1,200 mm rainfall	Beans - 800 kg/ha Peanuts (unshelled) 500 kg/ha Maize - 450 kg/ha Cassava-5,000 kg/ha Bananas-7,000 kg/ha	Robusta coffee (parchment) - 1,200 kg/ha Sugar cane (Mosso area)
Central Plateau	Ngozi, Gitega south almost to Bururi	1,500-1,800 m altitude 19 -20 C (average daytime temperature) 1,000-1,200 mm rainfall	Beans - 650 kg/ha Bananas-6,500 kg/ha Maize - 400 kg/ha Sweet Potatoes - 4,000 kg/ha Cassava - (limited at higher altitudes) 4,500 kg/ha	Arabica coffee (parchment) 900-1,200 kg/ha
Zaire/Nile Divide	Rwanda border through Muramvya Ijenda, Tora	1,800 - 2,500 m altitude 17 -19 C (average daytime temperature) 1,300-1,600 mm rainfall	Maize - 450 kg/ha Wheat - 410 kg/ha Peas - 420 kg/ha Sorghum/Millet - 550 kg/ha Sweet Potatoes - 4,580 kg/ha White potato - 4,790 kg/ha	Tea - 900-1,500 kg/ha made tea) Truck gardening

Source: USAID 1983 and comments by M. Potts, J. Standaert.

Note: Some experts state Burundi may have up to 11 regions depending on the definition of ecological zone. The table listed maybe arbitrary, but it does describe the broad, basic types of climate and agricultural production.

Table 1.4. Burundi: Growing seasons for potatoes on the Zaire/Nile Divide.

Season/Local Name	Planting	Harvesting
L'Agatasi or Urutasi[1]	September - November	December - February
L'Impeshi[1]	April - June	July - August
L'Ici[2]	June - August	October - November

Source: Ndimira and Christensen (1983: 168) and comments from M. Potts.

1 Rain-fed crop on the hillsides.
2 Planted in the marshes and swamps.

The first potato crop is planted from September to November on hillsides (sur colline) immediately after the short rainy season has begun. Potatoes are most frequently intercropped along with beans and maize during this season. Nevertheless, the first crop constitutes roughly 30% of the annual area planted in potatoes (Ndimira and Christiansen 1983:86). Harvesting takes place from December to February. Yields are lowest at this time of year.

The second potato crop is cultivated from April to June during the long rainy season. Potatoes are grown in the hilly areas and once again cover only a small percentage of all land then under cultivation. This second crop is harvested in July to late August.

Growers plant a third, marais crop in swamps and marshes during the dry season months of June, July, and August. This crop makes up roughly 4 % of annual land area planted in potatoes and from 60% to 80% of total potato production (M. Potts, personal communication). These potatoes are harvested in October and November.

(ii) Producers and their Technology

Types of Producers

Peasant farmers dominate potato production in Burundi. No large-scale, commercial farms grow table potatoes in the Republic. A farm run by the Programme d'Amélioration de la Pomme de Terre produces improved seed (Potts 1986). These tubers are then multiplied and distributed through the Service des Semences Sélectionnées (SSS), rural development programs, and missions.

Peasant potato producers, like most farmers in Burundi, farm small areas of land. According to Ndimira and Christensen (1983: 63-65),

estimated total land utilized per farm per year in the two principal potato growing regions ranges from 0.3 to 1.3 ha. Their survey of 120 potato producers found that farmers devote approximately 15% of the land cultivated during the year to potatoes and associated crops (Ndimira and Christensen:76).

Farm households in the potato growing areas also are small in size. Five persons make up the average potato farmer's family (Ibid.:62) and from those five only two are adults actively engaged in agriculture (Ibid.: 70).

With limited land and human resources, most farmers who grc potatoes do so in a diversified, risk-averse cropping pattern. Producers generally intercrop potatoes in one or two fields in each growing season on plots that range from four to 14 are. Cereals, roots, tubers and vegetables are cultivated together to insure that, in spite of capricious weather patterns, pests, and diseases, food from the farmers' own fields will be available throughout the year.

Production Technology

Farmers employ basic production technology. Modern inputs like chemical fertilizers and pesticides rarely are available; thus, in lieu of pesticides, growers utilize broad, scattered spacing as well as late planting and intercropping to inhibit disease. They generally employ cow manure and/or compost instead of chemical fertilizers. They do all soil preparation, cultivation, and harvesting with hand tools. Intercropping and steep terrain discourage mechanization (Haverkort 1986).

Most farmers use their own potatoes as seed. They also may buy, or barter for, seed from traders, fellow producers, or official sources. Estimates of seed utilized per hectare range from between 0.5 t to 2.3 t The widespread practice of intercropping, however, makes these figures subject to a considerable margin of error. Farmers also reportedly prefer small-sized tubers for seed rather than the agronomically preferable medium-sized potatoes.

(iii) Varieties

Farmers typically plant and sell an assortment of varieties. Information about these potatoes, particularly their commercial characteristics, is scarce. According to Ndimira and Christensen (1983:1) official introduction of new potato varieties in Burundi began around 1929. During the ensuing 50 years, first Institut National d'Etudes Agronomiques au Congo (INEAC) and later, independently, ISABU, registered each new potato variety that entered the country. Over 500 potato varieties have been introduced to date.

Since the early 1960s, a small number of new varieties have received special attention: Arka, Kenya Baraka, Muhabura, Nascor, Radosa, Renova, and Sangema (see Dolpire 1977, Sindayigaya 1981, and Ndimira and Christensen 1983:88). Various accounts report that Arka was im-

ported, multiplied, distributed, and recommended for a number of years. However, in the early 1970s, disturbances in nearby countries severely curtailed, and finally stopped, overland shipment of seed. In more recent years, air freight charges have made foreign planting material prohibitively expensive to import. Meanwhile, Arka and several other varieties gradually have become less popular because changes in the fungi population make them more susceptible to late blight. New varieties that recently have been released by the Potato Improvement Program in collaboration with International Potato Center (CIP) include Muziranzara -- late blight resistant and high yielding -- and Ndinamarga -- late blight and bacterial wilt tolerant as well as high yielding (Potts et al. 1985).

Present efforts to categorize and study potato varieties planted by Burundese growers have been hampered by a series of factors. The number of potatoes, area planted, and geographical dispersion of potato farmers makes a complete survey nearly impossible. Furthermore, the multitude of introductions, combined with the regular practice of planting several varieties in the same field, makes identification difficult. Nevertheless, recent research on variety preferences has found that growers prefer cultivars with short dormancy and short vegetative cycle but have no strong skin color preference (Haugerud 1985:8).

(iv) Production Constraints

The shortage of improved seed and disease problems are the principal constraints to increased potato production at the farm level (Ntiburumunsi 1984). The degenerated state of producer material and the evolution of existing pathogen populations make the continued introduction, multiplication, and effective distribution of improved seed absolutely imperative (Mendoza 1977). Ideally, such seed would be tolerant to both late blight and bacterial wilt, currently the most important local diseases (Turkensteen 1984).

Credit presents an additional problem. Soils along the Zaire/Nile Divide are frequently poor and of declining fertility due to erosion and shortened fallow periods. Simultaneously, an increasing number of Burundese growers have only minimal amounts of cash or marketable surpluses which makes it difficult for them to increase investments in manure or labor. Yet production credit is scarce (see, e.g. Sinankwa 1980) and growers are reluctant to assume the associated financial risks because of the agro-climatic hazards associated with potato cultivation.

Extension and agro-economic research constitute related but distinct constraints. The extension service in Burundi is undermanned. Furthermore, little on-farm research, like testing improved practices against traditional farming techniques, had been carried out until recently. Thus farmers are not sure that suggested innovations will produce the same results on their farms as on the experiment station. Finally, producer surveys such as that conducted by Ndimira and Christensen (1983) are few and far between. Such information is essential to the design and successful diffusion of improved producer practices.

1.3 CONSUMPTION

Various opinions exist about potato consumption in Burundi. Some observers contend that most potatoes are consumed by expatriates and well-paid civil servants. A corollary to this idea is that growers produce potatoes almost exclusively as a cash crop. Others argue that potatoes are eaten by producers themselves as well as by urban residents. No household budget survey has been conducted in Burundi. Limited available information suggests a broad cross section of consumers eat potatoes.

(i) Potatoes in the Burundese Diet

According to MiniPlan estimates, 80% of the Burundese diet is made up of five commodities: bananas, beans, maize, manioc, and sweet potatoes (Rèpublique du Burundi 1982b, 2:36). Burundese do not eat much meat, fish, eggs, or milk. Consumption of lipids is particularly deficient (N.U. 1981:12). Potatoes currently account for about 3% of the average daily intake of calories (Table 1.5).

Potatoes are a more important part of the diet in the major producing regions. They constitute an estimated 4% and 8% of the available calories from food crops in Bututsi and Mugamba regions respectively (République du Burundi 1982b: Annexe 7.03). Potatoes are an especially important dietary component in these regions before the harvest of maize and beans when household food stocks are exhausted (Ndimira and Christensen 1983: 124).

Potatoes are normally consumed as a vegetable. In rural areas, they normally are eaten boiled and almost always with beans.[3] In towns and cities, potatoes are commonly prepared as French fries in restaurants and hotels that cater to high income Burundese, resident expatriates, and tourists.

Potatoes are invariably consumed in an unprocessed form. There are no canned, frozen, or dehydrated potato products available in Burundi. Potatoes are not used for industrial products or as livestock feed.

(ii) Types of Consumers

In the countryside, potato producers themselves are the most important group of consumers. Ndimira and Christensen (1983: 124) found that farmers eat nearly 70% of the potatoes they harvest. While their sample was small (n= 120), their results were corroborated by Bergen (1983b: 23) and by the informal interviews of potato producers carried out for this study.

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3 In certain provincial markets, like Ngozi and Kayanza, women will buy potatoes wholesale. They then cook, mash, and mix them with onions before they fry and sell them as a snack; however, this is an isolated practice.

Table 1.5. Burundi: Average daily per capita supply of calories and proteins by major food group, 1979-1981.

Food group	Per capita supply of calories (number/day)	% of total	Per capita supply of proteins (grams/day)	% of total
Roots and crops	833	38.8	8.3	14
(sweet potatoes)	(440)	(20.5)	(6.0)	(10.1)
(cassava flour)	(358)	(15.1)	(1.7)	(2.9)
(potatoes)	(10)	(3.0)	(0.2)	(2.9)
Cereals	594	27.6	16.9	28.5
Pulses	382	17.8	24.8	41.8
(dry beans)	(314)	(15.0)	(20.3)	(34.2)
Fruit	129	6.0	2.0	3.4
Oils and fats	76	3.5	0.0	0.0
Meat and offals	27	1.3	2.2	3.7
Milk	29	1.3	1.6	2.7
Vegetables	19	0.9	1.2	2.0
Nuts and oilseeds	33	1.5	1.4	2.4
Fish and seafood	6	0.3	0.9	1.5
Sugars and honey	19	0.9	0.0	0.0
Eggs	2	0.1	0.1	0.2
Total	2,149[1]	100.0	59.4[1]	100.0

Source: FAO 1984.

[1] Burundese consumers receive an additional 203 cal and 3 g of protein per capita per day from the consumption of various alcoholic beverages.

Many rural nonproducers in potato growing zones also eat potatoes. Potatoes, however, are too expensive for consumption by nonproducers in nonproducing areas.

In urban areas, and especially in the capital, high-ranking civil servants like to eat potatoes. Potatoes are also served regularly at the national university and, on special occasions, in secondary schools. Military personnel eat potatoes from time to time as well. Interviews conducted for this study found that even low-income families in the working class districts of Bujumbura commonly eat potatoes when they can afford to buy them.

Consumption Levels

Reported consumption levels for potatoes in Burundi are, at best, educated guesses. No detailed consumption surveys have been conducted. Because statistics are poor, inferences about consumption based on estimates of potato production and imports must be considered tentative.

The Food and Agricultural Organization of the United Nations (FAO 1980:195) estimated that annual potato consumption was 31 kg per capita in 1975-77, although FAO's original production estimates for 1975-77 recently have been revised downwards by roughly a third. The decline in output and the steady increase in population together suggest that per capita potato consumption has probably fallen in recent years. Horton and Fano (1985) used FAO data for 1980-82 to estimate annual consumption at 9 kg per capita. FAO statisticians estimated consumption at 5 kg in 1979-81 and 2 kg in 1981-83 (FAO 1984,1985).

Consumption levels undoubtedly differ between rural and urban areas but no one knows by how much. Ndimira and Christensen (1983: 124) found average per capita consumption among potato producers was approximately 26 kg per year (over ten times the latest FAO figures). Potato consumption by nonproducers in rural areas is certainly less. There are no studies of comparative potato consumption.

(iii) Tastes and Preferences

The size of the potato tuber is important for Burundese consumers. Restaurants and hotels in the capital that serve French fries usually prefer large potatoes. Many expatriates complain that such potatoes are insipid, hollow, and watery, and they prefer smaller tubers. In general, however, small (egg-sized and smaller) potatoes are sold at lower prices than medium to large ones. Two specific examples encountered during this survey were: (1) in the Gitega central market piles of large potatoes were sold for 30 FBU versus 15 FBU for small potatoes, (2) a restaurant operator in Bujumbura acknowledged paying 40-50 FBU per kg for mixed-size lots of potatoes but would pay up to 55 FBU per kg for large ones.

Informal interviews with traders have turned up mixed results on the issue of skin color. The large number of varieties grown means some potatoes offered for sale have white, red, or dark blue skins. Most

merchants, especially in rural markets, report skin color is not a factor that influences sales. Some urban shopkeepers and wholesalers, however, say that blue-skinned potatoes are harder to sell. Given the limited supplies of potatoes currently available for sale, skin color does not appear to be an important factor influencing sales.

(iv) Consumption Constraints

Constraints on increased potato consumption vary by location and type of consumer. In the prime potato producing areas, the shortage of seed material and the high price of improved quality seed tubers are the principal constraints to higher production and consumption. The poor condition of local seed depresses yields and increases post-harvest losses. Diseased potatoes, especially bacterial wilt infected tubers, do not store well and this reduces the quantities available for consumption (Turkensteen 1984).

In secondary and marginal growing areas, producers are discouraged from eating potatoes because of the difficulties in growing the crop under warmer conditions.

In Bujumbura and Rumonge, both traders and consumers agree that potatoes are an expensive commodity. Hence, consumers cannot afford to purchase them on a regular basis. When traders in the capital were asked if they would be able to sell more potatoes at half the price, responses ranged from disbelief to amusement, though all agreed that they could sell a great deal more. Nevertheless in the recent past, potatoes have been anywhere from one to five times the price of substitutes such as fresh manioc, sweet potatoes, or green bananas (Bergen 1982:24, World Bank 1981:178). Some observers attribute these high prices to inefficiencies in the marketing system.

1.4 MARKETING

Considerable disagreement exists in Burundi concerning the nature of potato marketing activities. Some observers believe that potatoes are produced primarily for sale. Others argue that growers sell few potatoes. Additional points of disagreement include the relative importance of local production vs. imported stocks, the services, if any, provided by private traders, and the reasons for price fluctuations and variations from place to place. While the available evidence is meager, it suggests that growers sell few potatoes, imports are modest, and marketing agents provide many necessary services.

(i) Foreign Trade

Burundi does not export potatoes, but it imports some from Rwanda and Zaire. Shipments from Rwanda are continuous, but especially high in July during seasonal shortages in the capital. According to traders in Bujumbura's central market, potatoes from Zaire are sold in November. Bergen (1983b:110) reports, however, that some potatoes from Zaire are sold in Cibitoke and Nyesheriza from June to August.

Ndimira and Christensen (1983:159) estimate that imports generally averaged around 100 t per year from 1972 to 1976 and nearly 800 t in 1981. According to the Ministry of Commerce, import figures for the period 1979-82 never exceeded 550 t annually (Table 1.6). Dürr (1983:29) reports that Rwanda exported roughly 500 t of potatoes to Burundi in 1979. Traders contacted for this survey (1983) indicated annual imports are between 500 t and 1,500 t. Although potato imports are negligible in relation to national production, they comprise a conspicuously large share of the potatoes sold in urban markets, particularly in Bujumbura (Bergen 1982:36).

(ii) Domestic Commerce

Less than 15,000 t of potatoes are sold annually in Burundi. Most are produced locally. A minor share are shipped in from Rwanda and the Kivu region of Zaire. Nevertheless, the total quantity of potatoes marketed each year is not known. This is due to the relatively small quantities of potatoes produced and imported as well as the informal nature of the marketing networks for this crop. Different government offices publish vastly divergent estimates of the percentages and quantities of local potatoes that are sold.

The government planners estimate that 80% of production is sold (République du Burundi 1983b); however, estimates by Burundi's National Service for Studies and Statistics (SNES) are much lower. They indicate the average share of total production sold increased from 5% in 1970-72 to 10% in 1977-79 (Table 1.7). Ndimira and Christensen (1983:132) cite similar percentages. Informal interviews with growers and traders carried out for this study suggest the SNES percentages are reasonable; thus, the quantities of domestically marketed potato has been between 3,000 t and 15,000 t per year. These figures are based on the SNES percentages for share of potatoes sold and ISABU/MinAgri production statistics (Table 1.7).

(iii) Marketing Channels and Participants[4]

Marketing Channels

Burundese potatoes are sold in rural and rural-to-urban markets. Available evidence, albeit meager, suggests most potatoes are traded through local rural marketing channels (Figure 1.1). This observation is consistent with the fact that 95% of the Burundese population is rural. Growers sell some of their potatoes in rural or town markets where they are purchased by petty retailers or directly by consumers. Other potatoes are shipped to rural or provincial markets in different parts of the country for final sale.

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4 This section is based on visits by the author and his field assistant to the following markets: Ngozi, Birambi (near Ngozi), Kayanza, Kuvumfu (near Rwegura), Muramvya, Katabo, Ngara (near Mwaro), Mwaro, Gitega, Matana, Bururi, Rumonge, and Bujumbura.

Table 1.6. Burundi: Volume (t) and value (000 FBU) of potato imports by country of origin, 1979-1982.

Year	Rwanda		Zaire		Total	
	Volume	Value	Volume	Value	Volume	Value
1979	192	2,295	0	0	192	2,295
1980	507	5,779	15	201	522	5,980
1981	184	1,787	65	688	249	2,036
1982	172	3,478	0	0	172	3,478

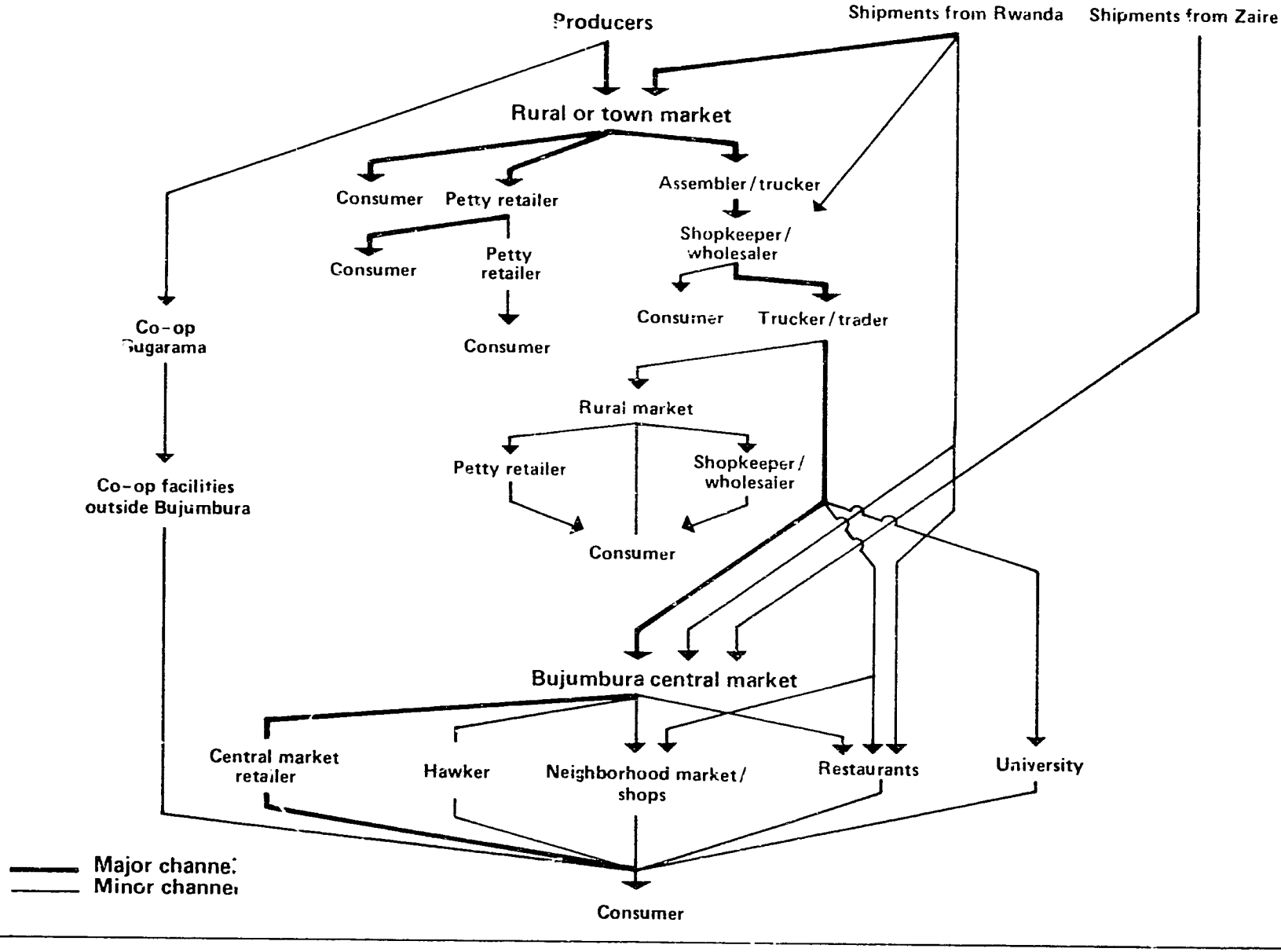
Source: Ministry of Commerce.

Table 1.7. Burundi: Potatoes marketed, 1970-1979.

Year	Marketed potatoes as a % of production	Estimates of marketed potatoes (000 t)	
	1	2	3
1970	5.1	1.8	5.2
1971	3.9	1.3	3.5
1972	6.7	2.4	12.3
1973	5.5	2.0	12.9
1974	5.0	1.4	11.9
1975	5.6	2.0	8.2
1976	6.6	2.5	6.6
1977	7.4	2.8	8.1
1978	6.7	2.0	1.6
1979	15.0	5.0	2.8

Source: (1) SNES, as cited in Ndimira and Christensen (1983: 131);
(2) Based on SNES/MiniPlan estimates of total production (Table 1.2);
(3) Based on MinAgri and ISABU estimates of total potato production; (Table 1.2).

Figure 1.1. Burundi: Principal marketing channels for potatoes.



Source: Elaborated for this study.

The domestic marketing channel that links growers in the Mugamba region with consumers in the capital handles the largest volume of tubers. These potatoes are often assembled in rural areas, then shipped directly to Bujumbura. Potatoes assembled at two rural collection points near Bugarama by the Producers' Vegetable Marketing Cooperative (COMABU) follow a similar route (Map 1.2).

The most important marketing channel for imported potatoes transfers shipments from Rwanda through shopkeeper/wholesalers in Kayanza and then by truck to the capital.

Marketing Participants

Participants in potato marketing include:

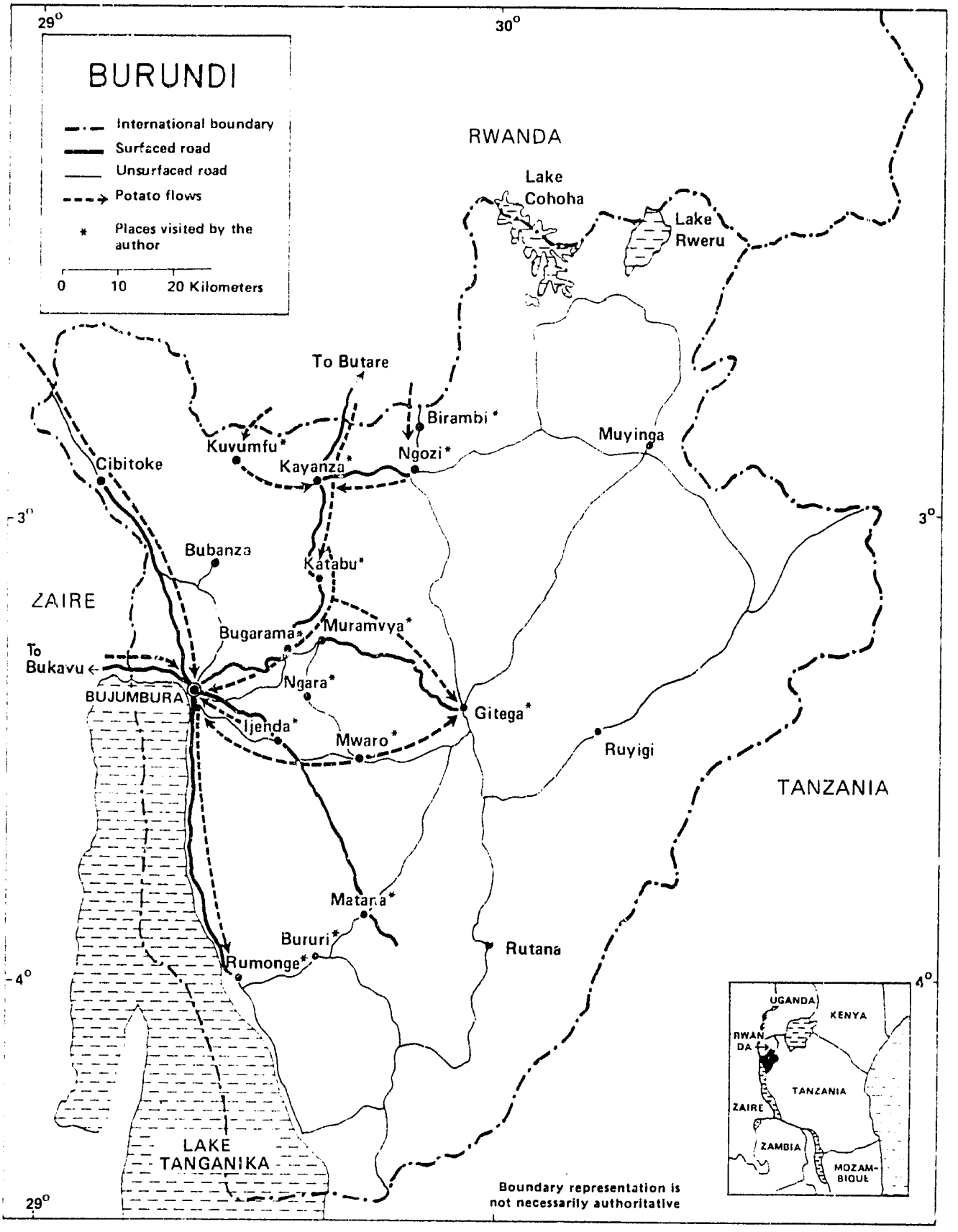
- producers
- rural petty retailers
- shopkeeper/wholesalers
- truckers/traders, and
- urban petty retailers.

Traders themselves are few in number and no sharp division of labor exists between them.[5] Limited surpluses makes specialization in potato wholesaling economically unattractive. With the exception of the retailers in Bujumbura's central market, most traders buy and sell various commodities on a regular basis.

Producers. Although potato production is promoted as a cash crop by government officials, producers are largely subsistence-oriented. They utilize most of what they produce for household consumption or seed. Still, producers normally sell at least some potatoes and typically these sales are motivated by the desire to acquire cash for the purchase of household necessities (see Sinamenye 1982). Growers sell potatoes directly to rural consumers for use as food or seed at the local weekly market , or to provincial traders (Figure 1.1). Sales of vegetables, including potatoes, to expatriates or to bus passengers are also popular near Bugarama.

5 In visits to Gitega, Muramvya, and Ngozi, the author found three or four shopkeepers/wholesalers adjacent the town square and seven or eight petty retailers in the market itself selling potatoes. In Rumonge and Matana, two or three shopkeepers said they keep a few potatoes as an additional item for local consumers. Similar findings are reported for potatoes by Bergen (1983b, 1984a: 32, 1984b).

Map 1.2. Burundi: Principal potato flows.



Source: Elaborated for this study.

Rural petty retailers. Petty retailers are the largest group of rural potato marketing participants aside from the growers themselves. Petty retailers buy and sell small quantities of potatoes, generally less than 50 kg per market day, in the marketplace itself. They usually work alone and use basic equipment like a small scale and/or bicycle.

Some petty retailers are simply revendeurs. They buy potatoes from producers early in the morning and resell them during the remainder of the day. Other petty retailers buy potatoes and transport them to some other market for sale.

Shopkeeper/wholesalers. Shopkeeper/wholesalers are involved in the trade of various agricultural commodities. Their shops are located around the marketplace square in Mwaro, Ngozi or, just off the main road in Kayanza. These traders frequently have large scales to facilitate the purchase of potatoes in big lots. They buy from growers and trucker/traders.

Some of these tubers are sold wholesale to truckers in 1 to 2 t quantities. A few shopkeeper/wholesalers operate their own vehicles to transport potatoes themselves. They all sell potatoes retail to local consumers. A few shopkeepers along the Zaire/Nile Divide report selecting out the smaller potatoes and keeping them in a spare room for eventual sale as seed.

Trucker/traders. Trucker/traders also engage in potato marketing, either as traders or as shippers contracted to provide transport services. These individuals generally operate in one of two fashions. Some trucker/traders atend rural markets to purchase a truckload of vegetables which includes potatoes. These products are then resold to shopkeepers/wholesalers in provincial centers such as Kayanza, or hauled directly to the capital. Others haul potatoes from provincial assembly centers such as Kayanza to Bujumbura and charge a fixed, per kilo fee.

Potatoes shipped to Bujumbura may go to any one of several outlets: the central market, neighborhood markets, institutions such as the University or a restaurant, or to the packing headquarters of the producers' marketing co-op on the outskirts of the city. No statistics exist on this product flow, but most potatoes appear to pass through the central market.

Urban petty retailers. The most conspicuous group of potato traders in the central market is the approximately 30 retailers who buy 50-100 kg of potatoes from provincial trucker/traders and then resell them in small lots (2 to 5 kg) on the same site. Most are young, male Burundese who apparently took up this occupation after they arrived in the capital and could not find other employment.

Hawkers, retailers in district markets, and restaurant personnel also buy potatoes in the central market. Hawkers buy various vegetables including potatoes. They then carry them for sale through commercial districts and residential areas in the capital. Similarly, petty retailers based in different parts of the city will come to the central

market, purchase a sack of potatoes, and then return to a spot in the district market to sell them in small quantities. Shopkeepers in Rumonge follow a similar practice. Restaurant personnel occasionally buy several sacks of potatoes in the central market. The more expensive dining places (perhaps four or five in number) prefer to buy their potatoes in small truckloads either directly from the provinces or from Rwanda.

Some trucker/traders have arrangements with buyers outside the central market with whom they deal directly. Such arrangements may be formal, for example the University asks for sealed bids to supply potatoes during several months, or informal, some trucker/traders will deliver potatoes for district markets in the capital on the basis of an understanding with particular retailers about the quantity, price, and timing of deliveries. Finally, the producers' cooperative has a truck that hauls potatoes and other vegetables from two rural collection points straight to a packing site in the suburbs of the capital. From there, potatoes are delivered directly to regular customers or sold at a downtown shop.

Marketing Procedures

Potatoes, unlike coffee or tea, have no fixed price set by the government. Instead, prices are determined in negotiations between the buyer and seller at the time and place of sale. Trading is conducted without contracts or written receipts. The co-op's purchases from member-farmers at Bugarama and the sales to the University are the notable exceptions to this general rule. There are no standard grades or packages. Nevertheless, the procedures involved can vary considerably. For example, producers around Mwaro, Kayanza, and Ngozi may sell their entire basket of potatoes to the first buyer they encounter on market day. Typically such a transaction involves a brief discussion about price and estimated weight, inspection of the potatoes, and an exchange of cash.

Alternatively, growers first carry their potatoes to the shopowners adjacent the market. There they ask for the going price per kilo and for their potatoes to be weighed on the merchant's scale. If producers are not satisfied with the stated price and weight, they move on to other shops or into the market square itself to look for buyers. By pursuing various options, producers try to compensate for their lack of market information about prices and numbers of buyers and sellers, before arriving at a decision.

Shopkeeper/wholesalers generally weigh potatoes for sale either retail or wholesale. In contrast, trucker/traders that wholesale potatoes in Bujumbura follow a procedure of selling potatoes by sacks of 100 kg. Shopkeepers in Rumonge complain that these sacks rarely weigh the full 100 kg, although it is hard to say what percentage of the loss in weight takes place in shipment to the capital, in the central market itself, or in transfer to the provinces.

Although retailers frequently quote prices on a per kilo basis, they usually sell potatoes in small heaps. These heaps vary in size from retailer to retailer. Moreover, they generally are not weighed prior to sale, though retailers frequently include a few extra potatoes with each purchase.

(iv) Prices and Margins

Ndimira and Christensen (1983:139-199) have analyzed the evolution of annual and monthly average retail prices in Bujumbura, Gitega and Ngozi (Table 1.8).[6] Their findings can be summarized as follows:

First, retail prices for potatoes in Bujumbura rose slightly faster -- 14.1% versus 13.3% -- than the cost of living on an average annual basis from 1972 to 1982. The reasons offered include:

- lower supplies contributed to rising prices because the fall in production during the mid to late 1970s was not sufficiently offset by imports;

- the rapid growth in the capital's population -- about 5% per year -- exceeded the rate of increase in marketable surpluses (Table 1.7) and the resulting demand forced prices upward.

Potato program personnel also comment that the reason production began to fall sharply in 1973-74 was because of diseases. Older varieties, such as Arka, were not replaced, therefore the decline in output accelerated by the end of the decade. In addition, the bulk of the production increases in 1980-82 was retained in the countryside for local consumption.

Second, average seasonal indices for monthly retail potato prices in the capital, (calculated from 1972 to 1982), reflect the local production calendar (Table 1.4). Seasonal indices are lowest in November and December because potatoes are abundant at this time of year. The poor condition of local varieties limits storability; hence, growers must eat or sell their potatoes shortly after harvest. Conversely, from June to August, rural trucker/traders are almost totally involved with the coffee harvests. As a result, there are fewer vehicles available to haul potatoes to market. These months also coincide with the coffee harvests and seasonal supply shortages for potatoes in Rwanda (see 2.4) imports are handicapped as well. Moreover, the coffee harvests provide a periodic boost to local incomes, even in the capital, and Burundese are reported to buy potatoes when they can afford them. Thus, the seasonal decline in shipments, combined with a rise in purchasing power, push up potato prices.

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6 Several studies briefly present potato prices in one or more markets (Bergen 1982: 22-33; 1984a: 32; 1984b: 110-111; Hakizimana 1977:10, 19, 21; Muyuku and Nimbona 1974: 32; République du Burundi 1977: 6-7, 18).

Table 1.8. Burundi: Average seasonal indices of monthly retail prices for potatoes in selected markets.

Market	Time Period	Seasonal Indices											
		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bujumbura	1972-82	.90	.89	.94	.94	.99	1.19	1.41	1.22	1.04	.88	.81	.80
Gitega	1977-82	.86	.93	1.00	1.07	1.11	1.23	1.25	1.04	.96	.87	.82	.81
Ngozi	1978-82	.81	.92	.97	1.02	1.07	1.23	1.11	1.07	1.19	1.01	.86	.76

Source: Ndimira and Christensen (1983: 163, 184, 188).

Table 1.9. Burundi: Prices and margins for potatoes, 1983.

Marketing Participant	Selling Price (FBU/kg)	Price Sold Less Price Paid (FBU/kg)	Marketing Margin 1
Grower in rural market near Kayanza	20.0	20.0	42
Rural trader in rural market	25.0	5.0	11
Rural trucker/trader in Kayanza	28.0	3.0	6
Trucker to Bujumbura	32.0	4.0	8
Shopkeeper/Wholesaler in Bujumbura	34.0	2.0	4
Petty retailer in Bujumbura	47.5	13.5	29

Source: Elaborated for this study.

1 Price sold less price paid, divided by retail price.

Third, during the period 1978-82, retail prices for potatoes in Bujumbura rose faster (12.7%) on an annual average than those in Gitega (11.2%) and Ngozi (4.3%). Although Gitega (pop. 8,000) is a much smaller city than Bujumbura (pop. 140,000), the increasing concentration of civil servants probably generated considerable demand for potatoes and a comparable upward pressure on prices.[7] In contrast, Ngozi (pop. 4,000), a small town with few civil servants or expatriates, is much closer to prime domestic potato growing areas and has easier access to imports from Rwanda.

Spatial Price Comparisons

Several surveys report potato prices in different markets (Bergen 1984a, 1984b; République du Burundi 1977), although these studies are more interested in marketing flows for various farm commodities than in potato prices *per se*. Nevertheless, the meager information available suggests that prices for potatoes can vary considerably between markets during the same time period. For example, Bergen (1984a: 110-111) reports potato prices that range between 14 FBU in Cibitoke and 61 FBU in Kimana.

Ndimira and Christensen (1983:192-194) analyzed the correlation between monthly retail prices in Bujumbura, Gitega, and Ngozi. They found that prices in Bujumbura and Gitega were highly correlated (coefficient of correlation = 0.826) during 1977-80, but neither Bujumbura (0.565) nor Gitega (0.503) prices (1978-80) were correlated with those in Ngozi.

The results of these price comparisons merit three observations. First, major differences in prices appear more persistent between small, provincial markets and between small markets and major towns. There are no large price discrepancies between major trading centers such as Bujumbura and Gitega.

Second, price differences partly represent poor transportation links between different locations. Potato prices may be consistently lower in certain markets because it is hard to ship potatoes out of these locations.[8]

Third, the smaller quantities sold in many provincial urban markets suggest that price differences may be real, but few producers or consumers are affected (see Ndimira and Christensen 1983: 132).

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7 These population figures are based on World Bank estimates.

8 Prices may also reflect traders' ability to manipulate the market, though precisely how they do this has not been studied.

Marketing Margins

Marketing margins for potatoes are hard to estimate precisely (see also FAO 1985:60-65). Relatively few traders buy and sell potatoes. Producer prices are scarce. Information about marketing costs -- freight rates, loading and unloading charges, and shrinkage losses -- is also limited. Without such data it is hard to establish what percentage of the difference between the price charged by producers and the price paid by consumers constitutes trader expenses and what percentage is trader profits. Some studies have assumed that traders' profits represent 100% of this difference (see, e.g., Hakizimana 1977:21). No study considers the risks associated with the business of selling potatoes.

Prices for potatoes shipped via Kayanza to Bujumbura were recorded for this survey. They allow a tentative calculation of marketing margins on this particular route.

Growers sold potatoes in a rural market some 30 km from Kayanza for 20 FBU/kg. The village merchant resold these potatoes for 2,500 FBU/100 kg to a trucker/trader who transported them to Kayanza. The trucker/trader then resold them for 2,800 FBU/sack to a local shopkeeper/wholesaler who paid 4 FBU/kg to ship them by truck to Bujumbura. In addition, the shopkeeper/wholesaler paid for loading (10 FBU/sack), unloading (20 FBU/sack), and taxes (50 FBU/sack) in Kayanza and Bujumbura. In the capital, the shopkeeper/wholesaler sold the potatoes for 3,300-3,500 FBU/100kg/sack to petty retailers in the central market. These petty retailers, in turn, paid a tax of 50 FBU per day to sell potatoes for 45-50 FBU/kg to area consumers.

Producers receive the largest share of the retail price, some 40%-45%, according to these data (Table 1.9). Freight rates represent a minor component of the retail price. According to truckers contacted for this survey, increased competition for freight and the government's ambitious road-building campaign are largely responsible for this.

Shopkeeper/wholesalers in Kayanza made 4% to 12% of the retail price depending on whether they also transported the potatoes to the capital. These shopkeeper/wholesalers express repeated concern about day to day price fluctuations in Bujumbura. They arrive in the central market without knowing the prices at which they can sell their potatoes; yet, potatoes are perishible, the weather in the capital is hot and humid, and there are no local, cold storage facilities. In fact, some shopkeeper/wholesalers sell the remainder of the previous day's shipment at prices well below those for fresh supplies simply to recover some money for the product.

Petty retailers in the central market receive the largest increase in price of any trader -- 12-15 FBU/kg. Their 25% to 30% share of the retail price is partly attributable to the shrinkage losses that they must absorb and the small volume that they sell on a daily basis. If they find damaged tubers in the sack they purchase, they have difficulty selling them. Similarly, competition between petty retailers is discouraged by the fact that they all make their daily income from the sale of 50-100 kg of potatoes. Still, these retailers are also aware that

they are selling a luxury vegetable and charge their customers accordingly.

(v) Government Programs and Policies

Government involvement in table potato marketing has been restricted to setting import duties and local taxes. The government also purchases a limited amount of table potatoes for related institutions. Potato marketing has also benefited from the government's road-building program.

Taxes and Potato Trade

Three types of taxes can be imposed on potatoes. Potatoes from neighboring countries are subject to an import duty. This tax is set by the Ministry of Finance. It was reportedly 8% in late 1983; thus, potatoes shipped in from Rwanda valued at 24 FBU/kg would receive a 2 FBU/kg tax. Such duties are hard to collect, however, because of Burundi's open border policy with neighboring countries.

Potatoes sold in rural markets and provincial towns are taxed in the markets themselves. Typically this involves a 50 FBU tax either per sack for larger volumes or per trader for small quantities. According to the inspector for provinces and communes, each commune has the right to set its own tax. As a result, potatoes shipped from one commune to the next may be taxed on several occasions.

In Bujumbura, the mayor's office administers its own set of taxes. Potato retailers are taxed 50 FBU, which is considerably higher than the 20 FBU per day tax for traders of other commodities. Traders in suburban markets are taxed similarly. Plans are underway to establish tax norms for potatoes.

Institutional Procurement of Potatoes

Government institutions also buy table potatoes either by making a contract for several shipments or through specific orders. The University asks for sealed bids to supply the campus in Bujumbura with a certain quantity of potatoes per week. The bidder with the lowest price per kilo wins the order and supplies the University with between 50 and 100 t of potatoes during a 15-week term.

Payment for such shipments normally comes at the end of the contract period rather than on a shipment by shipment basis. In some instances, payment is delayed for as long as 18 weeks after the term ends. Traders contacted for this study said that in order to supply the University, or bid on similar such government contacts, one has to have a considerable amount of working capital.

Traders in Kayanza said they occasionally supply schools in Gitega with potatoes. These sales are strictly on a purchase order, commande, basis.

(vi) Marketing Constraints

Scarce and unreliable information, irregular rural transportation, minimal infrastructure, limited extension and credit, and post-harvest diseases all handicap potato marketing. At the policy and planning level, decision-making about potato marketing is affected by a weak statistical base. Government statisticians regularly collect information on retail prices in the major towns. However, figures for wholesale prices, volumes traded (in Bujumbura), or prevailing freight rates are rarely noted. In addition, the statistics that are collected are neither analyzed nor widely circulated in official publications (République du Burundi 1983a). Although potato-marketing participants seek out and exchange trade information, they are restricted in these collection efforts by the time- consuming and costly nature of such activities when carried out on an individual basis. As a result, growers, traders, and truckers face great financial risks and have few potential marketing alternatives.

In the rural areas, poor roads and irregular transportation are also important marketing constraints. Farm households are dispersed, volumes marketed per grower per sale are small, and production takes place in some of the most rugged areas of the country. Furthermore, existing roads in many of these areas are fully or partially blocked during the rainy seasons. Consequently, growers must either sell in local markets or carry their potatoes on their heads to alternative selling sites. On the other hand, trucker/traders face the danger of breakdowns, delays, or accidents that, given the semi-perishable nature of potatoes, can have disasterous financial consequences.

The infrastructure at most markets is meager. There are no public or storage facilities in Bujumbura for keeping agricultural products overnight. Public scales for checking weights are not available. Covered areas are either absent or in limited supply.

Little agricultural extension directed at improving grower's participation in potato marketing exists aside from the foreign technical assistance provided through the producers' marketing co-op, based near Bugarama, and its retail outlets in Bujumbura. Similarly, public credit programs for growers and traders to help finance new marketing ventures have yet to be established.

Finally, poor seed material not only produces low yields but also tubers that are disease infested and therefore highly susceptible to post-harvest losses. These losses raise risks, and therefore marketing costs, for traders as well as growers, forcing up margins and prices.

1.5 CONCLUSIONS

The potato has considerable potential as a food crop in Burundi. High yields and a relatively short vegetative cycle make the potato attractive from a production point of view. The crop is particularly suited to the land-scarce farm households at higher elevations. In

fact, potatoes already serve as an integral component of the elaborate cropping patterns of many growers.

Production Problems as Principal Limiting Factor

The weight of the available evidence indicates that production, not marketing, problems are the principal constraint to improved output and use of potatoes. Although knowledge is limited about trends in potato production, neither the available literature nor informed observers cite marketing problems like low prices or gluts. Sources suggest that the recurrent outbreak of potato diseases and drought have been the two factors most responsible for the fluctuations in potato production. Currently, the country has no large-scale, commercial, potato producers. Instead, potato producers are all small-scale, semi-subsistence farmers. Given their limited land, labor, capital, and poor quality seed, these growers are unable to produce sufficient potatoes to satisfy rural food requirements and urban demand.

High Retail Marketing Margins

Growers receive roughly 40% of the retail price for potatoes sold in Bujumbura. The remainder of the rural producer-urban consumer price differential is taken up by rural assembly costs, trucking charges, and, in particular, the marketing margins of petty retailers in the capital's central market. These findings suggest four observations.

First, there is a tendency to equate marketing revenues of potato traders with pure profit. Traders contacted for this study invariably had costs. Furthermore, the risks associated with buying and selling a semiperishable commodity such as potatoes should not be underestimated. Volumes traded in most locations are small, hence prices are prone to sharp fluctuations. There is no government support price for potatoes.

Second, the evidence suggests that as the transportation infrastructure improves and the stock of transport vehicles expands, competition increases. This observation appears particularly true for the marketing of potatoes between Kayanza and Bujumbura. This means that government programs to promote trade can help reduce marketing margins.

Third, petty retailers in the capital have relatively high marketing margins.[9] The margins of shopkeeper/wholesalers and trucker/traders appear modest in comparison. The principal problems faced by these retailers are the limited volumes sold on a daily basis and the risk of losses from spoilage. Still, given their high marketing margins, the trading operations of these individuals merit closer examination.

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9 High retail margins for roots and tubers is common throughout sub-Saharan Africa (see FAO 1985:63).

Fourth, much attention has been focused on rural producer-urban consumer price differentials. This preoccupation reflects the dependence of urban areas on the transfer of surpluses from the countryside, the availability of government statistics on prices for major towns, and a more general concern with improving interregional trade. While this is understandable, it distracts attention from strictly rural marketing activities which are for more important because 95% of the population resides in the countryside.

Availability and Price Restrict Potato Consumption

Informal interviews with traders and consumers in urban areas indicate that a broad cross section of the population eats potatoes when they are available and when people can afford them. The evidence strongly suggests that greater availability and declining prices will stimulate increased potato consumption. The outlook for potatoes in Burundi appears promising indeed.

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RWANDA

Chapter 2

Currency Equivalents
(October 1983)

Currency Unit	Rwandese Francs (FRW)
FRW 96.00	US$ 1.00
FRW 960.00	US$ 10.00

Weights and Measures

Rwandese System		quivalent
1 kilometer (km)	=	.62 mile (mi)
1 are	=	.01 hectare (ha)
1 kilo (kg)	=	2.205 pounds (lb)
1 ton (t)	=	1000 kgs/2205 (lb)

Abbreviations

CIP = Centre International de la Pomme de Terre
(International Potato Center)

ISAR = Institut des Sciences Agronomiques du Rwanda
(Rwandese Institute of Agricultural Sciences)

MinAgri = Ministère de l'Agriculture
(Ministry of Agriculture)

MiniPlan = Ministere du Plan
(Ministry of Planning)

PNAP = Programme National pour l'Amélioration de la Pomme de Terre
(National Potato Improvement Program)

SSS = Service des Semences Sélectionées
(Selected Seed Service)

Rwanda is the most densely populated country in continental Africa The Republic has no major mineral resources. Foreign exchange earnings are modest. These factors, coupled with the nation's geographic isolation in the heart of the continent (Map 2.1), mean Rwanda must rely on domestic production to meet local food requirements. With one of the world's fastest growing populations, the Rwandese face a mounting challenge to feed themselves in the years ahead (EEC 1982).

The recent success of Rwanda's National Potato Improvement Program (PNAP) suggests rapid increases in food production are within local capabilities. The sharp rise in potato output raises the following questions about potato marketing:

- What types of farmers produce potatoes?
- What is the relative importance (by volume) of existing marketing channels?
- What factors account for rural producer-urban consumer price differentials?
- What are the prospects for increased potato consumption?

This chapter addresses these issues utilizing fieldwork results, official statistics, and the findings of earlier studies, particularly, those of Dürr (1983), Monares (1984) and Poats (1981).

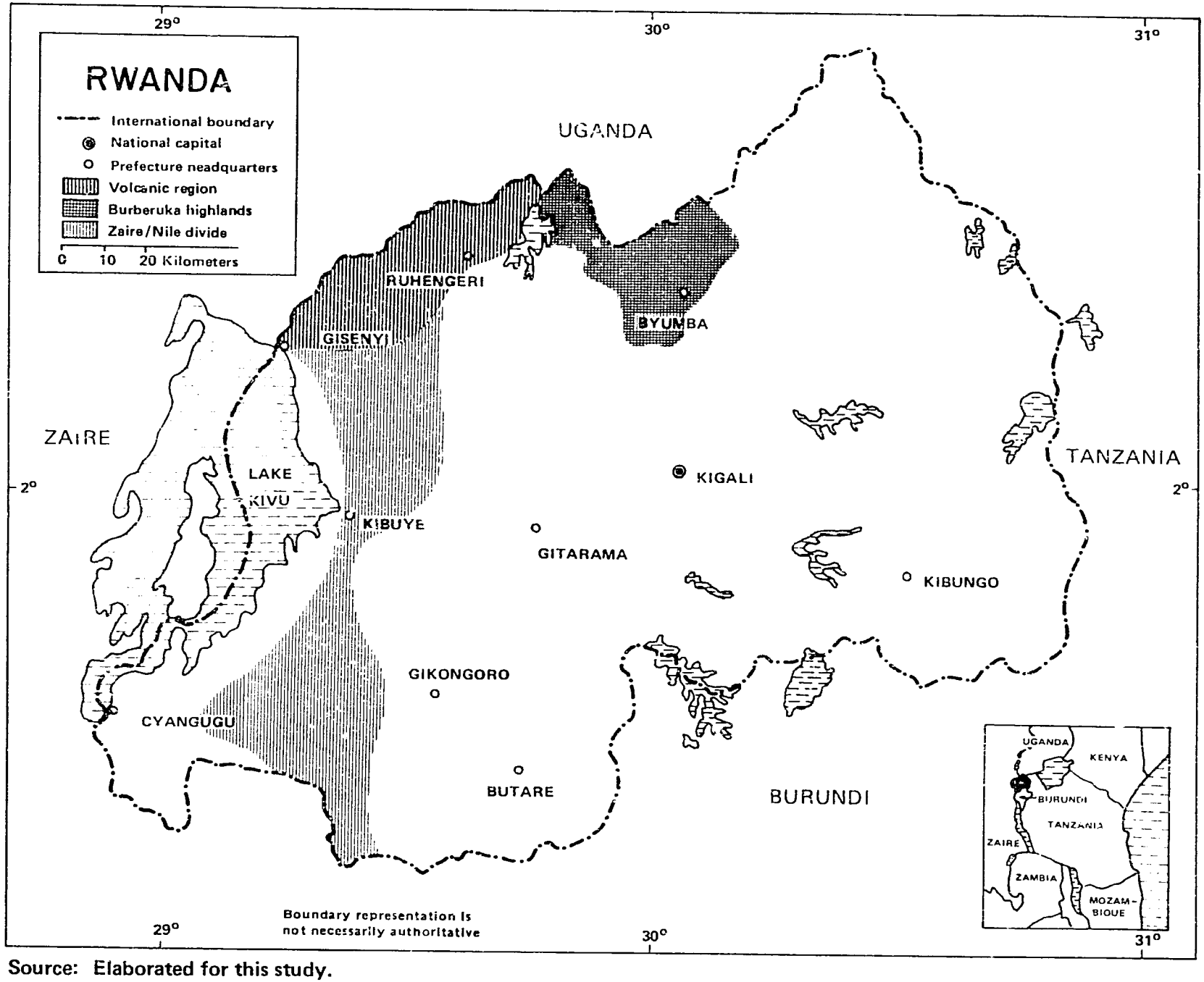
2.1 MACROECONOMIC SETTING

Potato marketing in Rwanda is best understood as part of a larger process intended to improve general socioeconomic conditions. The Rwandese economy is dominated by a large, predominantly subsistence-oriented, agricultural sector. Recent estimates put Gross National Product (GNP) per capita at US$280. Daily caloric supplies -- 2,276 per capita -- are 98% of estimated minimum requirements and average life expectancy is 47 years (World Bank 1987). Rwanda's population is roughly 5.8 million and has one of the fastest annual growth rates in the world --between 3.6% (Ibid.) and 3.8% (FAO 1980a:13). Although less than 5% of the population lives in urban areas, the Republic's small size (26,300 km^2) means population density is roughly 390/km^2 of agricultural land; even higher than in India according to World Bank sources.

The Rwandan government's Third Five-Year- Development Plan (1982-86) has as its principle objectives:

- achieving food self-sufficiency both qualitatively and quantitatively;
- promoting employment that is sufficiently remunerative so as to satisfy basic needs, and education and/or training for each Rwandese;

Map 2.1. Rwanda: Principal potato growing areas.



Source: Elaborated for this study.

- promoting the level of health, ensuring housing, producing mass consumer goods, and developing a cultural life; and,

- developing Rwanda's external relations to reduce the country's isolation and achieve a balanced foreign trade (République Rwandaise 1982b:104; Garvey 1983:2).

In order to achieve these objectives, the Plan emphasizes growth in national production and productivity. Agriculture and, in particular, food self-sufficiency remain a first priority.

(i) Agricultural Performance, Goals, and Strategy

Performance

According to official estimates, the agricultural sector grew at about 4% per year from 1969 to 1981.[1] Still, this aggregate trend disguises acute differences in the evolution of particular commodities. Sweet potatoes, manioc, potatoes, and maize all experienced rapid growth in output during the last decade. More modest increases were registered for bananas, beans, and sorghum (Table 2.1). Coffee and tea occupy 98% of area planted for export crops. Subsistence agriculture still accounts for about 40% of Gross Domestic Product.

While the questionable accuracy of agricultural statistics precludes a detailed analysis of food production trends, more land has been devoted to roots and tubers than to traditional legumes. The increase in coffee output -- from 24,000t in 1975 to 31,000t in 1981 -- was partly due to the guaranteed government purchase price. Conversely, World Bank personnel have noted that problems with rural assembly and payments to growers for pyrethrum prompted some of these farmers to shift more land into competing crops such as potatoes.

Goals and Strategies

The Third Development Plan has identified three general goals for the agricultural sector:

- Intensification of agricultural production;

- Provision of farm families with a remunerative return for their production; and

- Establishment of an equilibrium between industrial and food crop production.

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1 Though production figures appear dubious, the consensus according to World Bank sources is that food production grew faster than population.

Table 2.1. Rwanda: Trends in food crop production, area and yields, 1970-1980.

	Production (000 t)			Area Planted (000 ha)			Yields (t/ha)		
	1970	1980	% Increase	1970	1980	% Increase	1970	1980	% Increase
Bananas	1,656	2,063	24	146	225	54	11.3	9.2	-19
Sweet potatoes	379	871	130	65	114	75	5.8	7.6	31
Cassava	330	542	64	28	46	64	11.8	11.9	1
Beans	145	181	25	161	257	60	0.9	0.7	-22
Sorghum	141	179	27	132	145	10	1.1	1.2	9
Potatoes	134[1]	217	62	21	32	52	6.4	6.7	5
Peas	64	35	-45	76	51	-33	0.8	0.7	-13
Maize	50	85	70	50	72	44	1.0	1.2	20
Groundnuts	15	16	7	16	17	6	0.9	0.9	-
Soybeans	n.a.	4	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	n.a.

n.a. = not available.

Source: Ministries of Agriculture and Planning.

1 This figure does not correspond to the revised FAO estimate (Table 2.3) nor to the earlier MinAgri statistic (Table 2.4).

The strategy to achieve these goals involves a series of government initiatives. Specific actions to be undertaken include:

- intensifying the program of applied research on food crops;
- improving the technology transfer and agricultural extension system;
- expanding the agricultural credit system;
- improving marketing input and grower prices;
- establishing an agro-industrial processing industry for the purpose of fomenting more intensive crop and livestock production; and
- expanding the training and educational program for rural cadres and agricultural researchers.

(ii) Potatoes in Rwandese Agriculture

Beyond the broad, sectoral, production targets and the general strategy to achieve them, the Plan includes specific projections for each food crop.

Potatoes rank first among the major food crops in terms of planned increases (Table 2.2). Average annual growth rates envisioned for the period 1982-86 are 7.9% and 5.4% for production and yields respectively. The Plan foresees these increases resulting from two factors. Yield increases result from the use of improved seed. Potato cultivation is to expand in fertile marshlands and newly cleared forests.

The Plan notes deficiencies in existing marketing arrangements for all food crops. Wholesale distribution of food crops is considered to be insufficiently developed. Retail trade is regarded as poorly adapted to local conditions because of the geographic isolation of certain regions, the insufficiency of mechanisms to fix and control prices, and the excessive number of middlemen between producers and consumers.

The Plan proposes various government initiatives to improve commercial activities, including the Rwandization of retail trade, price controls, fixed marketing margins, the regulation of marketing channels and the creation of a national training center for commerce to upgrade the technical capacity of local businessmen. The national road network is to be extended and improved and credit programs for small and medium enterprises are to be expanded through the Banque Rwandaise de Developement.

Table 2.2. Rwanda: Food crop projections for 1986 and 2000.

	Objectives 1986			Average Annual Growth (%) 1978-80 to 1986			Objectives 2000		
	Production (000 t)	Area (000 ha)	Yield (t/ha)	Production (000 t)	Area (000 ha)	Yield (t/ha)	Production (000 t)	Area (000 ha)	Yield (t/ha)
Bananas	2,300.0	230.0	10.0	2.0	1.4	0.5	3,375.0	250.0	13.5
Sweet Potatoes	1,270.0	127.0	10.0	6.1	2.7	3.3	2,148.0	140.0	15.0
Cassava	650.0	50.0	13.0	3.6	2.6	1.0	1,200.0	60.0	20.0
Potatoes	370.0	37.0	10.0	7.9	2.4	5.4	600.0	40.0	15.0
Beans	214.5	286.0	0.8	2.7	2.7	--	330.0	300.0	1.1
Sorghum	194.4	162.0	1.2	1.5	1.0	0.5	288.0	160.0	1.8
Maize	106.2	88.5	1.2	3.9	2.9	1.0	250.0	100.0	2.5
Peas	37.5	50.0	0.8	-1.3	-1.9	0.6	28.5	30.0	0.9
Taro	37.0	7.4	5.0	8.4	7.0	1.2	56.0	8.0	7.0
Groundnuts	25.0	25.0	1.0	7.4	6.0	1.2	45.5	35.0	1.3

Source: République Rwandaise (1983c: 56).

2.2 PRODUCTION

Potatoes have been cultivated in present-day Rwanda for nearly a century. Most accounts trace the introduction of the crop to the arrival of German missionaries in the late 19th century (see Poats 1981). Striking increases in production in recent years have focused growing attention on the potato's potential in the nation's agricultural development. Official interest in the improvement of potato production, however, is a relatively recent phenomenon. The national potato program was only founded in 1979 (Monares 1984).

(i) Production, Area, and Yields

Potato production has increased from about 60,000 t to 330,000 t since 1960 (Table 2.3). The 7% annual growth rate in output is partly attributable to a 3.5% annual increase in area planted from 18,000 ha to 42,000 ha. In the process, potatoes became the country's sixth most important crop in terms of area planted (Haugerud and Nyirazikwiye 1986). Yields have been erratic. They rose rapidly from 3.4 t/ha to 7.5 t/ha in the 1960s, fell in the mid 1970s, and have recovered to nearly 8.0 t/ha since then.

Location of Production

Potato cultivation is currently concentrated in three areas (Map 2.1): the volcanic region, along the Zaire/Nile Divide, and in the highlands of Buberuka (Vander Zaag et al. 1984). The volcanic region derives its name from the chain of seven volcanoes that dominate local topography in the border area of northwest Rwanda. Potato production takes place between 1,800 and 2,800 m and is greatly facilitated by the area's deep, volcanic soils, abundant rainfall, and mild temperatures. Precipitation is continuous throughout the year and averages over 100mm per month October through January and March through May; mean temperatures are between 13^{o} and 18^{o}C (Ibid.). Area planted and total production per prefecture are highest in this region (Tables 2.4-2.5).

Potatotes are also grown along the Zaire/Nile Divide. This rugged belt runs from the northern to southern border down the western side of the country. Soils along the Divide are often severely depleted due to erosion, leeching, and intensive crop cultivation. Yields, therefore, are lower there than in the volcanic region. Potatoes are most commonly planted at altitudes between 1,800 and 2,400 m. Pockets of particularly intensive potato cultivation are found in Gikongoro and Kibuye prefectures.

Potatoes are also grown in other parts of Rwanda; however, hotter, more humid growing conditions discourage cultivation on more than a minor scale. As a result, over 80% of total potato production is

Table 2.3. Rwanda: Potato production, area and yield, 1961/65-1984.1

	Production (000 t)	Area (000 ha)	Yield (t/ha)
1961/65	62.0	18.2	3.4
1966	57.3	9.5	6.0
1967	107.3	16.5	6.5
1968	78.8	17.5	4.5
1969	129.0	17.2	7.5
1970	126.0	18.0	7.0
1971	148.2	21.2	7.0
1972	131.4	18.8	7.0
1973	140.1	19.3	7.3
1974	109.6	20.0	5.5
1975	149.8	22.7	6.6
1976	169.8	25.7	6.6
1977	177.3	28.8	6.2
1978	218.7	32.2	6.8
1979	214.9	32.0	6.7
1980	220.0	34.0	6.5
1981	225.0	35.0	6.4
1982	269.0	40.0	6.6
1983	322.0	41.0	7.9
1984	330.0	42.0	7.9

Source: FAO.

1 Figures for 1970, 1979, and 1982 do not correspond to official statistics (see Tables 2.4-2.6).

Table 2.4. Rwanda: Potato production (000 t) by prefecture: selected years.

Prefecture	Year							
	1970	1973	1974	1975	1976	1978	1979	1982
Butare	5.1	2.4	3.1	4.0	2.6	2.4	1.6	4.0
Byumba	18.3	21.9	27.8	29.8	27.0	29.3	28.3	15.0
Cyangugu	1.9	4.6	3.9	2.9	2.0	4.1	4.0	6.3
Gikongoro	11.1	13.4	7.2	13.9	25.1	33.4	31.0	27.0
Gisenyi	12.2	30.1	17.5	32.9	37.8	52.6	62.2	117.0
Gitarama	9.1	3.1	1.1	2.6	1.7	1.0	3.1	15.0
Kibungo	2.2	3.9	2.1	3.6	3.4	6.0	5.3	16.0
Kibuye	1.8	6.7	2.7	7.2	11.0	14.7	25.8	14.0
Kigali	2.2	5.1	2.4	4.4	6.3	6.1	10.8	1.0
Ruhengeri	46.2	48.9	41.9	48.5	53.1	69.2	66.6	80.0
Total	110.1[1]	140.1	109.6	149.7	169.7	218.7	238.7[1]	295.3[1]

Source: 1970 (Prefol, B. and G. Delepierre 1973: 110); 1973-76 (République Rwandaise 1977:70); 1978 (Dürr 1983: 65); 1979 (Monares 1984: 12); 1982 (République Rwandaise 1983b: 16).

1 Figures for 1970, 1979, and 1982 do not correspond to revised FAO estimates (Table 2.3)

Table 2.5. Rwanda: Potato area (000 ha) by prefecture: selected years.

Prefecture	Year					
	1973	1974	1975	1976	1978	1979
Butare	0.5	0.9	0.8	0.6	0.4	0.3
Byumba	3.1	5.1	4.3	3.9	4.0	4.4
Cyangugu	0.7	0.9	0.5	0.4	0.6	0.5
Gikongoro	1.7	1.4	2.1	3.9	5.5	5.4
Gisenyi	3.8	3.0	4.8	5.6	7.5	7.6
Gitarama	0.5	0.3	0.5	0.4	0.2	0.5
Kibungo	0.8	0.6	0.8	0.8	1.3	1.2
Kibuye	1.1	0.6	1.1	1.7	2.1	2.9
Kigali	1.0	0.7	0.9	1.3	1.1	1.9
Ruhengeri	6.1	6.5	6.8	7.4	9.5	10.1
Total	19.3	20.0	22.7	25.7	32.2	34.8

Source: 1973-76 (République Rwandaise 1977: 70); 1978 (Dürr 1983: 64); 1979 (Monares 1984: 12).

currently concentrated in Byumba, Gikongoro, Gisenyi, Kibuye and Ruhengeri prefectures (Table 2.5).2

The evolution of production within the country has varied considerably. Production has grown most rapidly in Gikongoro, Gisenyi, Kibungo, and Kibuye prefectures. Area planted has expanded in nearly every prefecture (Table 2.5). Yields have risen fastest in Cyangugu and Kibuye (Table 2.6).

Growing Seasons

Potatoes are planted throughout the year in two major and two minor crops (Haverkort and Bicamumpaka 1983). The most important crop is cultivated in the dry season from May to September. A second major crop is grown from September to January during the petite rainy season. Most growers plant potatoes in these two periods, though planting dates vary considerably by region (Table 2.7).

Some producers along the Zaire/Nile Divide also plant potatoes in the marshy valleys from July to October. Still another crop is cultivated from November to March. Production is particularly intense in the volcanic region where agro-ecological conditions permit virtually continuous cultivation.

(ii) Producers and their Technology

Types of Producers

Potato producers in Rwanda include small-family farmers, settlement growers, and large, commercial producers. The overwhelming majority are traditional, family farmers who plant less than 1.5 ha of the crop during the calendar year. These growers frequently cultivate several tiny plots at the same time, mixing cultivation of potatoes with cereals, root crops, or other tubers (République Rwandaise 1983a, Haugerud and Nyirazikwiye 1986). Potatoes are used principally for on-farm consumption and seed; however some potatoes are marketed and for many farmers this represents an important source of cash income.

Farmers in government-organized settlements (paysannat) also plant potatoes. These growers are obliged to cultivate a certain percentage of their land in industrial crops such as tea, coffee, and pyrethrum. They also grow potatoes both for sale and for household consumption.

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2 According to official statistics, 50% to 75% of all potatoes are harvested in only seven communes: Kivu (in Gikongoro), Ramba and Kayove (Gisenyi), Rutsiro (Kibuye), and Kinigi, Mukingo, and Nkuli (Ruhengeri) (Dürr 1983:72-76). Still, Dürr notes that production figures for Kayove are unrealistically high. PNAP officials also are skeptical about this seemingly high degree of concentration.

Table 2.6. Rwanda: Potato yield (t/ha) by prefecture: selected years.[1]

Prefecture	Year					
	1973	1974	1975	1976	1978	1979
Butare	4.8	3.4	5.0	4.3	6.0	5.3
Byumba	7.1	5.5	6.9	6.9	7.3	6.4
Cyangugu	6.6	4.3	5.8	5.0	6.8	8.0
Gikongoro	7.9	5.1	6.6	6.4	6.1	5.7
Gisenyi	7.9	5.8	6.9	6.8	7.0	8.2
Gitarama	6.2	3.7	5.2	4.3	5.0	6.2
Kibungo	4.9	3.5	4.5	4.3	4.6	4.4
Kibuye	6.1	4.5	6.5	6.5	7.0	8.9
Kigali	5.1	3.4	4.9	4.6	5.5	5.7
Ruhengeri	8.0	6.4	7.1	7.2	7.3	6.6
Total	7.3	5.5	6.6	6.5	6.8	6.9

Source: 1973-76 (République Rwandaise 1977: 70); 1978 (Dürr 1983: 64-65); 1979 (Monares 1984: 12).

1 Average yield calculated by dividing production by area planted.

Table 2.7. Rwanda: Principal growing seasons in the main potato producing areas.

Prefecture	Main season		Short season	
	Planting	Harvest	Planting	Harvest
Ruhengeri[1]	May/June	Sept.	Nov/Dec.	Feb/Apr.
Gisenyi[1]	July	Oct.	Nov/Dec.	Feb/Apr.
Byumba	March	July	Oct.	Jan/Feb.
Gikongoro	June	Sept/Oct.	Nov.	Feb.
Kibuye	Apr/May	July/Aug.	Nov.	Dec/Jan.

Source: Bicamumpaka (1982); Dürr (1983).

1 Potatoes are grown nearly all year around in these prefectures.

A few large (5 to 10 ha in potatoes), commercially-oriented growers have recently emerged in the volcanic region, principally in Gisenyi prefecture. Many of these farmers are engaged in non-agricultural occupations like the civil service and have taken up potato production because of the apparent profit-making potential.

A number of seed producers also grow potatoes in Rwanda as part of the current seed multiplication and distribution program (PNAP 1982:41-43; 1983:49-52). PNAP grows some improved potato seed on part of its 45 ha farm located at Kinigi and at a 120 ha site at Gishwati. Half this seed is then multiplied by the Service des Semences Selectionées (SSS). SSS operates seed farms for potatoes and other crops at Kanyundo (15 ha) and Mutura (20 ha) in the volcanic region as well as at Masogwe (18 ha) and Ruhunde (14 ha). The other half goes to rural development projects and farmer cooperatives for multiplication and distribution (Bicamumpaka et al. 1980).

Production Technology

Most potato producers in Rwanda utilize traditional, though complex, production technology. Growers rely on their accumulated knowledge of local soils, climate, pests, and plants. Producers utilize crop rotations and mulches, they delay plantings, and intercrop to prevent diseases. They depend heavily on labor and tool exchanges with neighbors and family. Steep hillsides prevent use of machinery and small plots make animal traction impractical (Haverkort 1986b). Purchased inputs, if any, consist almost entirely of seed, though some growers rent land in different micro-climates to reduce risk and to diversify crop production.

Two basic factors influence the choice of production technique by potato farmers in Rwanda. First, nearly all growers have limited land and meager financial resources and government-sponsored production credit for potato cultivation is scarce; thus the vast majority of farmers cannot afford to increase production by purchasing and employing greater amounts of traditional inputs like labor and seed.

Second, most modern inputs, such as chemical fertilizer and mechanical equipment, are either unavailable or prohibitively expensive (Goeteyn 1977:3), therefore most growers do not think of improving production and yields by investing in such technology.3

(iii) Varieties

Since the potato's introduction in Rwanda nearly 100 years ago, numerous varieties have been grown. No one knows how many varieties are

3 According to PNAP officials, a drop in the price of fungicides since 1983 has stimulated their use by commercially-oriented growers.

presently cultivated;4 however about a dozen varieties currently dominate production (Table 2.8).

Gashara and Magayane are local names for varieties probably introduced by the Belgians in the 1940s and 1950s (see Poats 1981:84). They are now considered traditional varieties and are known for their short vegetative cycle. Bufumbira, Malirahinda, and Muhabura came from Uganda in the 1970s. Condea, Montsama and Sangema were introduced by the Rwanda's Institut de Sciences Agronomiques (ISAR) in 1972. Since then, Sangema has proven particularly popular because growers appreciate its resistance to late blight and its floury taste. PNAP released Gahinga, Gasore, Kinigi, and Kseko in 1982 and Cruza and Petrero in 1985. Gasore is popular for its early maturity and the other varieties are all known for their high yields.

Haugerud (1985: 2-3), in her recent producer survey, found that most potato growers plant four to five different cultivars and some plant as many as eight. Growers explained that while some cultivars are more tolerant to capricious climatic conditions, others are more resistant to attacks by pests and diseases. Growers also said that some cultivars are planted because they produce tubers with the preferred starchy taste and are ideal for home consumption. Other cultivars, whose tubers have a high water content, are grown specially for sale.

(iv) Production Constraints

Potato production is handicapped primarily by diseases, a shortage of quality seed, and limited extension.

Production in virtually all of Rwanda is threatened by potato diseases. Late blight (Phytophthora infestans) is particularly widespread (see Turkensteen 1984). Bacterial wilt (Pseudomonas solanacearum) is also important especially in the south and at lower altitudes (Ibid.). Erwinia chrysanthemi can cause severe losses in some potato varieties. Lack of fungicides in more isolated areas, and a shortage of resistant varieties, make it difficult to control these diseases.

Availability of improved seed is an additional constraint (Van Loon 1983:88). The current seed program is partly a victim of its own success. As improved seed has made its way into farmers' fields and resulted in higher yields, the demand for such material has grown. Tropical growing conditions necessitate continuous introduction of clean seed to overcome recurrent late blight infestation caused by changes in the fungus population (Haverkort 1986a). Growers in more isolated parts of Rwanda, like the Gikongoro prefecture, appear to be most affected by seed shortage.

4 Haugerud (1985) found a total of 35 varieties being planted by the 90 farmers she interviewed.

Table 2.8. Rwanda: Principal potato varieties and their characteristics.

Variety	Origin	Principal place of cultivation	Vegetative Cycle (days)	Yield (t/ha)	Skin Color	Shape	Taste	Other
Bufumbira	Uganda	Volcanic region	90	2-6	white	round	good, floury	———
Condea	Germany	Central Rwanda	80-90	5-7	white	flat	good	taste not much appreciated
Cruza[1]	CIP-Lima	Recently named	110-130	20-25	white/ purple eyes	n.a.	floury	resistant to late blight and bacterial wilt, purple ring in flesh
Gahinga[1]	Mexico/ CIP Lima	recently named	110-130	n.a.	red	flat, oblong	n.a.	resistant to late blight
Gashara	Belgium	nearly all growing areas	90	1-7	white	round	good	n.a.
Gasore	Belgium	recently named	75-90	n.a.	yellow/ red	oblong to oval	n.a.	recommended for lower altitudes
Kinigi[1]	CIP-Lima	recently named	100-120	n.a.	red	round	n.a.	resistant to late blight[2]
Magayane	Belgium	nearly all growing areas	90	n.a.	purple	oblong	good	known for short duration
Malirahinda	Uganda	Buberuka commune Byumba prefecture	90	3-15	white	round	good	stores well; taste not much appreciated
Montsama[1]	Mexico	Buberuka commune Byumba prefecture	90-100	3-30	red	round	good, floury	known for good taste; short duration
Muhabura	Uganda	Volcanic region	90	3-10	white	round	poor, watery	known for high yields
Nseko[1]	Mexico/ CIP-Lima	recently named	110-130	n.a.	dark pink	oblong	n.a.	resistant to late blight
Petero[1]	CIP-Lima	recently named	100-120	20-25	red	n.a.	n.a.	resistant to late blight and bacterial wilt
Rubengera	n.a.	Central Rwanda along Zaire/Nile Divide	120	7	purple	round	poor, watery	resistant to late blight
Sangema[1]	Mexico	nearly all growing areas	100-120	4-30	pink	round	good	disease resistant[2], high yields, taste appreciated by farmers

n.a. = not available.

Source: Unpublished field notes of Haugerud and Poats.

1 Selected and distributed by PNAP.
2 Resistance to late blight declining.

Farm-level improvements in potato production are also restricted by the limitations of the extension service (see Schiffman 1982). Most potato producers can neither read nor write so personal contact is often required to transmit technical information. Settlement patterns are highly dispersed and transportation difficulties handicap extension service personnel in the exercise of their duties (Harroy 1980:209).

2.3 CONSUMPTION

Although knowledge about the evolution of potato consumption in Rwanda is scarce, European missionaries were practically the only potato consumers in the country during the early 1900s (Poats 1981:84). Taboos and mistaken beliefs were largely responsible for the reluctance of local consumers to eat potatoes. The famines of 1928-29 and 1944-45, however, induced greater potato consumption (Vander Zaag 1980:2). As the availability of potatoes expanded through the growth in production, popular perceptions of the tuber also changed. Today in many urban areas potatoes are considered a high status food. Research by Poats (1981) has contributed to the growing consensus that potato consumption may be much higher than previously believed and that ample opportunity exists for increased consumption.

(i) Potatoes in the Rwandese Diet

The diet of most Rwandese consists largely of beans, sweet potatoes, and beer from bananas and sorghum (Dürr 1983: 11). These staples are supplemented by maize, peas, cassava, and potatoes; however, the relative importance of secondary foods varies considerably by region and by season. Potato consumption is higher in producing than nonproducing areas. More potatoes are eaten during and after the main harvests because of the bimodal production pattern and the inability of most growers to store potatoes for extended periods of time. Although potatoes remain, for most Rwandese consumers, a supplementary vegetable that according to FAO accounts for about 3% of the calories available per capita per day (Table 2.9), they occuppy an increasingly important place in the average diet. Annual per capita consumption has nearly doubled in the last 10 years.

Two important exceptions to this general pattern are urban areas and those communes where potato production is unusually high. Urban diets are more diversified than rural diets because urban consumers have relatively higher incomes. In addition to the basic staples mentioned above, urban residents consume more oils, bread, and sugar than rural households (Dürr 1983:69, 71); thus, although potatoes are often a relatively expensive food, in many towns they are eaten year round.

Potatoes assume a much more prominent role in the diet in potato producing areas. In communes such as Kinigi in Ruhengeri prefecture, potatoes are planted and harvested on a nearly continuous basis throughout the year. For farm families engaged in this type of potato production, potatoes assume the role of a basic staple (Poats 1981: 87-88).

Table 2.9. Rwanda: Average daily per capita supply of calories and proteins by major food group, 1979-1981.

Food group	Per capita supply of calories (number/day)	% of total	Per capita supply of proteins (grams/day)	% of total
Roots and crops	953	49.1	10.2	20.4
(sweet potatoes)	(482)	24.9	(6.5)	13.0
(cassava)	(386)	20.0	(1.9)	3.8
(potatoes)	(66)	3.4	(1.4)	2.8
Cereals	236	12.2	6.3	12.6
Pulses	392	20.2	25.4	50.9
(dry beans)	(308)	15.9	(19.9)	39.9
Fruit	228	11.8	2.1	4.2
Oils and fats	29	1.5	0.0	0.0
Meat and offals	26	1.3	2.5	5.0
Milk	18	0.9	0.9	1.8
Vegetables	18	0.9	1.0	2.0
Nuts and oil seeds	22	1.1	1.3	2.6
Fish and seafood	0	0.0	0.1	0.2
Sugars and honey	16	0.8	0.0	0.0
Eggs	1	0.1	0.1	0.2
Total	1,939[1]	100.0	49.9[1]	100.0

Source: FAO 1984.

1 Rwandese consumers receive an additional 334 cal and 4.6 g per capita per day from the consumption of alcoholic beverages.

Potatoes are invariably consumed fresh and peeled by Rwandese consumers. Rural households prepare boiled potatoes that are then eaten with beans, peas, or corn (Ibid.: 91). Urban restaurants, hotels, and cafés frequently serve French fries. No processed potato products are made locally, nor are potatoes employed for industrial uses like alcohol or starch.

(ii) Types of Consumers

Poats (1981) has developed typologies of rural and urban potato consumers for the purpose of analyzing current consumption patterns in Rwanda (Table 2.10). Poats argues that different variables distinguish consumers within each group. Rural potato consumers include large and small-scale potato producers as well as nongrowers; hence the quantity of potatoes produced and proximity to prime growing areas differentiate consumers in the countryside. Urban consumers can be stratified on the basis of occupation and income.

Consumption Levels

Detailed information on the quantities of potatoes consumed by region and by income group will not be available until the results of the government's recent household survey are made public. In the absence of such statistics, two types of estimates merit attention: the national average level of per capita potato consumption and the quantities of potatoes consumed in different regions of the country.

Dürr (1983:29) calculated national per capita consumption at 35 kg per year in 1978 using the food balance sheet method. He took national production, subtracted 20% for seed and marketing losses, and divided by the population to arrive at his estimate. Using a similar approach, FAO statisticians report annual per capita potato consumption was 28 kg for 1975-77 and 34 kg for 1979-81 (FAO 1980b, 1984). The most recent estimate of per capita potato consumption utilizing this method is 45 kg for 1983.[5]

Poats (1981: 89-90) computed national per capita potato consumption between 85 kg and 100 kg per year in 1980. Results of her structured interviews served as the basis for this estimate.

The large discrepancy between Poats' figures and those generated by the food balance sheet method are a function both of the statistics employed (primary vs. secondary) and the methods utilized to derive them. The continued upward revision of past production statistics

5 Population estimated to be 5.7 million (World Bank 1985); production calculated at 320,000 t (Table 2.3). FAO (1985:42-44) reports annual per capita potato consumption at 7.8 kg in 1981-83, although per capita production is estimated at 51.0 kg for the same period.

Table 2.10. Rwanda: Estimates of average per capita potato consumption (kg/yr) by region and by socioeconomic group, 1980.

Commune (prefecture)	Average	Range	Avg. by Socioeconomic group
			Producers/non-producers
Kigombe (Ruhengeri)	216	140-320	320/174
Mugusa (Butare)	21	0-71	35/12
Kivumu (Kibuye)	78	15-167	85/35
Giuye (Gisenyi)	49	3-429	429/15
Kanama (Gisenyi)	191	59-500	226/66
			Big producers/small producers
Musambira (Gitarama)	15	0-48	48/12
Kigoma (Gitarama)	34	18-69	38/24
Kidaho	133	34-332	218/107
			Salaried/non-salaried
Nyakinama (Ruhengeri)	89	17-191	108/83
Kibilira (Gisenyi)	19	8-36	34/12
			Co-op members/non-members
Kivu (Gikongoro)	171	44-341	267/7
			Military/non-military
Nyarugenze (Kigali)	117	75-205	126/89

Source: Poats (1981).

Table 2.11. Rwanda: Estimates of average potato consumption (kg/capita) by region: 1967-71, 1980.

Region[1]	1967-71 (Vis et al. 1975)	1980 (Poats 1981)
East	16	26
Center	17	28
West	4	-
Periphery of volcanic Region	50	72
Zaire/Nile Divide	-	125
Urban Areas	62	153
Volcanic Region and Byumba	58	261

Source: Poats (1981).

1 See Poats (1981) for a detailed description of these regions.

undermines the credibility of the food balance sheet approach. This method repeatedly underestimates consumption by using data that underestimates production. On the other hand, the small number of interviews (n=168), and the apparent emphasis on potato producers, raises doubts about the representativeness of Poats' sample and suggest her estimate is probably inflated.

Estimates of national, per capita potato consumption in Rwanda merit three observations. First, all the figures cited are considerably higher than the 9 kg per person per year in 1980 that was projected by FAO in 1971 (Durr 1983: 28, note 1). Increased potato consumption indicates a much greater propensity for changes in eating habits than previously believed.

Second, current average per capita consumption levels are probably between 50 kg and 60 kg per year based on a simple interpolation of previous estimates. It should be emphasized that this figure is a weak "best estimate" in light of the questionable accuracy of available statistics.

Third, more research on the factors influencing potato consumption in Rwanda would be extremely useful.

Poats (1981) provides some estimates of per capita potato consumption by region and socioeconomic category (Table 2.10).6 The levels of potato consumption she reports are probably high for reasons previously mentioned. Nevertheless, her results indicate that potato consumption reflects the distribution of production around the country. This pattern seems entirely reasonable. In other words, consumers in major potato growing areas, such as Kigombe (Ruhengeri) commune, eat more potatoes than those in minor growing areas like Musambira (Gitarama) commune. Certain consumers, such as households of military personnel in the capital, are the exception. They manage to grow some potatoes and their steady incomes enable them to purchase potatoes in the off season.

The range of reported per capita consumption levels is also noteworthy. For example, in Kivumu commune, consumption per year averaged 78 kg and ranged between 15 and 167 kg (Table 2.10). This implies that increases in potato consumption are certainly possible, even in those regions where current average consumption levels are already relatively high. Poats' comparison of her results for 1980 with those of an earlier study covering the period 1968-71 reinforces this impression (Table 2.11). Different methods were employed in these studies so their findings must be compared with caution. Still, the general tendency is clear. Potato consumption increased in every region between the two periods. Moreover, the highest increases appear to have taken place in those regions where consumption was already quite high. In the volcanic region, consumption rose from 58 kg/capita/yr in 1967-71 to 261

6 Interested readers should see Dürr (1983: 66-67) for information by prefecture in 1969-71 as well as Laure (1982) for data on Kanama Commune, Gisenyi, in 1980-81.

kg/capita/yr in 1980. Finally, the high level of potato consumption among nonproducers in Ruhengeri versus small and even large-scale producers in Gitarama prefecture, suggests that improvements in the transfer of potatoes between rural areas might be one way to raise consumption levels nationwide.

(iii) Tastes and Preferences[7]

Taste and size are the two characteristics most frequently mentioned by Rwandese potato consumers. Rural consumers especially prefer a potato that is "floury." Conversely, they tend to describe poor quality potatoes as "watery" (Table 2.8). One apparent justification for this particular preference is related to rural cooking habits. Consumers in these areas are accustomed to boiling their potatoes; they cannot afford to purchase oils for frying. If the potato being cooked is "watery," then it has a tendency to crack and to decompose in preparation.

Urban consumers generally prefer large potatoes. There appear to be two reasons for this. First, large size facilitates cooking. Second, some urban consumers, and even some consumers in rural markets such as Gikongoro, associate large potatoes with those grown in the volcanic region. In the minds of these consumers, potatoes from this region are of particularly high quality because the area's soils produce a better tasting tuber.[8] These potatoes are also more likely to be fresh because growers in the volcanic region produce potatoes throughout the year.

Skin color and shape are of minor importance to most consumers. Consequently, there are no price differentials for red-skinned versus white-skinned potatoes as is the case in Kenya for example (see Dürr and Lorenzl 1980: 100). Round, oblong, and oval shaped potatoes are equally acceptable.

(iv) Consumption Constraints

Constraints to increased potato consumption vary by region. In marginal or nonproducing areas, high prices discourage rural consumers from buying potatoes (Durr 1983:29). They simply cannot afford them.

Meager food budgets also restrict increased potato consumption in urban areas, though potato prices in the major towns are generally lower

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7 This section is based on informal interviews with growers, traders, and consumers carried out for this study as well as personal communication with Angelique Haugerud, formerly of PNAP.

8 Differences of opinion exist on this issue. Haugerud observes that some consumers consider potatoes from Gisenyi and Ruhengeri to be more watery -- hence of lower quality -- than those from Byumba, but that this varies greatly by cultivar (Haugerud, personal communication). Dürr (1983:31) makes a similar observation.

than those in rural markets outside potato production regions. Nevertheless, in urban markets like Kigali substitutes such as sweet potatoes are generally cheaper than potatoes.[9]

In potato producing regions, increases in potato consumption are restrained by seasonal production patterns, storage problems, and tastes and preferences. Potato consumption is higher in certain months than in others partly because rainfall patterns and traditional crop rotations restrict off-season production. Growers also tend to harvest potato tubers prematurely, causing their skins to peel and consequently eliminating the possibility of storage (Hunt 1983: 57-64). Finally, while potatoes are a preferred food in many areas, beans, bananas and, in some instances, maize are also desirable. Growers with a relative abundance of potatoes may sell or barter some tubers to procure other foods, either to diversify their diets or to consume more foods of customary importance like bananas for beer.

2.4 MARKETING

Potatoes are regularly referred to in Rwanda as a cash crop. This characterization is correct in the sense that growers sell some potatoes for cash and these sales may represent an important source of cash income. However, it is misleading to suggest that potato marketing is similar to the marketing of crops such as coffee which is produced exclusively for sale. The bulk of marketed potatoes are sold in domestic markets by private traders. Coffee is sold in foreign markets by a state marketing agency. Producer prices for potatoes are not subject to government intervention whereas producer prices for coffee are.

(i) Foreign Trade

Rwanda normally exports about 2,000 t of potatoes a year or less than 1% of annual production. These potatoes are sold in Burundi and Zaire.[10] Rwanda does not import potatoes.

Annual shipments from Rwanda to Burundi in recent years (early 1980s) have averaged about 1,500 t according to traders interviewed in

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9 According to PNAP officials, the drought of late 1984 made sweet potatoes less abundant in early 1985. As a result, sweet potatoes became more expensive than potatoes in certain urban markets. This shift in relative prices (potatoes versus sweet potatoes) appears to have been only temporary.

10 According to Haugerud, plans are underway (1986) to ship some Rwandese potatoes to Gabon and the Central African Republic (Haugerud, personal communication).

both countries.[11] These potatoes are normally purchased from rural traders in the volcanic region or in the Ruhengeri market from where they are trucked to Butare for resale to Kayanza and Bujumbura (Map 2.2). Larger trucker/traders in both the Ruhengeri area and in Butare appear to be involved in this business although information is scarce due to occasional restrictions on potato exports.

A few hundred tons of potatoes produced in Gisenyi prefecture are also marketed across the border in northeastern Zaire each year (Map 2.2). Primarily growers or small-scale, itinerant traders sell these potatoes. They carry them into Zaire in baskets (paniers) on their heads.

(ii) Domestic Commerce

Most observers estimate that between 35% and 50% of Rwanda's potatoes are marketed (Table 2.12). The percentage of total potato output that is traded does not appear to have grown with the expanded production of the late 1970s and early 1980s.[12] The evidence to support this apparent trend is largely conjectural as few figures exist. Still, Poats' pilot survey results indicate considerable on-farm consumption. In addition, the modest rise in retail prices for potatoes in Kigali suggests a moderate rise in quantities sold.

Sharp increases in the volume and share of potatoes sold were projected for 1980-84 in the five principal potato producing prefectures: Byumba, Gikongoro, Gisenyi, Kibuye, and Ruhengeri (République Rwandaise 1981:30). The volume of potatoes sold does appear to have increased with the growth in output in these areas. The percentage of total production marketed, however, probably has remained roughly 40%.

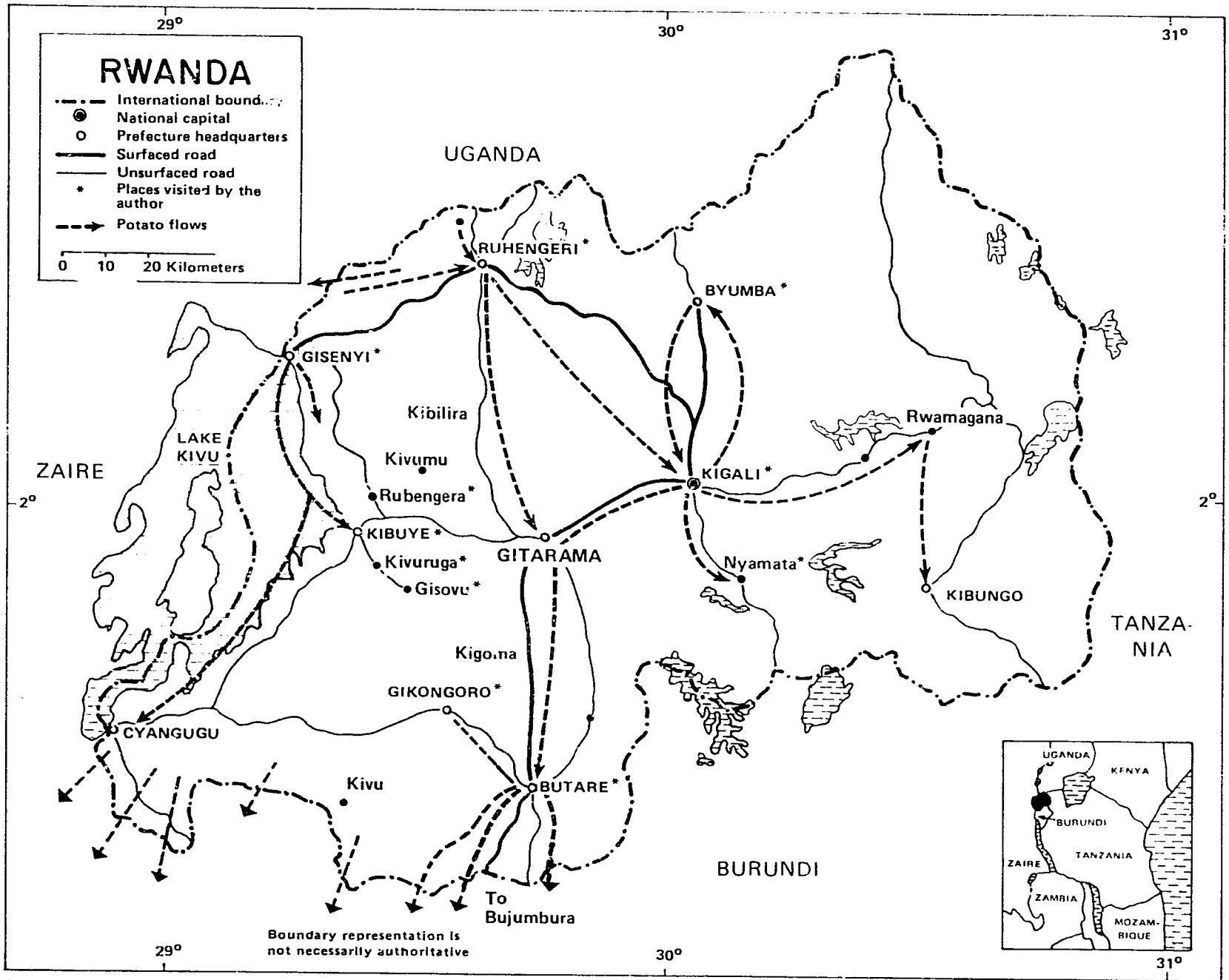
Both the percentage of total production marketed and the quantity of potatoes sold varies by region in Rwanda. According to unpublished data from Poats' survey, the percentage of marketable surpluses is highest (45%) in the volcanic region (Map 2.1). Reasons for this would include greater land area planted in potatoes per farm, higher yields, and multiple crops during the calendar year. Total quantities sold are also highest in the volcanic region because production in this area is greatest.

A smaller percent of production is sold along other parts of the Zaire/Nile Divide and in the marginal growing areas in the eastern part of the country. Poats' unpublished data for 1980 indicate 15% - 25% was sold. Ministry estimates for 1979 show 30% - 40% was marketed. Smaller total land area in potatoes, due to fewer plantings per year and lower yields in these areas, means that growers have fewer potatoes to cover food and seed requirements.

11 Some reports estimate annual potato exports to Burundi as low as 500 t or as high as 8,000 t (Dürr 1983:24).

12 The 60% - 70% for 1980 reported by IFAGRARIA (1980:75) seems unrealistically high.

Map 2.2. Rwanda: Principal potato flows.



Source: Elaborated for this study.

Table 2.12. Rwanda: Estimates of potatoes marketed as a percent of total production: selected years.

Year	Marketable Surplus (%)	Source	Basis
1970	14	World Bank	Economic accounts
1975	36	Ibid.	MinAgri
	48	République Rwandaise (1977: Table XIII)	MinAgri
1976	47	Ibid.	MinAgri
	40	World Bank	MinAgri
1977	38	Morris (1979:68)	n.a.
	less than 50	Dürr (1983: 21,29)	Informal interviews with growers
1979	45	World Bank	MinAgri
1980	35	Poats unpublished data	Pilot consumption survey
	60-70	IFAGRARIA (1980: 75)	n.a.
1981	48	République Rwandaise (1981: 58)	n.a.
1982[1]	40-50	Monares (1984: 9,14)	MinAgri

n.a. = not available.

1 According to PNAP personnel, MinAgri statisticians recently estimated 45% of production is marketed.

(iii) Marketing Channels and Participants

Marketing Channels

Rwandese potatoes are sold through two foreign and three domestic marketing channels. Foreign marketing channels consist of l .g-distance shipments by trucks to Burundi and local, small-scale trade across the border with Zaire. Principal domestic channels include local rural and rural-to-urban shipments.

Most potatoes are traded through local, rural marketing channels (Figure 2.1). This includes exchange between producers and their neighbors or relatives, sale to rural traders who in turn supply non-producers with table potatoes or seed, or sale to rural petty retailers (itinerant traders or revendeurs) in local markets. These merchants then resell the potatoes to area consumers. An estimated 75% of all potatoes are traded through local channels.

The importance of rural marketing channels is substantiated by two observations. First, most estimates calculate 40%, or approximately 130,000 t, of potato production is marketed based on 1983-84 production estimates; yet urban demand plus exports account for roughly 30,000 t.[13] The remaining 100,000 t are most likely traded in adjacent producing regions because the low incomes of households in other rural areas discourage potato purchases.

Second, Poats' findings indicate that potato consumption by non-producers in the volcanic region is higher than that of growers in other regions or of urban consumers (Table 2.10). If some potato producers prefer to sell or barter their surpluses in order to consume more sorghum and bananas, then other producers do just the opposite. Moreover, nonproducer, potato-consuming households are roughly one third to one half of all the farm households in Gisenyi and Ruhengeri prefectures, or from 300,000 to 500,000 people, a substantial number of consumers (République Rwandaise 1982b: 6).'[14]

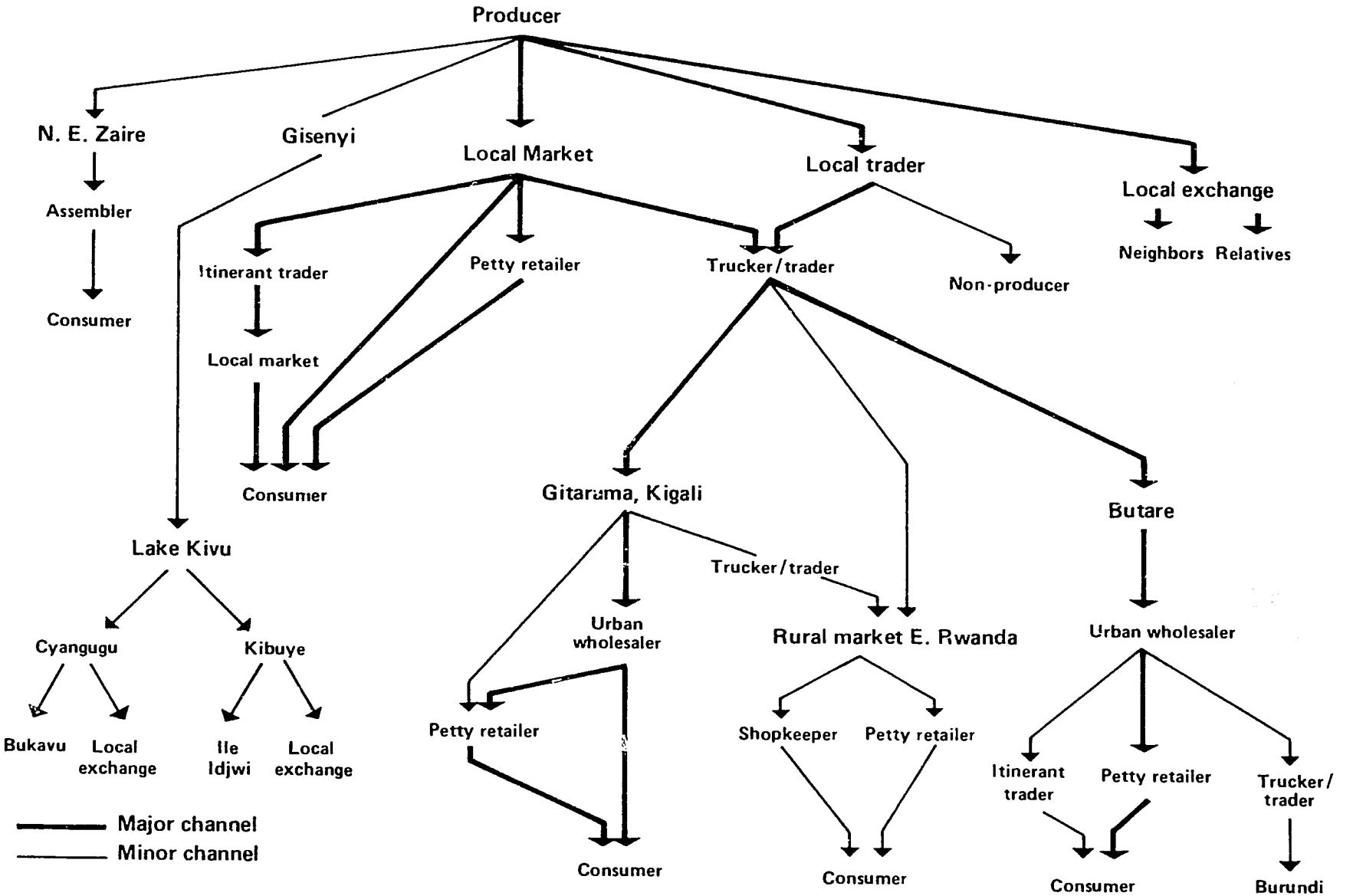
Rural-to-urban marketing channels involve the transfer of potatoes from the countryside to Gisenyi, Ruhengeri, and then on to Kigali, Gitarama and Butare (Map 2.2). Some potatoes also are shipped from Byumba to Kigali. Based on Dürr's (1983:29) and Poats' estimates (Table 2.10), urban residents consume approximately 29,000 t of potatoes per year.[15] Most potatoes sold in Kigali are shipped from the volcanic region by trucker/traders who operate 2-3 t pickup trucks. Typically,

13 Urban population is assumed to be roughly 290,000 people (5% of 5.8 million). Annual urban consumption assumed to be 100 kg per capita, or 29,000 t in total.

14 This estimate is based on estimates presented in République Rwandaise (1981:12

15 These estimates are higher than Dürr's figures to take in account the growth in demand since 1979.

Figure 2.1. Rwanda: Principal marketing channels for potatoes.



Source: Elaborated for this study.

these traders collect the potatoes at the house/warehouse of a rural trader or at markets in Gisenyi or Ruhengeri and sell them either to wholesalers in central Kigali (or Butare) or directly to retailers in suburban markets. A few traders based either in Ruhengeri or the capital operate larger vehicles (5-10 t cargo capacity). Gitarama receives potatoes directly from Ruhengeri, from Kigali wholesalers, or from trucks that make interim sales on their route to Butare. Potatoes may move from Byumba to Kigali in July and January and from Kigali to Byumba in September and April.

Some potatoes (1,000-2,000 t) are also sold in rural areas outside the prime potato producing areas. Growers in these more marginal regions sell local potatoes for local consumption. In addition, trader/truckers will transport potatoes directly from the volcanic region or from Kigali and sell them in outlying settlements or areas in the far eastern part of the country (Map 2.2).

Marketing Participants

Several different participants in potato marketing can be identified:

- producers
- rural traders
- cooperatives
- trucker/traders
- urban wholesalers, and
- urban petty retailers.

Producers. Most potato producers sell at least some potatoes in small lots (less than 50 kg) when they need cash. Growers also barter potatoes.

The vast majority of growers trade their potatoes in nearby markets, at the closest cooperative's depot, or at the local rural trader.[16] A few commercial growers around Gisenyi reportedly sell their potatoes by prior arrangement right from the field to trucker/traders (Waldstein 1983: 5).

Rural traders. Some rural traders in the volcanic region act as assemblers. They accumulate small lots of potatoes into several tons in their home or shop. They themselves, however, generally do little trading. Moreover, they require buyers to provide the sacks and labor for bagging as well as hire their own vehicle for transporting the potatoes. The primary service these rural traders provide growers is prompt payment in cash -- unlike some cooperatives that make producers

16 Some growers apparently walk up to 20 km to market their potatoes.

wait for their money. These rural traders also reportedly are less stringent on grading than some co-op buyers and their place of business is often more convenient than depots or markets which can be several hours walking distance from home.

Many different kinds of traders sell potatoes retail in rural areas. They include itinerant traders who buy potatoes (typically less than 100 kg) in one weekly rural fair and sell them in another; revendeurs, who resell small quantities of potatoes that they purchased in the same market on the same day; producers who sell their own potatoes; and rural traders or shopkeepers who sell potatoes by the kilo direct to the public.

Cooperatives. Travail, Fidelité et Progres (TRAFIPRO) a nationwide cooperative with headquarters in Kigali, buys 5 to 10 t of potatoes each week at a depot in Kinigi. Most of these tubers are sold in Kigali, but a few are shipped by launch from Gisenyi to Kibuye and Cyangugu. TRAFIPRO's administrative personnel consider potato sales a social service to their member-consumers. In their view, potato marketing is not very profitable.

Several producer organizations dedicated to rural development have also marketed potatoes since 1979. They include the pre-cooperative Caprage Jenda in Nkuli commune, the groupement Shingiro in Mukingo commune, the pre-cooperatives Cavepraki and Coproviki, and the groupement Bisate in Kinigi commune. These organizations market potatoes for growers and in some instances rent them space in cooperative storage facilities. They usually sell farm supplies and offer technical assistance in the form of documentation and group meetings with technical personnel. Their principal outlets for potatoes are hotels, secondary schools, and wholesalers in Kigali.

Some growers prefer to sell to TRAFIPRO or through one of the rural development organizations because they feel they can get a better price and more accurate weight for their potatoes than they can from a private trader. Still, for various reasons, all these institutions have had difficulty in securing adequate volumes of tubers. Many farmers only sell to cooperatives when the prices offered by private traders are very low because producers must carry their potatoes to the co-op depot, grade the potatoes themselves, and accept back small or damaged tubers. Marketing depots for certain cooperatives also have suffered from poor location.

Trucker/traders. Most potatoes are transported through one of two types of truckers/traders. The first type are transporters who haul various commodities like coffee, sorghum, beans. These transporters haul potatoes for urban merchants on a per kilo prior arrangement basis or they purchase potatoes in one area, ship them to another, and sell them in bulk on arrival. The second type are full-time potato traders who own their own vehicles. These traders haul potatoes on a regular basis from the growing areas (or from Kigali) to their place of business. They then sell the tubers per basket to retailers or per kilo to consumers.

The service furnished by the first type of trucker/trader is transportation. The second type provides both transportation and bulk-breaking.

Urban wholesalers. Most potatoes shipped to large towns are sold to wholesalers who have shops adjacent to the central market. There are less than ten wholesalers in Butare and Kigali and only one or two in Gitarama. These merchants handle much larger volumes than other potato traders. Wholesalers in the capital sell 5 to 10 t per week and as many as 35 t the last week of the month. They receive potatoes by the truckload and sell most by the sack or basket. Urban wholesalers often specialize in table potatoes, although they may also sell other foodstuffs.

Most urban wholesalers have a regular set of trucker suppliers; however they are seldom willing to provide truckers cash advances to purchase potatoes on their behalf or to sell retailers potatoes on credit. Wholesalers will advance potatoes to retailers in the morning and receive payment at the end of the day.

Urban petty retailers. These traders sell potatoes in small quantities directly to consumers. Some sit in open-air, central markets or in shop verandas. Others peddle tubers by walking or riding a bicycle through suburban neighborhoods. Most of these petty retailers tend to specialize in potatoes. Still, their daily volumes are small -- 50-200 kg. Urban petty retailers generally allow consumers to see the ungraded potatoes that they are buying, but subtly discourage them from selecting their own. They do this to avoid being stuck with small tubers. Sales are always for cash.

The main service provided by both rural and urban retailers is bulk-breaking. Some urban petty retailers also make purchases more convenient by carrying the potatoes to locations closer to the consumer's place of residence. Traders do very little grading and store potatoes only for short periods.

Marketing Procedures

Marketing procedures for potatoes sold in Rwanda generally are informal. No written contracts, receipts, standardized grades, or packages are used.[17] Prices are negotiated at the time and place of sale on the basis of bargaining between buyers and sellers.

17 Truckers must record with a provincial-level commerce inspector the quantity of potatoes they have brought into a market to sell (see sec. 2.4 (v) below). Exceptions to this general rule are the potatoes sold by order to the University in Butare, by Ruhengeri traders, and the marketing arrangements between certain producer/organizations in Gisenyi prefecture and hotels in Kigali.

Few rural traders and urban wholesalers offer credit (Waldstein 1983: 5). Risks associated with potato production discourage advances to growers prior to harvest. Rural traders are also reluctanct to tie themselves to a specific trucker/trader. Though they often may know their buyer, they usually negotiate and finalize a sale when the potatoes are bagged and loaded.

Government officials say that producers are victimized by middlemen -- traders allegedly pay low prices and reap high profits. Evidence to substantiate this claim is mixed. Most peasant potato producers are unable to read or write, live in geographically isolated communities, and are short on cash at harvest. Furthermore, rural and urban traders frequently practice a sort of price leadership. On a given day they settle on a price per kilo which all merchants tend to follow. This means that growers are in a disadvantageous bargaining position. Representatives of producer marketing organizations, however, often refer to the risks of potato marketing and the small profit margins that rival private traders consider acceptable. DÜrr (1983:31) has noted that producer prices depend on the size, condition, and quality of the tubers. Traders pay more for large potatoes such as Sangema and Muhabura varieties. If the potatoes are in poor condition (covered with mud, the skins peeling) traders will offer the same price per kilo, but deduct a certain percentage from the total paid to cover shrinkage losses. Hence, some traders probably do take advantage of growers. However, the propensity of traders to pay low prices -- especially at harvest -- reflects fundamental supply and demand conditions as well as the risks associated with the potato trade (see Sec. 2.4 (iv) below).

(iv) Prices and Margins

Retail prices for potatoes in Kigali -- in nominal FRW per kilo -- rose by over 175% between 1965/66 and 1977/78 (Table 2.13). This increase was higher than for sweet potatoes, plantains, or manioc flour. Nonetheless, year-to-year price changes were less erratic for potatoes than for several other foodstuffs.

Price increases were particularly acute from 1973 to 1975 when they moved from 8 to 15 FRW/kg. The sharp drop in potato production from 1973 to 1974 seems partly responsible (Table 2.3). The rapid rise in the official minimum wage from 30 FRW/day in 1973 to 60 FRW/day by late 1974 probably also contributed. The supply of potatoes fell, demand rose with the increase in urban wages, and the combined effect was a nearly 100% jump in prices. As output steadily accelerated in the late 1970s and wages remained stationary, potato prices also stabilized.

DÜrr (1983: 28) has noted that monthly potato prices are generally highest each year from May to Jul /August. The within-year price fluctuations largely correspond to recognized growing seasons for potatoes (Table 2.7). After the bulk of the main crop has been harvested and sold, prices rise. In addition, a shortage of transport usually develops at this time of year as most truckers are busy with the coffee harvest.

Table 2.13. Rwanda: Average prices (FRW/kg) for potatoes and other selected commodities in Kigali, 1965/66 versus 1977/78.

	1965/66	1977/78	% Increase 1965/66-1977/78
Official minimum wage	17.0	60.0	353
Beans	14.7	25.7	179
Sweet potatoes	6.9	10.1	147
Potatoes	7.9	13.9	178
Plantains	9.2	11.4	124
Cassava (flour)	16.9	23.3	139
Smoked fish	13.0	158.0	1,215
Eggs	63.3	204.0	322

Source: Laure (1979).

Monthly price changes include several unpredictable elements. For instance, peak retail prices in Kigali have ocurred in May (1976), July (1977), and August (1981). The magnitude of the increase from harvest ending prices in April has varied from 7% in 1976, to 45% in 1977, to 31% in 1981. Prices have gone up after the short-season harvest in some years and fallen in others. Uncertainty about price movements, as well as the wet condition of the tubers, particularly during the main season, discourage rural traders from storing for speculative purposes (Dürr 1983:31; Waldstein 1983:7).

Spatial Price Comparisons

Potato prices vary considerably from one market to another in Rwanda. This topic has not been studied thoroughly; however, field notes prepared by Poats (1980) indicate that during one week in July 1980 prices offered growers in 11 potato markets ranged from 5 to 18 FRW/kg (Table 2.14).

Prices tend to be lowest in markets like Kinigi that are located in the prime, potato growing area. They are 20% to 100% higher in Ruhengeri some 15 km away. This difference reflects growers' relatively weak bargaining position, trucking costs, and the risks associated with potato marketing. Traders report difficulties finding a complete truckload of potatoes on a buying trip, getting stuck on an isolated rural road with a truck-full of perishable produce, or an inability to sell the potatoes at the anticipated price upon arrival in Ruhengeri. Therefore 20% increase in price between Kinigi and Ruhengeri probably just covers transportation costs.

Data presented in Poats (1980) for 1980 and Dürr (1983: 57) for 1971-73 indicate prices in Ruhengeri and Kigali move in parallel fashion. Still, much smaller differences occur -- 1-2 FRW/kg versus 2.5-3 FRW/kg -- in the off-season months of May to September than in the peak harvesting periods from January to April and October. Prices are actually higher in Ruhengeri than in Kigali in July and November (Table 2.14).

These price differentials tend to reflect seasonal changes in supply and demand conditions in the two markets. Prices are very low at harvest because there is an abundance of potatoes. Food requirements of grower households are easily satisfied at this time. Producers are eager to sell in order to obtain cash. In fact, producers sometimes sell potatoes at very low prices to receive at least some money for tubers that were harvested prematurely or were soaked by rain after digging. In the months after harvest, the opposite situation develops. Prices in the countryside turn upward and continue to rise. Traders in Kigali are discouraged from maintaining the high mark-up, in part because of the availability of alternative foods. For example, beans are abundant in the months when potatoes are scarce (Dürr 1983:28). When potato prices reach their peak in Ruhengeri, traders in Kigali most likely secure their supplies from other growing areas, such as Byumba in July, where the harvest is in full force and prices are lower (Table 2.14).

Table 2.14. Rwanda: Average weekly buying and selling prices for potatoes (FRW/kg) in selected markets, 1980.[1]

Market (Commune)	WEEK 1		2		3		4		5	
	A	B	A	B	A	B	A	B	A	B
Ruhengeri (Nyakinama)	12	15	13	15	12	15	12	15	12-13	15
Kabuga (Gikoro)	16	18	10	15	12	16	—	—	—	—
Rwamagana (Rutonde)	--	--	--	--	17	20	17	20	17	20
Kigali (Nyarugenge)	12	16	12	16	12	17	13	17	11	16
Musambira (Musambira)	15	20	20	25	14	20	20	25	20	25
Ruhango (Kigoma)	14	16	15	18	15	20	20	23	18	20
Mugusa (Mugusa)	--	--	--	--	--	--	20	25	20	25
Muganza (Kivu)	18	20	18	20	--	--	18	20	20	22
Kivumu (Kivumu)	15	20	15	20	15	20	15	20	15	20
Gatumba (Kibilira)	17	20	17	20	17	20	17	20	17	20
Kinigi (Kinigi)	10	12	9	12	9	10	8	10	7	10

Market (Commune)	WEEK 6		7		8		9		10	
	A	B	A	B	A	B	A	B	A	B
Ruhengeri (Nyakinama)	13	15	11-12	15	10	13	10	13		
Kabuga (Gikoro)	--	--	--	--	--	--	--	--		
Rwamagana (Rutonde)	17	22	18	22	18	22	18	22		
Kigali (Nyarugenge)	13	16	13	16	14	16	13	16		
Musambira (Musambira)	20	25	20	25	20	25	20	25	20	25
Ruhango (Kigoma)	17	20	15	18	15	17	16	18	16	17
Mugusa (Mugusa)	19	23	19	22	19	22	19	22	—	--
Muganza (Kivu)	20	22	20	22	20	22	20	22	--	--
Kivumu (Kivumu)	15	20	15	20	15	20	15	20	15	0
Gatumba (Kibilira)	13	18	13	18	13	18	13	18	13	18
Kinigi (Kinigi)	6	10	6	10	7	9	7	9	6	8

A = buying price. B = selling price.

1 Average prices per week beginning July 7 and ending September 12, 1980.

Source: Poats, unpublished field notes.

Relative Prices

Potatoes were cheaper on a per kilo basis than bananas, beans, sorghum (beer), and manioc (flour) throughout much of the 1960s and 1970s though they tended to be more expensive than sweet potatoes (Laure 1979). When a drought in 1984 reduced supplies of sweet potatoes to certain urban markets, sweet potatoes became more expensive.

Despite their low price on a per kilo basis, potatoes are a relatively expensive source of calories (Table 2.15). This situation does not appear to have changed with the growth in production during the late 1970s and early 1980s. A continued rapid increase in potato production, accompanied by a slowdown in the rate of growth of production of other food crops, could make potatoes relatively less expensive in the years ahead. Nevertheless, accelerating population expansion will place upward pressure on all food prices.

Marketing Margins

The increment in potato prices between the grower and consumer is a topic of considerable controversy in Rwanda. Information on this issue is scarce, but can be grouped under three headings:

- buying and selling prices in the countryside;
- buying and selling prices in urban areas; and
- analyzing prices paid and received in the entire marketing chain.

Differences between buying and selling prices in the countryside vary considerably. For example, Dürr (1983:31) reports, on the basis of his field work in the Gisenyi-Ruhengeri area in 1979, that assembler/traders received about 1 FRW/kg when the price to the grower was 5 to 7 FRW/kg. Dürr (Ibid.: 78) also reports a producer cooperative's buying and selling prices for potatoes in Gisenyi for selected months in 1977-79. In 1977, this difference ranged between 3 FRW/kg in July to 1 FRW/kg in November/December; in 1978, between 3.5 FRW/kg in June/July and 1 FRW/kg in November/December; and in 1979, between 3 FRW/kg in May/June and 2 FRW/kg in April and October. Although the figures are not strictly comparable, they suggest that the cooperative has tended to operate with a higher mark-up than private traders.[18]

Weekly average prices during July to September 1980 recorded by Poats indicate the difference in price per kilo tends to be smaller in rural markets in the producing areas, such as Kinigi and Ruhengeri, than in urban or rural markets in non-producing areas, such as Kigali or Rwamagana (Table 2.14). Potato merchants in rural markets far from

18 A technical advisor to one of the cooperatives contacted for this study supports this observation (see also Harroy 1980:208).

Table 2.15. Rwanda: Cost per unit of energy and protein supplied through selected food commodities, 1981.

	Average price/kg (Kigali 1981)	Energy Kcal/kg	Protein g/kg	Energy FRW/1,000 kcal	Protein FRW/kg
Beans	22.8	3,000	220	7.6	103.6
Potatoes	13.7	800	17	17.1	805.9
Sweet potatoes	13.1	1,100	20	11.9	655
Banana	16.2	1,100	13	14.7	1,246.2

Source: Energy and Protein data, Dürr (1983:44); Price data, Ministry of Commerce.

Table 2.16. Rwanda: Prices and margins for potatoes, 1983.

Marketing Participant	Selling price (FRW/kg)	Price Sold less price paid (FRW/kg)	Marketing Margin[1]
Grower near Ruhengeri	6.0	6.0	42
Local rural trader near Ruhengeri	7.0	1.0	7
Trucker/trader (Ruhengeri to Kigali)	11.0	4.0	29
Wholesaler in Kigali	12.5	1.5	11
Retailer in Kigali	14.0	1.5	11

Source: Elaborated for this study.

1 Price sold less price paid divided by retail price.

prime, producing areas probably face little competition; however they work with smaller volumes as the high selling price dampens sales. Handling losses of these merchants are also probably higher because there is greater shrinkage in the warmer, lower altitudes.

What accounts for the large discrepancy between the per kilo earnings of potato merchants in Ruhengeri and Kinigi as reported by Poats versus those described by Dürr? Merchants studied by Poats sold potatoes retail. Their larger margins result from the small volumes sold per sale and per day. In contrast, assembler traders studied by Dürr generally sell several tons of potatoes and expect to earn less per kilo when they do so.

Price checks carried out for this survey showed that wholesalers in Butare, Gitarama, and Kigali received approximately 1 to 2 FRW/kg. They typically purchased at 11-12 FRW/kg and sold at 12-13 FRW/kg.19 Retailers in these locations received similar amounts per kilo, roughly 1-2 FRW/kg. Retailers in smaller towns such as Byumba, Gisenyi, Kibuye, Rubengera, and Ruhengeri received 2-3 FRW/kg. These larger price differentials reflect not only the reduced competition but also the greater risks associated with marketing potatoes at these sites.

Based on prices gathered for this survey, growers around Ruhengeri received roughly 40% to 45% of the final consumer price in Kigali (Table 2.16). Assembler/traders and trucker/traders received 7% to 8% and 25% to 30% respectively. Wholesalers and retailers in the capital each obtained from 8% to 13%. Poor road links between principal potato growing areas and the capital as well as the risks of long-distance trading explain the major share received by trucker/traders. Marketing personnel for cooperatives based in the Ruhengeri area sometimes have had difficulty selling potatoes at the anticipated price in the capital. As a result, the cooperatives suffered losses on these shipments.

The percentage received by each market participant is highly variable in both space and time. Growers receive 100% of the final price for potatoes sold directly to rural consumers in provincial markets such as Kibuye. The grower's share averages about 80% for potatoes sold in Kora and in Gisenyi. Alternatively the grower's share of the final consumer price can fall as low as 30% for shipments between Ruhengeri and Kigali during peak harvesting periods (see Dürr 1983: 78-79, 81).

(v) Government Programs and Policies

Direct, government involvement in potato marketing is minimal. While the government has declared offical prices for potatoes as well as acceptable profit margins for food commodities, it does not have the resources to enforce these measures. Still, the government influences potato marketing through its taxes, licenses, record-keeping, and the authorized wholesale distribution of potatoes at the provincial level.

19 These are rough estimates of average daily prices based on field work in October, 1983.

Taxes and Licenses

Potato traders in most locations pay a daily tax, taxe d'emplacement, to the commune or municipality for occupying space in the marketplace. This tax equals the prevailing price for one unit of goods to be sold; so if one small pile of potatoes is selling for 20 FRW, then the daily market tax is 20 FRW. In some areas, petty retailers are not charged the daily market tax because it is assumed that they are producers selling part of their harvest. In others, anyone who sells potatoes in the marketplace must pay the tax.

Traders who work from a storefront in the prefecture capitals, especially Kigali, also pay a licensing fee. Traders pay a one-time fee of 5,000 FRW to have their names recorded in the registry as authorized sellers of the product indicated and these records are maintained by the office of the Inspecteur du Commerce in each major town.

Traders around the central square in Kigali do not have to pay a daily market fee to the commune, however, they do pay 500 FRW/mo for the collection and disposal of bad potatoes and trash. The commune has suspended retail sale of potatoes in Kigali's central market in an effort to organize the market. Traders in neighboring markets such as Nyamirambo and Nyabugogo pay 500 FRW for an ambulatory commerce card, carte du commerce ambulant, as well as the daily tax in the market itself.

Record Keeping and Authorized Wholesaling

While marketing procedures for potatoes are generally informal, they are not entirely unregulated. Each trucker/trader must see to it that the quantity of potatoes that he brings into an area to sell is recorded by personnel from the local commerce inspector's office. The inspector then authorizes and records the quantities of potatoes sold to area retailers. As a civil servant (and, in this capacity, required to work outside his prefecture of birth), the commerce inspector can exercise considerable control over trade in his area of jurisdiction. Some inspectors are more vigorous in performing their duties than others. The individual trucker/trader's commercial success may depend on his working relationship with such authorities. Consequently, trucker/traders continuously attempt to cultivate improved political/social ties with local commerce inspectors.

(vi) Marketing Constraints

Transportation, credit, and information are the principal constraints to improved potato marketing. While the government's ambitious road-building program has greatly improved road links between major towns, most potato growers still live in remote areas and usually reside in a highly dispersed fashion across the countryside (Schiffman 1982). Under such circumstances, the existing network of unpaved, rural roads severely hampers assembly and transfer of potatoes not only to urban areas but also between rural markets. The resulting transporta-

tion bottlenecks inflate post-harvest losses, increase risk, reduce competition, raise marketing costs and prices, and thereby impede greater consumption of potatoes off the farm.

Many growers sell their potatoes at harvest when prices are lowest because at the end of the growing season they need cash. On the other hand, traders, cooperatives, and truckers also need capital to participate in marketing (see, e.g. Reintsma n.d.) and little institutional credit is currently available for small-scale trading ventures. The shortage of credit serves to perpetuate forced selling by growers, limits entry into this type of commerce by prospective traders, and handicaps efforts toward greater vertical integration by producers and established merchants. It also aggravates seasonal supply/price movements and creates greater instability in all facets of potato marketing.

Most potato marketing is underreported by government agencies. Prices are collected and sales are monitored in major towns but official statistics are rarely analyzed and only made available on a restricted basis after considerable delay. As a result, marketing participants' knowledge of prices and quantities traded, while at times surprisingly accurate, more often simply reflects local supply and demand conditions. Moreover, growers, traders, and public officials are frequently caught unaware of sharp, year-to-year changes in area planted and production. Subsequent developments in the potato trade, like temporary gluts, leave little time for policy makers and administrators to alleviate the resulting marketing crises.

Additional farm-level, marketing constraints include the shortage of good-quality seed and post-harvest extension. Poor, degenerated seed produces disease-infested tubers. These potatoes are highly susceptible to losses in storage, handling, and transport. Similarly, growers often harvest their potatoes prematurely causing the skins to peel. The resulting poor appearance means lower prices for producers. Yet, agricultural extension to improve grading and handling remains weak.

Finally, minimal marketing infrastructure further handicaps potato trading. In both rural and urban markets, few public facilities, like scales and storage deposits, are available. Telecommunication between markets is either poor or nonexistant.

2.5 CONCLUSIONS

The potato has attracted increasing attention in Rwanda for two reasons. First, alarming rates of population growth and a rapidly vanishing agricultural frontier have generated various strategies to increase food production (see e.g., République Rwandaise 1982a, 1983c). Second, recent spectacular increases in area planted and output of potatoes suggest the crop's potential may be far greater than previously believed. Marketing issues, however, have raised doubts about the potato's future. Topics of particular interest concern the types of growers who produce potatoes, the relative importance of different marketing channels, rural producer-urban consumer price differentials, and the prospects for increased potato consumption.

Small Growers Dominate Production

The vast majority of producers are small-scale, semi-subsistence farmers. Hence, they produce potatoes primarily for on-farm use as food and seed. Potatoes are attractive for these farmers because, with available technology, they can satisfy household consumption requirements and still market 40% of harvested production. The structure and orientation of production have two important implications for potato marketing.

First, because 95% of the nation's population lives in the countryside and population growth rates are currently over 3.5% per annum, the rural demand for food will grow accordingly. Population growth, however, will inevitably reduce average farm size.[20] This will force growers to produce as much, if not more, food on less land and farmers will be strongly inclined to use productivity improvements as a means to achieve this objective. In the process, higher yields from the use of improved seed potatoes will enable farmers to free lands for other crops and reduce agronomic risk by maintaining a diversified cropping pattern.

Second, the structure of potato trade will become more fragmented. As the rural population expands, the number of farms will increase. Thus, the number of producers participating in potato marketing will grow. At the same time, the potential for high yields (and low unit production costs), the expanding demand for food in towns, and the improved highway system, will stimulate large-scale, commercial, potato production. This implies an increased demand for marketing services like transport, extension, and credit by both small and large-scale farmers.

Rural Marketing Channels Are Most Important

Although the largest single markets are in urban areas such as Kigali, marketing channels that serve the rural population are far more important. Calculations based on the limited available data suggest that roughly 75% of all potatoes sold move through local rural trading channels. In contrast, about 15% of potatoes sold go to urban areas. Less than 5% are exported or sold through long-distance channels in rural markets.

Most potatoes sold move through rural marketing channels for the following reasons: nearly all consumers live in the countryside; potatoes are bulky and perishable; rural settlement patterns are highly dispersed; and rural roads are poor. Consequently, assembly and transport from growing regions to urban markets is difficult and costly. Until recently, potatoes had been relatively expensive for most urban consumers. In production centers themselves, however, potatoes have always been remarkably cheap. These low prices facilitate barter or sale to local consumers.

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20 The prefectures in which they produce the most potatoes are those in which the population per km2 of arable land is highest (Klaver 1979).

Transport Costs Dominate Marketing Margins

Growers in the Ruhengeri area receive (October 1983) roughly 40% of the price paid by Kigali consumers. When producer prices decline due to seasonal gluts or a bumper crop, growers receive an even smaller percentage of the urban retail price. Many observers attribute these rural producer-urban consumer price differentials to the weak bargaining position of peasant producers, especially at harvest. However, informal interviews carried out for this survey suggest marketing costs and risks are more important reasons.[21]

Trucker/traders have the highest marketing margin of all potato traders in the Ruhengeri-Kigali marketing channels. They receive 30% or more of the urban retail price depending on farm prices; if producer prices fall, trucker/traders' share of the retail price goes up. This large marketing margin reflects the essential physical marketing functions trucker/traders perform, the costs they absorb, and the risks they incur.

Finally, concern over rural producer-urban consumer price differentials has meant that two other phenomena are overlooked. First, attempts to substitute producer cooperatives for private traders have not been successful. One reason is that the marketing margins of private merchants are more modest than commonly believed. Second, primary attention given to rural-to-urban trade distracts policy makers from local, rural marketing; yet local, rural marketing channels handle the bulk of potatoes traded.

Population, Prices, and Potato Consumption

Population growth is the most important factor influencing future prospects for potato consumption. Rwandese generally like the taste of potatoes. Producers themselves eat substantial quantities. Nevertheless, national average per capita consumption levels (around 50 kg/yr) are modest compared with Europe (81.3 kg/yr).[22] With a population growth rate over 3.5% per year, it will be difficult to sustain annual increases in output that will maintain current per capita consumption levels. The biggest increase in production in recent years has come in those prefectures most ideally suited to potato production like Gisenyi (Table 2.4). As good quality seed and improved agronomic practices are introduced in more marginal areas, production increases are likely to be more modest.

In the near future temporary gluts may develop due to bumper crops, particularly in certain areas where new technology is introduced or commercial potato production emerges. Growers' cash incomes from

21 These estimates are only rough approximations.

22 Figures for Europe are taken from Horton and Fano (1985).

potatoes may shrink unless the increase in yields, and decline in unit production costs, are sufficient to offset the fall in producer prices. As a result, growers may shift marginal amounts of land to other crops. Still, nonproducers in potato growing areas should benefit from lower producer prices and the improved highway links between the Ruhengeri and other major towns should reduce transport costs, cause urban prices to fall, and spur greater potato consumption. These transitory developments, however, should not distract policy makers and program leaders from the urgent task of sustaining increases in food production in the medium and long-term.

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ZAIRE

Chapter 3

Currency Equivalents
(October 1983)

Currency Unit	=	Zairian Zaire
Z 32.00	=	US$ 1.00
Z 320.00	=	US$ 10.00

Weights and Measures

Zairian System		Equivalent
1 kilometer (km)	=	.62 mile (mi)
1 are	=	.01 hectare (ha)
1 kilo (kg)	=	2.205 pounds (lb)
1 ton (t)	=	1000 (kg)/2.205 (lb)

Abbreviations

CIP	=	Centre International de la Pomme de Terre (International Potato Center)
CECOPANE	=	Centre de Commercialisation des Produits Agricoles du Nord-Est (Marketing Center for Agricultural Products from the Northeast)
COVEPALA	=	Cooperative de Vente des Produits Agricoles du Lac Amin (Marketing Co-operative for Agricultural Products from Lake Amin Region)
INERA	=	Institut National d'Etude et de la Recherche Agronomique (National Institute for Agronomic Research and Studies)
ITAV	=	Institut Technique Agricole et Vétérinaire, Butembo (Technical Institute for Agricultural and Veterinaty Studies, Butembo)
SOCOPLAKI	=	Société de Commercialisation de Plantes Agricoles du Kivu (Kivu Marketing Company for Agricultural Crops)
UMAKI	=	Union Maraîchere Agricole du Kivu (Kivu Vegetable Groweres' Union)

Zaire is a mineral-rich nation nearly the size of Western Europe. Despite its size and abundant natural resources, Zaire's index of per capita food production has fluctuated considerably during the last decade (World Bank 1985; 1987). Consequently, the country's capacity to feed itself has been called into question. A series of disturbing trends are apparent. Estimated rates of population growth continue to be revised upward. Mounting foreign debt and declining terms of trade have halted economic growth and diminished the nation's ability to import food. Gross National Product per capita is currently estimated at US$170 (World Bank 1987). Interest in the potato and its potential in increasing domestic food production, reducing dependence on imports, and raising rural incomes has emerged in this context.

Potato program personnel and foreign technicians frequently express special concern about marketing issues (see Haverkort 1985a: 68-69). Most observers agree that the introduction of improved seed and agronomic practices could increase yields well above the present national average of 6.0 t/ha. Until now, however, potato production has been concentrated in the remote eastern side of the country (Map 3.1). Major urban markets, in particular the capital city of Kinshasa, are located 2,000 km away. The following questions are important:

- If growers produce more potatoes, where will these potatoes be marketed?
- What factors influence urban demand for potatoes?
- How might potato producers and urban consumers be more effectively linked?

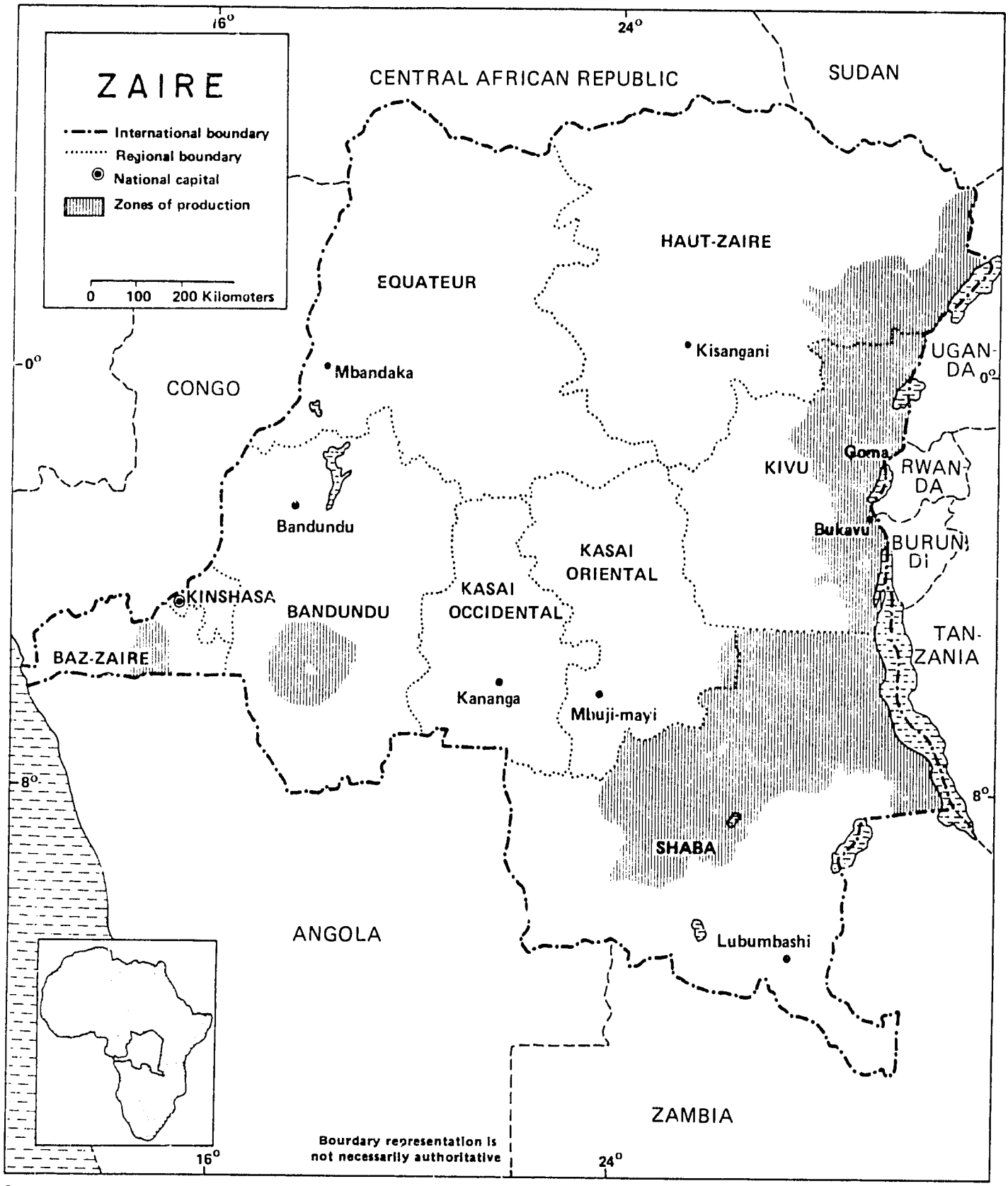
The following chapter analyzes past and present potato production and consumption patterns, and relates them to current marketing practices in order to answer these questions. Official statistics, earlier studies (in particular, Haverkort (1985a) and SDIS (1981)), and the author's field work in the North Kivu region provide the basis for this analysis.

3.1 MACROECONOMIC SETTING[1]

Zaire's Gross National Product (GNP) per capita declined at an average annual rate of -2.1% during 1965-85. Growth was especially weak in the last decade as the world recession reduced demand for the country's primary commodities. The value of exports suffered as the terms of trade sharply deteriorated between 1973 and 1983. External public debt, outstanding and disbursed, rose from 17.6% to 132% of GNP during the same period. These events placed serious financial restrictions on the economy.

1 Unless otherwise indicated, all data cited in this section are taken from World Bank (1985, 1987).

Map 3.1. Zaire: Principal potato growing areas.



Source: Potato Program – INERA.

During the same period population continued to grow at 3.0% per annum and the growth rate is projected to reach 3.0% during the 1980s and 1990s. Moreover, towns and cities expanded by roughly 7% a year from 1973 to 1983 and, as a result, today nearly 40% of the nation lives in urban areas. The government's new development strategy emphasizes agricultural output and improved marketing to feed the growing, and increasingly urban, population.

(i) Agricultural Performance, Goals and Strategy

Performance

Agriculture grew at an average annual rate of 1.4% from 1973 to 1984. It was the only sector with a positive growth rate. Agriculture's share of Gross Domestic Product (GDP) increased from 21% to 31% between 1965 and 1985.

Annual food production in Zaire includes manioc (14.2 million t), bananas (1.5 million t), sugar cane (0.7 million t), and maize (0.7 million t). All these crops experienced an average annual rate of growth in excess of 4.5% between 1960 and 1980 (Table 3.1).

Despite declining yields (Table 3.1), potato production increased at an even faster rate. Average yields for potatoes (5.5 t/ha) still exceed those for secondary crops like sweet potatoes, maize, rice, and peanuts. As a result, potatoes have attracted increasing attention as an crop with unrealized potential.

Goals and Strategy

Zaire's plan for agricultural development gives top priority to self-sufficiency in food production (République du Zaire 1982:2). Development strategy calls for two principal thrusts: re-organization of marketing and technical assistance to growers. Specific measures intended to improve domestic food marketing include:

- setting of regional support prices;
- designating private economic agents to purchase, collect, and transfer food surpluses to the cities;
- providing these private economic agents with marketing credit;
- maintaining highways and access roads in agricultural regions; and,
- furnishing food producers with basic commodities.

Technical assistance to growers emphasizes planning by both region and product. Training and technical assistance for peasant producers will be carried out by the Departments of Agriculture and Rural Development in cooperation with the private sector. The Department of Agricul-

Table 3.1. Zaire: Production, area and yield of principal food crops, 1961/65 versus 1982/84.

	Production (000 t)		Annual average rate of increase (%)	Area (000 ha)		Annual average rate of increase (%)	Yield (t/ha)		Annual average rate of increase (%)
	1961/65	1982/84	1961/65-1982/84	1961/65	1982/84	1961/65-1982/84	1961/65	1982/84	1961/65-1982/84
Manioc	7,676	14,527	4.3	614	2,087	11.4	12.5	7.0	-2.1
Banana	45	323	29.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sugar cane	351	733	5.2	11	18	3.0	32.8	41.6	1.3
Sweet potato	269	315	0.8	46	65	2.0	5.8	4.8	-0.8
Maize	239	678	8.7	266	813	9.8	0.9	0.8	-0.5
Peanuts	133	369	8.4	222	520	6.4	0.6	0.7	0.8
Rice	62	256	14.9	72	321	16.5	0.9	0.8	-0.5
Potato	19	204	46.4	3	35[1]	56.1	6.0	5.8	-0.2

n.a. = not available.

Source: FAO. Production Yearbook Vol. 30 and Vol. 38.

1 FAO estimate.

ture will be charged, in particular, with the distribution of improved seed in all regions of the country.

Finally, the Plan envisions that private firms, integrated, rural-development projects, and cooperatives will play a prominent role both in increasing output and improving food marketing, e.g., Canadian-funded technical assistance to Compagnie pour la Commercialisation des Produits Agricoles du Nord-Est (CECOPANE) in the Kivu region.

(ii) Potatoes in Zairian Agriculture

Potatoes are thought to have unrealized potential in Zaire for a number of reasons (see, e.g., Mundundu n.d.).

Five of Zaire's nine political-administrative regions have ecological conditions that favor potato production. These regions include Bas-Zaire (near Mbanza Ngungu and surrounding areas), Bandundu (Feshi, Kalemba), Haut-Zaire (Ituri), Shaba, and Kivu.

The vegetative cycle of the potato is relatively short. Consequently, the potato is ready to harvest in three to four months whereas manioc requires from 18 to 24 months to reach maturity (except in the case of unusually early varieties). The potato is also a relatively high yielding crop.

Many small producers located in Zaire's higher altitude regions (above 2,000 m) already produce potatoes; however these growers have been forced to rely on their own, or locally available, degenerated seed material. The introduction of improved seed could markedly improve yields.

One of the principal problems in developing more precise objectives for food production in Zaire is the shortage of information. A 5.5% projected annual growth rate (1981-84) for horticultural crops referred to potatoes but no specific targets for increased potato production were made in the Plan for 1982-84.

3.2 PRODUCTION

Potatoes were introduced into the territory of present day Zaire during the last century (Mundundu 1985). Subsequently production evolved such that potatoes are now planted in five regions of the Republic with cultivation largely concentrated in the Kivu region (Map 3.1).

(i) Production, Area, and Yields

Potato production in Zaire rose 100% during the last 20 years from less than 20,000 t in 1961-65 to over 220,000 t in 1984 (Table 3.2). Little information exists about factors contributing to this spectacular increase in output and published statistics must be interpreted with caution.

Table 3.2. Zaire: Potato production, area and yield, 1961/65-1984.

Year	Production (000 t)	Area (000 ha)	Yield (t/ha)
1961/65	18.5	3.0	5.2
1966	27.0	5.0	5.4
1967	28.0	5.2	5.4
1968	29.0	5.4	5.4
1969	30.2	5.6	5.4
1970	28.4	5.2	5.5
1971	37.0	8.0	4.6
1972	45.0	10.0	4.5
1973	60.0	12.0	5.0
1974	75.0	15.0	5.0
1975	110.0	20.0	5.5
1976	120.0	22.0	5.5
1977	130.0	24.0	5.5
1978	140.0	26.0	5.4
1979	150.0	28.0	5.4
1980	165.0	30.0	5.5
1981	175.0	32.0	5.5
1982	193.0	35.0	5.5
1983	200.0	35.0	5.7
1984	220.0	35.0	6.3

Source: FAO.

A rapid expansion in area planted appears largely responsible for the growth in potato production. Official figures indicate that area planted has risen steadily from 3,000 to 35,000 ha during the last 20 years. In contrast, average yields initially fell from 5.2 t/ha in 1961-65 to 4.5 t/ha in 1972, then recovered to 5.8 t/ha in 1982-84.

These divergent trends seem reasonable in light of demographic and agronomic developments. Population growth in the prime potato growing areas such as the Kivu region (see Carael et al. 1979:8), are probably responsible for the extension of area planted. At the same time, yields have declined due to the high incidence of diseases, degenerated seed, and the cultivation of marginal land.

The initial improvement in yields since 1971-72 probably resulted from tubers brought from other areas via immigration and informal trade (see Haverkort 1985b:8). Recent efforts by the national potato program to improve cultivation practices partly account for the latest increase in yields (Ibid.).

Observations about the level of national potato production, area, and yields must be qualified as the statistics themselves have recently undergone drastic revision. For example, potato production for 1980-82 was previously estimated by FAO at 31,000 t (Horton and Fano 1985) whereas the revised figure is 178,000 t (Table 3.2). Recent official estimates of the area planted by region suggest that the nationwide total may be as high as 50,000-60,000 ha (Mundundu 1985), or about double the official statistics.

Location of Production

Potato production in Kivu region represents from 50% (Mundundu 1985) to 85% (Table 3.2 and 3.3) of the national total. Potatoes are also cultivated in Bandundu, Bas Zaire, Haut-Zaire, Kivu, and Shaba regions (Map 3.1). The percentage of national output produced in these regions is not known.

Within the Kivu region itself, potato production is concentrated in certain growing areas. Thus, while potatoes rank fifth among food crops in terms of total production on a regional basis (Table 3.3), they are considerably more important in the higher altitude areas above 2,000 m (Haverkort 1985b). Moreover, over 90% of total regional production is located in the subregion of North Kivu (Table 3.4). Growers in the Misisi zone of North Kivu alone produced roughly 65% of all the potatoes harvested in the Kivu region, 55% of the national total, during the 1981-82 agricultural year (Table 3.2 and 3.3).[2]

2 These observations are subject to the qualification that the data may under or overestimate production in certain zones. Official statistics appear to underestimate area planted in the Lubero zone (see Haverkort 1985b:7).

Table 3.3. Zaire: Production, area, and yield of principal food crops in Kivu region, 1981/82.

Crops	Production (000 t)	Area (000 ha)	Yield (t/ha)
Cassava	1,849.3	273.1	6.8
Sweet potatoes[1]	n.a.	n.a.	n.a.
Beans	263.3	280.0	0.9
Maize	246.1	216.2	1.1
Potatoes	157.7	28.6	5.5
Paddy	111.1	127.3	0.9
Peanuts	107.7	105.6	1.0
Sorghum	58.9	82.2	0.7
Legumes	32.6	5.9	5.5
Wheat	9.9	13.1	0.8
Soybeans	5.3	6.9	0.8

Source: Cabinet du Gouverneur de la Région de Kivu, Productions vivrières, Campagne 1981/82.

Sweet potatoes are among the most important crops in the Kivu region in terms of total production; however, regional statistics for this commodity are not available.

Table 3.4. Zaire: Potato production, area, and yield in Kivu region by zones, 1981/82.

Zones	Production (t)	Area (ha)	Yield (t/ha)
Subregion of North Kivu			
Beni	11,200	1,835	6.1
Goma	n.a.	n.a.	n.a.
Lubero	19,868	2,843	7.0
Masisi	102,859	18,235	5.6
Rutshuru	10,143	1,923	5.3
Walikali	161	97	1.7
Subregion of South Kivu			
Fizi	56	141	0.4
Idjwi	288	411	0.7
Kabare	198	137	1.4
Kalehe	2,805	935	3.0
Mwenga	363	165	2.2
Shabundo	n.a.	n.a.	n.a.

n.a. = not available.

Source: Cabinet du Gouverneur de la Région de Kivu, Productions vivrières, Campagne 1981/82 (as cited in Haverkort 1985b).

Annual potato production in the Kivu region has fluctuated considerably. Data are only available for the Lubero zone and only for certain years. Nevertheless, the statistics show that production fell from 25,000 t in 1969 to 4,000 t in 1972, then rose to 12,000 t in 1974 (Table 3.5). Haverkort (1985b:8) attributes these oscillations to recurrent spells of dry weather that, in turn, induced heavy attacks of late blight. Yields recovered as the weather improved and new varieties reduced the impact of diseases.

Growing Seasons

Although potatoes are harvested throughout the year, production is most intense during two major, and one minor, growing seasons. The timing and relative importance of these seasons varies from year to year and from growing area to growing area depending on local rainfall patterns.

Planting for the most important season generally occurs in October and November. This crop is cultivated at higher altitudes (above 2,000 m) on rain-fed, hillside fields. Harvesting usually takes place in March and April, though in some areas it extends into May (Durocher 1985).

A second major crop is planted in April and harvested from mid-August to mid-October. In some zones the harvest goes into December and January (Ibid.). This crop is also rain-fed and cultivated at higher altitudes on hillside fields. These two major crops are particularly important in North Kivu.

A third, potato crop is grown in lower altitude, bottom land (marais) during the dry season. This crop is much less important in the North Kivu region.

(iii) Producers and their Technology

Types of Producers

Potato producers in Zaire, particularly those in North Kivu, are small, resource-poor farmers. Given population density and prevailing land tenure arrangements in the potato growing areas, the average farm household has a very limited amount of land at its disposal. Durocher (1985) estimates the typical farmer in North Kivu cultivates about 1.3 ha/yr and only a proportion of total farmland is devoted to potatoes. According to the most recent government statistics, 153,000 farmers in the Kivu region plant an average of 0.2 ha/yr in potatoes (see Haverkort 1985b). Crop rotation patterns are such that potato production is divided into growing seasons. During each season, potatoes are grown in a series of small, separate plots. The scale of farm operations for potato producers, therefore, is small indeed.

Table 3.5. Zaire: Potato production, area, yield, and percentage sold in the Lubero zone (North Kivu), 1956-1980.

Years	Production	Area	Yield	Percentage sold
	(000 t)	(000 ha)	(t/ha)	(%)
1956	8.1	1.2	6.8	n.a.
1957	15.0	1.9	7.9	n.a.
1958	6.5	0.9	7.2	n.a.
1959	6.0	0.6	10.0	n.a.
1960	n.a.	n.a.	n.a.	n.a.
1961	5.7	1.1	5.2	n.a.
1962	n.a.	n.a.	n.a.	n.a.
1963	n.a.	n.a.	n.a.	n.a.
1964	n.a.	n.a.	n.a.	n.a.
1965	n.a.	n.a.	n.a.	n.a.
1966	n.a.	n.a.	n.a.	n.a.
1967	17.5	3.5	5.0	n.a.
1968	16.6	3.3	5.0	n.a.
1969	24.7	4.1	6.0	n.a.
1970	4.3	1.1	3.9	n.a.
1971	6.9	2.2	3.1	28.9
1972	4.1	2.1	2.0	60.7
1973	7.5	3.8	2.0	42.2
1974	11.8	7.9	1.5	20.6
1975	10.8	4.8	2.3	22.2
1976	9.6	n.a.	n.a.	27.6
1977	3.7	n.a.	n.a.	51.8
1978	8.5	n.a.	n.a.	30.3
1979	18.2	n.a.	n.a.	10.7
1980	14.9	n.a.	n.a.	21.9

n.a. = not available.

Source: National Potato Program in Zaire (as cited in Haverkort 1985b).

National Potato Program (NPP) personnel in the Kivu region produce seed potatoes on experiment stations at Mulungu (near Bukavu) and Ndihira (Map 3.2). Seed harvested at Mulungu is sold directly to growers. Tubers grown at Ndihira are sold to technicians at the Centre d'Adaptation Permanent du Service de l'Agriculture (CAPSA) at Luotu, 60 km from Butembo. This seed is then multiplied at the center at Luotu (4 ha) and Kipese (2 ha) and distributed to local growers (Haverkort 1985b; Katsuva 1985).

Production Technology

Potato producers rely heavily on traditional cultivation techniques. They use no modern inputs like chemical fertilizers, pesticides, or machinery. Such products are not sold in the geographically isolated, potato-growing areas (Haverkort 1986). Moreover, growers could not afford to buy them even if they were available. Production credit for potatoes through government lending agencies does not exist. Instead, peasant potato farmers employ family labor or rely on traditional labor exchange. They utilize simple hand tools such as a hoe and machete and they either plant their own tubers as seed, or they barter/purchase new seed from neighbors or in local markets. According to FAO estimates, growers in Zaire use about 1,100 kg of seed potato per hectare.[3] However, in North Kivu producers use as much as 3,000 kg of seed per hectare because they plant big tubers and place them close together.[4]

(iv) Varieties

Seseni is among the most widely grown potato varieties in Zaire, particularly in the North Kivu region. Brought from Uganda in the early 1970s (Haverkort 1985b), Seseni has proven popular with growers for three reasons. First, Seseni is resistant to late blight — a widespread disease which severely reduces yields.

Second, Seseni is also resistan to Verticilium albo-atrum. This disease is commonly found in fields in which potatoes are continuously planted. According to Turkensteen (1984:5), farmers in some North Kivu villages have planted potatoes in the same field for more than 40 years, therefore, Verticilium is an important disease and susceptible varieties can suffer up to 60% losses in yields. Seseni appears less affected than other locally grown varieties (Ibid.).

Third, Seseni has a long vegetative cycle that allows farmers to harvest some potatoes after three, four, and up to six months. The possibility of multiple harvests is especially attractive to growers

3 Based on unpublished FAO statistics for 1981.

4 Turkensteen, personal communication

because it eliminates the labor requirements associated with continuous replanting.[5] In addition, it permits some tubers to be collected at irregular intervals in response to short-term changes in potato prices or the periodic cash needs of the household. Recurrent gathering of tubers also corresponds to the continuous food requirements of the farm family.[6]

Sientje, Eigenheimer, Nervea, Marita, Deka Tendria, and Pimpenel are among other potato varieties introduced by Europeans over 25 years ago and currently grown in Zaire. Sientje is of Dutch origin and is perhaps the most important among this group. It has a vegetative cycle of 100-110 days, but can be harvested early. Still, Sientje and all these other varieties are now highly degenerated as no improved potato seed of any kind was introduced from 1960 to 1979 (Mundundu 1985).

Beginning in 1980, Zaire's NPP initiated trials with improved genetic material. The varieties included were: Atsimba, Montsama, and Sangema. Small quantities of these varieties have recently been distributed in the Kivu region.

(v) Production Constraints

Declining soil fertility, potato diseases, a shortage of good quality seed and the geographic isolation of growers are the principal farm-level constraints to potato production. Furthermore, farm households will be increasingly hard pressed to maintain production levels as population pressure continues to reduce farm size in the potato growing areas.

As more farm households crowd into the same limited area, fallow periods are shortened. Steep terrain in North Kivu makes erosion a serious problem (Katsuva 1985). Potato production involves intensive use of available soil nutrients; thus the steady expansion of area planted in potatoes, combined with serious erosion problems, further accelerate soil depletion.

Diseases such as late blight (Phytophthora infestans), bacterial wilt (Pseudomonas solanacearum), and Verticillium albo-atrum are also important constraints. Late blight reduces yields directly by attacking the plant itself and indirectly by inducing shifts in planting time that increase the risk of damage due to inadequate rainfall. Bacterial wilt causes losses both in the field and after harvest that can be as high as 40%. Verticillim causes wilting and early maturity.

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5 According to Durocher (1985), the labor requirements for potatoes are among the highest for any crop grown in North Kivu.

6 The disadvantages of multiple harvests are that the tubers are frequently gathered prematurely. As a result, they do not store well. Moreover, their appearance suffers easily in transportation and handling; the skins peel which in turn affects their marketability.

The shortage of good quality seed is a related and major constraint. From 1960 until 1980, the NPP's activities consisted entirely of maintaining the existing germplasm collection (Bouwe 1983). No new varieties were tested. No improved seed was distributed. Program leaders, in collaboration with the International Potato Center (CIP), established a small, seed multiplication program in 1980 and while these efforts show promise, they continue to be hampered by financial and manpower constraints (Mundundu 1985).

The geographic isolation of peasant potato producers combined with the limited resources of the extension service also represent a major constraint to improved potato production. The North Kivu region, in particular, is in one of the most remote parts of the country. The extension service has few funds for either farm visits or a program of grower-oriented, on-farm research. Thus, with the exception of those growers located near a small number of special, rural-development projects, the vast majority of potato producers are beyond the reach of technical assistance.

3.3 CONSUMPTION

Although the potato currently plays a minor role in the average consumer diet in Zaire, its importance as a food crop among certain segments of the population is sometimes overlooked. Recent production increases have all been consumed within the country. Furthermore, the favorable prospects for greater output suggest that the potato's potential contribution to nutrition levels and consumption patterns has yet to be realized.

(i) Potatoes in the Zairian Diet

Cassava, maize, plaintains, and rice are the staple foods in Zaire (FAO 1984). Cassava alone accounts for nearly 60% of total calorie consumption on an average daily basis (Table 3.6). Consumption of these foods is supplemented by palm oil, peanuts, wheat (in the form of bread in urban areas), sweet potatoes, dry beans, bananas, and yams. Potatoes account for less than 1% of average daily total calories and proteins. Still, their importance in particular diets varies from that of a luxury vegetable to a near staple.

Potatoes are a scarce and expensive food commodity for the vast majority of urban consumers. If available at all, they are sold as a highly priced vegetable in shops, hotels, and restaurants that cater exclusively to upper-income clientele. This is especially true in larger cities such as Kinshasa, where pockets of wealthy consumers are willing and able to purchase costly, fresh vegetables. In towns and smaller cities adjacent to the principal production zones (Butembo, Goma in the Kivu region), potatoes are sold on a regular basis as one of any number of complementary vegetables eaten by the more affluent segments of the local population.

Potatoes play a considerably more important role in the diets of farm households in the potato producing areas. This is particularly

Table 3.6. Zaire: Average daily per capita supply of calories and proteins by major food group, 1979-1981.[1]

Food group	Per capita supply of calories (number per day)	% of total	Per capita supply of proteins (grams per day)	% of total
Roots and crops	1,243	59.4	8.0	24.5
(sweet potatoes)	(23)	(1.1)	(0.3)	(0.9)
(cassava flour)	(1193)	(57.0)	(7.2)	(22.1)
(potatoes)	(8)	(0.4)	(0.2)	(0.6)
Cereals	309	14.8	7.7	23.6
Pulses	39	1.9	2.6	8.0
(dry beans)	(24)	(1.1)	(1.6)	(4.9)
Fruit	131	6.3	1.4	4.3
Oils and fats	163	7.8	0.0	0.0
Meat and offals	39	1.9	4.2	12.9
Milk	3	0.1	0.3	0.9
Vegetables	31	1.5	2.3	7.1
Nuts and oil seeds	97	4.6	4.2	12.9
Fish and seafood	12	0.6	1.8	5.5
Sugars and honey	24	1.1	0.0	0.0
Eggs	1	0.0	0.1	0.3
Total	2,092[1]	100.0	32.6[1]	100.0

Source: FAO 1984.

1 Consumers in Zaire receive an additional 33.0 cal and 0.4 g of proteins per person per day from alcoholic beverages.

true in the high altitude (above 2,300 m) regions of North Kivu. In these areas, potato cultivation is nearly continuous, alternative crops are few, and marketed surpluses are a minor percent of total output.

The form in which potatoes are consumed in Zaire varies by region. Potatoes are boiled in rural areas. They frequently are served as French fries in cafes, hotels, and restaurants in urban areas. Potatoes are not processed in Zaire to make snack foods or industrial products such as starch or alcohol.

(ii) Types of Consumers

Potato consumers in Zaire can be classified into urban and rural groups. The former group consists primarily of wealthy Zairians (e.g., high-ranking civil servants), tourists, and resident expatriates. This group also includes some middle-income Zairians in population centers close to the prime, potato growing areas. Producers, and a certain number of non-potato growing, rural households located in the major production zones, constitute the overwhelming majority of rural consumers. Rural consumers far from the potato growing areas rarely eat potatoes. These households have limited purchasing power; hence the high price of what for them is an unusual tuber, discourages consumption.

Consumption Levels

Estimated average per capita potato consumption in Zaire has gone from 1.7 kg/yr to 4.1 kg/yr between 1965 and 1980 according to FAO calculations (FAO 1971, 1980).[7] The increase largely reflects the recent accelerated growth in domestic potato production. Potato imports declined during the last decade (see Section 3.3 below).

Consumption Levels in Kinshasa

Household budget surveys carried out in Kinshasa indicate per capita potato consumption in the capital remained at or below 2.5 kg/yr throughout the 1970s. Results of various studies summarized in SDIS (1981) indicate per capita consumption fluctuated from 1.2 kg/yr in 1969 to 2.5 kg/yr in 1975 to .1 kg/yr in 1980.[8] These per capita consumption levels suggest the total demand for potatoes in Kinshasa fell from roughly 5000 t in 1970 to 2000 t in 1980 (Ibid.).

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7 Horton and Fano (1985) reported average annual per capita potato consumption in Zaire to be 0.8 kg during 1980-82. They used FAO data. The difference between their figure and that of more recent FAO calculations referred to above can be traced to recently revised estimates of potato production.

8 The estimate for 1969 includes sweet potatoes. The 1980 figure is based on interviews by SDIS researchers with over 1,700 consumers and was corroborated by data on monthly potato shipments into the capital.

Shifts in the demand for potatoes in the capital result from the segmentation of the Kinshasa market. Demand for potatoes among local consumers shrank to nearly zero (100 t) while that of expatriates remained fairly steady (1,900 t). The apparent sharp contraction in local demand is attributed to an estimated 30% drop in real incomes during the 1970s (SDIS 1981). Potatoes became cheaper compared to manioc during the 1970s (Table 3.11), however, with an estimated price elasticity of -0.1, price changes had little impact on consumption.

Consumption Levels in Provincial Urban Areas

Results of periodic research conducted outside the capital indicate sharp variations in the level of potato consumption in different parts of the country and among different segments of the population. For example, estimated potato consumption in Kisangani was less than 5 kg/capita/yr in 1972.[9] Statistics on potato shipments in and out of Kisangani between July 1979 and June 1980 indicate that potato consumption among resident expatriates was 75 kg/capita/yr and 1 kg/capita/yr for local consumers (Ibid.). Similar procedures were used in Goma and potato consumption there was conservatively estimated at 13.1 kg/capita/yr (Ibid.).[10] The relatively high level of average per capita potato consumption in Goma is attributed to the regular influx of tourists and the distinct eating habits of the local populace.

Consumption Levels in Producer Households

The level of potato consumption among producer households in North Kivu ranges between less than 0.1 kg/capita/yr at altitudes below 2,000 m to 130-220 kg/capita/yr above 2,300 m.[11]. The available evidence suggests potatoes are far more important in the crop rotations of peasant farmers at high altitudes. Consumption by nonproducers residing in potato growing areas in North Kivu has not been studied.

In summary, Zaire has different types of potato consumers. Local eating habits and regional production patterns as well as income differentials influence the quantity of potatoes consumed. Relatively

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9 This figure includes potatoes and sweet potatoes.

10 Actual level of potato consumption in Goma is probably higher than 13.1 kg because of the flow of potatoes into the city from neighboring Rwanda. SDIS (1981) researchers apparently failed to take account of these shipments.

11 The latter figures are based on an average total production of 3,000 kg per year less 650-850 kg sold (see Durocher 1985); 25% from the remaining 2,150-2,350 kg is deducted for seed and shrinkage, and the remainder divided by estimated household size (8-12 people).

high levels of potato consumption in those areas where potatoes are regularly available at a moderate price imply that there is potential to increase consumption in markets where potatoes are now a scarce, luxury vegetable. Demand projections for potatoes in Kinshasa, based largely on the estimated future growth in per capita income, underestimate this potential because they do not take into account improvements in production and marketing. Furthermore, the emphasis on food requirements and consumption patterns in the capital tends to obscure the existing and potential contribution of potatoes in the diets of consumers in other parts of the country.

(iii) Tastes and Preferences

Tastes and preferences of potato consumers in Zaire tend to vary by income group and place of residence. Wealthy, expatriate consumers in large cities such as Kinshasa are especially selective. They prefer highly uniform, sparkling-clean potatoes that are neatly packaged. According to traders contacted for this survey, potatoes shipped to the capital from North Kivu have sold at lower prices than imported potatoes because they were of mixed sizes, skin color, and condition. At least some consumers in Kinshasa reportedly favor potatoes that are round to oval rather than oblong and medium to large tubers are prefered over those that are egg-sized or smaller.

Local, low-income consumers in the North Kivu growing areas are far less demanding in terms of the potato's appearance, size, and shape. They purchase potatoes with a minimum amount of attention to spoiled or damaged tubers. No persistent price differentials exist between potatoes of different skin color or size. Most observers agree that local consumers like the taste of potatoes.[12]

(iv) Consumption Constraints

The high price of potatoes relative to other foods is perhaps the most important constraint to increased potato consumption. The vast majority of households have meager food budgets and therefore cannot afford regular purchases of expensive vegetables. This constraint is particularly important among urban consumers in the major cities and rural consumers in the nonproducing areas such as in the Equateur region.

The seasonal, and occasionally erratic, availability of potatoes in the marketplace is a second major constraint to increased potato consumption. At certain times of the year, particularly during June, July, and August, few, if any, local potatoes are available outside the prime growing areas.

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12 In some isolated instances, potatoes were reportedly considered either "poor people's food" or less appetizing than sweet potatoes or manioc.

In rural, nonproducing areas, unfamiliarity with potatoes constitutes an additional constraint to increased consumption. Within a country as vast as Zaire, many rural consumers rarely see potatoes. Therefore they have limited knowledge of when, how, or for whom to prepare them. Such considerations may hamper future efforts to increase potato consumption.

In the potato growing areas, population growth, reduced farm size, and the decline in soil fertility are forcing producers to raise yields in order to maintain existing consumption levels. These same factors, in turn, handicap prospects for increased potato consumption.

3.4 MARKETING

In Zaire, producers, program leaders, and policy makers each have their own perspective on potato marketing. Producers consider potatoes not only an important food crop but also a valuable source of cash income. NPP personnel see potato marketing as a potential stumbling block to grower adaptation of yield-increasing, technical improvements. Policy makers view improved potato marketing as one means to help meet both the growing food requirements of urban areas and the policy objectives of reducing food dependence and raising rural incomes.

(i) Foreign Trade

Annual potato exports from Zaire have been less than 20 t during the last 25 years.[13] Zaire's neighbors, Burundi, Rwanda, Zambia, also produce potatoes and production in several of these countries has risen sharply during the last two decades reducing Zaire's potential export market. The geographic isolation of growers, minimal marketing infrastructure, and perishability of potatoes also have handicapped Zaire's export prospects.

Annual potato imports were over 4,000 t in volume and over US$350,000 in value for much of the 1960s (Table 3.7). Since 1970, however, potato imports have steadily declined in volume. In recent years, imports have amounted to less than 500 t annually.

Zaire, nevertheless, continues to receive an unknown quantity of potatoes carried into the Kivu region by semisubsistence producers and itinerant traders from Rwanda (see Chapter II, Sec. 2.4). Some potatoes also are carried into North Kivu from Uganda and, reportedly, shipped from Zambia to Lubumbashi. In addition, potatoes imported from South Africa and Western Europe are still sold in Kinshasa. National Potato Program officials complain such imports, especially from developed countries, run counter to the government's stated goal of increasing food self-sufficiency. Traders in the North Kivu region contacted for this study share this opinion.

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13 FAO statistics indicate potato exports were less than 20 t throughout the last two decades —except for 1970 (59 t) and 1978 (534 t)-- and have dropped to zero since 1979. A minor quantity of potatoes are exported to Burundi (see Chapter I Sec. 1.4 (i).

Table 3.7. Zaire: Volume, value and price of potato imports, 1961/65-1984.

Year	Volume (t)	Value (000 US$)	Price (US$/t)
1961/65	4,243	379	89.3
1966	4,915	554	112.7
1967	3,199	330	103.2
1968	3,482	380	109.1
1969	3,380	430	127.2
1970	4,282	540	126.1
1971	3,763	360	95.7
1972	3,627	540	148.9
1973	2,597	578	222.6
1974	2,223	436	196.1
1975	1,076	287	266.7
1976	1,439	632	439.2
1977	902	286	317.1
1978	390	128	328.2
1979	450	150	333.3
1980	550	180	327.3
1981	687	223	324.6
1982	100	33	330.0
1983	130	21	n.a.
1984	450	n.a.	n.a.

n.a.= not available.

Source: FAO.

(ii) Domestic Commerce

Potato farmers in Zaire trade considerably less than 50% of their annual production, although how much less is not known. According to government officials, only a small percent of national production is marketed (FAO 1985a:251).

SDIS (1981) reports some 4500 t of potatoes were shipped out of North Kivu from July 1979 to June 1980. This statistic is misleading, however, because it suggests that marketed surpluses were less than 5% of North Kivu production.[14] Potatoes traded within the region raise the volume and percentage of potatoes sold. Statistics for the Lubero zone of the North Kivu region indicate that producers generally traded between 20% and 30% of annual output from 1970 to 1980 (Table 3.5). Durocher (1985) estimates that marketed surpluses of potatoes for growers in the Beni and Lubero zones of North Kivu constituted between 22% and 27% of output in 1980. These percentages seem reasonable given low yields, household food requirements, and difficult access to markets.

While potato farmers currently trade a minor share of annual output, the following question emerges: Under what conditions would they sell more? Common sense suggests that if they produced more potatoes, they would have more to sell. Yet, statistics for the Lubero zone indicate that when growers produced more, they sold a smaller percentage and when they produced less, they sold more (Table 3.5). Thus, it appears that the quantity of potatoes demanded is more or less fixed. This observation is consistent with available information about consumption patterns in cities such as Kinshasa where potatoes are expensive and demand restricted. It raises additional questions about domestic potato marketing i.e., do shifts in supply influence retail prices and if not, why?

(iii) Marketing Channels and Participants

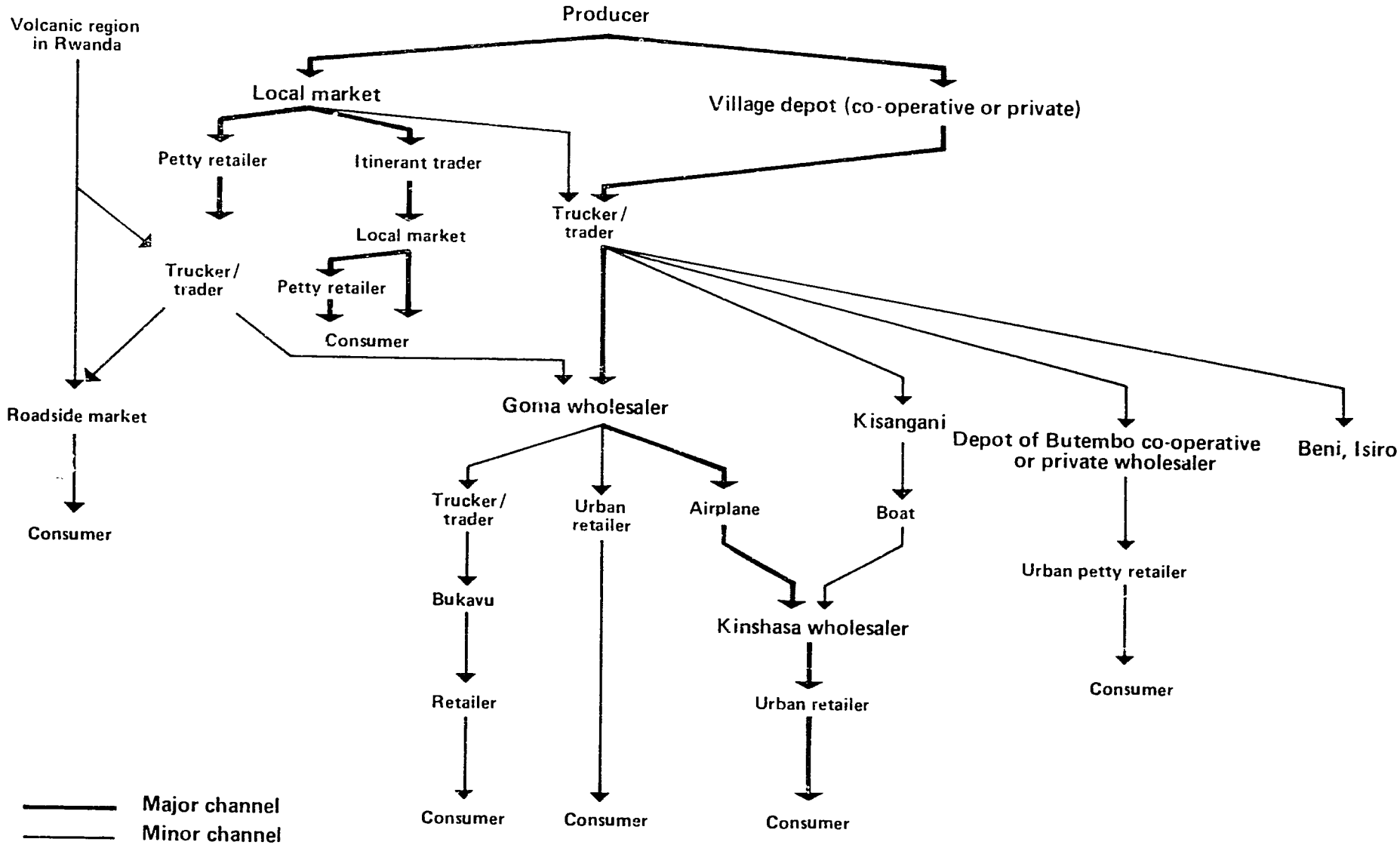
Potatoes produced in Zaire are traded through three principal types of marketing channels:

- local,
- regional, and
- interregional (Figure 3.1)

Local marketing channels are best characterized by the small size of most transactions and the restricted number of middleman between producer and consumer. Local marketing channels include direct exchange between producer and consumer in the form of sale, barter, gift, or

14 This 5% calculation uses the 1981/82 production figure of 157,000 t as a point of reference.

Figure 3.1. Zaire: Principal marketing channels for potatoes from North Kivu.



Source: Elaborated for this study.

payment for labor in potatoes. In North Kivu, local marketing channels also consist of the barter and/or sale of potatoes in rural fairs. Producers trade with consumers or small-scale traders in these markets. A third type of local marketing channel, also found in North Kivu, is the acquisition, transfer on foot, and sale of potatoes between different rural markets.

Regional marketing channels involve the shipment of potatoes from rural growing areas to urban consumption centers. They differ from local channels in three respects. First, this type of channel handles bigger volumes; therefore assembly and bulk-breaking are more conspicuous. Second, the volumes exchanged and distances traveled between buying and selling points require truck transport. Third, regional marketing chains involve varied participants. Two of the most important regional marketing channels for North Kivu potatoes consist of shipments to wholesaler/retailers in Goma or to cooperative distribution outlets in Butembo; in both instances for final sale locally.

Potatoes produced in North Kivu are also traded through interregional marketing channels. These channels involve long-distance transport and an elaborate chain of middlemen. In the most prominent channel of this type, potatoes are shipped by truck to Goma and from there by jet aircraft to Kinshasa (Figure 3.1). A second major interregional marketing channel consists of shipments by truck to Kisangani and then to the capital by riverboat or by plane (Map 3.2).[15] Minor interregional channels include shipments by light plane to Lubumbashi, by truck to Bunia and Isiro, and by truck to Bukavu (via Goma).

A rough estimate of the quantitative importance of these different marketing channels can be made based on the figures presented in SDIS (1981). A one year monitoring of truck movements found that 4530 t of potatoes left North Kivu between July 1979 and June 1980. Truckers shipped 1,700 t of these 4,530 t to Goma. Moreover, of these 1,700 t, 650 t were flown to the capital (Table 3.8). The remaining 1,000 t were consumed locally. Truckers hauled an additional 1,105 t to Kisangani. About half (600 t) of this total was forwarded to Kinshasa and the remainder eaten locally. Truckers also transported 230 t to Isiro and 4 t to Bunia during this same time period. These figures are perhaps best understood as an indication of the relative importance of different shipping routes because the quantities no longer correspond to revised estimates of potato production in North Kivu.[16]

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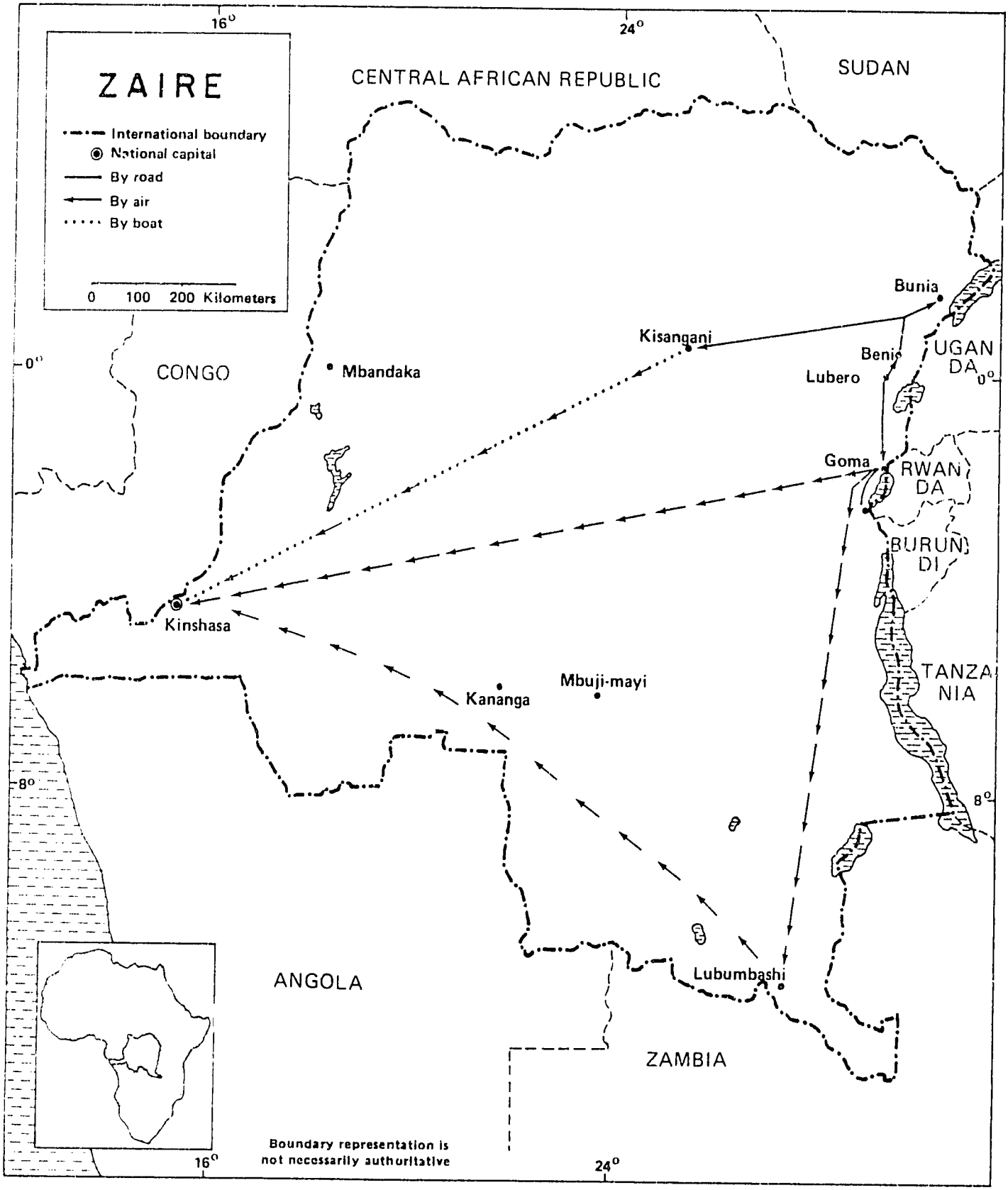
15 Use of this channel has reportedly declined in recent years due to deteriorating road conditions and the logistical problems associated with transfer of the tubers to boat operators.

16 It should be emphasized that these are only rough approximations. The data indicate that of the 4,530 t shipped out, 1,400 t or roughly one third of the total, were either lost to shrinkage or sent to some unspecified destination. Some potatoes sent to Goma are sold to buyers from Bukavu.

Map 3.2. Zaire: Principal potato flows.



Source: Elaborated for this study.

Table 3.8. Zaire: Monthly unloadings of potatoes (t) in Kinshasa by shipping point and type of transport, 1979-1980.

Month	From Kisangani		From Goma	Total
	By river	By air	By air	
July 1979	12	0.3	65.1	77.4
August	5	0.0	56.3	61.3
September	17	4.7	162.8	184.5
October	33	1.4	57.1	91.5
November	170	0.0	76.4	246.4
December	111	0.1	80.2	191.3
January 1980	6	0.9	29.2	36.1
February	100	2.1	37.8	139.9
March	66	0.0	45.6	111.6
April	14	7.9	22.9	44.8
May	34	0.0	44.3	78.3
June [1]	31	0.0	6.6	37.6
Total	599	17.0	665.4	1,292.4

1 Incomplete.

Source: Registry of transport documents, as cited in SDIS (1981).

In concluding this discussion, a brief set of observations concerning the timing of shipments to Kinshasa are in order. Roughly 75% of all potatoes sent to the capital are dispatched in the months of September to December and February to the end of March (Table 3.7). This reflects seasonal demand and supply patterns. For example, when Europeans leave the capital on vacation from June through August demand for potatoes falls off considerably. Alternatively, shipments via Kisangani by boat are highest in the dry-season months of November, December, February, and March when the road to Kisangani is most accessible. Shipments are especially high in November when river conditions reduce the average travel time from 10.5 days to 7.0 days (SDIS 1981). Shipments by air from Goma are particularly high in September as the peak harvest in North Kivu period begins, European residents return to Kinshasa, and road conditions discourage shipment via Kisangani.

Marketing Participants

Potato marketing in Zaire embraces an elaborate set of participants. The most conspicuous types of individuals and institutions involved in this activity include:

- producers
- itinerant traders
- rural assemblers
- trucker/traders
- provincial wholesaler/shippers
- marketing organizations (including cooperatives)
- boat operators (from Kisangani)
- air freight companies
- urban wholesaler/retailers (in Kinshasa), and
- urban petty retailers.

The division of labor between these different participants is not always clear, nevertheless, the principal activities of each are discussed below.

Producers. Most potato producers trade, barter, or sell at least some tubers. Potatoes are considered the most profitable crop and the most important source of cash income in the Beni and Lubero zones (Durocher 1985). Though grower participation in potato marketing is highest

during peak harvesting periods, sales continue throughout the year as cropping patterns permit and household cash requirements dictate. Growers typically market potatoes in very small quantities, less than 50 kg per transaction, with minimal grading and without a sack or basket. Such trading generally take place in rural areas because the small quantities sold by individual growers do not justify the time-consuming trip to urban markets.

Itinerant traders. Apart from producers themselves, the most numerous participants in rural potato marketing are the itinerant traders. These commerçants typically buy or barter small quantities (50-100 kg per market day) of agricultural commodities including potatoes in one area and transfer them in baskets on their heads to another location for sale.[17] Their trading routes may vary from a circuit of two or three nearby markets completed in a few days, to an elaborate chain of locations, dozens of kilometers apart, and requiring several weeks travel. Itinerant traders have no equipment except perhaps a hand scale or extra basket(s).

Nearly all itinerant traders are women which facilitates purchase from and eventual resale to female heads of households.

Rural assemblers. In the major production centers such as Masereka, Kipese and Katondi (near Ndihira), rural assemblers procure, package, and store potatoes for eventual forward shipment. Most rural assemblers are independent, private traders. A few act as agents for either trucker/traders or marketing organizations. These assemblers normally work out of a converted house that serves as a combined office, work place, and a temporary storage for the commodities that they assemble. Some rural assemblers also sell or barter dry goods.

These traders typically accumulate the equivalent of a truckload of potatoes through numerous individual, small purchases. Most rural assemblers pay cash for the potatoes.[18] They also pay suppliers for bamboo boxes that they use as packages. Upon procurement of the tubers the assemblers hire village boys to pack them into the boxes. Some rural assemblers will procure and pack potatoes upon a verbal agreement with an interested buyer, but most sell to the first willing buyer.

Trucker/traders. Potatoes are shipped out of the growing areas by trucker/traders. According to SDIS (1981), 400 of such traders operate in North Kivu purchasing and transporting various types of agricultural commodities including potatoes.

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17 In some instances, they may merely resell the potatoes at the same location thereby acting as simple revendeurs.

18 Some barter with growers interested in salt, oil, cloth, or other manufactured goods.

Most potatoes are shipped by traders who own their own trucks. While some transport firms are exceptionally large, there are numerous small-scale shippers.[19] As a result, trucker/traders without their own vehicle can easily hire one. Trucker/traders generally send the produce to Goma or Kisangani and only occasionally accompany the shipment.

Provincial wholesaler/shippers. Potatoes shipped to Goma are generally received by wholesaler/shippers. These traders are involved in two types of potato marketing. First, they accumulate several tons of potatoes in the form of hundreds of 10 to 20 kg boxes for shipment to Kinshasa. Such shipments may be arranged with buyers who come to Goma from the capital or they may involve forwarding the produce to Kinshasa. Second, they sell small lots of potatoes to local retailers or to buyers from Bukavu. Sales of either type are done on a first come, first serve basis.

Some wholesalers/shippers in Goma work out of converted houses and market potatoes and other fresh vegetables. Others operate trading establishments that buy and sell a variety of different products including beer, salt, and sugar, as well as potatoes. In the latter instance, dry goods may actually be shipped to rural assemblers in North Kivu who send back potatoes in exchange.

Marketing organizations. A number of producer-marketing organizations also trade potatoes in North Kivu.[20] Several have their headquarters in Butembo while one of the more recent organizations, CECOPANE, has offices in Luotu, Kisangani, and Kinshasa. These organizations handle a variety of fresh vegetables. Most have rural depots that serve as collection and packing centers for member/growers' produce. Some also have business contacts with independent rural assemblers that regularly supply them with baskets of potatoes. These organizations transport the potatoes from rural assembly points to urban areas by rented truck.

COVEPALA sells the bulk of their potatoes in Butembo. Their wholesale depot serves as a marketing center for sales to both the co-op's retail outlets and petty retailers who resell the tubers in the local daily market. These organizations also send some potatoes to Kinshasa via Kisangani or Goma. Most of these sales are through independent, provincial wholesaler/shippers. CECOPANE, however, operates a warehouse in the capital from which it sells potatoes on both a wholesale and a retail basis. Financial, logistical, and managerial problems have been a source of continuous difficulty for these organizations.

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19 In their trucking survey, SDIS (1981) found that 40% of the truckers operated 71% of the transport capacity. One transport company based in Goma has 1,000 t of trucking capacity and hauls largely coffee and petrol.

20 Marketing organizations contacted for this study include Union Maraîchère Agricole du Kivu (UMAKI), Co-opérative de Vente des Produits Agricoles du Lac Amin (COVEPALA), Société de Commercialisation de Plantes Agricoles du Kivu (SOCOPLAKI) and CECOPANE.

Boat operators. Nearly all potatoes sent to Kinshasa from North Kivu via Kisangani travel the 1,750 km distance from Kisangani to the capital by boat (Table 3.8). These shipments are carried out by some 125 boat operators/traders (SDIS 1981). These riverboat merchants are engaged in the business of buying and transporting various food commodities including fish, pepper, and potatoes.

Most potato shipments by boat from Kisangani are less than 4 t each and nearly all are less than 8 t (SDIS 1981). Furthermore, shipments are generally done by boat operators who purchase the potatoes in Kisangani and sell them to wholesaler/retailers in Kinshasa. Trucker/traders from North Kivu do not also operate boats in Kisangani, nor do the boat operators also act as wholesaler/retailers in Kinshasa.

Air freight companies. A number of air freight companies with offices in Goma and Kisangani handle plane shipments to Kinshasa of fresh Kivu produce.[21] With the exception of Air Zaire, which carries passengers as well, most of these firms operate aircraft for the purpose of transporting freight. The bulk of this cargo involves manufactured and industrial goods sent from Kinshasa. Planes often return to the capital partially empty. As a result, the companies offer greatly reduced rates for freight to be flown to Kinshasa. For example, freight shipped from Kinshasa to Goma cost 25 Z/kg (October 1983), whereas potatoes sent from Goma to the capital could go for 8.5-9 Z/kg. Problems with air freight from the potato shipper's point of view include irregular arrivals and departures, uncertainty about the availability of space, and the shortage of temporary storage space in Goma and Kisangani.

Urban wholesaler/retailers. Most potatoes shipped to the capital are sold through urban wholesaler/retailers (demi-grossistes). Wholesalers/retailers who sell primarily potatoes have distinct operating characteristics from those who sell principally manioc or maize.[22] On average, potato wholesaler/retailers make fewer monthly purchases than manioc traders. Nearly all their transactions are less than 1 t. Maize traders typically buy more than 1 t per transaction (Table 3.9). Potato wholesaler/retailers cannot afford larger, more frequent purchases because their operating capital is limited and potatoes are expensive relative to other root crops. In addition, potato wholesaler/retailers rarely own a vehicle and none own cold-storage facilities. Hence, the bulkiness and perishability of potatoes discourage more and bigger purchases.

Potato wholesaler/retailers generally procure their tubers at the airport (Table 3.10). The irregularity of air freight shipments means that these traders spend an average of two to three days acquiring fresh

21 These companies include: Air Zaire (the state-run airline), Domaine Kitale, Lucas Air Transport, and Vic Air Cargo.

22 Potatoes, manioc, maize, and beans are all sold by wholesaler/retailers. Few, if any, traders sell these products strictly wholesale or specialize in just one of these commodities (SDIS 1981).

Table 3.9. Zaire: Size of transactions among wholesaler/retailers in Kinshasa, 1979.

Size of transaction	Distribution (%)		
	Potatoes	Manioc	Maize
Less than 1 t	84.2	52.8	22.2
More than 1 t	5.3	42.2	66.7
Mixed	10.5	5.3	11.1

Source: SDIS (1981).

Table 3.10. Zaire: Procurement sites for wholesaler/retailers in Kinshasa, 1979.

Product	Distribution (%) of procurement sites				
	Kinshasa		Wholesaler/retailer		
	Port	Airport	Bas-Zaire	Bundundu	Other
Potatoes	23.7	70.1	--	--	6.2
Manioc (tuberlets)	21.2	--	--	54.6	24.2
Maize	92.8	--	--	--	7.2
Beans (dried)	52.4	--	35.6	--	10.2

Source: SDIS (1981).

supplies for every day selling potatoes. Moreover, given their limited access to cold storage and capital, traders keep few potatoes in stock (roughly 200 kg). Potato traders cannot be accused of speculation, however, their limited stocks, as well as irregular air freight arrivals, contribute to greater supply and price instability.

Potato wholesaler/retailers are nearly all self-employed merchants who hire only temporary help, generally porters and nightwatchmen. The typical potato wholesaler/retailer in the capital has 1.43 employees. As a result, his average monthly costs consist primarily of freight and subsistence expenses, i.e., hotel, meals.[23]

Urban petty retailers. Potatoes are sold retail in Kinshasa by small-scale retailers. Most of these retailers buy their potatoes from wholesaler/retailers. A few buy their tubers from retailers located in major retail markets and resell them in smaller, satellite markets.

Retailers in Kinshasa typically purchase between 25 and 30 kg every three or four days. They then resell the tubers -- about 10 kg per day -- along with limited quantities of one, or occasionally two, other products. Principal constraints confronted by potato retailers are product perishability and limited operating capital.

Marketing Procedures

Marketing procedures in Zaire are informal. Potatoes are bought and sold on the basis of negotiations at a given time and place. No standard grades or weights exist.

Potatoes are often packed, shipped, and sold wholesale in small, bamboo boxes. Nevertheless, these packages, when full, can vary in weight from 10 to 40 kg. Moreover, the packing itself is highly irregular. Some boxes include only clean tubers of uniform size and shape, but more often they contain a mix of sizes and shapes as well as damaged and undamaged potatoes.

At the retail level, potatoes are sold with minimal grading, particularly in North Kivu. Although prices are quoted on a per kilo basis, they are often lowered in the course of haggling between buyer and seller. The potatoes themselves may be sold in bamboo boxes from roadside depots, by the basket in rural markets, or in small piles of various sizes in daily urban markets. Weighing prior to the exchange of tubers for money is a generally accepted practice. Retailers in North Kivu will sometimes include a few extra tubers at no extra charge to make the sale more attractive.

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23 Other costs are wages and taxes. According to marketing research carried out in 1979-80, freight and subsistance expenses constituted 50% and 20% respectively of total operating costs (SDIS 1981).

Potatoes are sold for cash with three notable exceptions. In the past, CECOPANE has advanced cash to rural assemblers in order to insure a steady supply of high-quality potatoes. Such arrangements have proven successful only temporarily. Trucker/traders in North Kivu usually pay cash for the potatoes collected at rural depots, then forward the tubers to Kinshasa via Goma and wait for payment to be sent from the capital. Cooperatives based in Butembo collect potatoes from their grower/members one week and pay them the next.

Potato shipments by truck from North Kivu to Goma (or Kisangani) legally require a receipt to serve as proof of purchase as well as considerable additional documentation.[24] There are similar requirements for produce sent to Kinshasa through air freight companies or by river. In practice, however, such regulations are loosely respected and only sporadically enforced. Receipts are rare among urban wholesaler/retailers and petty retailers; they are nonexistent in rural markets.

(iv) Prices and Margins

Prices

Potatoes are a high-priced commodity in most urban markets in Zaire, especially in Kinshasa. In October 1983, they sold retail for about US$ .8/kg (versus US$ .15/kg in Kigali, Rwanda). This means that, although retail prices for potatoes in the 1970s rose less rapidly than those for manioc during the same period, they were still three times higher on an average per kilo basis at the end of the decade (Table 3.11-3.12). Potatoes also tend to be more expensive than beans. High marketing costs account for this difference as producers receive less than 10% of the retail price.[25]

Retail prices for potatoes also tend to be more unstable than those for commodities like manioc (Table 3.12). Greater price instability results from the limited quantities traded. Relatively small changes in supply can therefore have a considerable impact on price. Supplies themselves are highly variable due to the extended, and poorly coordinated, marketing chain for domestically produced tubers and the irregular arrival of imports in the capital. In addition, the demand for potatoes is inelastic.

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24 According to trucker/traders interviewed for this study, complete documentation includes: a receipt for the potatoes, shipping order, trucking permit, vehicle insurance, technical vehicle inspection, and proof of purchase for vehicle. All documents must be appropriately stamped by the relevant authorities.

25 This observation was true in 1979-80 (see SDIS 1981) and in 1983 according to the fieldwork carried out for this study.

Table 3.11. Zaire: Retail price index (October-December 1964=100) in Kinshasa for selected food products, 1970-1980.

Year	Product			
	Potatoes	Manioc	Dried beans	Onions
1970	285.5	341.6	391.4	181.5
1971	231.7	435.1	482.2	209.3
1972	240.1	442.3	503.9	186.4
1973	264.9	763.8	545.3	307.5
1974	377.8	998.1	637.1	420.9
1975	502.8	1,168.7	1,041.8	664.2
1976	1,445.1	1,968.8	1,828.9	1,009.0
1977	1,367.7	3,837.2	2,832.3	1,841.2
1978	2,817.2	6,427.8	4,535.7	3,545.8
1979	6,551.1	11,661.4	7,689.8	6,142.7
1981[1]	8,156.7	12,596.7	10,136.7	8,101.7

Source: SDIS (1981).

1 First 3 months of the year only.

Table 3.12. Zaire: Average wholesale and retail prices (Z/kg) for potatoes, manioc, and beans in Kinshasa, 1979-1980.

Product	Retail				Wholesale/retail			
	n	Mean	Standard deviation	Coefficient of variation	n	Mean	Standard deviation	Coefficient of variation
Potatoes	237	5.73	117	20.4	232	4.37	84	19.2
Manioc	229	1.88	41	21.6	231	1.51	21	13.9
Beans (colored)	238	3.70	74	19.9	n.a.	n.a.	n.a.	n.a.

n.a.= not available.

Source: SDIS (1981).

Retail prices for imported potatoes sold in Kinshasa tend to be higher than those for locally produced tubers. During 1979-80 foreign potatoes were more expensive by a third than those produced locally (SDIS 1981). According to North Kivu traders interviewed for this study, this price differential reflects the relative condition of the tubers, their respective uniformity in terms of size and shape, as well as their cleanliness.

Spatial Price Comparisons

The relationship between prices for potatoes in different markets within Zaire is erratic. While prices are generally much lower in North Kivu than in Kisangani or Kinshasa, they do not always move as fast or even in the same direction (Table 3.13).[26]

Within the Kivu region itself, the differences in price reflect the geographic isolation of certain markets. On the other hand, previous research found that prices at the farm level in one rural area (Kyondo) were higher than those received by wholesaler/retailers in Butembo some distance away (Table 3.13). Perhaps fewer potatoes were traded that year in the former market than in the latter, or, the data may not accurately describe prices for the same quality or quantity of potatoes.

Movements of wholesale/retail versus retail prices in Kinshasa are also irregular (Table 3.13). Wholesale/retail prices are nearly always lower than retail prices. In the past, however, retail prices have risen or fallen after changes in wholesale/retail prices have occurred. In addition, retail prices are more volatile; thus a small increase (or decrease) at the wholesale/retail level can trigger a sharp increase (or decrease) at the retail level. The lag in price movements reflects the extent to which retailers pass on the cost of potatoes to consumers. Prices probably are more unstable at the retail level because sales are small; hence more readily affected by changes in neighborhood supply and demand conditions.

Marketing Margins

From 1979 to 1980 biweekly producer prices for potatoes in North Kivu averaged less than 10% of the retail price in Kinshasa (Table 3.13). Growers received higher prices in Kyondo (x = 28.5) then in Mageria (x = 28.5), but their share of the retail price in the capital never exceeded 15%. In late 1983, growers in Masereka and Luotu received between 3% and 6% of the estimated retail price in Kinshasa.[27]

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26 The following average potato prices (Z/kg) for wholesaler/retailers prevailed from December 1979 to March 1980: Kinshasa: Z 4.37, Kisangani Z 1.78; Butembo Z 0.37. While prices in Butembo were stable, prices in Kisangani and Kinshasa moved in the opposite directions during the four months studied (SDIS 1981).

27 The author did not visit Kinshasa, but relied on rural assemblers, officials from cooperatives, and CECOPANE personnel in North Kivu for estimates of prices in the capital.

Table 3.13. Zaire: Evolution of average potato prices (K/kg) in the North Kivu to Kinshasa marketing chain, 1979-1980.[1]

Week	Producer		Wholesaler/retailer		Retailer
	Mageria	Kyondo	Butembo	Kinshasa[2]	Kinshasa[2]
30-7-79	29.2	n.a.	n.a.	462.0	412.0
13-8	33.5	25.0	n.a.	630.5	716.0
27-8	33.1	60.0	n.a.	543.0	641.5
10-9	30.6	37.5	n.a.	486.5	588.0
24-9	29.4	37.8	n.a.	437.5	542.5
8-10	19.2	32.9	n.a.	528.0	531.0
22-10	24.7	32.5	n.a.	480.0	563.5
5-11	24.3	83.3	41.5	445.0	638.0
19-11	22.7	50.0	39.0	376.5	432.0
3-12	21.8	n.a.	37.5	353.0	525.0
17-12	22.1	50.0	39.5	352.0	507.0
31-12	22.2	40.0	35.0	372.0	429.0
14-1-80	29.9	n.a.	33.5	452.0	744.5
28-1	24.4	41.7	31.2	450.0	677.0
11-2	22.8	51.1	31.5	372.5	508.0
25-2	22.2	n.a.	31.0	456.5	515.5
11-3	23.7	80.0	38.5	423.0	545.5
25-3	28.4	64.0	39.0	n.a.	529.0
8-4	32.3	54.9	39.0	n.a.	559.0
22-4	31.8	94.4	40.0	470.0	645.5
6-5	27.1	58.3	42.5	n.a.	n.a.
20.5	28.2	31.3	39.0	392.0	n.a.
3-6	31.2	35.9	41.0	470.0	n.a.
17-6	31.6	42.9	n.a.	452.0	n.a.
1-7	53.8	67.5	n.a.	n.a.	n.a.
15-7	42.1	50.0	n.a.	n.a.	n.a.

n.a.= not available.

Source: SDIS (1981).

1 One Likuta (K) = .01 Zaire (Z).

2 These prices are for potatoes produced in North Kivu.

Margins of other marketing participants are hard to calculate because the division of labor between traders is often ad hoc, units of sale vary in size, and prices are highly volatile. Rough estimates of marketing margins in the North Kivu-to-Kinshasa marketing chain can be computed based on informal interviews with merchants in North Kivu (October 1983) carried out for this study (Table 3.14).

Rural assemblers in North Kivu have a gross income of about 2.25 Z/kg. They buy potatoes at 1.5 Z/kg from growers and assemble them at their depot. In addition, they pay village youth 5 Z/kg per box to do basic grading and to pack the tubers in bamboo boxes. They pay 2 Z for the empty boxes and 100 Z/mo to rent a depot. Their selling price, less cost of the potatoes, leaves 0.75 Z/kg to cover these operating costs, pay themselves a wage and earn a profit. Their margins are about 3% of the Kinshasa retail price.

Trucker/traders that haul the potatoes from North Kivu to Goma earn about 2.00 Z/kg. This amount covers the freight rate for loading, transporting, and unloading the potatoes. It also includes a fractional sum for advancing the cash, assuming the risks of highway travel and price fluctuations between buying and selling, and waiting to be paid after the tubers have been forwarded to the capital. These 2.00 Z represent approximately 8% of the Kinshasa retail price.

Air freight companies in Goma charge approximately 8.75 Z/kg for shipping potatoes to the capital. This amount includes the basic freight rate plus a local government surcharge, an air transport permit, a Deptartment of Agriculture levy, and a fee for completing the paperwork. Air freight costs represent 34% of the Kinshasa retail price and constitute the largest marketing margin.

Marketing margins of wholesaler/retailers and retailers in the capital are the hardest to estimate. Prices for potatoes in Kinshasa can change so fast (see Table 3.13) that average net returns per kilo presented here are only rough approximations. According to traders and truckers in North Kivu, wholesaler/retailers who sell potatoes in Kinshasa earn 8.00 Z/kg (Table 3.14). This sum must cover transport costs from the airport to the city as well as the fee paid to a porter to carry the tubers to the actual place of sale. Additional costs include interest on operating capital and subsistence expenses. Shrinkage losses are minimal due to rapid turnover. Consequently, in Kinshasa wholesaler/retailers receive about 31% of the retail price; however, the volatility of wholesale prices suggests this estimate should be interpreted with caution.

Potato retailers in Kinshasa have a mark up of 4.5 Z/kg. They do no grading, packaging, or processing; however at least some retailers transport potatoes to distant points in the city which provides consumers with greater convenience of purchase. Additional expenses include taxes, permits, operating capital, and shrinkage losses. According to North Kivu merchants, the retailers' mark-up represents about 18% of the Kinshasa retail price of potatoes.

Table 3.14. Zaire: Price and margins for potatoes, 1983.

Marketing Participant	Selling Price (Z/kg)	Price Sold Less Price Paid (Z/kg)	Marketing Margin[1]
Grower in North Kivu	1.50	1.50	6
Rural assembler in North Kivu	2.25	0.75	3
Trucker/trader to Goma	4.25	2.00	8
Air freight to Kinshasa	13.00	8.75	34
Wholesaler/retailer in Kinshasa	21.00	8.00	31
Urban petty retailer in Kinshasa	25.50	4.50	18

Source: Elaborated for this study.

1 Price sold less price paid, divided by retail price.

Although marketing margins are high, profits of potato traders appear to be modest (SDIS 1981). This reflects their limited capital, hence reduced capacity to expand operations. It also results from the risks associated with the potato trade. Traders try to buy and sell quickly to avoid unfavorable price fluctuations. In addition, given prevailing transport costs from North Kivu and relative prices for potatoes versus other crops in the capital, the size of the potato buying market in Kinshasa is small.

(v) Government Programs and Policies

Government plays a minimal role in potato marketing in Zaire. Official programs and policies are largely directed at controlling, regulating, and taxing. Many of these measures are only loosely and sporadically enforced.

Taxes and Permits

Potato traders are subject to a variety of different taxes. In weekly rural markets, producers, itinerant traders, and revendeurs must pay a tax of about 1 Z/day to sell potatoes. Traders that operate collection depots must pay an annual tax to the local authorities (groupement) of 50-100 Z and be registered at the office of the sub-zone. Furthermore, according to individuals contacted for this study, rural traders and trucker/traders also must pay a 0.05 Z/kg tax at the end of the year on the volume they have sold in the region.

Potatoes sent to Kinshasa from Goma are charged 2.5% of their value as a contribution to the local rural development fund (Fonds du Développement Rural). They also are taxed 0.03 Z/kg by the air traffic authorities (Regie des Voies Airiennes) and 0 .05 Z/kg by the office of the Department of Agriculture.

In Kinshasa, wholesaler/retailers are obliged to pay 1% of the value of the potatoes as a tax in order to enter the Central Market (Grand Marché). Retailers pay a daily tax for space in the market.

Imports

Government officials can also authorize potato imports, although in North Kivu the open border with neighboring countries makes such authority difficult to exercise. In Kinshasa, potatoes are imported via the ocean port at Matadi or by air. These shipments are easier to monitor and therefore to control; however given the minor volumes involved, the government seems to overlook such trade. Even small shipments of foreign potatoes remain a sore spot with Kivu traders and NPP personnel.

(vi) Marketing Constraints

Transportation is perhaps the single most important constraint to improved potato marketing in Zaire, particularly in North Kivu. The bulk of production is located in North Kivu, hundreds of kilometers from most major urban markets. Roads from production centers to major shipping points are in poor condition. Fuel shortages are not uncommon. River travel between Kisangani and Kinshasa is slow. Air traffic from Goma to the capital is irregular. Therefore the transfer of a semiperishable commodity like potatoes from growers to consumers is complicated, time consuming, and plagued with uncertainty.

Poor telecommunications also thwart efforts to improve potato marketing in Zaire. Given the tremendous distances between growing areas and urban markets as well as the elaborate marketing chain that links them, logistical problems associated with coordinating the sale of potatoes are formidable. There is a clear need to monitor rapidly-changing supply and demand conditions so as to adjust selling practices accordingly and limited telecommunications network severely hamper this coordination and monitoring.

Existing financial practices handicap potato marketing activities as well. Traders based in Kivu base their participation in the potato trade on the time necessary for final payment to be sent from Kinshasa. No government credit programs finance this type of marketing. Established banking procedures are cumbersome and time-consuming.[28] Under these circumstances, marketing participants must limit the size of their individual transactions and reduce the scope of their operations which, in turn, discourages greater product specialization (and the capture of associated economies) and multiplies the number of middlemen.

Grower production patterns also represent an important marketing constraint. The most popular potato variety in North Kivu, Sisene, has a six-month vegetative cycle. Growers currently harvest this variety at various intervals and tubers are often dug prematurely causing their skins to peel. Growers' seed, however, is frequently degenerated to begin with; hence it is already vulnerable to attack by pests and diseases in the course of the vegetative cycle. Harvested potatoes, therefore, are highly susceptible to post harvest losses in packing, shipping, and handling, especially when sent from cool, high-elevation production centers to hot, low-elevation urban markets.[29]

Finally, the overall effect of these specific constraints, combined with the shortage of market information, and the limited technical assistance available for marketing, should not be overlooked. The interdependence of these various factors makes each one separately that much more difficult to overcome.

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28 Payment by check is not a widely accepted practice. Bank notes in small denominations require considerable time for counting.

29 Goma has limited cold storage capacity (30 t).

3.5 CONCLUSIONS

Potato production in Zaire has increased by 300% during the last ten years despite only modest improvements in yields. Production specialists, therefore, believe even greater increases in output are technically possible through the introduction of new varieties, the use of good quality seed, etc. The NPP's efforts to introduce such improvements are already under way. The question emerges: If farmers in Zaire, and specifically North Kivu, produce more potatoes, where will these tubers be marketed?

Rural and Regional Demand

Results of this survey indicate the bulk of potato production in North Kivu is consumed on the farm. Pressure on land in North Kivu due to local population growth and immigration has been a major factor behind the steady rise in output throughout the 1970s and 1980s. As population growth rates accelerate, average farm size dwindles, and fallow periods for idle land become shorter, small, semisubsistence growers will be hard-pressed to maintain existing levels of per capita household food production. Under such circumstances, the on-farm demand for food is likely to induce further expansion in potato productixon because agro-ecological conditions -- especially at higher elevations -- favor potato cultivation over cultivation of other crops.

Local sale and/or barter of potatoes in weekly rural markets has emerged as an important trading channel in field work for this study. Demographic and agronomic trends suggest this type of trade will increase in volume as more and more growers are forced into using a greater concentration of arable land to grow crops favored by local soil and climatic conditions. Non-potato-producing farm households near North Kivu potato production centers represent an additional market for potential surpluses.

A third, promising outlet for North Kivu potatoes is the towns and urban areas in, or near, the region itself -- Bukavu, Beni and, to a lesser extent, Goma.[30] Rural-to-urban migration and expanding economic activities will spur the future demand for food in these centers. Potatoes already have attracted consumer attention because seasonal spurts in available surpluses make them cheaper than other roots and tubers. This tendency suggests that the impact of marketing costs on the retail price in these markets is not severe enough to make potatoes prohibitively expensive. Future yield increases and minor improvements in marketing practices could make potatoes even more attractive.

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30 Although these same socioeconomic trends are at work in Goma, the demand for North Kivu potatoes will be dampened somewhat by informal imports from Rwanda. The volume of these imports should be limited by strong, rural demand for food in Rwanda itself.

Prices and Incomes in Kinshasa

Prospects for an increased volume of potato trade in Kisangani and Kinshasa are somewhat more complicated, partly due to the segmented nature of these markets. A projected, although modest, growth in the expatriate demand for potatoes in these cities is unlikely. Estimated annual, per capita consumption among this group of consumers is already quite high, roughly 75 kg, and the foreign population is small and not likely to expand rapidly. The decline in potato imports in the 1970s as well as possible future restrictions on such imports, however, could present North Kivu potato producers with an opportunity to capture the local market.[31] High quality and steady supplies, rather than price, are the key criteria for selling to these consumers.

Local consumers in Kinshasa and Kisangani present a different challange. Projected demand for potatoes in these markets is next to nothing because real incomes among local consumers are low and the price of potatoes is high. Furthermore, these projections assume relative prices for different foodstuffs will remain unchanged.

Potatoes are an expensive, luxury vegetable in these cities and are predicted to stay that way. Growers in North Kivu receive less than 10% of the final, retail price in Kinshasa. Therefore, declines in production costs per kilo resulting from the introduction of new varieties and higher yields in North Kivu will not have much impact on relative prices in the capital. Moreover, shipping costs for truck and air (or boat) transport are not likely to decline. In addition there are logistical, information, and financial constraints. The overwhelming evidence points to a continued modest volume of potato shipments from North Kivu to distant markets like Kinshasa and Kisangani.

Potato Producers and Urban Consumers

Potato producers located in the western part of the country might alter the picture for potato marketing/consumption among low income consumers in Kinshasa. NPP personnel in North Kivu know potatoes are produced in Bas-Zaire, but they are relatively unfamiliar with activities so far from their offices. While growers in Bas-Zaire have not sold potatoes to the capital in the past, their location places them in an ideal position to pass lower production costs directly on to consumers in Kinshasa. A rapid fall in relative prices would lower a major barrier to more widespread potato consumption in Zaire. It merits greater study.

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31 Informed observers claim such restrictions would be hard to enforce given the minor quantities involved. Nevertheless, the restrictions would be entirely consistent with the government's goal of greater food self-sufficiency and better financial incentives for local growers.

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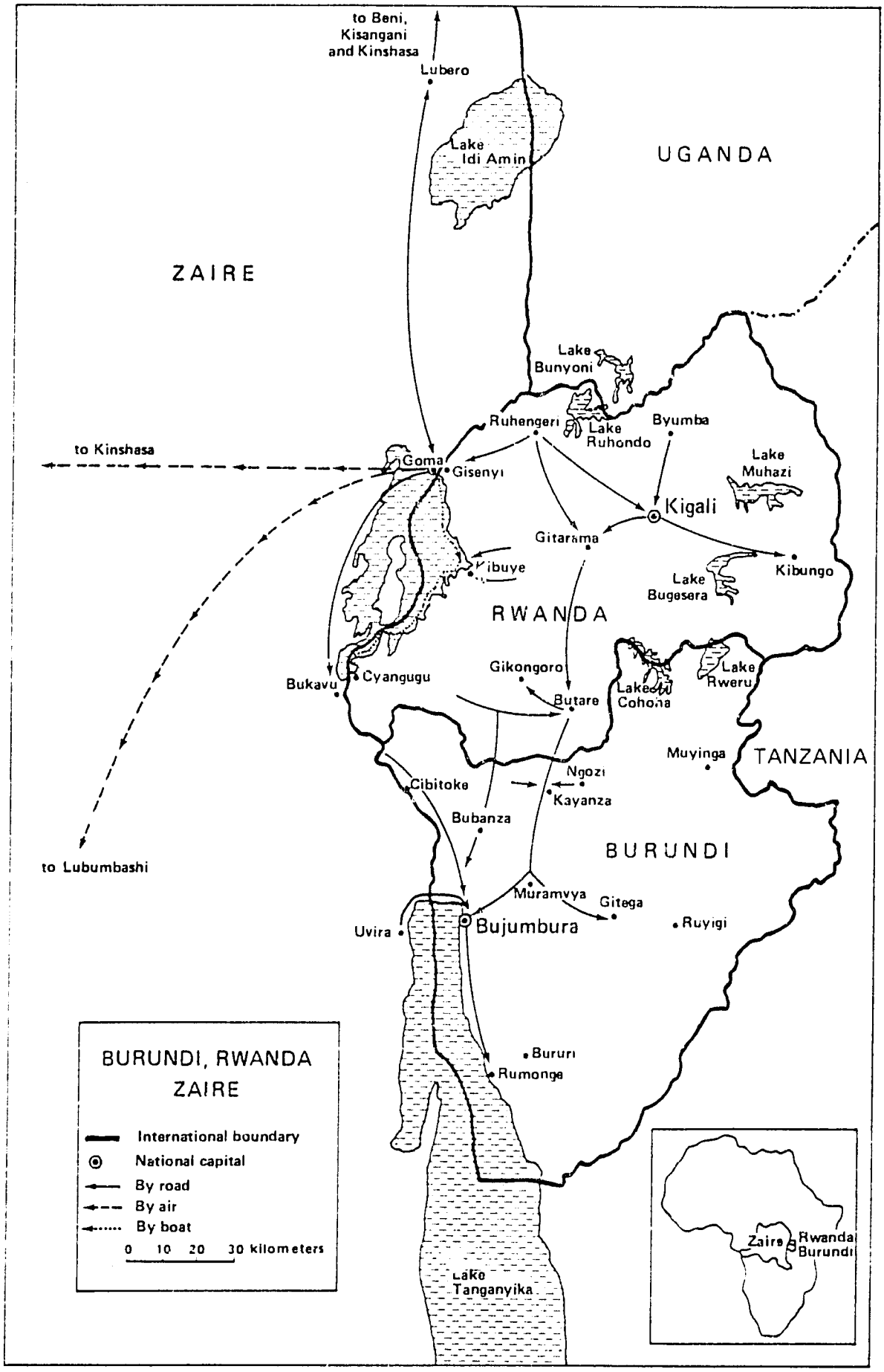
Potatoes in Central Africa: A synthesis

Chapter 4

Map 4.1. Burundi, Rwanda and Zaire: Principal potato flows.



Source: Elaborated for this study.

Inadequate food production has frustrated development efforts in sub-Saharan Africa for decades. It is the persistent and growing imbalance between food supplies and population growth, however, that has gradually transformed the nature of this problem. No longer simply a stumbling block to economic growth, the ability of each country to feed itself has become an issue of human survival. As a result, local and international concern has focused added attention on new strategies to meet this challenge. In Burundi, Rwanda, and (North Kivu) Zaire in particular, there is a growing realization that continued expansion of an overwhelmingly rural population combined with a shrinking agricultural frontier requires initiatives attuned to a rapidly changing agrarian scene. Interest in the potential of the potato — a crop not normally associated with traditional cropping patterns or established eating habits -- arises in this context. Questions about current marketing patterns and future demand prospects are considered to be of special importance. Following the approach of the earlier chapters, this synthesis now reviews the results on the macroeconomic setting, production, consumption and marketing of potatoes in comparative perspective.

Macroeconomic Setting

Burundi, Rwanda and Zaire confront similar problems of economic development. Per capita incomes are low — less than US$ 300; life expectancy is 51 years or less; current estimates of annual population growth are 3.1, 3.0 and 3.7% respectively (World Bank 1987). Still, in Zaire, a nation nearly the size of Western Europe, 40% of the 31 million residents live in urban areas. Furthermore, the rate of urbanization is 8.7%. In Burundi (pop. 4.8 million) and Rwanda (5.8 million), 95% of the citizenry still lives in the countryside. Nevertheless, Rwanda is Africa's most densely populated country with Burundi and (North Kivu) Zaire not for behind.

Although agriculture represents between 31% (Zaire) and 61% (Burundi) of Gross Domestic Product (GDP), it employs the overwhelming majority of the labor force in Burundi (93%), Rwanda (93%) and Zaire (72%). Growth in agricultural production averaged over 2.5% in Rwanda and Zaire during 1980-85 but was more modest (0.8%) in Burundi. These increases tended to result from an expansion in land area planted as yields either stagnated or improved only modestly. Thus, while all these countries witnessed slight improvements in the index of food production per capita between 1979 and 1985, average daily calorie requirements are still barely being met.

Recent development planning has given top priority to increasing agricultural productivity and raising farm incomes. In Burundi, policymakers have proposed regional specialization as a strategy to develop domestic agricultural output. Each agro-ecological region is to exploit its comparative advantage. Rwandese planners emphasize the importance of intensifying applied research on food crops, expanding credit and improving marketing. In Zaire, greater incentives to private trade and improved extension are considered key elements in the drive to accelerate food production.

Production

Area cultivated in potatoes is about 90,000 ha in Burundi, Rwanda, and Zaire combined. About half of this total is in Rwanda, where area planted has doubled during the last ten years. Growth in area planted in Zaire has been even more spectacular, going from 13,500 ha in 1973-74 to 35,000 ha in 1983-84.[1] Population increases at higher altitudes, the potato's comparative advantage in terms of yield per hectare under Highland agro-ecological conditions and its short vegetative cycle have been the principal contributing factors to expanded cultivation. Yields average about 7 t/ha, but are especially high in the volcanic region of northwest Rwanda where they can surpass 30 t/ha.

Most potatoes are grown above 1800 m along the Zaire/Nile Divide which runs through Burundi, Rwanda, and northeast Zaire. Some potatoes are grown in western Zaire as well, but little is known about this production. Roughly 80% of potato production in Burundi is harvested from the bottom-land crop planted during the dry season. Rain-fed, hillside production dominates potato cultivation in Rwanda and Zaire. The main crop is harvested from September to October in Burundi and Rwanda versus March and April in Zaire.

Nearly all potato producers in Burundi, Rwanda, and Zaire are small, semi-subsistence farmers.[2] The typical farm household plants less than 1 ha per year in potatoes.[2] Production consists of a series of plantings in separate plots during the calendar year. A small number of commercial growers who are conspicuously large in land size (5-10 ha) have begun to emerge in Rwanda.

Most potato producers use traditional, albeit complex, technology. Modern inputs, such as chemical fertilizers, pesticides, and farm machinery, are either unavailable, too expensive, or simply inappropriate. Even peasant growers are nevertheless willing to adopt new potato varieties such as the recently introduced Muziranzara and Ndinamarga in Burundi and Kinigi, Kseko, Cruza and Petrero in Rwanda. Growers in North Kivu prefer Seseni. Seeding rates vary tremendously from 0.5-2.3 t/ha in Burundi to 3.0 t/ha in Zaire.

Principal production constraints include diseases (late blight and bacterial wilt), the shortage of good quality seed, declining soil fertility, and a weak extension service. While considerable on-farm research has been undertaken in Rwanda, and to a lesser extent Burundi, little work of this type has been done in Zaire. A precise ranking of these various constraints is difficult; however, available information suggests that a shortage of seed and declining soil fertility are most important in Burundi and Zaire while diseases are most detrimental to potato crops in Rwanda.

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1 Recent estimates indicate area planted in potatoes in Zaire may be as high as 50,000-60,000 ha (see Chapter Three).

2 This estimate is merely an approximation given that potatoes frequently are intercropped; hence area planted per farm is hard to measure.

Consumption

Potatoes have been eaten in what now is Burundi, Rwanda, and Zaire for over a century. Though commonly considered a cash crop for sale as a luxury vegetable to expatriates and the urban elite, most potatoes are not grown primarily for the market. While growers typically sell some of what they produce, the largest position of output is utilized on the farm for household consumption and seed.

Annual per capita consumption levels are about 2 kg in Burundi, 50 kg in Rwanda, and 4 kg in Zaire; but, these averages mask considerable variation within each country. A potato consumption survey in Rwanda found some producers in the volvanic region eat over 300 kg/capita per year. Pockets of high potato consumption also exist in the potato production centers of North Kivu, Zaire. The evolution of potato consumption is also quite dynamic. Per capita consumption in Rwanda has nearly doubled in the last ten years.

Potatoes comprise a minor portion of the average daily intake of calories in Burundi, Rwanda, and Zaire. However, they are much more important component of regular food intake in the potato producing regions. In the growing areas of Burundi, in particular, potatoes sustain household food stocks before the harvest of maize and beans.

In addition to rural households that produce the tuber, wealthy local urban consumers and resident expatriates also eat potatoes. Low income consumers in Bujumbura and Kinshasa would like to consume more potatoes but can only afford to do so on special occasions. Urban consumption is more widespread in Rwanda because recent production increases and new roads have lowered the price of potatoes.

Most consumers like the taste of potatoes, especially tubers with a high, dry-matter content. Preferences for a particular size, color, or shape of tuber are not pronounced in Burundi, but have begun to emerge in certain markets in Rwanda. Grading and appearance are important only among the urban elite and expatriate consumers in Zaire. Potatoes are typically boiled in rural households and served as French fries in urban restaurants and hotels. Potatoes are not used for industrial processing, animal feed or in the preparation of packaged food products.

Principal consumption constraints are the potato's availability, particularly far from the main production centers in Burundi and Zaire, and its high price relative to other foods in urban markets. In addition, many consumers in Zaire, especially those in rural areas distant from potato growing areas, rarely see potatoes; hence they are not familiar with its preparation and nutritional attributes.

Marketing

Burundese growers sell about 10% of the potatoes they produce. Potato producers in Rwanda and Zaire sell approximately 25% and 45% of total output. Rwanda exports from 500 t to 1500 t of potatoes annually.

In recent years, Burundi (500 t - 1500 t) and Zaire (500 t) have imported potatoes. Such imports are a substantial share of all potatoes sold in Bujumbura and Kinshasa. Nevertheless, the bulk of locally marketed tubers are produced domestically in all three countries.

Potato sales are an important source of cash income for area growers. While potatoes are traded through diverse marketing channels, the largest percentage of these tubers are marketed through local, rural marketing networks. Although potatoes are conspicuous in many urban markets, the volume of tubers sold in rural markets is probably far superior. In Burundi and Rwanda, 95% of the population lives in rural areas. In Zaire, major, urban markets are located at considerable distances from principal production zones. The potato's bulkiness and perishability discourage long-distance trade whereas rural demand provides a ready outlet for available surpluses.

Potato marketing is not characterized by a rigid division of labor. The small volumes handled by most traders -- a few 100 kilos a week -- preclude specialization. Wholesalers exist only in a few urban markets like Butare, Goma, Gitarama, and Kigali. Trucker/traders are key marketing agents in Burundi. Producer marketing organizations exist in all three countries, but are most prominent in North Kivu.

Potato marketing is informal throughout the region. Potatoes are sold with minimal grading. Negotiations are generally done at the time and place of sale. Sales are almost always for cash and without a recepit. Packages vary in form and size from 15 kg bamboo boxes (Zaire) to 50 kg baskets (Rwanda), to 100 kg sacks (Burundi).

Government participation in potato marketing is minimal. Potato prices are set by supply and demand; however, local authorities frequently impose an assortment of taxes on marketing participants. Trading permits are also required. Import regulations are hard to enforce due to long, open borders between countries.

Annual and within year price fluctuations appear largely to reflect supply and demand conditions. However, within-year price movements have been particularly erratic in Rwanda, e.g., rising during certain months in some years and declining in others.[3] Spatial price comparisons indicate greater integration between major, urban markets than between small, rural markets. In urban areas, relative prices for potatoes versus other food commodities have declined most noticeably in Rwanda where increases in production, the volume of potatoes sold and the expanding national highway system have resulted in expanded shipments to places like Kigali.

Growers receive about 40% of the retail price in the capital cities of Burundi and Rwanda versus less than 10% in Zaire. The largest marketing margins are received by urban petty retailers in Burundi

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3 Nevertheless, it should be noted that year-to-year price fluctuations have frequently been greater for other food crops than for potatoes.

(13.5%), trucker/traders in Rwanda (29%), and air freight companies in Zaire (34%). Although the available evidence is meager, these margins appear to reflect the limited physical and financial infrastructure in each of the three countries, the small volumes marketed by most traders, and the risks associated with buying and selling a perishable product like potatoes.

Principal marketing constraints include the shortage of market information; the poor, rural, road network; limited physical infrastructure in markets themselves; scarce public credit for small-scale marketing ventures; weak post-harvest extension, and, poor-quality seed material. Highly dispersed, rural-settlement patterns are a special challenge in Burundi and Rwanda. Poor seed material and multiple, often premature, harvests are particularly important marketing constraints in Zaire.

Policy Implications

Principal policy implications that may be of relevance not only in Burundi, Rwanda and Zaire but also in other countries where potatoes are currently being grown include the following.

1. Although food production has declined throughout much of sub-Saharan Africa during the last two decades, potatoes have had quite a different record. In Rwanda, output increased by 500% and in Zaire by 1000%. Production in Burundi has fluctuated. These production increases were achieved without extensive production incentives to growers or the use of expensive, imported inputs. Similarly, governments were not required to engage in consumer subsidies. Rather, the potato's adaptability to local growing conditions and its high yields in a relatively short period of time have induced growers to plant more of this crop. Efforts by local national potato programs to provide new varieties and impoved quality seed have reinforced growers' initiatives. As the bulk of these increases have come from an expansion in area planted, considerable potential exists to raise production through yield-increasing, new technology.

2. Although potato farmers in Burundi, Rwanda and Zaire are generally small, traditional growers, they are not unwilling to utilize new production technology when it is available and appropriate. Thus, farmers have not made use of chemical fertilizers because they find them either unavailable or prohibitively expensive. In contrast, growers have been eager to receive improved potato varieties. Similar improvements offer the potential of equally widespread adoption.

3. Frequent categorization of potatoes as a cash crop is simplistic. Growers sell potatoes for cash, but most of what they produce is for on-farm use. Pressure on land at higher altitudes resulting in reduced farm size is likely to result in increased interest by growers in labor intensive crops such as potatoes that can be both eaten and sold.

4. Potatoes remain an expensive, luxury vegetable for rural residents outside the principal growing areas and for most urban consumers. Consumers generally like the taste of potatoes and eat them when they can afford to. In other words, declining retail prices for potatoes are likely to encourage even greater potato consumption.

5. Although high marketing margins discourage greater potato production and consumption -- particularly in North Kivu, Zaire, the costs and risks associated with potato marketing appear primarily responsible for this phenomenon. The alleged high profits of rural middlemen, especially in the case of Rwanda, have led to various attempts to replace private traders with producer organizations. According to representatives of these groups, such efforts have often not been successful because they tended to underestimate the logistical problems and overestimate the profits associated with potato marketing. In contrast, road-building campaigns and measures to increase the number of truckers (e.g. operating between Kayanza and Bujumbura) have led to greater competition on freight rates and marketing margins between provincial towns and the capitals of Burundi and Rwanda.

6. Various institutions and individuals are involved with different aspects of potato development in Burundi, Rwanda and Zaire. For example, the national potato programs serve as the umbrella organization for agro-biological research and to lesser extent farm-level, socio-economic studies; the Ministries of Commerce monitor trading activities; and the Ministries of Planning chart progress in food production, the effects on nutrition levels, etc. The integration of these efforts -- agro-biological, socio-economic, political -- has been more difficult. Consequently, knowledge about particular food system components eg. seed, diseases, consumption, marketig margins is more advanced than that of the system as a whole. This obscures medium to long term objectives such as steady increases in output to keep pace with population growth and magnifies short term adjustments of the system to technological innovation e.g. local gluts or poor potato prices in a given season. Baseline data gathered for this study might be easily up-dated to maintain a clearer picture of how the food system for potatoes is evolving in each country. Consultations between neighboring countries might achieve this for the region as a whole.

7. Local research on the socio-economic aspects of potatoes in Burundi, Rwanda and Zaire has been limited by the shortage of trained personnel assigned to this crop. As potato production, consumption and marketing continues to evolve in the region, socio-economic issues are likely to increase in importance. For example, expanding road networks and pressure to pursue comparative advantage means growers will be increasing influenced by and interested in market developments. Ways to increase social science input within national programs need to be explored. One alternative would be to encourage university professors and their

students to conduct research in this area.[4] Another would be to seek more active collaboration with other government agencies that have expertise in this area.[5] Finally, regional collaboration between national potato programs might also prove useful.[6] Specific marketing topics that merit future attention include: informal seed marketing channels; rural marketing patterns, prices and margins; marketing practices of small-scale urban retailers.

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4 This strategy has been pursued in Burundi (see, e.g., Ndimira and Christensen 1983).

5 Such was the case for a recent study of potato marketing in Madagascar (see Rasolo, F. et al. 1987.)

6 Potato programs in the Andean region have initiated such a program (see PRACIPA 1986).

APPENDIX I

A Note on Issues and Methods

The purpose of this brief note is to outline the issues examined and methods employed in carrying out this study.[1] The procedures described here could be utilized to conduct similar studys for other food crops.

Issues

This survey is concerned with two major issues and several, related questions. The two major issues are:

- the precise nature of current potato marketing arrangements and their impact on prevailing production and consumption patterns; and
- ways to improve marketing procedures so as to promote increased potato production and consumption.

In order to address the major issues listed above, this survey focuses on the following questions:

1. What are the recent levels and planned increases of potato production envisioned by the current National Plan? How will marketing patterns, programs, and policies affect the realization of these production targets?
2. How important have been marketing factors such as prices in explaining the evolution of potato production?
3. Has potato production increased faster than population? Does this trend suggest a change in the orientation of potato production?
4. Where are potatoes produced and at what times of the year? Are established, regional, growing seasons complementary or competitive?
5. What type of producer plants potatoes?
6. What type of producer grows the majority of marketable surpluses?
7. Do potato producers plant certain varieties for market and other for their own consumption?
8. What is the role of potatoes in the local diet? Does this vary by region?

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1 Interested researchers may also wish to consult Jones, W. 1974. "Regional Analysis and Agricultural Marketing Research in Tropical Africa: Concepts and Experience. "Food Research Institute Studies. Vol. XIII. No.1: 3-28.

9. What size, shape, and skin color of potatoes are preferred? By which consumers?

10. What are current levels of annual per capita potato consumption nationally? regionally? In ruban versus rural areas? Was this level changed significantly over time?

11. How do incomes levels effect potato consumption?

12. What share of total potato production is sold? Consumed on the farm for food? For seed? Lost in post-harvest storage and handling?

13. What volume of potatoes are exported? Imported? Sold in urban areas? Traded for local consumption in rural markets located in growing areas? Shipped to rural markets in non-growing areas?

14. Who are the participants in the principal potato marketing channels? What are their functions?

15. What is the nature of current buying and selling practices? Do traders finance production? Are growers paid in cash at the time of sale?

16. How much do potato prices rise and fall in periods of abundance versus shortage periods?

17. How much do potato prices vary between principal markets? What are the reasons for these variations?

18. Have retail prices for potatoes in the capital risen faster in the last ten years than prices in general? Than the prices of potato substitutes? of complements?

19. What share of the retail price is received by producers? By rural assemblers? Truckers? Wholesalers? Retailers? What are the reasons for the distribution of these shares? Have the shares of producers, rural assemblers, etc., changed over time?

20. What is the role of government in marketing of table potatoes? Do government agencies provide information? Build roads? Markets? Supply credit? Purchase and/or store potatoes? Regulate potato prices? Impose taxes?

21. Which government institutions assume marketing responsibilities?

Methods

Given the shortage of available information on agriculture generally, and potato marketing specifically in the countries surveyed,

the author used a variety of different procedures to examine the questions outlined above.[2] The results presented in this survey are based on:

- an analysis of international documentation including World Bank reports, FAO studies and statistics, and United Nations Development Program background documents;
- local literature, particularly Ministry of Agriculture reports and student theses;
- official statistics from various government agencies;
- participant observation through visits to potato growing areas, provincial and capital markets, transportation depots, storage facilities, and wholesale and retail outlets; and
- informal interviews with growers, traders, consumers, and Ministry personnel.

This report relies largely on a discussion of broad trends and a qualitative assessment of many specific problems, though statistics are referred to substantiate certain observations. It is envisioned that subsequent, more detailed research could build on the findings contained in this survey.

2 For a more detailed treatment of procedures for conducting marketing research in developing countries see Holtzman, J. 1986. Rapid Reconnaisance Guidelines for Agricultural Marketing and Food System Research in Developing Countries. International Development Paper. Working Paper No.30. Michigan State University.