REPUBLIC OF ZAIRE
MINISTRY OF AGRICULTURE, RURAL ANIMATION AND COMMUNITY DEVELOPMENT

Synthesis of Data on Agricultural Production and Marketing

Contribution to Baseline for Project Monitoring and Evaluation

Written and Translated by

Walter West

January 1991

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THE PRAGMA CORPORATION
116 EAST BROAD STREET
FALLS CHURCH, VA 22046

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FAX 703-237-9326

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1 Introduction

The following report provides a synthesis of information and data currently available concerning the production and marketing of agricultural products in the zone covered by USAID Project 660-0102 (PROCAR). This synthesis is a contribution to the development of a baseline for the monitoring and evaluation of this Project's activities and to the design of future activities.

The goals and objectives of Project 660-0102 are the following (from the Project Paper and Logical Framework, reproduced in Pragma Corporation, n.d.):

1. Improve the standard of living of the rural population of central Bandundu, with particular attention to the situation of women who are the primary agricultural producers of the region (Project Paper)

2. Strengthen the capacity of local NGOs to provide agricultural extension, marketing and transformation services to producers of agricultural products (P.P.)

3. Increase the level of agricultural production, marketing and the transformation of agricultural products within the Project's area of operation (P.P.)

4. Strengthen the region's capacity to produce and export agricultural products for the Kinshasa market to ensure that the food needs of that city are met (P.P.)

5. Improve the situation of the rural population of the region as measured by the following indicators: health and nutrition, ownership of consumer goods, household revenue, quantity and diversity of foods consumed, education levels (Logical Framework)

6. Raise agricultural productivity (L.F.)

7. Increase the marketing of agricultural surplus (L.F.)

8. Improve methods of transformation of agricultural products in rural areas, and introduce appropriate new methods (L.F.)

These objectives are broadly defined and entail a wide range of possible actions and interventions. It follows that the information and data needed for feasibility studies, planning, monitoring and evaluation are correspondingly numerous and varied. Fortunately for this report the first phase of the Project (1988-1990) limited the scope of activities by establishing certain priorities and choosing a limited number of paths of intervention. This document takes note of these and limits itself to those priority areas which are, in addition,

those in which the research and information-gathering programs of the Project were concentrated.

The highest priority for PROCAR in its first phase has been the strengthening and improvement, overall, of agricultural production. While this is not an unexpected direction for the Project to follow, given its mandate, the conceptual bases and parameters of intervention have never to our knowledge been the objects of public discussion or formal definition. The following parameters and principles are therefore extrapolated from the observed actions of the Project:

1. The Project's activities are concentrated on three principal crops: cassava, maize and peanuts. This is a publicly-stated principle established by USAID

2. The principal method for increasing production is the diffusion of improved varieties. The definitive intervention in the first phase of the Project, in this domain, is the program of multiplication and demonstration fields. Improved techniques of production have been demonstrated (and published in local-language manuals for farmers), but these are of secondary importance in a program which emphasizes promotion by demonstration over diffusion and direct supervision of the implementation of a variety/technique/technology package. Neither the distribution of fertilizers nor the development and diffusion of improved production equipment is prominent in the current strategy of the Project. Moreover, the Project has been formally forbidder (by the GOZ and by USAID) to do independent variety trials or to test improved production techniques and technologies, and must restrict its activities to the diffusion of methods and varieties developed by the national research program.

   However, the Project may also pursue interventions outside these limits if the programs of partners NGOs require this. PROCAR has organized demonstration fields of rice, soybeans and cowpeas in collaboration with DPP, CEA/Ekubi and CAL.

3. The Project has accorded more latitude to the definition of peripheral and secondary activities. Neither direct assistance (to NGOS, to extension programs) nor training programs have been tied to specific crops or methods. The training division has addressed the problems of agricultural equipment, and the production/extension division has developed technical manuals in local languages for crops and techniques that are otherwise outside the current scope of the Project. The EPIF/CAL program which is quasi-independent has proved to be the most flexible and adaptive of all of PROCAR's interventions in the identification of areas of activity, in the adaptation of extension methods to

local realities, and in the choice of methods and crops to promote. This is perhaps due to the direct relation between PROCAR's agents in EPIF/CAL and farmers, where in most cases the Project works indirectly with farmers through NGOs.

The Project has engaged other activities, but compared to the emphasis placed on the promotion of agricultural production these have been, in the first phase of the Project, much less clearly delineated. Marketing interventions have been, at least until the current market project at Petit Kasaï, spot interventions related to a particular need or request rather than part of a clearly defined and well-considered plan. The same can be said of interventions in appropriate technology, aid to institutional development, and local transformation of agricultural products.

We have already indicated that EPIF/CAL is a special activity which may well become more central to the Project's approach. By its very definition EPIF/CAL is an experimental activity which, if successful, could serve as a model for similar programs with other organizations. The Project has in fact realized s eral trial programs: aid to the CEA/Ekubi for rice marketing; training of metalsmiths; trials of cassava dryers and mills, etc. It is only fair to remember that the first phase of the Project was originally designated as an experimental period in which a number of types of intervention were to be tried out in order to identify those which could be expanded into an effective long-term program.

The report which follows addresses the following issues: agricultural production - with emphasis on the three primary crops named above - at the household level; and the relationship between this production and marketing, characteristics of producer households, and household-level indicators of socio-economic well-being. A fundamental assumption is that an increase in production per household should, over time, have a measurable and sustained effect on household-level socio-economic indicators of all kinds. A number of other levels of indicator have been considered and rejected, whether because they cannot logically be linked to the current program of activities of the Project or because the existing database does not support the elaboration of baseline data. Among those abandoned as no longer applicable are: indicators of institutional development among the NGOs; indicators of the status and well-being of rural women, as a primary target population; and monitoring of the evolution of market structures in the region[1]. Among useful baseline analyses which have been set aside for lack of available data

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[1] This is now rather a concern for PROCAR's sister Project 660-098, whose scope of intervention is more directly involved with marketing.

are, in particular, those which would link the nutritional and health situation of rural populations to agricultural production. These have been abandoned with regret because they may well, in the current context of volatile economic and political conditions, represent the best possible objective measures of well-being of rural peoples.

1.1 Documentation of the Data

The list of reports and databases used for this report is to be found in the table of references at the end of the document. For those who would like more information on the various research methods used with each data set, a summary discussion can be found in the report "Documentation des Bases de Données au Projet 660-0102" (West, 1990). For each data set the original methodological discussion can be found in the following documents:

1. RRAs (1988) - Adelski et al., 1989, Report 6, pp. 1-4
2. Small Farmer Study - Eele and Newton, 1985, pp. 3-13, and in a series of unpublished documents ("Sample design", "Enumeration", "Data Structure and Coding") available in the Documentation Center at PROCAR, Kikwit
3. K.U.Leuven/DMPCC studies: Publication 4, pp. 2-8 (Marketing study); Publication 2, pp. 2-3 (Production study); Publication 8, pp. 3-6 (Price data); Publication 9, pp. 2-7 (Measures of quantities sold); Publication 16, pp. 2-8 (Methods and conversions for analysis of effects of household composition); Statcom 4, p. 1 (Conversion factors for standardization of marketing and production statistics)
4. Preliminary results, 1984 Census: Guide to enumerators (partial photocopy available at PROCAR-DRI, originally from USAID: Glenn Rogers' office)
5. 1989 Season B Baseline and Farming Practices study: Ascher, 1989, pp. 1-4
6. Fresco cassava study: Fresco, 1986, pp. 40-55 (theoretical discussion); pp. 56-65 (methodology)
7. Labor time study: Springer-Heinze, 1988, section 2
8. EPIF/CAL Baseline: Russell et al., 1990, pp. 34-35
9. Yeboah and Mara, 1987, pp. 6-11; 1988, pp. 3-8.

2 Background data

2.1 Demographic Data

Basic demographic data is used in the following analyses:

1. Descriptions of the Project area, of the collectivities, of the agricultural household

2. Simple projections of the evolution of the demographic structure of the Project zone. Since the population in the area covered by the Project is virtually 100% rural and

agricultural, such projections can serve as rough indicators of emerging land pressures, labor availability, food needs, etc.

3. Calculation of socio-economic indicators, of which there are two categories:
   a. human resources and food needs in producer households, for comparative estimates of productivity, food self-sufficiency and available surplus
   b. categorization of households according to socio-economic characteristics so as to identify and distinguish between sub-groups within the overall population of agricultural households

Collectivity	Residents present			Residents absent		Residents		Persons	Number of :	By household:	
	Men	Women	Rank	Men	Women	present	total	present	households:	Residents	Persons
NKARA	31,214	35,373	1	3,564	2,571	66,587	72,722	68,125	12,120 :	6.00	5.62
KWILU-KIMBATA	31,401	35,030	2	2,427	1,650	66,431	70,508	67,361	14,117 :	4.99	4.77
KAPIA	29,900	31,860	3	2,498	1,805	61,760	66,063	63,696	11,620 :	5.69	5.48
MANZASAY	22,858	25,681	4	1,758	1,093	48,539	51,390	49,347	9,428 :	5.45	5.23
KILUNDA	22,256	25,768	5	2,454	1,578	48,024	52,056	48,782	9,469 :	5.50	5.15
DUE	20,290	24,509	6	3,911	2,318	44,799	51,028	46,124	9,402 :	5.43	4.91
LUNIUNGU	20,942	23,779	7	2,393	1,802	44,721	48,916	45,373	9,513 :	5.14	4.77
SEDZO	20,140	22,623	8	1,580	1,328	42,763	45,671	43,928	7,844 :	5.82	5.60
MATEKO	18,687	20,310	9	1,371	1,100	38,997	41,468	40,547	6,928 :	5.99	5.85
KEMBA	18,343	20,585	10	3,006	2,085	38,928	44,019	41,049	7,703 :	5.71	5.33
KIDZWEME	18,197	20,580	11	1,222	737	38,777	40,736	39,249	8,049 :	5.06	4.88
MIKWI	17,349	20,936	12	1,582	884	38,285	40,751	38,907	8,961 :	4.55	4.34
BULWEM	17,378	19,460	13	1,130	1,023	36,838	38,991	37,976	6,651 :	5.86	5.71
BANGA	16,592	18,365	14	829	732	34,957	36,518	35,533	5,922 :	6.17	6.00
KALANGANDA	12,766	14,832	15	1,751	1,376	27,598	30,725	28,466	5,301 :	5.30	5.37
BATERE	12,598	13,270	16	1,179	812	25,868	27,859	26,994	4,593 :	6.07	5.88
BULUNGU town	11,015	11,621	*	780	483	22,636	23,899	22,963	3,920 :	6.10	5.86
PROCAR	341,926	384,582		33,435	23,377	726,508	783,320	744,425	141,541 :	5.53	5.26

Source - Preliminary results of the 1984 Census

Table 2-1: Demographic statistics by collectivity, 1984

2.1.1 Basic population statistics and projections for the Project zone and by collectivity - 1984 Census, preliminary results

The 1984 Census is a full enumeration of Zaïre's population taken on a single day. The data used here are preliminary results which are neither the official nor the final rendering of the statistics. All

Collectivity	Deaths	Births	Natural increase	Unadjusted rates per 1000 persons: Deaths	Births	Natural growth rate (annual)	Resident population 1984	Population estimates for: 1989	1995	2000
NKARA	473	3,382	2,909	7.10	50.79	4.00%	72,722	88,478	111,954	136,210
KILUNDA	665	1,917	1,252	13.85	39.92	2.41%	52,056	58,624	67,610	76,141
MIKWI	136	1,746	1,610	3.55	45.61	3.95%	40,751	49,463	62,409	75,750
DUE	144	2,083	1,939	3.21	46.50	3.80%	51,028	61,488	76,908	92,674
KWILU-KIMBATA	263	2,894	2,631	3.96	43.56	3.73%	70,508	84,682	105,501	126,709
LUNIUNGU	260	1,848	1,588	5.81	41.32	3.25%	48,916	57,389	69,514	81,555
MATEKO	195	1,596	1,401	5.00	40.93	3.38%	41,468	48,963	59,765	70,566
KAPIA	262	2,856	2,594	4.24	46.24	3.93%	66,063	80,092	100,914	122,344
BANGA	163	1,539	1,376	4.66	44.03	3.77%	36,518	43,936	54,854	65,997
KALANGANDA	206	1,064	858	7.46	38.55	2.79%	30,725	35,261	41,598	47,739
KIDZWEME	452	1,767	1,315	11.66	45.57	3.23%	40,736	47,749	57,777	67,724
MANZASAY	217	2,084	1,867	4.47	42.93	3.63%	51,390	61,428	76,095	90,959
SEDZO	295	1,762	1,467	6.90	41.20	3.21%	45,671	53,493	64,666	75,741
KEMBA	267	1,941	1,674	6.86	49.86	3.80%	44,019	53,050	66,366	79,982
BULWEM	183	1,624	1,441	4.97	44.08	3.70%	38,991	46,749	58,121	69,685
BATERE	185	1,196	1,011	7.15	46.23	3.63%	27,859	33,294	41,234	49,279
BULUNGU town	177	902	725	7.82	39.85	3.03%	23,899	27,751	33,201	38,552
PROCAR	4,543	32,201	27,658	6.39	43.95	3.53%	783,320	931,891	1,148,486	1,367,608

Source - Preliminary results of the 1984 Census and own calculations
Table 2-2: Population projections by collectivity 1984-2000

statistical transformations and calculations (projections, densities) are our own calculations.

Tables 2-1 to 2-3 present collectivity-level population and household statistics from the 1984 census, and projections of total population and population densities to the year 2000.

2.1.2 Household demographics - 1984 Small Farmer Study

The Small Farmer Study includes 392 households in 39 villages in 15[2] collectivities - a total of 2206 persons. The sampling strategy for this study was designed to draw samples of agricultural **producers** and **households** representative of these populations in the project area as a whole (cf. Eele and Newton,

[2] The collectivity of MANZASAY was not included in the area covered by the study.

	Area in square km	Estimations of population densities in 1984	1989	1995	2000	Rank
NKARA	1,100	66.11	80.43	101.78	123.83	1
KILUNDA	800	65.07	73.28	84.51	95.18	2
MIKWI	700	58.22	70.66	89.16	108.21	3
DUE	900	56.70	68.32	85.45	102.97	4
KWILU-KIMBATA	1,900	37.11	44.57	55.53	66.69	5
LUNIUNGU	1,300	37.63	44.15	53.47	62.73	6
MATEKO	1,590	26.08	30.79	37.59	44.38	7
KAPIA	3,000	22.02	26.70	33.64	40.78	8
BANGA	1,675	21.80	26.23	32.75	39.40	9
KALANGANDA	1,423	21.59	24.78	29.23	33.55	10
KIDZWEME	2,538	16.05	18.81	22.76	26.68	11
MANZASAY	3,404	15.10	18.05	22.35	26.72	12
SEDZO	3,050	14.97	17.54	21.20	24.83	13
KEMBA	3,400	12.95	15.60	19.52	23.52	14
BULWEM	3,044	12.81	15.36	19.09	22.89	15
BATERE	2,750	10.13	12.11	14.99	17.92	16
BULUNGU town	*	*	*	*	*	
PROCAR	32,574	24.05	28.61	35.26	41.98	

Source - Preliminary results of the 1984 Census

Table 2-3: Population densities and projections per collectivity

1985, pp. 3-13; also Small Farmer Study working documents, 1984, "Sample Design").

Tables 2-4 and 2-5 give the distribution of the SFS sample of individuals according to age categories, sex, and whether or not the person was present in the village at the time of the study (principal dry season 1984).

AGE

Category	N	%	Cum %
0-4	341	15.5	15.7
5-14	631	28.6	44.7
15-24	455	20.6	65.6
25-34	301	13.6	78.0
35-55	322	14.6	92.8
55+	156	7.1	100.0
TOTAL	2206	100.0	

SEX

Category	N	%
Male	1053	47.7
Female	1153	52.3
TOTAL	2206	100.0

PRESENCE IN THE VILLAGE

Category	N	%	Cum %
Present	1837	83.3	83.3
Temporary absence	332	15.0	98.3
Permanent absence	37	1.7	100.0
TOTAL	2206	100.0	

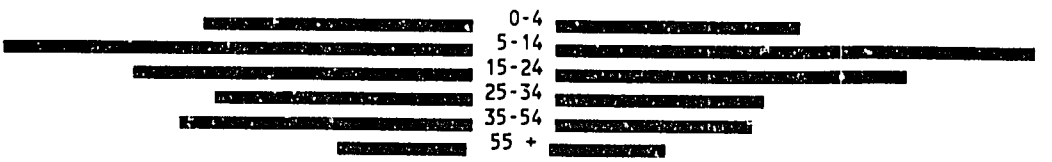
SFS data 1984

Table 2-4: Small Farmer study sample - breakdown by presence in village, age, and sex categories

2.2 Calculation of Analytic Variables Based on Household Demographic Composition

A. Age group and sex distributions of the Small Farmer Study sample population of persons present at time of inquiry

Women/girls				Men/boys		
N	%	Cum %	Age	N	%	Cum %
178	15.4	15.4	0-4	162	15.4	15.4
308	26.7	42.2	5-14	322	30.6	46.0
222	19.3	61.4	15-24	233	22.1	68.1
169	14.7	76.1	25-34	134	12.7	80.8
194	16.8	92.9	35-54	128	12.2	93.0
82	7.1	100.0	55 +	74	7.0	100.0
1153			TOTAL	1053		



B. Means and standard deviations of number of household members by age groups and by sex (SFS)

Category	Mean	Std. Dev.	Minimum	Maximum
Persons present	5.54	3.40	1	22
Age 0 to 4 years	0.87	0.94	0	5
Girl 5 to 15 years	1.36	1.42	0	9
Boy 5 to 15 years	0.90	1.11	0	6
Woman 15 to 55 years	1.33	1.07	0	5
Man 15 to 55 years	1.28	1.05	0	5
Woman more than 55 years	0.21	0.41	0	2
Man more than 55 years	0.21	0.41	0	2

All data from Small Farmer Study

Table 2-5: Age/sex pyramids, Small Farmer Study sample

Within the Project zone the agricultural household is the social unit that commonly defines and links agricultural production and family consumption. Since "household" can be, and is, variously defined in African social research, we should specify that the definition used here follows that used in the

K.U.Leuven/DMPCC studies[3]: a group of persons, related or not, living under the same roof or in the same living unit, making decisions together and sharing common resources to satisfy their vital needs, often under the leadership of an individual who is recognized as the final authority and decision-maker (K.U.Leuven/DMPCC, Publication 16, pp. 1-2). Conceptual debates aside, it is evident that the agricultural producer/consumer household is a definitive and primordial social unit in rural Bandundu as it is elsewhere in Africa.

2.2.1 Work units, consumption units and degrees of dependency

The household is defined here as a unit that makes decisions concerning economic production and the distribution of goods produced. Logically, these decisions are influenced by the levels of household resources available for production and the level of internal demand for that which is produced. The K.U.Leuven/DMPCC studies introduce the concept of work units, consumption units and degree of dependency within the household as an attempt to measure these influencing variables (K.U.Leuven/DMPCC, report 16, pp. 6-10; the formulas used here are drawn directly from that document).

Work units and consumption units are derived by simple formula calculations based on the demographic composition of the household. This is to say that each member of the household is assigned a work unit value and a consumption unit value, according to the person's sex and age. A single **work** unit is the work potential of an adult woman; a single **consumption** unit is the consuming power of an adult man. K.U.Leuven/DMPCC assigns unit equivalencies to other members of the household as follows:

Work units:	Adult woman	1.00 unit	Adult man	0.21 unit
	Girl < 15 yrs	0.05 unit	Boy < 15 yrs	0.01 unit
	Woman > 55 yrs	0.05 unit	Man > 55 yrs	0.01 unit
Consumption units:	Adult woman	0,75 unit	Adult man	1.00 unit
	Girl < 15 yrs	0.41 unit	Boy < 15 yrs	0.42 unit
	Woman > 55 yrs	0.67 unit	Man > 55 yrs	0.90 unit

The **degree of dependency** is simply the number of consumption units divided by the number of work units - the number of

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[3] Which is also that used in the Small Farmer Study (cf "Notes pour enquêteurs", n.d.). The SFS recognizes and identifies a category of "cooking pot" (foyer) which is a subunit of the household (family of a second wife, of an adult son or other relative living in the compound) settled within the household's compound and recognizing the authority of the head of household, but totally or partially independent in its production and consumption activities.

consumption units supported by each work unit, in other words.

K.U.Leuven/DMPCC calculates a mean value of 1.94 work units, 3.97 consumption units, and a degree of dependency of 2.05 for households in their sample in the Kwilu subregion. The corresponding values for the Maï-N'Dombe subregion are 1.86 work units, 3.97 consumption units and a degree of dependency of 2.13. For the Bandundu region as a whole the average household has 2.00 work units and 4.07 consumption units, for a degree of dependency of 2.03 (K.U.Leuven/DMPCC, publication 16, p. 10).

Application of the same conversion factors to the Small Farmer Study sample gives comparable although somewhat lower statistics:

	Mean	Std Dev.	Range: minimum - maximum
Work units	1.79	1.25	0.01 - 9.95
Consumption units	3.46	2.04	0.67 - 13.45
Degree of dependency	1.93*	7.78	0.75 - 90.00

* Calculated mean; the statistical mean is 3.75. The work unit/ consumption unit/degree of dependency measure is no more than a rough estimation of underlying capacities and needs. This is particularly true of the work unit measure which systematically discounts the productive potential of male workers, leading to significant distortions in work unit and dependency measures in particular cases where men participate in production. Extreme values of degree of dependency, such as the 90.00 maximum cited above, are almost always households made up of one or two men living together (i.e. one older man living alone = 0.01 WU/ 0.90 CU = DD of 90.00). These cases[4] do not differ in any systematic and significant way from the sample as a whole in any other characteristics, including measures of production and of revenue per worker. In fact they resemble closely a larger category of small households to which they belong (see section 2.2.2 below).

2.2.2 Types of household

The Small Farmer Study data allows for further exploration of possible classifications of households on demographic characteristics. The following classifications have been useful in distinguishing between types of household:

1. Family type: is the family monogamous, polygamous, or headed by a single woman or by a single man. This classification is explicitly provided within the Small

[4] There are 13 cases in the SFS in which the degree of dependency is 2 standard deviations or more above the sample mean.

Farmer Study data set by a variable HHTYPE (table 2-6).

		Persons present		Number of persons by sex: Male		Female	
	N	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Monogamous couple	230	5.5	2.7	2.8	1.6	2.8	1.7
Single man	18	3.0	[illegible]	2.1	1.7	0.9	1.3
Single woman	90	3.9	2.6	1.6	1.9	2.3	1.3
Polygamous	54	9.2	4.6	4.3	2.7	5.1	3.0

		Work units		Consumption units		Degree of dependency	
	N	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Monogamous couple	230	1.7	1.1	3.4	1.7	3.3	5.2
Single man	18	.8	.8	2.4	1.6	14.0	27.8
Single woman	90	1.4	.9	2.4	1.7	3.6	4.3
Polygamous	54	3.0	1.6	5.6	2.7	2.3	3.3

SFS data

Table 2-6: Characteristics of households classified by variable HHTYPE

2. Age/size characteristics: classification of households according to the number of persons by sex and age group. A preliminary categorization was made by factor analysis which identified the following orthogonal factors (60% of variation explained):

GT1 - middle-aged families with school-age or older children
GT2 - young families with children less than 15 years old
GT3 - older couples without dependents
GT4 - young couples with few or no dependents

Since households might well combine several of these characteristics the classification was further refined by rating each household (0 or 1) according to whether its factor score was high and positive on each factor. The resulting distribution of ratings was then reduced to six categories (GTSC score) which, in analysis and in correlation with other variables, seem to describe the household structure of the sample fairly well (cf tables 2-7 and 2-8).

Category	N	%	Cum %
Small household	47	12.0	12.0
Couple with dependents	85	21.7	33.7
Young family	91	23.2	56.9
Middle-age family	97	24.7	81.6
Older family	37	9.4	91.1
Extended family	35	8.9	100.0
TOTAL	392	100.0	

SFS data

Table 2-7: Distribution of households on family characteristics GTSC

1. Small household: one or two adults with few or no dependents, often an elderly couple or individual.
2. Couple with a few dependents - young children or aged parents.
3. Young family with very young children.
4. Middle-aged family with school-age children and even young adults.
5. Large older family, with a high proportion of adults.
6. Extended family, with numerous members in all age groups.

CATEGORY	PERSONS PRESENT		WORK UNITS		CONSUMPTION UNITS		DEGREE OF DEPENDENCY	
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Sample	5.5	3.4028	1.79	1.2502	3.45	2.0446	3.7	7.7819
Small family	1.7	0.8053	0.29	0.4028	1.29	0.6504	15.7	18.1084
Couple with dependents	3.4	1.3645	1.21	0.4382	2.35	0.9571	2.3	2.8420
Young family	5.1	1.7251	1.55	0.6639	2.88	0.8957	1.9	0.5548
Middle-age family	6.1	2.3273	2.29	0.9744	4.00	1.5974	1.8	0.5373
Older family	9.3	3.1451	2.25	0.8429	5.34	1.7390	2.6	1.4461
Extended family	11.1	3.6443	3.90	1.7523	7.01	2.1326	2.0	1.2004

SFS data

Table 2-8: Household composition characteristics by categories GTSC

2.3 Ecosystems and Natural Resource Bases

The Project zone as a whole is subject to the same climatic conditions, but it is generally recognized that it contains several ecological subzones. The most current categorization distinguishes between "savannah" and "forest" zones. Savannah is characterized by light sandy soils that are often not very fertile (the Kalahari sands identified by Fresco, 1986), distributed on plateaus or on hilltops, and by a grass or shrub cover. The savannah becomes progressively more dominant in the ecology as one moves from the center of the Region of Bandundu toward the south; within the Project area the savannah

environment is most evident in the south and the west. The forest environment is characterized by a dense forest cover on alluvial valley soils and, as one moves from the south of the Project area to the north and east, on upland soils of the Karroo complex which are richer and more humid than the Kalahari sands. The distinction between the two subzones is made on the basis of topography, soils, cover vegetation and geography. In reality the distinction is not precise and a number of other factors may intervene locally to affect the fertility and carrying capacity of lands: microtopography of the area, intensity of the exploitation of soils and their resultant degradation, etc. Nonetheless the savannah/forest distinction is robust and is recognized and used by farmers as well as outside investigators.

This said, it is also true that the Project zone is above all a zone of transition between the dominant forest ecosystem to the north and the savannah to the south. It is possible to identify parts of the project zone with each of these ecosystems. In general, the collectivities of the southwest (Kilunda, Luniungu, Kidzweme) belong to the savannah complex, while Kemba, Batere, and the collectivities of north-eastern Idiofa are forest collectivities. These broad assignments however hide differences between local conditions and even between the lands exploited by individual producers within the same locality. This variability suggests that the attribution of the influence of the ecosystem on a terrain needs to be approached with caution. Two different approaches have been used here, one drawing on fairly detailed information about the conditions of particular exploitations and the other based on broad categories which could override purely local considerations:

A. Proportion of forest fields (measured at the level of the individual producer, household, village or larger unit). The Small Farmer Study data allows such a measure based on information about each individual field. Throughout the Project zone farmers express and show a preference for forest fields over savannah fields since forest fields are generally more fertile and farmers are more familiar with production methods. In the Small Farmer Study 77% of fields identified were forest fields, and over 50% of the sample households did not claim any savannah fields at all. Other studies (cf RRAs; also Ascher, 1989 and EPIF/CAL reports by Reid and Bidimbu) suggest that these figures may be high for the area as a whole[5]. Nonetheless, they are indicative. The Project zone is an area of production primarily on

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[5] Also the number of fields is not as accurate a measure as would be the actual surface area cultivated in each ecosystem: savannah fields are more likely to be consolidated into larger terrains and thus may be proportionately more important than the number of such fields would indicate.

forest fields or on mixed fields in transition areas.

B. Classification by collectivity according to the ecosystem (topography and vegetation) categories identified by the FAO (1986): palm/steppe, palm/savannah, forest/savannah, and mosaic forest. This rough classification has been applied to the K.U.Leuven/DMPCC production data by the insertion of a variable ECO (see below, section 3.3.2).

Fresco (1986, pp.130-134) states that cultivation techniques do not differ significantly for forest and for savannah fields except that forest fields are maintained somewhat more intensively. Springer-Heinze notes that sandy plateau fields[6] require a less intensive preparation, but are also less productive (see section 3.2.1 below). Certain practices which are adapted to savannah conditions and which are current elsewhere in Bandundu (ridging, turning under of grass; see Springer-Heinze, 1988) are not commonly employed in the Project zone where, in general, savannah agriculture is a recent introduction (Russell et al., 1989; see also Reid and Bidimbu, EPIF/CAL reports).

The Small Farmer Study does not identify a farming system specific to savannah regions. This may be in part because the sample does not include any area where savannah agriculture is dominant. Also, the same principal crop - cassava - dominates forest and savannah production alike in the Project zone. There are certain crops which are closely associated with each ecosystem (Ascher, 1989, p.9): millet, voandzou, and certain vegetables are specific to savannah production, while maize, rice, coffee, bananas and pineapples are grown almost exclusively on forest fields. The Small Farmer data shows a millet/yam/vegetable complex associated with higher proportions of savannah fields, and a coffee/banana complex associated with forest lands, but neither is in any sense a dominant cropping system - both are adjustments to a cassava dominant system based on local conditions and resources.

Fresco (1986; cf also Russell et al., 1989; Reid/Bidimbu, EPIF/CAL reports) states that agricultural production systems throughout the Kwango-Kwilu are in long-term decline because of factors related to ecology. These include expansion onto marginal (often savannah/plateau) lands due to demographic pressures; abandonment of soil fertility maintenance techniques appropriate to savannah soils because of labor constraints (or

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[6] Fresco (p. 132) also distinguishes a category of fields on sandy soils on the plateaus, which she says are not lands traditionally cultivated in the Kwango-Kwilu. Farmers have recently moved onto these marginal lands as a response to land pressures in preferred environments.

lack of knowledge of these techniques among peoples newly exploiting the savannah); and long-term degradation of even the best soils due to over-exploitation and shortened fallow. If these observations are accurate then the sustainability of agricultural production, even at current low levels, depends on the identification and diffusion of new and appropriate techniques and technologies that permit intensification of exploitation at the same time that they preserve and restore soils. The measurement of degradation, identification of causes, and the development or salvage of techniques of sustainable intensified production are three research areas of primordial importance to the establishment of a program of long-term agricultural development in the Project zone.

2.4 Access to Agricultural Inputs and Information

Agricultural extension systems and inputs are not equally available across the Project area. The government extension system of agricultural monitors (monagris) is active in all collectivities of the Project zone except Kemba and Batere (Adelski et al., 1989, p.18). The monagri is also the person from which farmers most commonly receive agricultural advice (Ascher, 1989, p. 31). However, according to Adelski et al. (op. cit.) monagris are often ineffective and even mistrusted by farmers for a number of reasons: because they are poorly trained; because they have little to offer the farmer in terms of inputs and material; because they have no transport to get them out to visit farmers; and particularly, because they have been historically responsible for the enforcement of systems of forced production and other agricultural programs and policies imposed by the government. According to the Small Farmer Study, although most farmers know and have contact with the monagri only 3% of respondents said that they would seek this agent out for advice on agricultural problems.

In a study only undertaken in villages where NGO extension programs were active Ascher (1989) found that a quarter of respondents (out of a very restricted sample of 35 households) stated that they go first to an NGO extension agent for agricultural advice. Three quarters of the new or improved varieties of crop plants known to respondents had been introduced by such programs. The NGO programs have clearly had some success in introducing new varieties. On the other hand the agents also encounter problems of displacement and the programs have been criticized on the following points: that they do not always address themselves to all, or even the most important, farmers[7], and that they do not often give the kind of practical assistance

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[7] EPIF/CAL, for example, grew out of a concern that the program of the Centre Agricole de Lusekele did not reach women farmers.

Collectivity	Inputs: tools	fertilizer	Cassava F100	Improved seeds
Banga :	52.0%	8.0%	32.0%	8.0%
Kalaganda :	84.0%	88.0%	24.0%	92.0%
Sedzo :	96.0%	4.0%	12.0%	8.0%
Nkara :	100.0%	0.0%	0.0%	0.0%
Luniungu :	12.0%	0.0%	4.0%	0.0%
Kwilu-Kimbata:	84.0%	0.0%	80.0%	0.0%
Manzasay :	0.0%	0.0%	0.0%	0.0%
Kemba :	100.0%	0.0%	0.0%	0.0%
Batere :	52.0%	0.0%	0.0%	0.0%
PROCAR :	64.4%	11.1%	16.9%	12.0%

K.U.Leuven/DMPCC (enquête Vente) data

Table 2-9: % of households with access to inputs, by collectivity

(materials, inputs) that farmers are seeking (Adelski et al., 1989, p.19).

Availability of agricultural equipment in the form of standard tools does not appear to pose a major problem to farmers. Fewer than 10% of respondents in the RRAs cited access to tools as a major problem (Adelski e t al., 1989, pp.11-14). The data from both the K.U.Leuven/DMPCC and Small Farmer studies indicate in similar manner that most agricultural households have ready access to, and possess a sufficient number of, tools. Yeboah and Mara (1988, p. 26) suggest that in current production systems additional investment in tools would translate into an important rise in production. Because of the nature of (hand)tools used in the region, however, it is impossible to imagine what kind of investment they might be talking about that would not involve a concomitant increase in agricultural labor employed; limited agricultural labor is in fact one of the constraints limiting increases in production. While Yeboah and Mara may be right their theoretical model begs one of the most important research questions concerning agricultural production in the region: identification of an improved appropriate production technology which would permit a real increase in labor productivity.

Knowledge of improved varieties of crop plants is fairly widespread through the region, and particularly in areas where NGO extension programs have been active. Ascher (1989, p. 34) notes that 30 of 35 households studied knew of at least one improved variety of cassava, maize, rice or soybean, with an

average of 2.7 varieties known per household. The most widely recognized are those varieties for which there has been a long-standing and fairly intense program of popularization: cassava F100 (21 of 35 households), maize Bandundu I and Kasaï I (12 and 14 households respectively). Adoption does not necessarily follow knowledge, however: only 14 of 30 households which knew of improved varieties had actually tried them, and practically no household had tried more than one variety, all crops considered (Ascher, op.cit., p.41). Apparently farmers try out new varieties at a pace that allows them to evaluate and to protect themselves against possible hidden flaws in the innovation. Obviously the potential adopter must also find the variety attractive; some 20% of Ascher's respondents who had actually observed a new variety chose not to try it because of what they perceived as its flaws (op.cit., p. 38). The highest rates of adoption are found with cassava F100, chinese rice and soybeans (Ascher, op.cit., p.43) which have been the objects of fairly intensive specific extension and popularization programs.

The data from the K.U.Leuven/DMPCC studies (table 2-9) indicates that improved varieties, even where they are known, are not always available to all farm households. Fertilizers as well are difficult to find in the Project area. Note that Fresco (1986, p.184) proposes that the single most effective intervention to increase cassava production and productivity might be the systematic application of fertilizers.

3 Indicators

3.1 Production

The main source for data on agricultural production in the Project zone is the one-year Production and Marketing Study of K.U.Leuven/DMPCC (October 1987 - September 1988)[8]. The data for the Project zone is a subsample (225 households) of a larger group of households distributed throughout the entire Bandundu region. The Production section of this study concerns itself only with three principal crops - cassava, maize, and peanuts - which are both widely cultivated and economically dominant in farming systems throughout Bandundu. These three crops are the only ones cultivated by more than 5% of producers in all zones of the region - 98% of all producer households in Bandundu grow cassava, 93% maize, and 92% peanuts (K.U.Leuven/DMPCC, publication 4, p.3). Note that these figures correspond closely with the prevalence of these crops in the farming systems of

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[8] The Small Farmer Study collected data on production of certain crops which however presents problems of reliability and in conversion to standard calibration. This data will be referred to occasionally but is not used systematically in these analyses.

Crop	Production Households	Production %	Marketing Households	Marketing % of sample	Marketing % of producers
Cassava :	224	100.0	214	95.5	95.5
Maize :	216	96.4	185	82.6	85.6
Peanuts :	204	91.1	161	71.9	78.9
Seed gourds :	201	89.7	132	58.9	65.7
Saka-saka :	197	87.9	16	7.1	8.1
Yams :	119	53.1	54	24.1	45.4
Coffee :	98	43.8	77	34.4	78.6
Palm nuts and oil :	83	37.1	43	19.2	51.8
Rice :	42	18.8	30	13.4	71.4
Millet :	37	16.5	28	12.5	75.7

Data from the "Sales" section of the K.U.Leuven/DMPCC studies

Table 3-1: Households producing and marketing major crops

households in the Project area. Marketing goes hand in hand with production; 96% of households market cassava, 83% maize and 72% peanuts (see table 3-1 above for a comparison with other principal crops in the Project zone[9]).

Mean household production in kgs for the three principal crops are shown in table 3-2 below. Cassava dominates production by far, even when quantities are converted to the more conservative and realistic comparative measure of kilocalories: cassava accounts for 77.7% of kilocalories produced in the form of these three crops, maize for 13.2% and peanuts for 9.6%. Moreover, if the arguments of Fresco (1986) are valid, cassava may play an even more dominant role in the future as secondary crops are abandoned in favor of this crop which is less demanding of labor and of soil fertility.

Production means for the Project area are similar to those reported for the Kwilu subregion as a whole (see K.U.Leuven/DMPCC Statcom 4, August 1989) but differ in some details. Peanut production is approximately that of the Sous-Region as a whole (+/- 279 kg/hhld). Maize is in general somewhat more important in the Project area than in the Kwilu subregion - close to 590 kgs produced per household, against 510 for the larger region.

[9] Seed gourds, which are an economically and nutritionally important crop within the Project zone, are virtually ignored both by researchers and by extension personnel. The absence of any real information on this essential crop is a major gap in the understanding of the farming systems of the area.

Crop	Mean	Std Dev	Minimum	Maximum
Cassava (bitter)	8663.6	3429.49	3048.4	20203.3
Cassava (sweet)	102.9	214.25	0.0	1118.9
Cassava (total)	8766.4	3448.00	3069.3	20203.3
Maize (dry)	589.2	643.54	0.0	3024.0
Maize (fresh)	60.4	97.46	0.0	829.1
Maize (total)	649.6	668.95	0.0	3063.5
Peanuts	275.8	317.44	12.4	1977.6

Cassava is measured as tubercles; maize as cobs (dry or fresh); peanuts are calculated in the shell. All weights in kilograms

Data from the Production study of K.U.Leuven/DMPCC (N=225)

Table 3-2: Average household production in kilograms of three principal crops

Sweet cassava is less important (103 kg/hhld against 343 for the Kwilu), but more bitter cassava is produced (8664 kg/hhld against 7781 for the Kwilu).

Collectivity	Maize	Peanut	Cassava
Sedzo	1916.8	603.7	14156.4
Nkara	650.4	129.3	9631.4
Banga	836.2	245.2	8523.7
Kemba	136.5	104.1	8126.6
Kalaganda	675.3	148.6	7945.0
Kwilu-Kimbata	747.1	371.0	7811.9
Manzasay	119.3	758.7	7524.9
Luniungu	368.3	121.4	7597.9
Batere	127.0	27.9	7597.7
PROCAR	647.6	275.8	8766.4

Data from K.U.Leuven/DMPCC, Production study
N = 225

Table 3-3: Mean household production by collectivity, in kgs

The differences as a whole support the view that the Project area is more fertile than the Kwilu subregion as a whole. Maize in particular is a forest field crop: in the Small Farmer Study sample maize was present on 11% of forest fields but only 1.2% of savannah lands (see also Adelski et al, 1989, p.28). With

the exception of bitter cassava, not all crops are grown in every part of the Project area, nor by every farmer even within local areas. The standard deviations for most crops indicate large differences in per-household production. As table 3-3 shows, there is considerable variation even in the geographical distribution of per-household production averages.

The overall variations in production can be attributed in large part to household composition: a larger household will simply have more labor resources to be able to produce more, as well as a greater need for the produce and the income generated. However, the intraregional differences also show that other factors are in play. These include choices made by the producer, through preference or in response to environmental conditions, as to what mix of crops to plant and what importance to accord each crop. Soil types and fertility also will influence production, of course, as will (since these are figures drawn from a single year) rainfall patterns, diseases, pests, and other particular factors.

3.2 Productivity

Two aspects of agricultural productivity are considered here:

Yields per unit of land cultivated. This classic measure of productivity allows some degree of comparison through time and across the Project zone. This measure is sensitive particularly to factors affecting intensification of agricultural production, be they improved techniques or fertility decline.

The use of land as the denominator in productivity measures however poses a number of conceptual and measurement problems. For one, there is very little being done to try to promote intensification of land use, and little evidence of current trends toward intensification. Yeboah and Mara (1988, p. 5) argue that the Kwilu as a whole is land-rich - that access to land is not a constraint on expansion of production. Both the RRAs (Adelski et al., 1989, p.27) and Fresco (1986, p.175) find that while this may be true generally, some villages do suffer shortages of land. Fresco (op.cit., p. 209-210) also identifies a trend toward exploitation of marginal or fragile lands which indicates a real land shortage even if unexploited lands still seem to be abundant. The situation is further complicated by the prevalence of intercropping and by the practice, apparently deliberate and widespread, of low-density plantings (Springer-Heinze, 1988, 5.5). In short, the uncertainties surrounding the use of yield/unit land data are sufficient so that interpretation is clouded until research can establish overall existing levels and trends (and reasons

for these) against which to compare particular measures, or until a program is put in place which specifically aims at modifying yield per hectare (i.e. a fertilizer project).

2. Relationship between production and labor use (whether hypothetical, in the form of available and potential household labor, or as a measure of production per labor time [or per energy] expended). Again, there is considerable room for debate as to the real amount of labor available for production in the region. It is evident that in real terms labor is a constraint, probably more important in its effects on production than land. All authorities on the region's farming systems cite the effects of labor constraints in pushing producers to abandon crops and soil-maintenance practices, neglect or postpone such work as weeding, or reduce planting densities (Fresco, 1986, pp. 175 ff.; Russell et al., 1989; Springer-Heinze, 1988, 5.5). On the other hand there is underutilized or unexploited labor apparently available under existing conditions as well[10].

Fresco (1986, p.175) insists on the importance of both the foregoing measures, arguing that the relative importance of one or the other varies from region to region. In any event, in the absence of any technology (improved plant variety, inputs, or new techniques) that would unilaterally improve the performance of the plants themselves, production per unit of land is a function of productivity of labor.

3.2.1 Yield measures

Fresco (op. cit., p.187) suggests that the productivity of cassava can serve as a proxy for the productivity, the success and the evolution of the farming systems of the Kwango-Kwilu as a whole. The importance of cassava and the primordial position of that crop are undeniable. Cassava yields, however, are particularly difficult to measure in a consistent and systematic way[11] whatever control variable (land or labor) is used.

Intercropping of cassava with other crops is common (according to Yeboah and Mara, 1988, p.8, more than 60% of

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[10] One immediately thinks of the possibility of men becoming involved in agriculture, which generally seems more common than is recognized by most authorities. However, even the time devoted to agriculture by the women who are primary producers seems low, on the order of 840 hours per person per year (cf. Springer-Heinze, 1988, 4; also discussion in section 3.2.2 below).

[11] Fresco (1986, pp 177 ff.) has a detailed discussion of the problems which can be encountered and the consequent lack of good comparative data in this area.

exploitations are cultivated in this manner). Even on single crop fields, however, social and technical factors can influence planting methods and result in highly variable planting densities (Springer-Heinze, 1988, 5.5; Fresco, op.cit). The timing of planting, method of harvesting roots, the length of time roots are left in the soil to mature or to store all will affect, and to some degree confuse, the measure of productivity[12]. Leaf harvest, which is vital to the food economy of the region, also significantly affects root yield; yet leaf production is rarely measured[13] and is never calculated into measures of productivity (Fresco, op.cit., p.178).

Cassava is further capable of a wide range of performance and susceptible to large differences between production under favorable and unfavorable conditions. At the extremes Fresco (p. 184) cites yields of 38 tons of fresh root per hectare in PNE trials with fertilizer and 0.3 t/ha for a disease-susceptible variety on a farmer's field, both within the period 1975-1980.

The establishment of baseline production and productivity statistics for cassava is further hampered by the absence of a body of solid research and methodological development which would help resolve some of these difficulties. Table 3-4 below gives, as indicative figures, estimates and measurements of several authorities[14].

In principle it should be easier to measure yield data for other major crops such as maize and peanuts, these being annuals with well determined harvest periods. In reality, however, there is little reliable information for these crops as well (see table 3-5).

Fresco (1986, pp. 182 ff.) argues that while total production has steadily increased in the Kwango-Kwilu regions over the past few decades, this has largely been a function of

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[12] Fresco (op.cit., p.177) cites cases in which roots were harvested at 7 months and others when the harvest was as late as 41 months. Note that cassava long and variable cycle of production further complicates the measure of yield per unit land since this statistic generally implies a determinate growth cycle - usually a season or a year - with a specific harvest time.

[13] Note that some varieties of cassava appear to be grown primarily for the quality of their leaves; Ascher, 1989.

[14] Note that for this table and similar ones that follow the RAV and PROCAR statistics are based on very limited samples: 17 cases for the RAV cassava data, 26 for maize and 27 for peanuts; 96 trials of cassava and 150 of maize for PROCAR, but none on farmers' fields.

1. PROCAR trials on demonstration/multiplication fields, 1989:

4 improved varieties	13.5	t/ha
F-100	16.5	t/ha
Local	11.2	t/ha

2. RAV trials in fields of contact farmers (Keïta, 1990):

F100 mean 17,234 Kg/ha, minimum 4,000 kg/ha, maximum 31,111 kg/ha

3. Estimations of Springer-Heinze (1988, 5.6), varieties not identified:

forest fields: 6 to 12 t/ha savannah fields: 1.5 to 9 t/ha

4. From Fresco (1986):

Evolution of production - means from official statistics:

1952	(Kwango-Kwilu)	12.7 t/ha	1954	(Kwilu)	15.2 t/ha
1958	(Kwilu)	10.8 t/ha	1976	(Kwilu)	14.5 t/ha
1978	(Kwilu)	16.8 t/ha	1979	(Kwilu)	14.6 t/ha

Observed yields:

Best yield on farmer field (presumably forest land)	10 t/ha
Mean (sous-région Kwango)	7 t/ha
Worst yield in normal conditions (south Idiofa)	4 t/ha

5. Observations of Yeboah/Mara (1988, p.12): in pure stands, 2.35 tons of cossette/ha = 6.5 t/ha of fresh roots

All figures for fresh roots except 5.

Table 3-4: Estimates and observed measures of cassava yields per hect

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population growth and expansion of the area of land under cultivation. Productivity per land unit has steadily been decreasing. The downward trend can be followed over a decade of fairly reliable measurements from a high average of 13 t/ha in 1952 (mean figure for the whole Bandundu region). More recent statistics have been less reliable but Fresco situates the mean for the region at around 7 t/ha in 1980[15].

While Fresco's arguments are forceful and convincing the evidence mustered to support them are, in the absence of a solid base of supporting research, largely circumstantial. Does the hypothesis of productivity decline apply equally to the

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[15] The region had known, of course, the spread of a devastating cassava blight and a consequent famine in the 1970s.

1. Yields in kg/ha of maize and peanuts in RAV trials in fields of contact farmers (Keïta, 1990):

	Mean	Minimum	Maximum	Density/ha (means)	N
Maize	1530.77	800	2360	14,000	26
Peanuts	3691.33	0	5667	182,000	24

2. Average yields per hectare for 10 varieties of improved maize in trials on demonstration and multiplication fields - PROCAR (1989):

Variety	Kg/ha	Variety	Kg/ha
Sample	3,365.4	IKENNE 8	3,437.3
		KAHILA	3,270.1
BANDUNDU I	3,297.3	KAMB.83T	4,478.5
EV.8428	3,688.7	KASAI-I	3,586.7
FARAKO-B	3,774.7	SAM.83TZ	1,992.3
HYB.8644	3,683.6	SEK.85TZ	2,519.1

3. Estimates by Yeboah/Mara (1988, p.11; estimates for 1985):

Seed maize in pure stands - 0.68 t./ha
Peanuts in shell, pure stands - 0.57 t./ha

4. Estimates of Springer-Heinze (1988, 5.6) for several crops in intercrop on savannah and on forest lands:

	Planting density	Yields per hectare in forest	Yields per hectare in savannah
Maize	3,000 plants/ha	0.3 to 0.8 tons	0.1 to 0.5 tons
Peanuts	150,000 plants/ha	0.8 to 1.2 tons	0.3 to 0.8 tons
Millet	50,000 plants/ha	(on savannah only)	0.3 to 0.8 tons
Gourds	5,000 plants/ha	0.2 to 0.3 tons	0.3 to 0.6 tons

Table 3-5: Estimates and observations of yields of maize and peanuts

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relatively well-endowed Project zone and to the poorer lands of

the Kwango? In fact, a number of the contributing factors and trends cited by Fresco have been identified by the RRAs (Adelski et al., 1989) and by the EPIF/CAL studies (Russell et al., 1990; Reid and Bidimbu):

* Demographic pressures and pressures on available land: generally reduced fallow periods, marginal (often savannah)

lands being put into production[16].

* Political and economic pressures: a growing proportion of women's labor time taken by imposed labor, agricultural or otherwise, or directed to production, practices or agricultural calendars which are not adapted to local conditions. Moreover, a constantly deteriorating national economy forces producers to devote ever more land and energy to production for market.

* Change or outright abandonment of traditional crops and practices adapted to a cycle of production and subsequent regeneration of the resource base, under pressure of increased external demand and insufficient available labor. The key here, for Fresco (cf op.cit., p 186), is not so much that old practices are abandoned but that nothing new has taken their place. The system continues to operate as before (i.e., as if it was still a viable system of shifting agriculture and subsistence production) but at a much higher level of activity and of export of energy than such a system can support.

Outside of cassava there is very little comparative information on production and productivity tendencies over time. Among the authorities consulted here only Yeboah and Mara (1988, pp.11-12) observe a lowering of productivity per hectare of 15% for maize and 18.6% for peanuts, in pure stands, between data collected by FAO in 1980 and their own observations in 1985.

3.2.2 Productivity and labor capacity

The sociology of agricultural production in the Project area, as in the Bandundu region as a whole, is characterized by a fairly strict sexual division of tasks. Women are primarily or exclusively responsible for planting, weeding and maintenance, harvest and transport of produce; in the Small Farmer Study survey over 90% of respondents declaring that they were responsible for each of these activities were female, and over 60% of female respondents (all ages included) stated that they were responsible for or participated in some or all of these activities. Fewer than 5% of men and boys stated that they were responsible for planting and weeding, and 9% said they were responsible for harvest activities; 12 to 20% of men contributed to these activities. On the other hand men are in charge of clearing fields - 50% of males participated, and over 80% of persons responsible were men.

According to Fresco (1986, pp. 104-105) men contribute

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[16] The need to go ever further from the village to find land to farm in itself adds to the time and work devoted to production.

virtually nothing to the production of cassava except the clearing of the field, for which a man or boy is responsible in over 90% of observed cases. The existing concentration of women in agricultural production could then become even greater under the influence of two factors - the growing importance of cassava in the overall farming system, and the disappearance of forests (and greater exploitation of savannah lands) which would remove the need for men's greatest participation in agriculture.

A number of observers in the field, including the Project's own agents, suggest that the situation is not so simple. There are certainly men who participate, on their own or in partnership with the women of their household, in the production of all crops including cassava. In the Small Farmers Study data the declared active participation of men in agriculture seems to be linked to two factors: the absence or insufficiency of women's labor in the household, and an important production of specialized commercial crops, particularly coffee which is, more than any other, a "men's crop". According to Springer-Heinze (1988, 6.1) men are more drawn to agriculture in places where the proximity of a large center or a main road offers ready opportunities for marketing produce.

The eventual participation of men in agriculture becomes a vital issue as the labor productivity of women, using current techniques and technology, approaches a theoretical limit. What the potential contribution of men might be has not been evaluated; calculations of household agricultural capacity have not to date included hypothetical male labor except in relation to specific male-assigned tasks.

Springer-Heinze (op.cit., 4) calculates 17 days of labor per month per active worker (except where specified female) during 9 months of agricultural activity, plus 3 months at 5 days per month of agricultural activity during the long dry season. This totals to 168 days per year devoted to agricultural work, an estimation which takes into account a large number of factors which take a person away from farm work: numerous holidays and days off (often two of the latter a week); imposed labor (which, however, may be agricultural); family and community obligations; frequent illnesses and births; inclement weather, and numerous others. At 5 hours of agricultural work per day (which does not take into account travel time to and from work, however) this amounts to an average of 840 hours of labor time per year for an active participant in agricultural work. Otherwise calculated, this represents 1150 to 1380 hours of available women's labor time on average for a household, to which one can add 180 hours per man for those activities which are their domain: a total of between 1300 and 1500 hours of labor time resource on average for

Labor time per hectare in hours:

Forest(cassava/maize/peanut):	Hours/ha	Forest edge(cassava/peanut):	Hours/ha
Preparation	450 - 500		250 - 400
Planting	150 - 170		130 - 160
Weeding	300 - 590		250 - 400
Harvest	740 - 1240		710 - 1210
Totals	1640 - 2320		1330 - 2170

Savannah fields:

Flat (cassava/seed gourd):		Ridges (millet/maize):	
Preparation	300 - 400		300 - 400
Planting	100 - 120		70
Weeding	250 - 400		150
Harvest	450 - 680		60 - 100
Totals	1010 - 1480		650 - 740

Hours of labor per exploitation (observed):

Complex A:	Forest field 0.4 ha, season A	400 - 680 hours
	Savannah field mixed 0.3 ha, season B	330 - 470 hours
	Savannah field cassava 0.3 ha season B	300 - 440 hours
Total complex A:	1 ha	1030 - 1590 hours
Complex B:	Forest edge field mixed 0.4 ha ssn A	530 - 870 hours
	Forest edge field cassava 0.2 ha ssn B	200 - 300 hours
Total complex B:	0.6 ha	730 - 1170 hours
Complex C:	Forest field 0.3 ha season A	300 - 510 hours
	Savannah field, ridges 0.2 ha ssn A	210 - 260 hours
	Savannah field, ridges 0.3 ha ssn B	200 - 220 hours
Total complex C:	0.8 ha	710 - 990 hours
Complex D:	Forest field 0.6 ha season A	610 - 1020 hours
	Savannah field 0.2 ha season B	200 - 290 hours
Total complex D:	0.8 ha	810 - 1290 hours

From Springer-Heinze, 1988, 5.4

Table 3-6: Labor requirements for different types of fields

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a producer household[17].

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[17] This is close to Fresco's estimate of 1562 hours per year per household (cited in Yeboah and Mara, 1988, p. 16).

Springer-Heinze's estimates for the annual requirements in labor time for various types of exploitation are shown in table 3-6 above. The figures are given both in standardized per hectare per task form, and in the more realistic form of labor requirement per exploitation. Keeping in mind that there are considerable variations between households, it is still worth noting that the average labor requirement for an exploitation falls somewhere between 75% and 100% of the average labor available per household, men excluded. If this observation reflects reality then it follows that the proportionately higher demands on labor in season A must seriously stress the capacities of many households which are, in Springer-Heinze's formulation, prorated equally across the work year.

Springer-Heinze (op.cit., 5.5) defines labor as a "limiting factor" in production. This is the general consensus of all the authorities consulted for this report. Certainly much of Fresco's argument cited above, as well as the reports of the RRAs and EPIF/CAL, point to the labor constraint as one of the major factors influencing the present trends in production (cf also Yeboah and Mara, 1988, p.26, who argue that the need to rationalize the use of labor is the principal factor pushing farmers to intercrop).

Table 3-7 below gives estimates of production of 100 hours of labor time devoted to different crops on different types of fields (after Springer-Heinze, 1988, 5.6). As the wide range between minimum and maximum categories indicate, the underlying data is not strong (particularly production measures), so these estimates are best seen as indicative until better study data can be generated.

Another dimension of the productivity of agricultural labor can be captured using the household-level measure of available labor (work units) described above, and its corollary measures of

	Crop	Kilograms Min	Kilograms Max	Value in Zaïres (4/88) Min	Value in Zaïres (4/88) Max	Kilo-Calories Min	Kilo-Calories Max
On SAVANNAH :	Cassava	101	989	310	3300	303000	2967000
:	Maize	12	102	180	1530	38500	357000
:	Millet	33	154	660	3080	115500	439000
:	Gourds	33	111	520	1575	165000	555000
:							
In FOREST :	Cassava	339	1250	1100	3750	1017000	3750000
:	Maize	27	101	405	1515	94500	385000
:	Peanuts	45	141	640	1980	292500	916500

Calculated from the data of Springer-Heinze, 1988, 5.5-5.6.

Table 3-7: Estimates of labor productivity in weight, calories and value of produce per 100 hours labor

consumption units and degree of dependency. While the Springer-Heinze labor-time measures tend to provide normative benchmarks for the analysis of trends in labor use and returns to labor, the work/consumption unit/dependency set of measures provides a stronger basis for comparison between households and allow for examination of household labor allocation questions both within and outside agriculture. Insofar as the household is the principal production unit, as well as being the essential unit of consumption, the composition of the household and its particular mix of demand and productive power are necessarily going to exert a powerful if not dominant influence on the production strategy. The introduction of these more sociological variables opens a number of interesting conceptual directions - the possibility of developing standards of absolute and relative poverty, and of linking a household's economic strategies to its place in the family life-cycle.

A variant of the work/consumption unit measures, which are after all each closely correlated to household size[18], is to cut through details and simply measure production per person present. Less specific in its focus than either work or consumption unit, this measure offers a good background for observation of the behavior of these units. Moreover, the mean of the mean is in effect a classic statistic for regional baselines: per capita production, measured at the household level.

Table 3-8 on the following page gives productivity for three principal crops per labor unit, consumption unit and person present, measured in kilograms and kilocalories per household by unit. Both Small Farmer Study (1984) and K.U.Leuven/DMPCC (1987-88) data is used.

3.3 **Marketing of Agricultural Products**

3.3.1 Conditions of marketing

Producer prices of principal crops (see also table 3-9 below for the evolution over time of these) in 1987-88 are as follows[19]: cassava cossettes, 12.2 Zaïres/kg; maize grains, 14 Z/kg; peanuts in shell, 39.7 Z/kg.

From the same source (and time period), the prices of produce in the Kikwit market are: cassava 24.8 Z/kg, maize 23.2

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[18] As the degree of dependency, however, is not.

[19] Mean deflated prices for the Kwilu subregion; K.U.Leuven/DMPCC, 1989, publication 8). One US dollar= 161 Z.

Mean production by crop, in kilograms and kilocalories, per unit of household composition measure

	SFS	DMPCC	Crop	SFS	DMPCC	
Kg/WU	3731.0	3442.5	Cassava	5559	5129	Kc/WU
	280.3	258.6	Maize	1001	923	
	118.4	109.2	Peanuts	650	600	
	4129.7	3810.4	Total	7210	6652	
Kg/CU	1930.2	1682.2	Cassava	2876	2507	Kc/CU
	145.0	126.4	Maize	518	451	
	61.3	53.4	Peanuts	336	293	
	2136.5	1862.0	Total	3730	3251	
Kg/PP	1205.5	1093.0	Cassava	1796	1629	Kc/PP
	90.6	82.1	Maize	323	293	
	38.3	34.7	Peanuts	210	190	
	1334.3	1209.8	Total	2330	2112	

Overall means:

	Kg*	Kc	Conversion		SFS	DMPCC
Cassava	6678.5	9951	1490 Kc/Kg	WU	1.79	1.94
Maize	501.7	1791	3570 Kc/Kg	CU	3.46	3.97
Peanuts	211.9	1164	5490 Kc/Kg	PP	5.54	6.11

* Edible portion only

WU = work units
CU = Consumption units
PP = Persons present

Kg = Kilogram
Kc = Kilocalorie

DMPCC = K.U.Leuven/DMPCC data SFS = Small Farmer Study data

Based on production data from the Production study of K.U.Leuven/DMPCC, conversion factors given by K.U.Leuven/DMPCC (publication 16)and formulas for calculating work and consumption units per household from the same source; and household data from the Small Farmer Study.

Table 3-8: Two estimates of productivity per unit of household composition

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Z/kg; and peanuts 62.3 Z/kg. These figures can be compared with

Evolution of producer prices per kg 1980 - 1988

Date	Cassava cossette	Maize seed	Peanuts in shell	$1 =
1) 1980	0.46	0.4	-	2.98 Z
1982	1.2	2.0	4.0	5.74 Z
1987-88	24.8	23.2	62.3	160.7 Z
2) 1984-85	6.3	5.4	10.6	
1987-88	12.2	14.0	39.7	160.7 Z

1) Kikwit market 2) Kwilu subregion

Data from Fresco (1986) 1980, 1982; Yeboah/Mara (1987) 1984-85; K.U.Leuven/DMPCC (Publ. 8, 1989) 1987-88

Prices of other commodities on the Kikwit market, 1980 and 1982:

	Cotton cloth 4 meters	18 kilo sack of salt	Sardines 100 g tin
1980	90.00 Z	36.30 Z	4.50 Z
1982	145.00 Z	50.00 Z	5.00 Z

From Fresco (1986, p.87)

Table 3-9: Evolution of

Fresco's (1986, pp. 86-87) figures for the same products in 1980-82 (table 3-9).

Producer prices are subject to seasonal fluctuations as well as important variations due to the intensity of competition among buyers, distance and ease of access to Kinshasa markets, and local preferences.

Seasonal fluctuations are most pronounced for those crops maize and particularly peanuts - which have a specific harvest and marketing season (table 3-10). Cassava is slightly sensitive to climatic conditions in the sense that the conditions during the long dry season favor drying and shipping of the product. Producers also have more time available in this season for harvesting roots[20].

The price of maize knows two distinct seasons, particularly in the Kwilu subregion (K.U.Leuven/DMPCC, publication 8, p.19). Prices remain steadily high during the main growing season until harvest (October to February), then drop and stay low after harvest until the next planting season (March to September). While maize is a single-season crop with a distinct ripening period, it is fairly robust in storage and transport. Wittenberger (1990, p.6) notes that farmers commonly leave maize on the stalk after it dries, and harvest ears when they are needed. Maize is apparently also less suscep-tible to damage from rain and in transport than other produce.

Peanut prices are influenced, in the Project zone, by two growing seasons (K.U.Leuven, op. cit., p.22). Prices characteristically drop at harvest time for each season, then rise

[20] According to Springer-Heinze harvesting is the single most labor-demanding activity with cassava, requiring more than 50% of the labor hours devoted to production.

slowly in following months. Apparently, then, producers are selling most of their crop as soon as it is harvested.

Prices are also influenced by the distance and conditions of transport between the point of production and the principal markets. Kinshasa is by far the most important final destination for produce from Bandundu, although some produce from the Project area goes to regional centers (which also serve as bulking centers for Kinshasa-bound produce) and to neighboring regions (table 3-11). Transport is effected primarily by truck, although along major waterways evacuation by boat is common; thus, some areas which would appear to be isolated by their distance from main roads do in fact have an outlet to markets (Sedzo, Kemba and Batere, and northern Manzasay, for example).

Price variations at producer level within the Project area - per kg average prices 1987-88:

Zone	Cassava cossette	Maize seed	Peanuts in shell
Kutu	15.3	14.8	37.9
Bagata	16.7	17.7	39.0
Bulungu	12.5	13.1	48.8
Idiofa	10.7	14.1	35.0

K.U.Leuven/DMPCC data (Publ. 8, 1989)

Seasonal variations (deflated prices, 1987-88):

Product	Maximum	Month	Minimum	Month
Cassava cossettes	11 %	January	8.5 %	August
Maize seeds	13.5 %	November	9 %	June
Peanuts in shell	32 %	November	22 %	June*

* in the Kwilu subregion a second minimum is also reached in February

K.U.Leuven/DMPCC data (Publ. 8, 1989)

Table 3-10: Price variations

The price to the producer apparently reflects fairly accurately the retail price and costs to the transporter. K.U.Leuven/DMPCC (op.cit., p. 14) observes that the proportion of the final price per kilogram added by the collector and transporter is relatively low and stable throughout the year; truckers in fact appear to make most of their profit on the transport of manufactured goods out of Kinshasa. Prices to the producer can thus be expected to be most favorable in areas which combine the following conditions: short and easy trip to the final destination (preferably Kinshasa); strong local market for

Origin		Destination	
Kinshasa	53.8 %	Kinshasa	85.8 %
Bulungu	16.4 %	Congo-Brazzaville	5.3 %
SR Kwilu	10.7 %	Kasaï	0.9 %
Idiofa	8.4 %	Kikwit	0.4 %
Kikwit	3.6 %	Not stated	7.6 %
SR Maï-Ndombe	3.1 %		
Not stated	4.0 %		

Data from K.U.Leuven/DMPCC, "Vente" study

Table 3-11: Point of origin and destination of buyers

manufactured goods; sufficient local production. In fact this proves to be so. The K.U.Leuven/ DMPCC study (op.cit., p.13) notes that the most favored producers in the region are those who sell their produce at Kenge, who receive 27% of the final Kinshasa price; Idiofa producers get on average only 21%. Both towns serve as important regional centers and points of redistribution for manufactured goods. The region around Idiofa is far more productive and diversified than that around Kenge, but Idiofa is 640 km from Kinshasa and off the paved road, while Kenge is 270 km from the capital and right on the road.

Certainly the more isolated producers is the more vulnerable they become to unfavorable conditions imposed by monopsony buyers. Evidently, in some areas the major local buyers have divided territories between themselves and have specialized in the purchase of specific products rather than engage in head-to-head competition. Both Russell et al. (1990, p.21) and Yeboah and Mara (1987, p.14) describe situations in which a buyer in an remote village was able to buy cassava at around a third of the going price. Access to markets and the lack of buyers were cited as the number 1 problem in 19% of the villages studied in the RRAs, and as one of the top 3 problems in a third of the survey villages[21]. 30% of respondents to the K.U.Leuven/DMPCC Marketing survey indicated that the buyer imposes the price. Certainly, because of lack of transport and the absence of a dynamic system of periodic markets producers have few options but to deal with the buyer who comes to the farm; at least two thirds

% of marketed production which is sold at:	the farm gate	Village market	Elsewhere
Cassava	31.3%	35.2%	33.6%
Maize	28.1%	59.5%	10.7%
Peanuts	60.2%	28.6%	11.0%
Rice	87.1%	5.9%	7.0%
Voandzou	11.9%	53.5%	34.6%
Seed gourds	49.6%	43.8%	6.6%
Coffee	44.4%	55.4%	0.2%

K.U.Leuven/DMPCC data (1988) N=224

Table 3-12: Primary sales sites for major crops

[21] Note, however, that the most common major problem cited overall was by far access to health services. The Small Farmer Study in a similar study also found that people's primary preoccupation was health.

of all major crops are sold in the producer's home town (table 3-12).

The person selling produce is most often a woman (table 3-13). Men barely get involved in the marketing of cassava and maize but are somewhat more active in peanut sales. In all cases it appears that it is the producer her- or himself, or a person directly delegated by the producer, who sells the produce.

% of total value marketed by:

	Women	Men	Children
Cassava	68.7%	18.4%	13.0%
Maize	66.4%	23.5%	10.1%
Peanuts	52.4%	41.4%	6.1%

K.U.Leuven/DMPCC data (1988) N=224

Table 3-13: % of total value of crop sold by person selling

Who actually gains control of the revenue generated is less clear. According to the Small Farmer survey(Eele and Newton, 1985, vol.2, table 74) a man will decide the disposition of the revenue in 60% of cases when a woman is principal producer. Fresco (1986, p.101) suggests however that although a woman should, by custom, turn over all revenue to her husband, women very often keep all or part of their earnings. In either case the use of agricultural revenue is subject to a good number of family and household obligations, some of which are men's responsibility and some women's; much if not all revenue will then go to family needs in most households.

3.3.2 Marketed surplus

All crops grown for market in the Project zone, except for coffee and in some areas tobacco, are also grown for home consumption (Adelski et al., 1989, p.20). Very little specialization in any crop is evident, as households tend to produce the range of foodstuffs they eat, consuming what they need and selling the surplus. Very few households find it necessary to purchase cassava or maize. A somewhat larger percentage of households will buy peanuts during the year, given that all households do not grow this crop. Around a quarter of all households will purchase palm nuts or oil (K.U.Leuven/DMPCC, publication 6, p.7), but this is not a typical crop; the harvest of palm nuts and the manufacture of oil draw are specific skills, and the process is commonly a specialized form of gathering (Adelski et al., op.cit., p. 37).

Statistics of the marketing of produce thus give a fair overall approximation of surplus production available for marketing under present conditions. This is all the more true because producers are not inclined to store their production for long periods, and indeed could not do so with cassava if they wanted to once the roots are lifted from the ground.

% of producer households that market surplus or supplement production with purchases

	N	%	Crop	N	%	
Sell surplus	214	95.5	Cassava	18	8.0	Buy extra
	185	82.6	Maize	11	4.9	
	161	71.9	Peanuts	33	14.7	
Neither buy nor sell	2	0.9	Cassava	10	4.5	Both buy and sell
	32	14.3	Maize	4	1.8	
	44	19.6	Peanuts	14	6.3	

K.U.Leuven/DMPCC data, 'Vente' study

Table 3-14: % of producer households who buy and sell main crops

However, the K.U.Leuven/DMPCC analysis of the effects of house hold composition on production and home consumption of principal crops (publication 16, p.23) indicates that household consumption measured by kilocalories per unit of consumption decreases as the number of units of consumption in the household increases. Moreover, the quantity sold per consumption unit is negatively correlated with the amount consumed per consumption unit. This last relationship was examined as a follow-up to a CEPLANUT (1983) study which indicated that households along the main highway show higher levels of malnutrition which is attributed to the selling of produce to the detriment of nutrition. The assumption that the surplus people are willing to sell is the same as that which they can sell without detriment to themselves and their families is thus subject to question. It is clearly possible that in some cases economic pressures - need for cash, or even simply the ease of selling produce - will push a producer to sell more than is good for the household.

Table 3-15 gives some estimates of the percentage marketed of a number of important crops. Table 3-16 below, drawing on a more precise body of data, gives average quantities of cassava, maize and peanuts produced according to whether a household then chose to market some part of its production or not, as well as indicating the quantity and proportion of produce sold by those households that did so. Neither of these tables takes into account quantities bartered or purchased. In any event barter is not significant - non-monetary exchanges account for no more than 3% to 4% of marketed production in any case, and purchases are significant only in the case of peanuts: for those households that buy peanuts, the quan-tity purchased amounts to a quarter of the

% of production sold:

Maize	75%	Peanuts	62%
Rice	71%	Gourds	58%
Plantains	50%	Millet	26%

RRAs data (Adelski et al, 1989)

Table 3-15: Estimates of % of production sold

household's consumption, on the average. In the cases of cassava and maize, purchases amount to an average of around 4% of the quantity produced by the purchasing household.

The produce remaining in the household is that which the household must hold back for its own use, or chooses to keep in reserve[22]. This quantity can be broken down into the following elements:

- Quantity eaten by the family
- Post-harvest losses - mold and rot, insects, rodents, theft, etc.
- Processing losses
- Bequests, gifts and other unregistered transactions
- Non-food use: feeding livestock, manufacture of alcohol, etc.
- Seed reserve
- Long-term reserves for food security.

Quantities in kgs produced per household according to whether the household marketed part of its production or not

	Cassava	Maize	Peanuts
Sample	: 8766.40	619.66	278.87
None sold	: 6944.31	404.83	177.18
Part sold	: 8851.15	747.64	374.42

For households which did market a crop: means of quantities produced,sold and quantity kept in the producer's household

	Cassava	Maize	Peanuts
Qty produced	: 8851.15	747.64	391.42
Qty sold	: 4418.75	244.74	196.82
Remaining	: 4544.04	502.90	349.85
% sold	: 49.9%	32.7%	50.3%

K.U.Leuven/DMPCC data

Table 3-16: Mean household production and sales of principal crops

Cassava, it should be noted, is stored only in the soil, so that long-term storage is not an issue: production is registered at the time of lifting the roots, which directly precedes use or sales. Nor does planting stock impinge on production in the unique case of cassava.

The actual quantities reserved for each specific post-harvest use are difficult to specify. Certainly family

[22] In using the K.U.Leuven/DMPCC data it is probable that for maize and peanuts, because of the timing of the study (October to September), the full marketing cycle has been captured for the production cycle that is recorded. For the purposes of this analysis, then, the data is treated as if we knew that every grain of corn and peanut that the survey farmers intended to sell from the 1987-1988 production has been sold and registered in the sales survey data.

consumption is the most important of these. For cassava the FAO estimates that 79% of unsold production is destined for human consumption (cited in K.U.Leuven/DMPCC, publication 10, p.16). Fresco (1986, pp.99-101) calculates average consumption of cassava cossettes to be 180 kg per year per person, or 1100 kg for a household of 5 persons including losses (990 kg net). Calculating on the basis of 5.53 person per average household per household consumption should be 995.4 kg of cossettes, or 2552.3 kg of fresh tubers. Adding 6% for processing losses (K.U.Leuven/DMPCC, op.cit., p.15) this accounts for 3078.3 kg of cassava used for food in the average producer household. About 1500 kg, then, is not accounted for.

K.U.Leuven/DMPCC (Publication 9, pp.9-10) calculates losses and reserves as follows as a proportion of peanut and maize production:

Maize	- losses (Kwilu subregion)	9.0%;	seed reserve 6%
Peanuts	- losses (Kwilu s.-r.)	11.1%;	seed reserve 14%

which gives (compare to figures table 3-16):

Maize -	sample:	losses 55.8 kg;	seed reserve 37.2 kg
	none sold:	losses 36.4 kg;	seed reserve 24.3 kg
	sellers:	losses 67.3 kg;	seed reserve 44.9 kg
Peanuts -	sample:	losses 31.0 kg;	seed reserve 39.0 kg
	none sold:	losses 19.7 kg;	seed reserve 24.8 kg
	sellers:	losses 41.6 kg;	seed reserve 52.4 kg

Table 3-17 compares production and reserves between producers who sell and producers who do not. The final quantities consumed in the household are surprisingly similar, for maize in particular, and suggest that for this crop at least there may be an home consumption threshold below which producers will not sell.

Household composition influences whether or not a household is able to produce a sufficient surplus of maize or peanuts to market some of it. Table 3-18 below demonstrates some of the relationships. Logically one would anticipate that larger households with a relatively high level of labor resource and a low degree of dependency would be more likely than others to produce and market a surplus. This does appear to be so. Moreover, the percent of house-holds who sell surplus appears to follow almost exactly the constructed scale of household types introduced and described in section 2.2.2 above.

Production and marketed surplus are also sensitive to variations between areas within the Project zone. Among the number of factors which might account for these differences, ecological variables can be expected to be an important

Average quantity remaining on farm, in kgs, households marketing a crop and those not selling

	Maize	Peanuts
Non-sellers:		
Production	404.8	177.2
Losses	36.4	19.7
Seed reserve	24.3	39.0
Remaining	344.1	118.5
Sellers:		
Production less sales	502.9	349.9
Losses	67.3	41.6
Seed reserve	44.9	52.4
Remaining	390.7	255.9

Table 3-17: Comparison of quantities reserved by category of producer

influence. The variable ECO used as a proxy for subzone ecological differences[23] highlights some interesting variations (tables 3-19), including:

- a zone in which the cassava-maize complex dominates production, at the expense of peanuts, but where maize does not appear to be as important in marketing as its production would suggest. These are the palm subzones (palm/steppe and palm/ savannah) which are mostly collectivities in the northeast (Idiofa). They are, as well, among the more fertile and agriculturally diversified collectivities in the Project area; predictably, they are active across the board in marketing.

- forest/savannah zone (Manzasay) where peanuts are favored, and where this crop dominates commerce while other crops are weak

- the mosaic zone north of the Kasaï river (Kemba, Batere) where the production and marketing of both maize and peanuts is limited. This is clearly a different ecozone than the rest of the Project area, with more rainfall and more forest cover. Note also that the production and marketing of crops not analyzed here (coffee, rice) are more important in this area.

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[23] Classification by collectivity as follows:

Palm/steppe:	Banga, Kalaganda and Luniungu
Palm/savannah:	Sedzo, Nkara and Kwilu-Kimbata
Forest/savannah:	Manzasay
Mosaic:	Kemba and Batere.

All use of the variable ECO is in relation with K.U.Leuven/DMPCC data.

A. Comparison of household composition measure between households selling and not selling peanuts and maize

Crop	sold?	Persons Present	Units of: Work	Consumption	Dependency Degree
Peanuts	no	5,5	1,78	3,41	3,68
	yes	5,9	1,92	3,70	2,81
Maize	no	4,9	1,62	3,14	3,66
	yes	6,0	1,93	3,71	3,16

B. Percent of households by category according to whether they sell peanuts or maize, or not

sold?	Peanuts No	Peanuts Yes	Maize No	Maize Yes
Sample	46,0	54,0	34,0	66,0
Single man	75,0	25,0	44,4	55,6
Single woman	51,4	48,6	39,7	60,3
Monogamous couple	45,7	54,3	35,2	64,8
Polygamous	34,0	66,0	17,4	82,6
Small family	64,7	35,3	50,0	50,0
Couple with dependent	35,9	64,1	39,7	60,3
Young family	48,1	51,9	35,5	64,5
Older family	45,7	54,3	28,4	71,6
Several adults	47,1	52,9	27,3	72,7
Extensive family	40,6	59,4	20,0	80,0

Small Farmer Study data

Table 3-18: Composition and characteristics of households according to whether they sell maize and peanuts

3.4 **Revenue**

3.4.1 Agricultural revenue

In rural areas within the Project zone agricultural revenue represents on average between 60% and 70% of a households income (table 3-20). Cuevas et al. (1990) give average figures of 61% for the Zone of Idiofa and 64% for Bulungu, figures which are incidentally lower than the mean for all areas studied (Cuevas et

Production and sales in kgs, by ecozone

	Production	Sales	Percent of production remaining*	Percent of households selling
Cassava				
Palm/steppe	8022.19	4002.12	50.1	100.0
Palm/savannah	10533.26	4743.54	54.9	94.7
Forest/savannah	7524.93	4735.37	37.1	80.0
Mosaic	7853.15	3514.44	55.2	98.0
Peanuts				
Palm/steppe	171.72	100.96	41.8	60.0
Palm/savannah	368.00	279.56	24.0	37.3
Forest/savannah	748.40	452.77	39.5	100.0
Mosaic	66.00	41.96	36.4	42.0
Maize				
Palm/steppe	626.60	152.06	75.7	62.7
Palm/savannah	1104.78	243.11	77.9	58.7
Forest/savannah	119.27	51.49	56.8	52.0
Mosaic	131.75	71.67	45.6	74.0

* September 1988

K.U.Leuven/DMPCC data

Table 3-19: Production and sales by crop and by ecozone (ECO)

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al., op. cit., p.85). Fresco's estimates (1986) are 65% for the Karroo zone in 1982, but only 42% for the Kalahari zone (dependent, however, a high level of remittances from outside sources). The Kalahari region (more characteristic of the Kwango than of the Kwilu subregion) suffers from a number of problems, ecological and otherwise, which do not favor surplus production and marketing - poor soils, isolation, lack of circulating currency. Overall conditions are more favorable in the Kwilu (cf. K.U.Leuven/DMPCC, publication 7, p.9) although the Kalahari model is applicable in certain areas covered by the Project; for example in the plateau area to the southwest in the coverage area of the Lusekele agricultural center (cf EPIF/CAL reports by Reid and Bidimbu).

The K.U.Leuven/DMPCC studies concentrate on three principal crops as a proxy for overall agricultural income. According to Fresco (1986; also cited in K.U.Leuven/DMPCC, op.cit., p.6) these three crops - cassava, maize and peanuts - account for 88% of all agricultural revenue in the Karroo regions; cassava alone

for 74%. This last evaluation may be a little high insofar as within the K.U.Leuven/DMPCC sample cassava, maize and peanuts account for 73%, 14% and 13% of revenue respectively, no other crops considered (table 3-21). There is no question, however, that these three principal crops do in fact dominate agricultural income and can serve as a suitable proxy in analysis.

The Small Farmer Study includes a wider range of crops in the evaluation of income. The difficulty here is that the data for cassava only covers a one-month period prior to the study, while all other crops are accounted over the previous year. Nonetheless, cassava represents 73% of total revenue in this sample as well, with 93% of the total revenue accounted for by the principal three crops (table 3-21). The proportionate importance of any one crop is considerably accentuated if the sample is restricted to households which sell that particular crop. Coffee and peanuts in particular, as relatively specialized crops, gain tremendously in importance - from less than 1% of income to 15% for coffee, 8% to 21% for peanuts; secondary crops (rice, voandzou, millet, gourds) represent also around 15% of income for producers. The K.U.Leuven/DMPCC data also indicates that while 76% of households give cassava as their most important source of income, 10% cite coffee and 6% each maize and peanuts.

The dominance of cassava deserves a short side discussion at this point. Cassava represents several interests to the producer (cf. Fresco, 1986, pp. 176 ff.). The tuber is the preferred and staple starchy food in the local diet, and the leaves are the base for the most important sauce supplement. The plant is not particularly demanding as to nutrients, and will produce on poor or virtually exhausted soils. Labor requirements are relatively flexible; cassava adapts well to the more rigorous calendars of other crops and is also, given its long growth period, a useful crop for protecting or intercropping with others. The tubers store in the ground for long periods and can be harvested at need; moreover, demand for both the tubers and the leaves is strong and constant.

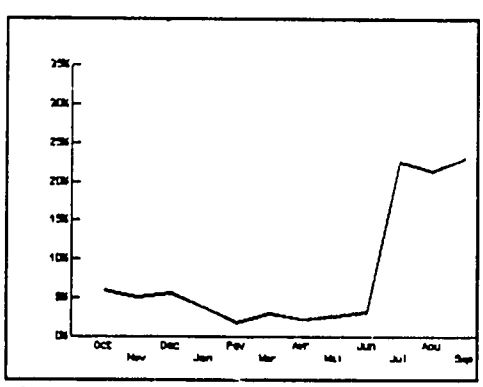

Figure 4: Annual pattern of cassava sales for hhlds selling only cassava

Production is thus spread, unlike most other crops, over the whole year. Moreover, cassava is relatively insensitive to changes in harvest patterns from

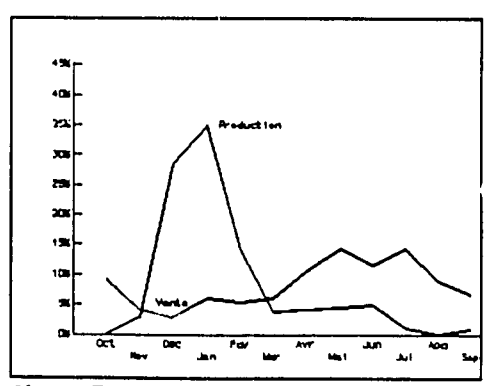

Figure 3: Monthly production and sales (vente) of peanuts as % of annual total

Distribution by category of household budgets converted to 1988 Zaïres

1982	Kalahari Zone				Karroo Zone			
	Z	Z	% cat.	% total	Z	Z	% cat.	% total
Agricultural production, including		16653		42.1%		34389		65.0%
Cassava	14762		88.6%	37.3%	25410		73.9%	48.0%
Maize	751		4.5%	1.9%	834		2.4%	1.6%
Peanuts	556		3.3%	1.4%	4253		12.4%	8.0%
Other crops	500		3.0%	1.3%	500		1.5%	0.9%
Processed products	83		0.5%	0.2%	3392		9.9%	6.4%
Livestock/fish		195		0.5%		3086		5.8%
Salaries/remittances		8952		22.6%		6144		11.6%
Artisan work		7756		19.6%		5949		11.2%
Other activities		6033		15.2%		3336		6.3%
Total		39588				52905		

Conversion 1 Z 1982 = 55,601 Z 1988

After Fresco, 1986

1989 data and conversion to 1988 values for comparison with K.U.Leuven/DMPCC data

1989	Idiofa			Bulungu		
	Net	1988	%	Net	1988	%
Agricultural production	73676	34996	61.1%	58316	27700	64.3%
Livestock/fish culture	8266	3926	6.9%	12398	5889	13.7%
Salaries/remittances	6436	3057	5.3%	7764	3688	8.6%
Artisan work	4520	2147	3.7%	2949	1401	3.3%
Others activities	27716	13165	23.0%	9279	4408	10.2%
Total	120614	57292		90706	43005	

Conversion 1 Z 1988 = 0,475 Z 1989

After Cuevas et al., 1990

Table 3-20: Indicative budgets for farm households

one period of the year to another. As such cassava is not only a reliable food resource but also a ready source of cash at any time that it is needed. It appears that households in fact use cassava as a means of stabilizing revenue throughout the year. Sales of cassava are lowest in the period from April to June, which is the main period of sales of maize and peanuts (Figures 1 to 3 compare the annual trends for these crops). Yet, this is not a period in which the need for cash is particularly low; on the contrary, this is the time of taxes and voyages and of preparations for the next agricultural campaign and the school year. In fact, for households that do not produce or sell maize and peanuts the harvest and sales of cassava actually increases abruptly in this period (Figure 4).

The advantages of a stabilized year-round income are

Distribution of agricultural revenues by crop, 1984:

	A			B		
	Zaïres	% total	N	Zaïres	% total	N
Ag. revenue				13880		313
Cassava	15155	88 %	257	12444	73 %	
Maize	859	19 %	197	541	12 %	
Peanuts	856	21 %	123	336	8 %	
Other	1122	15 %	132	473	6 %	
Coffee	2086	15 %	13	87	1 %	

A: Breakdown for households selling the particular crop
B: Breakdown for all households with an agricultural revenue

Small Farmer Study data, 1984; in 1984 zaïres.

The total for cassava is based on the amount recorded (i.e. for the month preceding the study, between May and August 1984) plied by 12 * 0.9, the supposition being that sales for a month in this period would be slightly higher than the annual monthly average

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Breakdown of revenue by principal crop, 1987-88:

	A			B		
	Zaïres	% total	N	Zaïres	% total	N
Revenue 3 crops				33502		165
Cassava	20976	73 %	165	20976	73 %	
Maize	6753	16 %	145	5934	14 %	
Peanuts	9458	19 %	115	6951	13 %	

A: Breakdown for households selling the particular crop
B: Breakdown for all households with an agricultural revenue

K.U.Leuven/DMPCC data; zaïres 1988

Table 3-21: Household agricultural revenues by crop, 1984 and 1987-88

countered by the absence of a specific harvest and sales period during which the producer can assemble a substantial sum of money at a given time for possible investment. Although maize and peanuts (and coffee) can be exploited in this kind of harvest/sales pattern, the benefits are limited as the income from these crops is called to substitute for cassava. Also, producers tend to try to spread the harvest and sales of even these crops over a relatively long period.

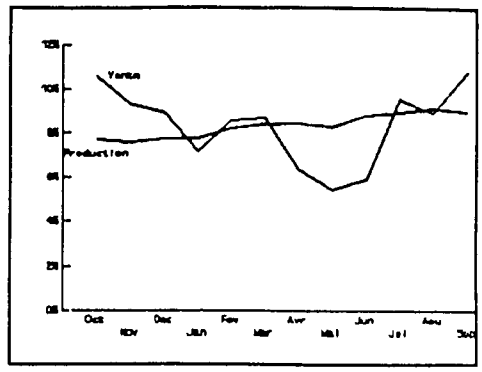

Figure 1: Monthly production and sales (vente) of cassava in % of annual total

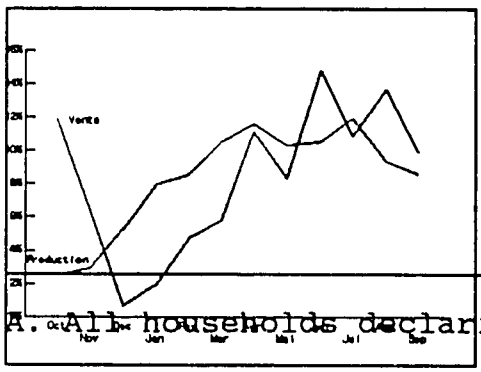

Figure 2: Monthly production and sales (vente) of maize as % of annual total

A. All households declaring any agricultural revenue:

	Cassava		Maize		Peanuts		Total
	Z	%	Z	%	Z	%	zaïres
Palm/steppe	17347	72,5	3754	14,0	3299	13,5	24401
Palm/savannah	25491	61,5	15347	26,6	8279	12,0	49117
Forest/savannah	35968	59,1	1009	1,7	25675	39,2	62652
Mosaic	14322	88,4	1332	7,6	578	4,0	16233

B. Households selling the crop in question

	Cassava		Maize		Peanuts	
	Z	%	Z	%	Z	%
Palm/steppe	17347	72,5	3911	14,7	3749	15,3
Palm/savannah	25491	61,5	15347	26,5	13132	19,0
Forest/savannah	35968	59,1	1556	02,6	25675	39,2
Mosaic	14322	88,4	1718	09,8	1288	8,9

K.U.Leuven/DMPCC data; 1988 Zaïres

Table 3-22: Mean revenues by principal crop and by ecological zone

Agricultural revenue and the relative contribution of each major crop vary according to ecological zone (table 3-22) and following the resources of the household (table 3-23,3-24). Cassava is most dominant in the poorest regions - in the palm/steppe regions of Banga, Kalaganda, and Luniungu, where it accounts for 72.5% of revenues, and in Kemba and Batere (88.4%). In fact, the K.U.Leuven/DMPCC data indicates that the relative importance of cassava to household revenues is an indicator of poverty: % of cassava revenue in the total of agricultural revenues is significantly and negatively correlated (-0.5885) to total revenue, while maize and peanuts are positively correlated (% maize 0.3084; % peanuts 0.5074, P=0.000 in all cases). The Small Farmer Study data also indicates a positive and significant correlation between diversity of crops sold and total revenue (see table 3-24).

Drawing on the Small Farmer Study data average household agricultural income per category of household is shown in table 3-23. In general revenue distribution follows the pattern predicted by the classifications according size and human resources. In looking at the revenue per component of household structure it is worth noting that households with limited human resources tend to be more productive per labor unit, although they are not wealthier overall. There is thus perhaps a minimum income that must be drawn from agriculture, especially in households which may not have many other options for income. The lowest agricultural incomes per labor unit are those of households which are larger, with more human resources and a more diverse structure - extended families and older families. Again, it is possible that these households find it easier to meet household income needs, or they may choose to reduce their economic risks by diversifying their sources of income.

Table 3-25 shows the relationship between various factors that could be expected to influence agricultural income. The correlation between revenue per household and revenue per unit of consumption is particularly strong. Although it is also significant the correlation between household and per work unit revenues is much weaker. The measure of income per work unit can be seen as a measure of productivity, while revenue per unit of consumption is closer to a real measure of wealth - always supposing this last measure is not gained at the expense of household nutrition.

Revenue per work unit shows a strong and positive correlation with the degree of dependence. This effect has already been mentioned: productivity is intensified where there is a need. Revenue per household does not correlate significantly with any of the household composition measures. This is somewhat surprising since one might expect that the number of work units and the degree of dependency might directly influence household-level revenue. Revenue per household

A. Mean revenue per household by type of household

Category	All households Z	All households N	Households with some ag. revenue Z	Households with some ag. revenue N
Sample :	11083	392	13880	313
Man alone :	3577	18	7154	9
Woman alone :	7850	90	9950	71
Monogamous couple :	9912	230	12458	183
Polygamous :	23962	54	25879	50
Small family :	7153	47	9888	34
Couple with dependent:	7916	85	11031	61
Young family :	10750	91	13043	75
Older family :	10515	97	12911	79
Several adults :	17607	37	19160	34
Extended family :	19596	35	22862	30

B. Revenue by component of household structure - means for households declaring some agricultural revenue

Category	Revenue per: Person present	Work Unit* 1	Work Unit* 2	Consumption Unit
Sample :	3003	18268	8421	4732
Man alone :	3088	18538	7600	3384
Woman alone :	3693	34641	5881	5829
Monogamous couple :	2601	13012	8348	4029
Polygamous :	3477	14206	11523	5994
Small family :	6015	99069	*	8494
Couple with dependent:	342[illegible]	9486		4964
Young family :	2554	9237		4537
Older family :	2278	6712		3527
Several adults :	2520	9117		4497
Extended family :	2315	7928		3927

* The effect of the "Small family" category on this variable is present in column 1, removed in column 2. This category has the largest number of households in which the value for work units underestimates the actual labor capacity, as demonstrated by actual production (see the discussion in section 2.2.1 above)

Small Farmer Study data. Z = 1984 Zaïres

Table 3-23: Agricultural revenue by household type and component

component does correlate, generally negatively, with the level of all such components. The larger a household is, by any measure, the less productive its labor force will be in generating income.

In a general sense diversity of agricultural production and of marketed crops correlates positively with all measures of household income. A corollary hypothesis, that greater concentration of production in a few crops and specifically in staples would correlate negatively with income measures, is more difficult to prove: while the signs are negative across the board the correlations are not strong. Fresco (1986) argues that households poor in labor power and land tend to concentrate their resources on production of a few crops (notably cassava). By the same logic households rich in resources may well diversify to take fullest advantage of the land's potential and to reduce risk. The number of crops grown and marketed may in itself be an indicator of the economic success of a household.

A. Correlations between measures

Revenue per:	Household	Revenue per Work unit	Person present
Work unit	**.2945**		
Person present	**.7903**	**.7191**	
Consumption unit	**.8408**	**.6756**	**.9858**

N = 313 P= 0,000

B. Correlations with household composition variables

N = 313	Work units	Consumption units	degree of dependence	persons present
Revenue per:				
Household	.0843 P= .068	.0908 P= .054	-.0543 P= .169	.1170 P= .019
Work unit	**-.2206** P= .000	**-.1812** P= .001	**.4115** P= .000	**-.1783** P= .001
Consumption unit	**-.1383** P= .007	**-.1687** P= .001	.0768 P= .088	**-.1424** P= .006
Persons present	**-.1629** P= .002	**-.1903** P= .000	.1045 P= .032	**-.1851** P= .001

C. Correlations with characteristics of the farming system

N = 392	Diversity of products marketed	grown	% of fields in* cash crops	staple crops
Revenue per:				
Household	**.3091** P= .000	.1040 P= .023	-.0373 P= .238	-.1191 P= .011
Work unit	.0913 P= .035	.1115 P= .016	-.0168 P= .374	-.0293 P= .288
Consumption unit	**.2745** P= .000	.1084 P= .019	-.0276 P= .299	-.0954 P= .034
Persons present	**.2871** P= .000	**.1233** P= .009	-.0267 P= .305	-.1000 P= .028

Cash crops are those crops which are primarily grown for market (coffee, tobacco, pineapples, bananas, sesame) while staples are those which are also produced for household consumption (cassava, maize, peanuts, millet, gourds etc.)

Small Farmer Study data.

Table 3-24: Correlations between measures of revenue and other influencing factors

3.4.2 Other sources of revenues

A study by Ohio State University (Cuevas et al., 1989) has found that total revenue for an average household in the Idiofa zone in 1989 was about 120,000 Zaïres, while the Bulungu zone the mean revenue was 90,000 Z[24]. Although agriculture dominates other sources of income are important as well, contributing between 25% and 35% of a household's income on average (Cuevas et al., op.cit., p.86). In the OSU sample commerce alone accounted for 15%, while animal husbandry brought in 13% of revenue in Bulungu. In these areas (unlike elsewhere in the OSU study area) salaries and remittances from migrants are relatively unimportant. This corresponds with what the RRAs found elsewhere in the Project zone: according to Adelski et al. (1989, p.44), most non-agricultural income is generated by activities engaged within the village or nearby. The OSU survey's "other activities" category, which covers a range of activities whose particulars vary according to local resources and opportunities[25], contributes between 10% and 25% of a family's income on average. Artisan work seems to contribute little to a global average, but this is not an activity in which everyone participates; also the returns are minimal (around 50 to 100 Z. per day in 1988 Zaïres, according to RRAs data).

Within the Project area farmers often raise livestock and fish, occupations complementary to agricultural production. 80% of the households surveyed in the Small Farmer Study raised some kind of livestock - 75% owned small livestock such as poultry or rabbits, but only 12% raised cattle or pigs - and 61% of households raised fish.

The same survey found that 87% of households had at least one member who claimed a principal remunerative activity outside of agriculture[26]. The data does not permit a detailed analysis, but it is possible to draw some further information. In most cases it is the men who look for work outside of agriculture. This is a logical extension of the principal of sexual division of responsibilities and tasks. The proportion of a household's

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[24] See also table 3-20.

[25] The RRAs (Adelski et al., op.cit., pp.45-46) identified a number of activities in this category, among which: palm nut harvest and the manufacture of palm oil; gathering of fibers, thatch, vines and similar products; felling trees and sawing boards; manufacture of alcohol; construction and repair of houses; day labor for loading and unloading boats and trucks; agricultural labor, including harvest of coffee.

[26] Livestock and fish husbandry did not count as an activity outside of agriculture.

men who are engaged in non-agricultural work, as well as the proportion of men's potential work time which is devoted to these activities, both appear to be positively correlated with the various wealth and household resource measures and negatively related to the degree of dependency (Small Farmer Study data). Insofar as agricultural income does not appear to be affected by the absence of male farmers, it is probable that this is a further example of a strategy of economic diversification practiced by those households that can do so.

Analysis of a small subsample (8%) consisting of households where women devote more of their time to non-agricultural activities than to agricultural shows a somewhat different picture. While households with a high level of male participation in non-agricultural activity tend to be larger and better furnished with potential agricultural labor than the average, households where women work outside of agriculture tend to be small and young families. These are also families where the pressure on the producer, measured by degree of dependency, is relatively low. Here the women appear to have made a conscious decision to pursue non-agricultural activities as a source of income at the expense of agriculture: agricultural income per household is well below the sample average, as is agricultural income per work unit (30% to 50% of the overall mean). Yet these are not poor households: by all measures, and especially in ownership of livestock, they are among the best placed of the sample.

3.4.3 Credit

Rural households can, in theory, call on a number of different types of institutions for credit. Formal institutions (banks, credit unions) can be found throughout the Project area, but their role is limited. Gadway (1988) finds that these institutions serve mainly as safe deposits for money that a farmer wants to keep and protect for a time; this despite the fact that interest rates are low and do not even protect against inflation. Lending to rural producers is almost non-existent. No more than 0.2% of all households in the OSU survey throughout Bandundu had borrowed money from a formal institution in the three years preceding the study (Cuevas et al. 1989, p.4). The Small Farmer Study found a slightly higher rate (2% of all respondents, but 6.1% of those having sought credit), but the RRAs did not find any evidence of a formal system of institutional credit operating in any of the study villages (Adelski et al, 1989, p.15). In fact the formal institutions of credit in Bandundu operate above all as commercial bankers, and the lion's share of credit (over 70%) goes to traders including agricultural traders (Cuevas et al., op.cit., p.106).

The OSU study did find, on the other hand, that 41% of respondents overall had received credit from an non-institutional

lending source (op.cit.,p.5). This corresponds closely to the 38.5% figure in the Small Farmer Study. The SFS figure is further broken down as follows: 44.1% of loans from relatives, friends or neighbors; 24.2% from a likelemba group; 3.8% from a trader or moneylender; 16.8% from other sources. The "other sources" can include missions, special interest groups (church groups, teachers' association, Red Cross) and other village mutual assistance groups (Adelski et al, 1989, p.15).

Money borrowed is for the most part used to meet emergency needs: health care, school expenses, funerals and the like. The credit system allows a farmer to raise the money necessary for an exceptional sudden expense, while the program of agricultural production and marketing is arranged to provide a limited but regular income throughout the year. The informal credit system should in principle also allow a producer to buy tools and inputs or to upgrade equipment. Cuevas et al. (1989, p.90) however found that less than 7% of all cash loans from non-formal sources were used to improve production, agricultural or otherwise. This would be in large part due to the fact that agricultural inputs and equipment are often not available even when farmers want them (Adelski et al., 1989, p.15). If credit is channeled to agricultural uses it is often in a variant adapted to local social and economic conditions. Some buyers and trading companies (for example BAT in Manzasay) advance credit in the form of materials or seed against repayment in produce at harvest; this can be for a trader a way of ensuring a position as the only buyer in the region, or a method for fixing prices before market conditions and inflation take their toll (cf reports concerning CEA/Ekubi where this practice has become the object of dispute between the cooperative and the trading company operating in the region). Another variant is the local agricultural labor self-help group in which each member in turn gets the aid of the whole group in field work - a non-cash form of likelemba (Adelski et al., 1989, p.32).

Clearly the non-formal credit structures and self-help groups are from the farmers' point of view more flexible, better adapted and more responsive to the needs of the rural populations than the formal institutions which, in any event, do not seem to show any interest in the needs of the average farmer. It appears however that even the non-formal structures do not offer credit to everyone, or that at the very least every rural household is not able to take advantage of this credit. In the Small Farmer Study data both the ability to get credit and the amount of credit drawn from non-formal structures are closely correlated with measures of household size and resources (coefficients of 0.2 to 0.25, p=0.000) and measures of wealth (0.25 to 0.3; table 3-25). Access to credit becomes, for households that already have a fair number of resources at their disposal, yet another potential resource to draw on.

Requests for credit	N	# of cattle	Livestock ownership scale	Agricultural income Z	Index of possessions 1	Index of possessions 2	Wealth scale
= 0	264	0.67	1.11	8956	28,53	8.11	-.33
= 1	108	0.45	1.12	13731	31.85	8.86	0.26
= 2 or +	20	2.70	4.15	24858	67.10	13.05	2.90

Requests for credit	N	Persons present	Work unit	Consumption unit	Dependency	Household resources scale
= 0	264	5.13	1.65	3.22	4.37	3.43
= 1	108	6.04	1.97	3.71	2.35	3.67
= 2 or +	20	8.30	2.70	5.14	3.18	5.50

Correlations of **Amount borrowed** with

	Agric. income	Index of possessions 1	Index of possessions 2	Wealth scale	Household resource scale
	0.1974	0.1719	0.2190	0.4131	0.1680
P =	0.000	0.000	0.000	0.000	0.001

	Persons present	Work unit	Consumption unit	Degree of dependency
	0.2095	0.1643	0.1978	-.0579
P =	0.000	0.001	0.001	0.126

Small Farmer Study data. Z = 1984 Zaïres.

Table 3-25: Access to credit according to household indicators

Informal credit is very little used for agricultural production, and is in general not currently used for investment. Nonetheless, the RRAs identified a desire on the part of producers to have access to credit for investment. The responses of farmers interviewed shows that the need most felt by farmers was not the lack of access to credit proper but the lack of credit linked to the possibility of reinvesting this money to productive ends (Adelski et al., 1989, p.15). It might be possible to introduce or develop a program of agricultural credit through existing non-formal structures but associated with a parallel program of distribution of agricultural inputs and equipment.

3.4.4 Other indicators of wealth

A household's accumulated wealth is measured better by indicators that take into account ownership of goods than by

revenue alone, be it agricultural income or otherwise. A family often invests its real surplus revenue in construction[27], durable goods or livestock. These investments improve the quality of life, enhance the family's social position and also serve as a hedge against eventual financial problems.

Both the Small Farmer Study and the OSU credit study collected data on socio-economic indicators based on ownership of goods (table 3-26).

The Small Farmer Study classification is reformulated into several indices. The original data set includes an additive index of untransformed values (INDX) and a scaled index (OWNINDX). Since this last was difficult to interpret it has been replaced in the analyses by INDX2, an index based on the presence of good in working order.

These indices broadly correlate with other measures of real or potential wealth including agricultural income and measures of household human resources, and to the size of the household and its stage in the life cycle. The latter is important because the durable goods counted are ones which tend to accumulate over a lifetime. None of this is unexpected. Less readily anticipated is the fact that the durable goods indices tend to correlate more strongly with non-agricultural sources of revenue than with agricultural income. These are also the only measures of wealth by which the household category "man alone" does not rank as the poorest class. It is possible that the priorities women apply to spending income, when they have a degree of control over it, differ from men's priorities and put less emphasis on the accumulation of goods[28]. There is also a possibility of a series of biased relationships: many of the goods counted - i.e guns, sewing machines, bicycles, cars and trucks - may also be the tools of a non-agricultural income-producing activity; which is, in turn, more likely to be associated with men.

Livestock ownership is a well-established measure of an African household's reserve of cash. This is also the indicator of surplus that is most likely to remain in the hands of women;

---

[27] The improvement of housing appears to be a particular interest in the Project zone (Adelski et al., 1989, pp. 11-14). More villagers (35% of respondents) cited the upgrading of housing as a top priority than any other concern except improved health care.

[28] The RRAs (Adelski et al., 1989, pp.11-14) asked questions about priorities for investment of both men and women; the responses can be compared on this point. CF also the discussion in K.U.Leuven/DMPCC, publication 16, pp.12-14, on the household economic strategies of woman-headed households.

% of households in sample by socio-economic indicator

A. OSU/SEP classification

Indicator	Idiofa	Bulungu	Bandundu
Resident owns house	87.7	93.9	89.6
Cement wall construction	26.3	1.5	16.3
Corrugate roof	78.9	9.2	37.8
Cement floor	0.0	0.0	4.8
Private latrine/WC	77.2	86.2	86.9
Cooks with other than wood	1.7	1.8	4.1
Well or public water pipe	0.0	1.6	10.0
One person who owns:			
Watch	47.4	36.9	43.3
Radio	17.5	15.4	25.9
Sewing machine	12.3	13.9	13.7
Bicycle	26.3	4.6	18.2
Motorcycle or moped	1.8	0.0	0.7
Car or truck	1.8	0.0	0.4

OSU/SEP study data, Cuevas et al., 1989, p.84

B. Small Farmer Study classification

Household owns one or more:	In working order? Yes	No	Total One	2 or +
Radios	15.6	7.1	18.6	1.6
Bicycles	11.5	14.0	23.2	1.4
Sewing machines	11.5	3.3	13.1	0.7
Watches	15.4	7.6	20.5	1.6
Guns	12.6	3.9	15.6	0.9
Kerosene storm lanterns	8.7	2.5	10.6	0.7
House has:				
Corrugate roof			2.8	
Windows			54.0	

SFS Data, 1984

Table 3-26: Socio-economic indicators

71% of the persons owning livestock in the Small Farmer survey were women.

Two indices have been developed to evaluate the livestock ownership surveyed in the Small Farmer Study. Both are additive scales based on the conversion of all livestock to a cattle equivalent using the formulas: Cattle of all kinds = 1; pigs = 0.4, goats and sheep = 0.3 and fowl = 0.1. In one index cattle and other stock are evaluated as a whole; in the second cattle are separated and evaluated apart. Again, livestock ownership as an indicator behaves relatively predictably in relation to our scale variables of household type and with the variables of components of household structure (table 3-29). Once again, it would appear that non-agricultural income sources correlate more closely with livestock ownership than does the measure of agricultural income.

Per household livestock ownership index statistics

		Mean	Std.Dev
Min	Max	N	
With cattle	A:	1,27	3,68
0,00	46,61	392	
	B:	1,57	4,03
0,01	46,61	317	
No cattle	A:	0,56	1,12
0,00	10,97	392	
	B:	0,70	1,22
0,01	10,97	311	

A: Complete sample
B: Households that own livestock

Small Farmer Study data

Table 3-28: Livestock ownership indices

Number and % of households owning livestock, by type

	N	%
Livestock	310	79.1
Sheep	37	9.4
Cattle	47	12.0
Pigs	48	12.2
Goats	129	32.8
Fowl*	294	74.8
Ponds	228	58.0

* Fowl and small animals (rabbits, guinea pigs); about 75% poultry.

Small Farmer Study data, 1984.

Table 3-27: Livestock ownership

A. Means of indices of ownership of livestock by type of household

	1	2		1	2
Sample	1.27	0.56	Small family	1.41	0.24
			Couple with dependents	1.05	0.52
Man alone	0.72	0.22	Young family	1.19	0.52
Woman alone	1.03	0.27	Older family	0.93	0.54
Monogamous couple	1.07	0.55	Several adults	1.87	0.87
Polygamous	2.68	1.14	Extensive family	2.10	0.87

1: Index with cattle 2: Without cattle

B. Correlations with household composition measures

		Units:		
	Pers.pres.	Work	Consumption	Degree dependence
Index:				
With cattle	0.1195	0.1051	0.0958	-.0527
	P=0.009	P=0.019	P=0.029	P=0.149
No cattle	0.2129	0.1806	0.1857	-.0850
	P=0.000	P=0.000	P=0.000	P=0.047
Cattle	0.0640	0.0587	0.0459	-.0314
	P=0.103	P=0.123	P=0.182	P=0.268

C. Correlations with other indices

	INDEX	INDX2	Agricultural Income	Other income sources
Index:				
With cattle	0.2537	0.2197	0.1813	0.4939
	P=0.000	P=0.000	P=0.000	P=0.000
No cattle	0.3300	0.2968	0.1322	0.6118
	P=0.000	P=0.000	P=0.004	P=0.000
Cattle	0.1792	0.1513	0.1652	0.3598
	P=0.000	P=0.001	P=0.001	P=0.000

Small Farmer Study data

Table 3-29: Livestock ownership indices - means and correlations with other indices

List of References

A. Data Bases:

Small Farmer Study, 1984, with extensive documentation produced the researchers (William Pruitt and Elizabeth Reid), enumerators' notes and notes of the data analysts (G.J. Eele et L. Newton): unpublished documents available at the Research and Information office of PROCAR, Kikwit

Preliminary Results of the 1984 Census, with documentation provided by the Program Office of USAID; data and documentation on file at PROCAR R+I

Data for the Project zone from the Production and Marketing Studies of Project AGCD-K.U.Leuven IN12766/11 (K.U.Leuven/DMPCC). Published documentation listed below

Results of production trials at RAV-Kiyaka, with additional informations provided by the researcher (Dougou Keïta)

Data generated by Project activities and research, including: result of varietal trials by Craig Smith; season B 1989 baseline and farming practices study, by Wendy Ascher; Rapid Rural Assessment studies of July-October 1988 (Adelski et al.).

B. Documents:

Adelski, Elizabeth, Sita Lumbuenamo, et Kabemba Mayombo, "Rapid Rural Appraisal in Central Bandundu, Zaire", Reports 6 and 7, University of Arizona,1989

Almy, Susan, and M. Gaudreau, "Rapid Reconnaissance Survey of the 102 Project Area", SECID, Washington DC, 1986

Ascher, Wendy, "Baseline on Farming Systems in Central Bandundu: with Special Attention to Knowledge, Attitudes and Practices with Improved Varieties and Techniques of Manioc, Maize and Peanut Production" (season B 1989 baseline), DP/PROCAR, December 1989

Cuevas, Carlos, Katayoshi Kabongo, Yampulu Mukendi, Gertrud Schrieder, Curtis Slover, Ossamba Tonyemba, and Laura Vigano, "Finance Rurale au Zaïre: une Evaluation dans les Régions du Bandundu and du Shaba", Ohio State University, September 1990.

Eele, G.J. and L. Newton, Small Farmer Study, Bandundu Region, Zaire, 2 vols., Oxford, England, 1985.

FAO/BEAU, "Etude de l'Aménagement du Territoire Bandundu", 1986

Fresco, Louise, Cassava in Shifting Cultivation, Royal Tropical Institute, Amsterdam, Netherlands, 1986

Pragma Corporation, "USAID/Zaire Area Food and Market Development Project (660-0102) Background Info", Falls Church, Va., n.d.

Projet AGCD-K.U.Leuven IN12766/11, "Commercialisation des Produits Agricoles" (K.U.Leuven/DMPCC), Kinshasa, Zaïre. Publications No:

2 - "La Vente de Produits Agricoles par l'Agriculteur Traditionnel dans les Sous-Régions du Kwilu and du Kwango and les Villes de Kikwit and Bandundu", September 1988

4 - "La Production du Maïs and d'Arachides dans la Région du Bandundu pendant la Période Octobre 1987 - Septembre 1988", Novembre 1989, and Annexe Statistique Statcom 4, August 1989

6 - "La Production and Commercialisation des Principaux Produits Agricoles dans la Région du Bandundu", January 1989

7 - "Le Revenu Agricole (Manioc, Maïs, Arachides) de l'Agriculteur Traditionnel dans la Région du Bandundu", May 1989

8 - "Les Prix au Producteur du Manioc, du Maïs and des Arachides dans la région du Bandundu and les Marges de Commercialisation pour le Marché de Kinshasa", September 1989

9 - "La Destination de la Récolte de Maïs and d'arachides dans la Région du Bandundu", September 1989

10 - "Analyse des Quantités Produites and Commercialisées du Manioc dans la Région du Bandundu", October 1989

16 - "L'Influence de la Composition du Ménage sur la Performance de l'Exploitation Agricole dans la Région du Bandundu", March 1990

Rapport PROCAR No 2 - "La Production du Maïs and d'Arachides dans le Rayon d'Action de PROCAR-Bandundu", n.d.

Projet AGCD-K.U.Leuven IN12766/11 series (continued)

Statcom 5 - "Différents Aspects des Conditions de Ve and d'Achat (Manioc, Maïs, Arachides) par le Paysan dans la Région du Bandundu", September 1989.

Projet USAID 070 - Service d'Etudes and de Planification - DADR/Pragma Corporation, "Enquête de la Bande Sud", Reports No 1 and 2, June 1986 and August 1987.

Reid, Catherine, and Bidimbu Miolo, journals and reports EPIF/CAI

Russell, Diane and Sixto Requena, "Women Farmers in Bandundu: EPIF/CAL Baseline Study", ICRW, 1989 and 1990

Springer-Heinze, Andreas, "Economie du Travail and Développement Rural au Kwango-Kwilu, Zaïre", GTZ-CODAIK, March 1988

West, Walter, "Description des Données dans les Fichiers de l'Etude du Petit Cultivateur", DRI/PROCAR, June 1989

"Description des Données dans les Fichiers de l'Etude DMPCC/K.U.Leuven", July 1989

"Documentation des Bases de Données au Projet 660-0102", USAID-ARD, March 1990

Wittenberger, Ted, "Post-Harvest Grain Storage", PROCAR, April 1990

Yeboah, Anthony and Nseye Mara, "An Evaluation of Two Cropping Systems in the Kwilu Subregion of Zaire", Research Report Number 1, International Agricultural Programs, North Carolina A&T University, Greensboro, N.C., May 1987

"Resource Productivity under two Farming Systems in Kwilu Subregion Zaire", Research Report Number 2, International Agricultural Programs, North Carolina A&T University, Greensboro, N.C., September 1988

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I. Production of crops and productivity

A. Proportion of households producing and marketing crops

Data from K.U.Leuven/DMPCC survey "Ventes - questions spécifiques", PROCAR-area subsample (N=224)

Crop	Production Households	Production %	Marketing Households	Marketing % of sample	Marketing % of producers
Cassava	224	100.0	214	95.5	95.5
Maize	216	96.4	185	82.6	85.6
Peanuts	204	91.1	161	71.9	78.9
Seed gourds	201	89.7	132	58.9	65.7
Saka-saka	197	87.9	16	7.1	8.1
Yams	119	53.1	54	24.1	45.4
Coffee	98	43.8	77	34.4	78.6
Palm nuts and oil	83	37.1	43	19.2	51.8
Rice	42	18.8	30	13.4	71.4
Millet	37	16.5	28	12.5	75.7

Notes: Number and percent of respondent households declaring having produced crop indicated in the previus year
Number and percent of respondent households, and of households having produced the crop, declaring that they marketed the crop in the previous year

B. Production data

1. Descriptive statistics for household production on 3 main crops

Data from K.U.Leuven/DMPCC survey "Production", PROCAR-area subsample (N=225)

All weights in kilograms

Crop	Mean	Std Dev	Minimum	Maximum
Cassava (bitter)	8663.6	3429.49	3048.4	20203.3
Cassava (sweet)	102.9	214.25	0.0	1118.9
Cassava (total)	8766.4	3448.00	3069.3	20203.3
Maize (dry)	589.2	643.54	0.0	3024.0
Maize (fresh)	60.4	97.46	0.0	829.1
Maize (total)	649.6	668.95	0.0	3063.5
Peanuts	275.8	317.44	12.4	1977.6

Cassava is measured as tubercles
Maize is measured as on-the-cob weight (dry or fresh)
Peanuts are calculated in the shell.

2. Household production for 3 main crops; average by collectivity

Data from K.U.Leuven/DMPCC survey "Production", PROCAR-area subsample (N=225; N per collectivity=25)

All weights in kilograms; mean of collectivity subsample

Collectivity	Maize	Peanut	Cassava
Sedzo	1916.8	603.7	14156.4
Nkara	650.4	129.3	9631.4
Banga	836.2	245.2	8523.7
Kemba	136.5	104.1	8126.6
Kalaganda	675.3	148.6	7945.0
Kwilu-Kimbata	747.1	371.0	7811.9
Manzasay	119.3	758.7	7524.9
Luniungu	368.3	121.4	7597.9
Batere	127.0	27.9	7597.7
PROCAR	647.6	275.8	8766.4

C. Production per unit land

1. Cassava production per hectare, various measures
(All figures for fresh roots except where stated)

PROCAR trials on demonstration/multiplication fields, 1989:

4 improved varieties	13.5	t/ha
F-100	16.5	t/ha
Local	11.2	t/ha

RAV trials of F100 in fields of contact farmers (Keïta, 1990):
Mean 17,234 Kg/ha, minimum 4,000 kg/ha, maximum 31,111 kg/ha

Estimations of **Springer-Heinze** (1988), varieties not identified:
forest fields: 6 to 12 t/ha savannah fields: 1.5 to 9 t/ha

From **Fresco** (1986):
Evolution of production - means from official statistics:

1952	(Kwango-Kwilu)	12.7 t/ha	1954	(Kwilu)	15.2 t/ha
1958	(Kwilu)	10.8 t/ha	1976	(Kwilu)	14.5 t/ha
1978	(Kwilu)	16.8 t/ha	1979	(Kwilu)	14.6 t/ha

Observed yields:

Best yield on farmer field (presumably forest land)	10 t/ha
Mean (sous-région Kwango)	7 t/ha
Worst yield in normal conditions (south Idiofa)	4 t/ha

Observations of **Yeboah/Mara** (1988, p.12): in pure stands, 2.35 tons of cossette/ha = 6.5 t/ha of fresh roots

2. Maize and peanut production per hectare, various estimates and measures

Maize = dry crop on the cob; peanuts = weight in the shell

PROCAR trials of 10 new varieties of maize on demonstration and multiplication fields, 1989:

Variety	Kg/ha	Variety	Kg/ha
Sample	3,365.4	IKENNE 8	3,437.3
		KAHILA	3,270.1
BANDUNDU I	3,297.3	KAMB.83T	4,478.5
EV.8428	3,688.7	KASAI-I	3,586.7
FARAKO-B	3,774.7	SAM.83TZ	1,992.3
HYB.8644	3,683.6	SEK.85TZ	2,519.1

RAV trials of maize and peanuts in fields of contact farmers; unspecified improved varieties (Keïta, 1990):

	Mean	Minimum	Maximum	Density/ha (means)	N
Maize	1530.77	800	2360	14,000	26
Peanuts	3691.33	0	5667	182,000	24

Estimates of **Springer-Heinze** (1988) for several crops intercropped on savannah and on forest lands:

	Planting density	Yields per hectare in forest	Yields per hectare in savannah
Maize	3,000 plants/ha	0.3 to 0.8 tons	0.1 to 0.5 tons
Peanuts	150,000 plants/ha	0.8 to 1.2 tons	0.3 to 0.8 tons
Millet	50,000 plants/ha	(on savannah only)	0.3 to 0.8 tons
Courges	5,000 plants/ha	0.2 to 0.3 tons	0.3 to 0.6 tons

Estimates by **Yeboah/Mara** (1988; estimates for 1985):

Seed maize in pure stands - 0.68 t./ha
Peanuts in shell, pure stands - 0.57 t./ha

D. Production per unit labor time

1. Labor requirements for production of several important cropping systems in diverse ecozones
Data from Springer-Heinze, 1988

a. Labor time per activity per hectare in hours:

Forest(cassava/maize/peanut):	Hours/ha	Forest edge(cassava/peanut):	Hours/ha
Preparation	450 - 500		250 - 400
Planting	150 - 170		130 - 160
Weeding	300 - 590		250 - 400
Harvest	740 - 1240		710 - 1210
Totals	1640 - 2520		1330 - 2170

Savannah fields:

Flat (cassava/seed gourd):		Ridges (millet/maize):	
Preparation	300 - 400		300 - 400
Planting	100 - 120		70
Weeding	250 - 400		150
Harvest	450 - 680		60 - 100
Totals	1010 - 1480		650 - 740

b. Hours of labor per exploitation (observed):

Complex A:	Forest field 0.4 ha, season A	400 - 680 hours
	Savannah field mixed 0.3 ha, season B	330 - 470 hours
	Savannah field cassava 0.3 ha ssn B	300 - 440 hours
Total complex A:	1 ha	1030 - 1590 hours
Complex B:	Forest edge field mixed 0.4 ha ssn A	530 - 870 hours
	Forest edge field cassava 0.2 ha ssn B	200 - 300 hours
Total complex B:	0.6 ha	730 - 1170 hours
Complex C:	Forest fiels 0.3 ha season A	300 - 510 hours
	Savannah field, ridges 0.2 ha ssn A	210 - 260 hours
	Savannah field, ridges 0.3 ha ssn B	200 - 220 hours
Total complex C:	0.8 ha	710 - 990 hours
Complex D:	Forest field 0.6 ha season A	610 - 1020 hours
	Savannah field 0.2 ha season B	200 - 290 hours
Total complex D:	0.8 ha	810 - 1290 hours

E. Estimates of range of productivity (minimum, maximum) in weight, value and calories of **100 hours of labor** on major crops on savannah and on forest land
Calculated on the basis of data from Springer-Heinze, 1988

	Crop	Kilograms Min	Kilograms Max	Value in Zaïres (4/88) Min	Value in Zaïres (4/88) Max	Calories Min	Calories Max
On SAVANNAH :	Cassava	101	989	310	3300	303000	2967000
:	Maize	12	102	180	1530	38500	357000
:	Millet	33	154	660	3080	115500	439000
:	Gourds	33	111	520	1575	165000	555000
:							
In FOREST :	Cassava	339	1250	1100	3750	1017000	3750000
:	Maize	27	101	405	1515	94500	385000
:	Peanuts	45	141	640	1980	292500	916500

F. Production per unit of household composition: work unit, consumption unit, person present
Production data from K.U.Leuven/DMPCC "Production" survey, PROCAR area
Unit conversions based on K.U.Leuven/DMPCC means for Kwilu and Mai-N'Dombe subregions (DMPCC) and Small Farmer Study data (SFS)

Overall means:

	Kg*	Kc	Conversion		SFS	DMPCC
Cassava	6678.5	9951	1490 c/Kg	Work units	1.79	1.94
Maize	501.7	1791	3570 c/Kg	Consumption units	3.46	3.97
Peanuts	211.9	1164	5490 c/Kg	Persons present	5.54	6.11

* Edible portion only

	SFS	DMPCC	Crop	SFS	DMPCC	
Kilograms per work unit	3731.0	3442.5	Cassava	5559	5129	Kilocalories per work unit
	280.3	258.6	Maize	1001	923	
	118.4	109.2	Peanuts	650	600	
	4129.7	3810.4	Total	7210	6652	
Kilograms per consumption unit	1930.2	1682.2	Cassava	2876	2507	Kilocalories per consumption unit
	145.0	126.4	Maize	518	451	
	61.3	53.4	Peanuts	336	293	
	2136.5	1862.0	Total	3730	3251	
Kilograms per person present	1205.5	1093.0	Cassava	1796	1629	Kilocalories per person present
	90.6	82.1	Maize	323	293	
	38.3	34.7	Peanuts	210	190	
	1334.3	1209.8	Total	2330	2112	

II. Marketing of agricultural produce

A. Proportion of major crops marketed

1. Proportion of households marketing- See table II.A, p 8 above

2. Proportion of producer households that market surplus or supplement production with purchases
K.U.Leuven/DMPCC data, 'Vente' study, PROCAR subsample

	N	%	Crop	N	%	
Sell surplus	214	95.5	Cassava	18	8.0	Buy extra
	185	82.6	Maize	11	4.9	
	161	71.9	Peanuts	33	14.7	
Neither buy nor sell	2	0.9	Cassava	10	4.5	Both buy and sell
	32	14.3	Maize	4	1.8	
	44	19.6	Peanuts	14	6.3	

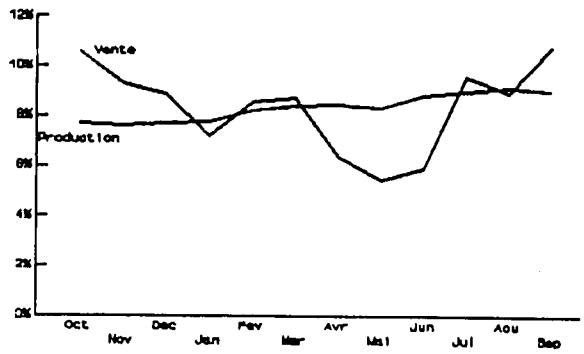
3. Percent of production sold, by crop
RRAs data

Maize	75%	Peanuts	62%	Rice	71%
Gourds	58%	Plantains	50%	Millet	26%

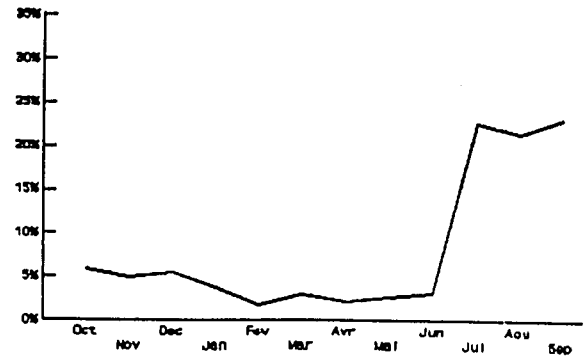
4. Mean quantities of major crops produced and sold per household, in kilograms
K.U.Leuven/DMPCC data (N=225)

	Cassava	Maize	Peanuts
Qty produced	8851.15	747.64	391.42
Qty sold	4418.75	244.74	196.82
Remaining	4544.04	502.90	349.85
% sold	49.9%	32.7%	50.3%

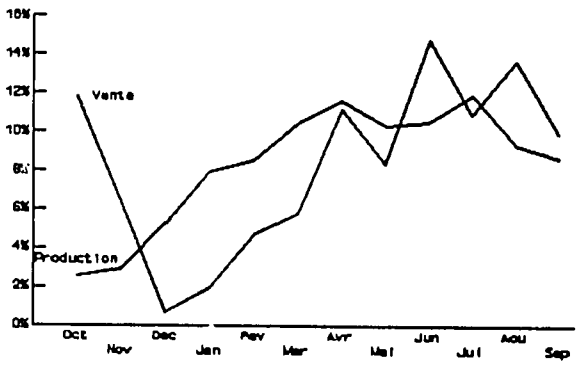
5. Month by month production and sales (ventes) of three major crops, as a percentage of total production and total sales
K.U.Leuven/DMPCC data



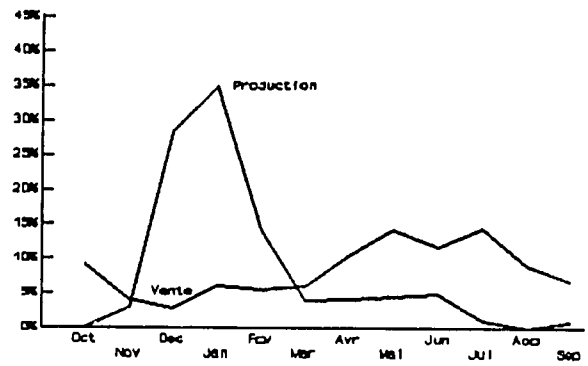
Cassava - all households marketing



Monthly cassava sales for households selling <u>only</u> cassava



Maize



Peanuts

6. Mean household production and sales of major crops in kilograms, broken down by ecozone
K.U.Leuven/DMPCC data (N=225)

	Production	Sales	% prod. left	% of hhlds selling
Cassava				
Palm/steppe	8022.19	4002.12	50.1	100.0
Palm/savannah	10533.26	4743.54	54.9	94.7
Forest/savannah	7524.93	4735.37	37.1	80.0
Mosaic	7853.15	3514.44	55.2	98.0
Peanuts				
Palm/steppe	171.72	100.96	41.8	60.0
Palm/savannah	368.00	279.56	24.0	37.3
Forest/savannah	748.40	452.77	39.5	100.0
Mosaic	66.00	41.96	36.4	42.0
Maize				
Palm/steppe	626.60	152.06	75.7	62.7
Palm/savannah	1104.78	243.11	77.9	58.7
Forest/savannah	119.27	51.49	56.8	52.0
Mosaic	131.75	71.67	45.6	74.0

B. Conditions of marketing

1. Proportion of produce sold by location of sale
K.U.Leuven/DMPCC "Vente" data, PROCAR subsample N=224

	Farm gate	Village market	Else-where
Cassava	31.3%	35.2%	33.6%
Maize	28.1%	59.5%	10.7%
Peanuts	60.2%	28.6%	11.0%
Rice	87.1%	5.9%	7.0%
Voandzou	11.9%	53.5%	34.6%
Seed gourds	49.6%	43.8%	6.6%
Coffee	44.4%	55.4%	0.2%

2. Point of origin and final destination of traders in agricultural produce
K.U.Leuven/DMPCC "Vente" survey, PROCAR subsample (N=224)

Origin		Destination	
Kinshasa	53.8 %	Kinshasa	85.8 %
Bulungu	16.4 %	Congo-Brazzaville	5.3 %
SR Kwilu	10.7 %	Kasaï	0.9 %
Idiofa	8.4 %	Kikwit	0.4 %
Kikwit	3.6 %	Not stated	7.6 %
SR Maï-Ndombe	3.1 %		
Not stated	4.0 %		

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3. **Household member marketing the produce, by crop**
K.U.Leuven/DMPCC data (1988) N=225

% of total value marketed by:

	Women	Men	Children
Cassava	68.7%	18.4%	13.0%
Maize	66.4%	23.5%	10.1%
Peanuts	52.4%	41.4%	6.1%

C. Comparisons between households that market major crops and those that do not

1. Comparison of household composition measures by crop sold (maize or peanuts)
Small Farmer Study data

Crop	sold?	Persons Present	Units of: Work	Consumption	Dependency Degree
Peanuts	no	5.5	1.78	3.41	3.68
	yes	5.9	1.92	3.70	2.81
Maize	no	4.9	1.62	3.14	3.66
	yes	6.0	1.93	3.71	3.16

2. Percent of households by type according to whether they sell peanuts or maize, or not
Small Farmer Study data (N=392)

	Peanuts		Maize	
sold? :	No	Yes	No	Yes
Sample :	46,0	54,0	34,0	66,0
:				
Single man :	75,0	25,0	44,4	55,6
Single woman :	51,4	48,6	39,7	60,3
Monogamous couple :	45,7	54,3	35,2	64,8
Polygamous :	34,0	66,0	17,4	82,6
:				
Small family :	64,7	35,3	50,0	50,0
Couple with dependent:	35,9	64,1	39,7	60,3
Young family :	48,1	51,9	35,5	64,5
Older family :	45,7	54,3	28,4	71,6
Several adults :	47,1	52,9	27,3	72,7
Extensive family :	40,6	59,4	20,0	80,0
:				

12'

3. **Quantities in kgs of major crops produced: mean per household according whether the household marketed part of its production or not**
K.U.Leuven/DMPCC data

	Cassava	Maize	Peanuts
Sample	8766.40	619.66	278.87
None sold	6944.31	404.83	177.18
Part sold	8851.15	747.64	374.42

4. **Average quantity remaining on farm, in kgs, according to whether a household sells part of its crop or not**
Small Farmer Study data

Non-sellers:	Maize	Peanuts
Production	404.8	177.2
Losses	36.4	19.7
Seed reserve	24.3	39.0
Remaining	344.1	118.5
Sellers:		
Production less sales	502.9	349.9
Losses	67.3	41.6
Seed reserve	44.9	52.4
Remaining	390.7	255.9

III. Income and revenues

A. Prices

1. Evolution of producer prices for main crops 1980-1988
Data from Fresco (1986) for years 1980, 1982; Yeboah/Mara (1987) for years 1984-85; K.U.Leuven/DMPCC for years 1987-88

All agricultural prices per kg in Zaïres of that date

	Date	Cassava cossette	Maize seed	Peanuts in shell	$1 =
1.	1980	0.46	0.4	-	2.98 Z
	1982	1.2	2.0	4.0	5.74 Z
	1987-88	24.8	23.2	62.3	160.7 Z
2.	1984-85	6.3	5.4	10.6	
	1987-88	12.2	14.0	39.7	160.7 Z

1. Kikwit market 2. Kwilu subregion

Prices of other commodities on the Kikwit market, 1980 and 1982 (from Fresco, 1986, p.87):

	Cotton cloth 4 meters	18 kilo sack of salt	Sardines 100 g tin
1980	90.00 Z	36.30 Z	4.50 Z
1982	145.00 Z	50.00 Z	5.00 Z

2. Price variations at producer level within the Project area - per kg average prices 1987-88: K.U.Leuven/DMPCC data

Deflated prices (cf K.U.Leuven/DMPCC, publication 8)

Geographic differences

Zone	Cassava cossette	Maize seed	Peanuts in shell
Kutu	15.3	14.8	37.9
Bagata	16.7	17.7	39.0
Bulungu	12.5	13.1	48.8
Idiofa	10.7	14.1	35.0

Seasonal variations (Kwilu/Maï-N'Dombe subregions)

Product	Maximum	Month	Minimum	Month
Cassava cossettes	11 Z	January	8.5 Z	August
Maize seeds	13.5 Z	November	9 Z	June
Peanuts in shell	32 Z	November	22 Z	June

B. Revenues

1. Distribution of average household agricultural revenues by crop - 1984

Small Farmer Study data N=392; 1984 Zaïres

	A			B		
	Zaïres	% total	N	Zaïres	% total	N
Ag. revenue				13880		313
Cassava	15155	88 %	257	12444	73 %	
Maize	359	19 %	197	541	12 %	
Peanuts	856	21 %	123	336	8 %	
Other	1122	15 %	132	473	6 %	
Coffee	2086	15 %	13	87	1 %	

A: Breakdown for households selling the particular crop
B: Breakdown for all households with an agricultural revenue

The total for cassava is based on the amount recorded (i.e. for the month preceding the study. beteen May and August 1984) plied by 12 * 0.9, the supposition being that sales for a month in this period would be slightly higher than the annual monthly average

2. Distribution of revenue by principal crop, 1987-88
K.U.Leuven/DMPCC data; 1988 Zaïres

	A			B		
	Zaïres	% total	N	Zaïres	% total	N
Revenue 3 crops				33502		165
Cassava	20976	73 %	165	20976	73 %	
Maize	6753	16 %	145	5934	14 %	
Peanuts	9458	19 %	115	6951	13 %	

A: Breakdown for households selling the particular crop
B: Breakdown for all households with an agricultural revenue

3. **Average household revenues by principal crop and by ecological zone**
K.U.Leuven/DMPCC data, 1987-1988; 1988 Zaïres N = 225

All households declaring any agricultural revenue:

	Cassava		Maize		Peanuts		Total
	Z	%	Z	%	Z	%	zaïres
Palm/steppe	17347	72,5	3754	14,0	3299	13,5	24401
Palm/savannah	25491	61,5	15347	26,6	8279	12,0	49117
Forest/savannah	35968	59,1	1009	1,7	25675	39,2	62652
Mosaic	14322	88,4	1332	7,6	578	4,0	16233

Households selling the crop in question

	Cassava		Maize		Peanuts	
	Z	%	Z	%	Z	%
Palm/steppe	17347	72,5	3911	14,7	3749	15,3
Palm/savannah	25491	61,5	15347	26,5	13132	19,0
Forest/savannah	35968	59,1	1556	02,6	25675	39,2
Mosaic	14322	88,4	1718	09,8	1288	8,9

4. Mean agricultural revenue per household by type of household
Small Farmer Study data, 1984; 1984 Zaïres N = 392

	All households		Households with some ag. revenue	
Category	Z	N	Z	N
Sample :	11083	392	13880	313
Man alone :	3577	18	7154	9
Woman alone :	7850	90	9950	71
Monogamous couple :	9912	230	12458	183
Polygamous :	23962	54	25879	50
Small family :	7153	47	9888	34
Couple with dependent:	7916	85	11031	61
Young family :	10750	91	13043	75
Older family :	10515	97	12911	79
Several adults :	17607	37	19160	34
Extended family :	19596	35	22862	30

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5. **Agricultural income by component of household structure Small Farmer Study data, 1984, subsample of households declaring agricultural income (N = 313); 1984 Zaïres**

Category		Revenue per: Person present	Work Unit* 1	Work Unit* 2	Consumption Unit
Sample	:	3003	18268	8421	4732
Man alone	:	3088	18538	7600	3384
Woman alone	:	3693	34641	5881	5829
Monogamous couple	:	2601	13012	8348	4029
Polygamous	:	3477	14206	11523	5994
Small family	:	6015	99059	*	8494
Couple with dependent	:	3420	9486		4964
Young family	:	2554	9237		4537
Older family	:	2278	6712		3527
Several adults	:	2520	9117		4497
Extended family	:	2315	7928		3927

* The effect of the "Small family" category on this variable is present in column 1, removed in column 2. This category has the largest number of households in which the value for work units underestimates the actual labor capacity, as demonstrated by actual production

Appendix A: <u>Population and demographic tables</u>

A. Collectivity-level population statistics and projections . . . . . Appendix A: 1
   1. Population base Appendix A: 1
   2. Number of households and number of persons per household Appendix A: 1
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   4. Projections of estimated population densities per square kilometer Appendix A: 2
B. Household-level demographics . . . . . Appendix A: 3
   1. Breakdown by age group and sex of the sample population Appendix A: 3
   2. Age-sex pyramids Appendix A: 3
   3. Per-household age-sex breakdowns: descriptive statistics Appendix A: 4

A. Collectivity-level population statistics and projections
Source: Preliminary results of 1984 national Census

1. Population base

Collectivity	Residents present Men	Women	Rank	Residents absent Men	Women	Residents present	total	Persons present
NKARA	31,214	35,373	1	3,564	2,571	66,587	72,722	68,125
KWILU-KIMBATA	31,401	35,030	2	2,427	1,650	66,431	70,508	67,361
KAPIA	29,900	31,860	3	2,498	1,805	61,760	66,063	63,696
MANZASAY	22,858	25,681	4	1,758	1,093	48,539	51,390	49,347
KILUNDA	22,256	25,768	5	2,454	1,578	48,024	52,056	48,782
DUE	20,290	24,509	6	3,911	2,318	44,799	51,028	46,124
LUNIUNGU	20,942	23,779	7	2,393	1,802	44,721	48,916	45,373
SEDZO	20,140	22,623	8	1,580	1,328	42,763	45,671	43,928
MATEKO	18,687	20,310	9	1,371	1,100	38,997	41,468	40,547
KEMBA	18,343	20,585	10	3,006	2,085	38,928	44,019	41,049
KIDZWEME	18,197	20,580	11	1,222	737	38,777	40,736	39,249
MIKWI	17,349	20,936	12	1,582	884	38,285	40,751	38,907
BULWEM	17,378	19,460	13	1,130	1,023	36,838	38,991	37,976
BANGA	16,592	18,365	14	829	732	34,957	36,518	35,538
KALANGANDA	12,766	14,832	15	1,751	1,376	27,598	30,725	28,466
BATERE	12,598	13,270	16	1,179	812	25,868	27,859	26,994
BULUNGU town	11,015	11,621	*	780	483	22,636	23,899	22,963
PROCAR	341,926	384,582		33,435	23,377	726,508	783,320	744,425

Notes: Rank: Ranked high to low on total of residents present
Residents absent: Persons registered as residents but who are not present at the time of enumeration are assumed be temporarily absent
Residents total: Residents present + residents absent
Persons present: Residents present + non-residents present at time of enumeration

2. Number of households and number of persons per household

Collectivity	Number of households	By household: Residents	Persons
NKARA	12,120	6.00	5.62
KWILU-KIMBATA	14,117	4.99	4.77
KAPIA	11,620	5.69	5.48
MANZASAY	9,428	5.45	5.23
KILUNDA	9,469	5.50	5.15
DUE	9,402	5.43	4.91
LUNIUNGU	9,513	5.14	4.77
SEDZO	7,844	5.82	5.60
MATEKO	6,928	5.99	5.85
KEMBA	7,703	5.71	5.33
KIDZWEME	8,049	5.06	4.88
MIKWI	8,961	4.55	4.34
BULWEM	6,651	5.86	5.71
BANGA	5,922	6.17	6.00
KALANGANDA	5,301	5.80	5.37
BATERE	4,593	6.07	5.88
BULUNGU town	3,920	6.10	5.86
PROCAR	141,541	5.53	5.26

Notes:
Residents: Total residents (prese + absent)

Persons: pers s present

3. Population increase projections

Collectivity	One year levels: Deaths	Births	Natural increase	Unadjusted rates per 1000 persons: Deaths	Births	Natural growth rate (annual)	Resident population 1984	Population estimates for: 1989	1995	2000
NKARA	473	3,382	2,909	7.10	50.79	4.00%	72,722	88,478	111,954	136,210
KILUNDA	665	1,917	1,252	13.85	39.92	2.41%	52,056	58,624	67,610	76,141
MIKWI	136	1,746	1,610	3.55	45.61	3.95%	40,751	49,463	62,409	75,750
DUE	144	2,083	1,939	3.21	46.50	3.80%	51,028	61,488	76,908	92,674
KWILU-KIMBATA	263	2,894	2,631	3.96	43.56	3.73%	70,508	84,682	105,501	126,709
LUNIUNGU	260	1,848	1,588	5.81	41.32	3.25%	48,916	57,389	69,514	81,555
MATEKO	195	1,596	1,401	5.00	40.93	3.38%	41,468	48,963	59,765	70,566
KAPIA	262	2,856	2,594	4.24	46.24	3.93%	66,063	80,092	100,914	122,344
BANGA	163	1,539	1,376	4.66	44.03	3.77%	36,518	43,936	54,854	65,997
KALANGANDA	206	1,064	858	7.46	38.55	2.79%	30,725	35,261	41,598	47,739
KIDZWEME	452	1,767	1,315	11.66	45.57	3.23%	40,736	47,749	57,777	67,724
MANZASAY	217	2,084	1,867	4.47	42.93	3.63%	51,390	61,428	76,095	90,959
SEDZO	295	1,762	1,467	6.90	41.20	3.21%	45,671	53,493	64,666	75,741
KEMBA	267	1,941	1,674	6.86	49.86	3.80%	44,019	53,050	66,366	79,982
BULWEM	183	1,624	1,441	4.97	44.08	3.70%	38,991	46,749	58,121	69,685
BATERE	185	1,196	1,011	7.15	46.23	3.63%	27,859	33,294	41,234	49,279
BULUNGU ville	177	902	725	7.82	39.85	3.03%	23,899	27,751	33,201	38,552
PROCAR	4,543	32,201	27,658	6.39	43.95	3.53%	783,320	931,891	1,148,486	1,367,608

Notes: Birth and death as reported in census for 12-month period prior to enumeration. Natural increase = births-deaths
Annual natural growth rate: the natural increase for the year preceding enumeration divided by the resident population at the time of the enumeration (persons present)
Population estimates: Linear projection of resident population by annual growth rate.

4. Projections of estimated population densities per square kilometer

Collectivity	Area in square km	Estimations of population densities in 1984	1989	1995	2000	Rank
NKARA	1,100	66.11	80.43	101.78	123.83	1
KILUNDA	800	65.07	73.28	84.51	95.18	2
MIKWI	700	58.22	70.66	89.16	108.21	3
DUE	900	56.70	68.32	85.45	102.97	4
KWILU-KIMBATA	1,900	37.11	44.57	55.53	66.69	5
LUNIUNGU	1,300	37.63	44.15	53.47	62.73	6
MATEKO	1,590	26.08	30.79	37.59	44.38	7
KAPIA	3,000	22.02	26.70	33.64	40.78	8
BANGA	1,675	21.80	26.23	32.75	39.40	9
KALANGANDA	1,423	21.59	24.78	29.23	33.55	10
KIDZWEME	2,538	16.05	18.81	22.76	26.68	11
MANZASAY	3,404	15.10	18.05	22.35	26.72	12
SEDZO	3,050	14.97	17.54	21.20	24.83	13
KEMBA	3,400	12.95	15.60	19.52	23.52	14
BULWEM	3,044	12.81	15.36	19.09	22.89	15
BATERE	2,750	10.13	12.11	14.99	17.92	16
BULUNGU ville	*	*	*	*	*	
PROCAR	32,574	24.05	28.61	35.26	41.98	

Notes: Areas given by the Small Farmer Study except Kemba and Manzasay (our own estimates)

Density is population (or projected population by the method in table I.C. above) divided by area. Rank is for density in 1984. Bulungu is not assigned to a collectivity but figures in the Project-wide (PROCAR) estimate.

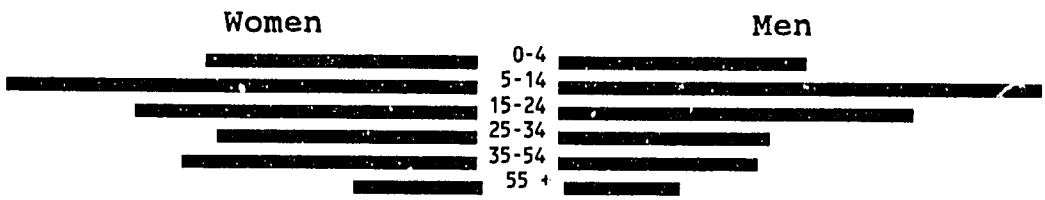
B. Household-level demographics
Source: Small Farmer Survey

1. Breakdown by age group and sex of the sample population (persons present at time of inquiry)

Category		N	%	Cum %
AGE	0-4	341	15.4	15.4
	5-14	631	28.6	44.0
	15-24	455	20.6	64.6
	25-34	301	13.6	78.2
	35-55	322	14.6	92.8
	55+	156	7.1	100.0
SEX	Female	1153	52.3%	
	Male	1053	47.7%	
TOTAL		2206		

2. Age-sex pyramids

Women and girls				Men and boys		
N	%	Cum %	Age	N	%	Cum %
178	15.4	15.4	0-4	162	15.4	15.4
308	26.7	42.2	5-14	322	30.6	46.0
222	19.3	61.4	15-24	233	22.1	68.1
169	14.7	76.1	25-34	134	12.7	80.8
194	16.8	92.9	35-54	128	12.2	93.0
82	7.1	100.0	55 +	74	7.0	100.0
1153			TOTAL	1053		



3. Per-household age-sex breakdowns: descriptive statistics
Small Farmer Survey data

Category	:	Mean	Std. Dev.	Minimum	Maximum
Persons present	:	5.54	3.40	1	22
Age 0 to 4 years	:	0.87	0.94	0	5
Girl 5 to 15 years	:	1.36	1.42	0	9
Boy 5 to 15 years	:	0.90	1.11	0	6
Woman 15 to 55 years	:	1.33	1.07	0	5
Man 15 to 55 years	:	1.28	1.05	0	5
Woman more than 55 years	:	0.21	0.41	0	2
Man more than 55 years	:	0.21	0.41	0	2

Appendix B: Measures and Indicators Based on Household Demography

A. Household capacity and need - work units, consumption units and degree of dependency . . . . . Appendix B: 1

B. Household organization and demography-based measures Appendix B: 1
1. Household organization classification Appendix B: 1
2. Type of household - development of the measure Appendix B: 2
3. Household classification and demography-based measures (Tables) Appendix B: 3

A. Household capacity and need - work units, consumption units and degree of dependency

Sources: K.U.Leuven/DMPCC analysis; Small Farmer Study data

A work unit is a measure of the agricultural labor resource a rural household can be expected to provide for itself based on the composition of the household. An adult woman represents one labor unit. Based on the observations of Springer-Heinze K.U.Leuven/ DMPCC (publication 16) assigns unit equivalencies to other members of the household as follows:

Work units:	Adult woman	1.00 unit	Adult man	0.21 unit
	Girl < 15 yrs	0.05 unit	Boy < 15 yrs	0.01 unit
	Woman > 55 yrs	0.05 unit	Man > 55 yrs	0.01 unit

A consumption unit is similarly a standardized measure of a household's need for food based on household composition. An adult man represents one consumption unit, with other memebers as follows:

Consumption units:	Adult woman	0,75 unit	Adult man	1.00 unit
	Girl < 15 yrs	0.41 unit	Boy < 15 yrs	0.42 unit
	Woman > 55 yrs	0.67 unit	Man > 55 yrs	0.90 unit

The **degree of dependency** is simply the number of consumption units divided by the number of work units - the number of consumption units supported by each work unit, in other words.

Mean values measured for by the K.U.Leuven/DMPCC (publication 16, p. 10)

Geographic zone	Work units	Consumption units	Degree of dependency
Kwilu subregion	1.94	3.97	2.05
Maï-N'Dombe subregion	1.86	3.97	2.13
Bandundu region	2.00	4.07	2.03

Application of the same conversion factors to the Small Farmer Study sample gives comparable although somewhat lower statistics:

	Mean	Std Dev.	Range: minimum - maximum
Work units	1.79	1.25	0.01 - 9.95
Consumption units	3.46	2.04	0.67 - 13.45
Degree of dependency	1.93*	7.78	0.75 - 90.00

* Calculated mean; the statistical mean is 3.75. The higher value is considered a distortion arising from an inherent bias in the measure that produces extreme values for the DD in cases where a man is the only producer in a household.

B. Household organization and demography-based measures Small Farmer Study

Appendix B:

1. Household organization classification

Classification of households according to whether they are monogamous, polygamous, or headed by a single man or a single woman. The ordering

single man-headed household
single woman-headed household
monogamous household
polygamous household

also provides a rough ranking from poorest to wealthiest class of household.

2. Type of household - development of the measure SFS

A classification according to household size and sex and age of members. An initial factor analysis using as variables the number of persons in each of a set of 10-yr age/sex categories produced the following orthogonal factors (60% of variation explained[1]):

GT1 - middle-aged families with school-age or older children
GT2 - young families with children less than 15 years old
GT3 - older couples without dependents
GT4 - young couples with few or no dependents

Since households might well combine several of these characteristics the classification was further refined by rating each household (0 or 1) according to whether its factor score was high and positive on each factor. The resulting distribution of ratings was then reduced to six categories (GTSC score).

1. Small household: one or two adults with few or no dependents, often an elderly couple or individual.
2. Couple with a few dependents - young children or aged parents.
3. Young family with very young children.
4. Middle-aged family with school-age children and even young adults.
5. Large older family, with a high proportion of adults.
6. Extended family, with numerous members in all age groups.

This classification then addresses several related but distinct household characteristics which, separately and in interaction, can be expected to influence the economic strategies and capacities of a household: number of persons, sex distribution, age distribution of individual members and stage at which the household finds itself in its life cycle.

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[1] While the interpretations of the factors are mine the original analysis, including the initial stages leading to final selection of age/sex categories, is stored on diskette at PROCAR.

The SFS sample households are distributed as follows:

Category	N	%	Cum %
Small household	47	12.0	12.0
Couple with dependents	85	21.7	33.7
Young family	91	23.2	56.9
Middle-age family	97	24.7	81.6
Older family	37	9.4	91.1
Extended family	35	8.9	100.0
TOTAL	392	100.0	

3. Household classification and demography-based measures (Tables)

Table I. By household organization category

		Persons present		Number of persons by sex: Male		Female	
	N	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Monogamous couple	230	5.5	2.7	2.8	1.6	2.8	1.7
Single man	18	3.0	2.4	2.1	1.7	0.9	1.3
Single woman	90	3.9	2.6	1.6	1.9	2.3	1.3
Polygamous	54	9.2	4.6	4.3	2.7	5.1	3.0

		Work units		Consumption units		Degree of dependency	
	N	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Monogamous couple	230	1.7	1.1	3.4	1.7	3.3	5.2
Single man	18	.8	.8	2.4	1.6	14.0	27.8
Single woman	90	1.4	.9	2.4	1.7	3.6	4.3
Polygamous	54	3.0	1.6	5.6	2.7	2.3	3.3

Table II. By household type

CATEGORY	PERSONS PRESENT Mean	PERSONS PRESENT Std Dev.	WORK UNITS Mean	WORK UNITS Std Dev.	CONSUMPTION UNITS Mean	CONSUMPTION UNITS Std Dev.	DEGREE OF DEPENDENCY Mean	DEGREE OF DEPENDENCY Std Dev.
Sample	5.5	3.4028	1.79	1.2502	3.45	2.0446	3.7	7.7819
Small family	1.7	0.8053	0.29	0.4028	1.29	0.6504	15.7	18.1084
Couple with dependents	3.4	1.3645	1.21	0.4382	2.35	0.9571	2.3	2.8420
Young family	5.1	1.7251	1.55	0.6639	2.88	0.8957	1.9	0.5548
Middle-age family	6.1	2.3273	2.29	0.9744	4.00	1.5974	1.8	0.5373
Older family	9.3	3.1451	2.25	0.8429	5.34	1.7390	2.6	1.4461
Extended family	11.1	3.6443	3.90	1.7523	7.01	2.1326	2.0	1.2004

Appendix C: Household budgets and socio-economic indicators

A. Agricultural household budgets, 1982 and 1989, converted to 1988 Zaïres . . . . . Appendix C: 1

B. Household-level socioeconomic indicators Appendix C: 2
1. OSU/SEP classification: % of households in sample by indicator Appendix C: 2
2. Small Farmer Study classification. % of households in category Appendix C: 2

C. Livestock ownership . . . . . Appendix C: 2
1. Number and % of households owning livestock, by type Appendix C: 2
2. Per household livestock ownership index statistics Appendix C: 3
3. Means of livestock ownership indices by category of household Appendix C: 3
4. Correlations of livestock index with household composition measures Appendix C: 3
5. Correlations of livestock index with other indices Appendix C: 4

A. Agricultural Household Budgets, 1982 and 1989, Converted to 1988 Zaïres

Drawn from Fresco, 1986 (1982 budget); Cuevas et al., 1989 (1989 budget)

1982	Kalahari Zone				Karroo Zone			
	Z	Z	% cat.	% total	Z	Z	% cat.	% total
Agricultural production, including		16653		42.1%		34389		65.0%
Cassava	14762		88.6%	37.3%	25410		73.9%	48.0%
Maize	751		4.5%	1.9%	834		2.4%	1.6%
Peanuts	556		3.3%	1.4%	4253		12.4%	8.0%
Other crops	500		3.0%	1.3%	500		1.5%	0.9%
Processed products	83		0.5%	0.2%	3392		9.9%	6.4%
Livestock/fish		195		0.5%		3086		5.8%
Salaries/remittances		8952		22.6%		6144		11.6%
Artisan work		7756		19.6%		5949		11.2%
Other activities		6033		15.2%		3336		6.3%
Total		39588				52905		

Conversion 1 Z 1982 = 55,601 Z 1988

1989	Idiofa			Bulungu		
	Net	1988	%	Net	1988	%
Agricultural production	73676	34996	61.1%	58316	27700	64.3%
Livestock/fish culture	8266	3926	6.9%	12398	5889	13.7%
Salaries/remittances	6436	3057	5.3%	7764	3688	8.6%
Artisan work	4520	2147	3.7%	2949	1401	3.3%
Others activities	27716	13165	23.0%	9279	4408	10.2%
Total	120614	57292		90706	43005	

Conversion 1 Z 1988 = 0,475 Z 1989

B. Household-level Socioeconomic Indicators

1. OSU/SEP classification: % of households in sample by indicator
   Data from OSU credit study, Cuevas et al. 1989

Indicator	Idiofa	Bulungu	Bandundu
Resident owns house	87.7	93.9	89.6
Cement wall construction	26.3	1.5	16.3
Corrugate roof	78.9	9.2	37.8
Cement floor	0.0	0.0	4.8
Private latrine/WC	77.2	86.2	86.9
Cooks with other than wood	1.7	1.8	4.1
Well or public water pipe	0.0	1.6	10.0
One person who owns:			
Watch	47.4	36.9	43.3
Radio	17.5	15.4	25.9
Sewing machine	12.3	13.9	13.7
Bicycle	26.3	4.6	18.2
Motorcycle or moped	1.8	0.0	0.7
Car or truck	1.8	0.0	0.4

2. Small Farmer Study classification: % of households in category
   SFS data, 1984, N = 225

Household owns one or more:	In working order? Yes	No	Total One	2 or +
Radios	15.6	7.1	18.6	1.6
Bicycles	11.5	14.0	23.2	1.4
Sewing machines	11.5	3.3	13.1	0.7
Watches	15.4	7.6	20.5	1.6
Guns	12.6	3.9	15.6	0.9
Kerosene storm lanterns	8.7	2.5	10.6	0.7
House has:				
Corrugate roof			2.8	
Windows			54.0	

C. Livestock ownership

1. Number and % of households owning livestock, by type
   Small Farmer Study data, 1984

	N	%
Livestock	310	79.1
Goats	129	32.8
Sheep	37	9.4
Cattle	47	12.0
Pigs	48	12.2
Fowl*	294	74.8

	N	%
Ponds	228	58.0

* Fowl and small animals (rabbits, guinea pigs); about 75% poultry.

2. Per household livestock ownership index statistics
Small Farmer Study, 1984

		Mean	Std.Dev	Min	Max	N
With cattle	A:	1,27	3,68	0,00	46,61	392
	B:	1,57	4,03	0,01	46,61	317
No cattle	A:	0,56	1,12	0,00	10,97	392
	B:	0,70	1,22	0,01	10,97	311

A: Complete sample
B: Households that own livestock

Livestock scale: Bovine= 1 unit; pig= 0.4 units, sheep or goat 0.3 units, poultry/rabbit 0.1 unit

3. Means of livestock ownership indices by category of household
Small Farmer Study data, 1984

	1	2		1	2
Sample	1.27	0.56	Small family	1.41	0.24
			Couple with dependents	1.05	0.52
Man alone	0.72	0.22	Young family	1.19	0.52
Woman alone	1.03	0.27	Older family	0.93	0.54
Monogamous couple	1.07	0.55	Several adults	1.87	0.87
Polygamous	2.68	1.14	Extensive family	2.10	0.87

1: Index with cattle 2: Without cattle

4. Correlations of livestock index with household composition measures
SFS

		Units:		
	Pers.pres.	Work	Consumption	Degree dependence
Index:				
With cattle	0.1195	0.1051	0.0958	-.0527
	P=0.009	P=0.019	P=0.029	P=0.149
No cattle	0.2129	0.1806	0.1857	-.0850
	P=0.000	P=0.000	P=0.000	P=0.047
Cattle only	0.0640	0.0587	0.0459	-.0314
	P=0.103	P=0.123	P=0.182	P=0.268

5. Correlations of livestock index with other indices

Index:	INDEX	INDX2	Agricultural Income	Other income sources
With cattle	0.2537 P=0.000	0.2197 P=0.000	0.1813 P=0.000	0.4939 P=0.000
No cattle	0.3300 P=0.000	0.2968 P=0.000	0.1322 P=0.004	0.6118 P=0.000
Cattle only	0.1792 P=0.000	0.1513 P=0.001	0.1652 P=0.001	0.3598 P=0.000