

Republic of Rwanda

Ministry of Agriculture and Livestock  
Division of Agricultural Statistics

**Sources of Agricultural Household Revenue, Exports,  
and their Impact on Food Availability  
in Rural Rwanda**

Agricultural Year 1990

by

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## Sommaire Français

Ce document utilise les données sur la production et transactions collectées auprès d'un échantillon de 1.208 ménages agricoles au cours de l'année agricole 1990. Il a pour but d'estimer le niveau et les sources de revenu des ménages agricoles, d'étudier les différences sociales et économiques des ménages agricoles selon leur niveau de revenu, et d'estimer le niveau global des importations et exportations du secteur rural.

La famille agricole moyenne a gagné environ 47.000 FRw pendant l'année agricole 1990 au Rwanda. Le revenu moyen par ménage à Kibuye et Gikongoro était nettement au-dessous de la moyenne nationale, alors que les producteurs de Kibungo et Kigali ont eu des revenus beaucoup plus élevés que la moyenne nationale.

L'agriculture rwandaise n'est toujours pas beaucoup orientée vers le marché: 63% de la valeur de la production ne quitte pas son lieu de production. La part de l'agriculture de subsistance dans le revenu total des ménages agricoles est de 44 pourcent. Les marchés de main d'oeuvre agricole au Rwanda sont apparemment assez actifs--la main d'oeuvre est le plus important intrant acheté par les ménages pour leur production. La vente du travail (y compris les ouvriers et les métiers) est aussi important comme source de revenu: il assure 24% des revenus des ménages agricoles au niveau national.

Les données montrent que les ménages agricoles sont, dans l'ensemble, des importateurs du haricot, du sorgho, et du manioc en quantités assez importantes. Des quantités importantes de la pomme de terre, la patate douce, et des bananes sont exportées par le milieu rural.

L'étude montre qu'on trouve les ménages agricoles très pauvres dans toutes les préfectures du pays, mais avec une plus forte concentration dans les préfectures de Gikongoro et Kibuye. Les ménages dans lesquels le chef est de sexe féminin tombent dans la catégorie des ménages plus démunis avec une fréquence plus élevée que parmi les ménages avec un chef de sexe masculin. Les ménages plus pauvres que les autres ont tendance à consacrer un plus grand pourcentage de leur terres à la culture de la patate douce. Malgré cette spécialisation, ces mêmes ménages sont de grands acheteurs nets de la patate douce.

Quand on tient compte des importations du secteur rural, on trouve que la disponibilité de nourriture dans le secteur rural est suffisante en termes de calories, mais probablement insuffisante en termes de protéines et lipides. Cependant, on trouve qu'une grande proportion des ménages n'ont probablement pas assez de disponibilité calorifique pour s'assurer une sécurité alimentaire. Etant donné que l'année agricole était normale, il y a lieu de tirer la conclusion que le Rwanda rural souffre d'une insuffisance alimentaire chronique.

## English Summary

This document presents data on production and transactions collected from a sample of 1208 agricultural households during the 1990 agricultural year. The objective of the analysis is to estimate the level and sources of agricultural household income, to study social and economic differences among households according to their income, and to estimate rural exports and imports.

The average Rwandan farm household made about 47,000 FRW during the 1990 agricultural year. Average farm household income in Kibuye and Gikongoro was quite a bit below the national average, while producers in Kibungo and Kigali had incomes much higher than the national average.

Rwandan agriculture is not very market oriented: 63% of the value of production never leaves the farm. Own consumption of agricultural production accounts for 44% of total farm household income. Agricultural labor markets are apparently fairly active--farm labor is the most important purchased input to production. Sales of labor (including skilled and unskilled) is also important as a source of income: nationally, 24% of farm household revenue comes from this source.

The data show that in the aggregate, Rwandan agricultural households are importing large quantities of beans, sorghum, and manioc. The rural areas export large quantities of potatoes, sweet potatoes, and bananas.

The study shows that very poor farm households are found in all of Rwanda's prefectures, but that the highest concentrations of poverty are in Gikongoro and Kibuye. Female-headed households are more frequently found in the lowest category of income per adult-equivalent than are male-headed households. The poorest households tend to put a larger percentage of their land in sweet potatoes than do other households. Despite this specialization, these same households are big net buyers of sweet potatoes.

When rural imports are taken into account, food availability is probably sufficient in terms of calories, but insufficient in terms of proteins and lipids. Even so, a large proportion of rural households probably don't have sufficient caloric availability to assure their food security. Given that 1990 was a normal agricultural year, it is likely that rural Rwanda suffers from chronic food shortages.

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## 1. Introduction

The objective of this document is to **describe the method used in estimating the revenue of agricultural households and provide tables of basic household averages** for agricultural year 1990. A second objective of the paper is to **examine social and economic differences between agricultural households with different levels of income**. A large proportion farm household economic activity consists of transactions involving food products. Depending on the productivity of the farm and the food security strategy followed, a household either sells or buys a particular product. Given Rwanda's more or less open borders, transactions by agricultural household can give rise to official or informal imports and exports. Since data on purchases and sales of producers provide insights on the level of national exports and/or imports of each product, and since Rwandan policymakers need information about border trade, a third objective is to **estimate the global level of imports and exports of the rural sector to or from urban areas and/or foreign countries**.

The data were collected via a survey on 1248 randomly selected households. These same households also participated in other surveys conducted by the Division of Agricultural Statistics. Neither non-farm nor urban households were included in the sample. To briefly describe the sampling method, the first level of sampling was the *District de Recensement* (DR), drawn from 21 agro-ecological and political strata throughout the country. The second level of sampling consisted of groups of households, drawn from the DRs selected. For details of the sampling methods used, see DSA (November 1991). The revenue-expenditure survey was based on questionnaires on purchases, sales, and gifts of agricultural products, inputs, animals, and labor supplied outside the farm. Questionnaires are available from DSA. The enumerators visited the selected households each monthly for twelve months. Forty households were dropped from the data set due to deaths, dissolution of the household, anomalous responses, or other problems; thus 1208 households remained in the sample for the analysis. This is the largest sample ever used for a revenue survey in Rwanda. The only other survey of this kind, the 1983 "Household Budget and Consumption Survey" (*Enquête Nationale sur le Budget et la Consommation des Ménages* henceforth ENBC), used a sample of 270 households.

## 2. Estimating Agricultural Household Revenue

### 2.1 Production and Own Consumption

A large proportion of rural income in Rwanda comes from production that is never marketed, but directly consumed by the household. Thus to provide a realistic estimate of rural revenue, it is necessary to estimate the value of own consumption. This is done in several steps.

*Step 1: Estimate the price received by the producers.* Average monthly producer prices were estimated by dividing the total amount received by producers selling their goods by the quantities sold. Estimated producer prices are reported in Table 2.1.

*Step 2: Estimate the value of production.* The value of production was estimated by multiplying

the prices found in Table 2.1 by the quantities of each crop the household produced for each month of the year, adjusted by the proportion of production that goes for seed as estimated by MINAGRI (May 1988, p. 6). Agricultural production was estimated via DSA's ongoing production survey. Table 2.2 reports the value of production by month and prefecture, whereas Table 2.3 shows the value of production by product and prefecture.

*Step 3: Estimate the value of products sold and given as gifts.* Household purchase and sales data was used to estimate the value of crops sold or given away. To avoid double counting, in cases where households bought or received crops and then sold or gave them away, net sales and gifts were used. That is:

$$\begin{array}{r} \text{sales} \\ + \text{ gifts given away} \\ - \text{ purchases} \\ - \text{ gifts received} \\ \hline = \text{ net value of sales and gifts} \end{array}$$

In cases where the household purchased and received more than it sold and gave away, net sales and gifts were considered to be zero.

*Step 4: Estimate the value of own consumption.* The value of own consumption was estimated by subtracting the values computed in step 3 from the value of production found in Table 2.3. The result is shown in Table 2.4. The ratio of the totals in Tables 2.4 and 2.3 provide an insight into Rwandan food crop movement: 63% of the value of production never leaves the farm<sup>1</sup>.

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<sup>1</sup>Here and throughout this document, own consumption of animal production as well as minor crops such as honey, fruit, and vegetables is ignored. These products are difficult and costly to measure. Both the ENBC and Vis (1975) found these items (including purchases) to account for less than 4% of total calories consumed.

Table 2.1  
MEAN MONTHLY PRODUCER PRICES OF MAJOR AGRICULTURAL PRODUCTS  
(FRW/kg)

	OCT 1989	NOV 1989	DEC 1989	JAN 1990	FEB 1990	MAR 1990	APR 1990	MAY 1990	JUNE 1990	JULY 1990	AUG 1990	SEPT 1990
BEANS												
FRESH	34	34	34	34	34	34	18	18	18	18	18	18
DRY	41	39	28	25	26	28	35	29	30	29	35	35
PEAS												
FRESH	41	41	41	41	41	41	32	32	32	32	32	32
DRY	45	45	45	45	45	45	47	47	47	47	47	47
PEANUTS												
IN SHELL	44	44	44	44	44	44	39	39	39	39	39	39
SHELLED	91	91	91	91	91	91	85	85	85	85	85	85
SOYBEANS												
FRESH	43	43	43	43	43	43	28	28	28	28	28	28
DRY	40	40	40	40	40	40	38	38	38	38	38	38
SORGHUM												
GRAIN	21	21	21	21	21	21	24	22	17	16	18	18
FLOUR	N/A	N/A	N/A	N/A	N/A	N/A	30	30	30	30	30	30
MAIZE												
PODS	14	14	14	14	14	14	20	20	20	20	20	20
GRAIN	14	14	14	14	14	14	17	17	17	17	17	17
FLOUR	18	18	18	18	18	18	N/A	N/A	N/A	N/A	N/A	N/A
WHEAT												
FLOUR	36	36	36	36	36	36	36	36	36	36	36	36
FINGER MILLET												
GRAIN	50	50	50	50	50	50	34	34	34	34	34	34
FLOUR	N/A	N/A	N/A	N/A	N/A	N/A	69	69	69	69	69	69
RICE												
MILLED	61	61	61	61	61	61	61	61	61	61	61	61
CASSAVA												
FRESH	7	7	7	7	7	7	10	10	10	10	10	10
DRIED	23	22	23	25	23	24	25	25	25	25	25	25
FLOUR	33	33	33	33	33	33	36	36	36	36	36	36
POTATOES	10	10	10	10	10	10	10	10	10	10	10	10
SWEET POTATOES	8	9	10	9	10	9	9	8	7	6	7	9
TARO	14	14	14	14	14	14	11	11	11	11	11	11
YAMS	17	17	17	17	17	17	12	12	12	12	12	12
COOKING BANANA	5	6	7	7	8	8	9	8	8	8	7	6
BEER BANANA	4	4	4	4	4	4	4	4	5	4	4	4
FRUIT BANANA	5	5	5	5	5	5	6	6	6	6	6	6
COFFEE	91	91	91	91	91	91	86	95	97	99	99	84
BANANA BEER	22	22	25	27	29	28	29	29	29	28	26	24
SORGHUM BEER	15	15	15	15	13	15	15	15	15	14	13	13

Note: For the crops with less than forty observed transactions per month, the table seasonal rather than monthly prices (Oct.-March=Season A, April-Sept.=Season B). Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

Table 2.2  
MEAN VALUE OF AGRICULTURAL PRODUCTION BY PREFECTURE AND MONTH  
(FRW per household, net of seeds)

	OCT 1989	NOV 1989	DEC 1989	JAN 1990	FEB 1990	MAR 1990	APR 1990	MAY 1990	JUNE 1990	JULY 1990	AUG 1990	SEPT 1990	MEAN
BUTARE	1733	2210	2108	3356	2055	1978	2084	3262	4238	2946	1872	1654	2458
BYUMBA	1969	1871	2144	4862	3846	3150	2030	2272	3196	7370	3079	2008	3150
CYANGUGU	1950	1534	2005	2562	2005	2678	3346	3946	3459	2276	2499	2060	2527
GIKONG.	798	747	1232	1638	1407	967	1296	1594	1946	2597	953	1139	1360
GISENYI	1275	1166	1880	3943	1738	3417	4388	2587	2392	1694	1482	1578	2295
GITARAMA	2467	2409	2978	3885	2190	2507	3003	4572	4468	3908	2987	2094	3122
KIBUNGO	5186	3710	4846	5524	4853	4428	3435	5969	8887	7038	5182	3639	5225
KIBUYE	879	1029	1425	2286	2170	1529	1271	1187	1168	2049	1385	920	1441
KIGALI	2972	3695	3012	6099	3762	2608	2594	4068	6467	5319	3189	2495	3857
RUHENG.	1976	2573	2685	3617	3645	2823	3193	2665	2554	3161	2992	2041	2827
RWANDA	2139	2193	2465	3929	2803	2616	2682	3266	3969	3942	2595	1980	2882

Note: Net of seeds means that production has been reduced by the amount estimated to go for seed.  
Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

Table 2.3  
MEAN VALUE OF AGRICULTURAL PRODUCTION BY CROP AND PREFECTURE  
(FRW per household, net of seeds)

	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	RWANDA
BEANS	2406	6818	1908	749	1880	3298	6913	2018	8544	4931	4183
PEAS	220	428	235	461	268	232	247	717	190	412	325
PEANUTS	346	1649	27	8	58	195	1159		975	4	474
SOYBEANS	1227	67	942	1114	47	1213	1518	31	67	31	605
SORGHUM	1461	5386	243	739	239	1039	3435	617	2691	2281	1919
MAIZE	207	877	784	433	3264	279	565	2712	367	1672	1040
WHEAT		429	12	290	65	132	102	234	45	530	184
FING. MILLET	19	11	44	102				116	11	146	41
RICE	1661	41	11		99		697		127	10	290
SWEET POTATO	6571	5406	3263	6425	4352	6392	3893	5239	4050	6764	5349
CASSAVA	5451	2404	6122	821	891	7797	3764	1202	7340	633	3927
POTATO	254	593	274	644	4418	243	312	1078	288	9452	1815
TARO	813	209	2395	746	303	807	452	700	688	653	733
YAMS	47		36	43	3	59	29	23	51	1	30
FRUIT BANANA	734	1892	853	158	400	1484	2652	231	1611	650	1104
OTHER BANANA	6157	10048	7307	2244	5056	9980	32190	2194	15172	5442	9530
COFFEE	1922	1539	5863	1339	6196	4318	4767	186	4065	312	3033
TOTAL	29496	37797	30319	16314	27539	37467	62697	17298	46279	33924	34580

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 2.4  
 MEAN VALUE OF OWN CONSUMPTION BY CROP AND PREFECTURE  
 (Value of production minus net sales and gifts given)  
 (FRW per household)

	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	RWANDA
BEANS	2287	5547	1889	749	1874	3034	5826	1978	8076	4853	3836
PEAS	184	356	220	372	252	210	228	641	188	382	289
PEANUTS	249	1508	21	8	58	182	964		845	4	413
SOYBEANS	1195	47	894	1025	47	1120	1508	31	67	30	575
SORGHUM	960	4165	168	606	96	682	1667	560	1802	1829	1342
MAIZE	187	647	729	422	3159	254	491	2331	344	1432	931
WHEAT		197	12	218	59	130	102	195	42	327	126
FING. MILLET	19	11	37	98				89	11	112	34
RICE	1207	41	11		92		565		-32	10	203
SWEET POTATO	6061	5027	3042	6049	3914	5670	3504	4994	3853	5965	4902
CASSAVA	5099	2147	6008	789	850	7046	3250	1098	6819	564	3622
POTATO	226	427	223	557	2355	237	247	909	252	4481	1009
TARO	744	190	2283	696	293	692	397	662	605	616	673
YAMS	45		36	43	3	59	29	21	49	1	30
FRUIT BANANA	692	1844	833	133	394	1425	2579	230	1563	643	1069
OTHER BANANA	2611	2884	1252	564	2786	2887	6852	821	4467	1929	2794
TOTAL	21765	25040	17657	12329	16232	23628	28209	14560	28949	23179	21846

Note: For sorghum and bananas other than fruit, the proportion of the production sold as beer was estimated based on the survey, on Haggblade's estimates of beer ingredients, and on survey results on beer sales.  
 Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

## 2.2 Net Value of Crop Sales and Gifts Received

Sales and gifts received are sources of revenue for the producer, and must be included in estimating revenue. The value of crops sold by producers less the value of crops purchased equals net crop sales. In cases where the value of purchases was larger than that of sales, net value of sales is considered to be zero. Net, rather than total sales were used to eliminate bias caused by households buying and selling the same crop. The net value of crop sales is reported in Table 2.5, while Table 2.6 shows the value of net gifts received.

Table 2.5  
MEAN VALUE OF NET SALES BY PRODUCT AND PREFECTURE  
(FRW per household)

	PREFECTURE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
BEANS	88	1169	14		1	225	993	9	392	47	303
PEAS	22	67	8	83	12	14	16	52		11	26
PEANUTS	95	132	6			6	165		129		57
SOYBEANS	32	20	46	76	0	56	10			1	24
SORGHUM	258	705	50	19	31	91	979		509	297	303
MAIZE	9	192	26	1	22	15	26	295	12	99	64
WHEAT		230		68	2	2		31	3	188	55
FING. MILLET			1	4				19		17	4
RICE	405				7		132		159		81
CASSAVA	338	242	83	32	30	734	459	74	494	40	283
POTATO	24	155	32	79	1914	5	63	177	36	4826	772
SWEET POTATO	851	618	360	751	750	1066	497	848	460	1071	747
TARO	67	17	83	44		108	49	32	59	5	48
YAMS	2							2	1		1
OTHER BANANA	179	312	381	210	179	225	2470	24	326	474	431
FRUIT BANANA	42	47	20	23	6	60	49	1	46	7	32
SORGHUM BEER	853	1075	12	1098	278	64	351	469	49	432	462
BANANA BEER	4761	5237	2804	1643	4306	4780	7635	1341	6910	3045	4447
COFFEE	1922	1539	5863	1339	6196	4318	4767	186	4065	312	3033
CASH CROPS	105	2229	1107		2	31	342	294		142	406
BEEF				4	1					98	13
OTHER MEAT	3			26		2		6	2	27	6
FISH	9						1		86		12
EGGS	13	29	2	23	9	69	8	13	91	58	36
HONEY	15	2	2	52	15	3	53		6	71	21
MILK	316	289		175	13	288	235		4		142
VEGETABLES	77	87	11	86	9	116	302	58	195	124	109
FOREST	162	153	21	381	269	19	90	419	476	243	223
FRUITS	21	2	3	32	10	50	15	9	15	66	24
FODDER	14			1		10			20	4	6
CATTLE	708	691	357	420	592	1534	824	777	1857	922	940
SHEEP	127	448	49	130	286	88	33	269	189	305	199
GOATS	427	886	285	288	615	371	1705	778	970	316	649
PIGS	661	112	373	650	14	175	560	21	55	166	265
POULTRY	120	143	38	40	52	107	72	33	150	76	91
GIFTS											
OTHER	469	497	120	944	963	1042	465	18	2332	2171	1005
TOTAL	13196	17325	12157	8723	16582	15674	23366	6255	20196	15561	15321

Note: For beer, the value of sales was reduced by an estimate of the cost of purchased ingredients. Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

Table 2.6  
MEAN VALUE OF NET GIFTS RECEIVED BY PRODUCT AND PREFECTURE  
(FRW per household)

	PREFECTURE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
BEANS	185	59	70	231	176	137	33	94	105	320	146
PEAS	3	14	6	7	26	1	9	11	3	100	19
PEANUTS	3	5	3		1	2	14		4	15	5
SOYBEANS	14	1	31	22	1	9	0	1	3	2	8
SORGHUM	45	82	2	141	50	35	11	76	11	189	64
MAIZE	63	12	94	59	70	24	5	57	10	171	55
WHEAT		8		2	1	5		4	1	17	4
FING. MILLET			1					2	1	35	4
RICE	40	1	2	4	5	2	3	14	25	5	11
CASSAVA	23	7	32	8	6	36	11	4	28	6	17
POTATO	12	7	19	7	93	7	2	57	9	115	32
SWEET POTATO	156	145	142	220	145	168	148	114	105	425	179
TARO	15		32	13	14	6	4	5	4	13	10
YAMS						1			1		0
OTHER BANANA	15	41	3	15	6	32	378	2	35	26	49
FRUIT BANANA		1		1			10		2	1	1
SORGHUM BEER	32	154	4	81	85	68	53	35	130	272	98
BANANA BEER	11	131	58	72	174	217	373	37	342	263	175
CASH CROPS											
BEEF											
OTHER MEAT											
FISH											
EGGS											
HONEY											
MILK											
VEGETABLES											
FOREST											
FRUITS											
CATTLE									108		14
SHEEP									13		2
GOATS			13								1
PIGS											
POULTRY											
GIFTS	194	429	265	377	243	292	1281	401	178	434	379
OTHER											
TOTAL	811	1097	776	1260	1097	1042	2334	915	1118	2408	1273

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 2.3 Input Purchases

When producers purchase inputs, their total revenue from production must be adjusted to account for these inputs. Table 2.7 reports producers' expenditures for inputs. Rwandan producers rely very little on chemical inputs for their production. In contrast, a fairly large agricultural labor market exists.

Table 2.7  
MEAN EXPENDITURES ON PURCHASED INPUTS BY PREFECTURE  
(FRW per household)

	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	RWANDA
AG. LABOR	1652	3568	672	527	2209	2554	6418	577	3080	3060	2503
CHEMICAL											
FERTILIZER	7	13		39	18		6		3	3	8
PESTICIDES	0	6		5	256		122	41	30	307	76
FODDER				7		19	5		17	9	7
TOTAL	1659	3587	672	578	2482	2573	6552	618	3129	3379	2594

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 2.4 Agricultural and Non-Agricultural Labor Sales

Just as some producers buy labor as an input to production, others sell their labor. This is an important source of revenue for many rural households, as shown in Table 2.8.

Table 2.8  
MEAN VALUE OF LABOR SALES BY PREFECTURE  
(FRW per household)

	PREFECTURE										RWANDA	
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH		
AGRICULTURAL												
LABOR	877	2901	1333	2460	2689	1237	1165	838	1714	1557	1687	
UNSKILLED												
LABOR	572	410	3171	563	3087	1004	575	951	1560	782	1219	
SKILLED												
LABOR	2309	6288	2135	3826	7349	4628	27543	2230	11833	17217	8447	
TOTAL LABOR	3758	9598	6639	6849	13125	6869	29283	4018	15107	19557	11353	

Note: Here and throughout this document unskilled labor is defined as non-agricultural work requiring no training. Examples of this would be guards, porters, messengers, and road repair crews.

Skilled labor includes tailoring, brick/tile making, masonry, carpentry, metal working, art making, mechanics, pottery making, basket weaving, commerce, and employment as a teacher or government official.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

## 2.5 Net Rural Household Revenue

Given the data presented in the above tables, it is possible to estimate the total household net revenue via the following formula:

$$\begin{aligned} & \text{own consumption} \\ + & \text{net sales} \end{aligned}$$

- + net gifts received
  - input purchases
  - + labor sales
- 
- = net household revenue

Table 2.9 recapitulates the preceding tables, and provides an estimate of total net revenue per household.

Table 2.9  
MEAN NET HOUSEHOLD REVENUE BY SOURCE AND PREFECTURE  
(FRW per household)

	PREFECTURE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
OWN CONSUMPTION	21765	25040	17657	12329	16232	23628	28209	14560	28949	23179	21846
NET SALES	13196	17325	12157	8723	16582	15674	23366	6255	20196	15561	15321
GIFTS RECEIVED (NET)	811	1097	776	1260	1097	1042	2334	915	1118	2408	1273
INPUTS	-1659	-3587	-672	-578	-2482	-2573	-6552	-618	-3129	-3379	-2594
LABOR SALES	3758	9598	6639	6849	13125	6869	29283	4018	15107	19557	11353
NET REVENUE	37872	49473	36557	28583	44554	44639	76641	25131	62241	57325	47199

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Assigning input costs proportionally to own consumption and net sales<sup>2</sup>, the proportion of income coming from each activity can be estimated. Table 2.10 shows the result of this computation.

Table 2.10  
NET HOUSEHOLD REVENUE BY SOURCE AFTER ALLOCATING INPUT COSTS  
(FRW per household)

	PREFECTURE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
OWN CONSUMPTION	21139	23573	17383	12093	14978	22610	25243	14374	27671	21826	20780
NET SALES	12163	15205	11759	8381	15354	14119	19780	5823	18345	13535	13793
GIFTS RECEIVED (NET)	811	1097	776	1260	1097	1042	2334	915	1118	2408	1273
LABOR SALES	3758	9598	6639	6849	13125	6869	29283	4018	15107	19557	11353
NET REVENUE	37872	49473	36557	28583	44554	44639	76641	25131	62241	57325	47199

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

<sup>2</sup> Except for forage, 100% of which is assigned to net sales.

Figure 2.1 summarizes Table 2.10 in graphical form. Figure 2.1 shows clearly that producers in Kibuye and Gikongoro are substantially below the national average, while Kibungo, Kigali, and Ruhengeri producers earn much more on average than do producers in other areas. The estimates in Table 2.10 are converted into percentage of income in Figure 2.2, which shows that there is less variability between prefectures in terms of their revenue producing strategies than there is in terms of levels of revenue.

**Figure 2.1**

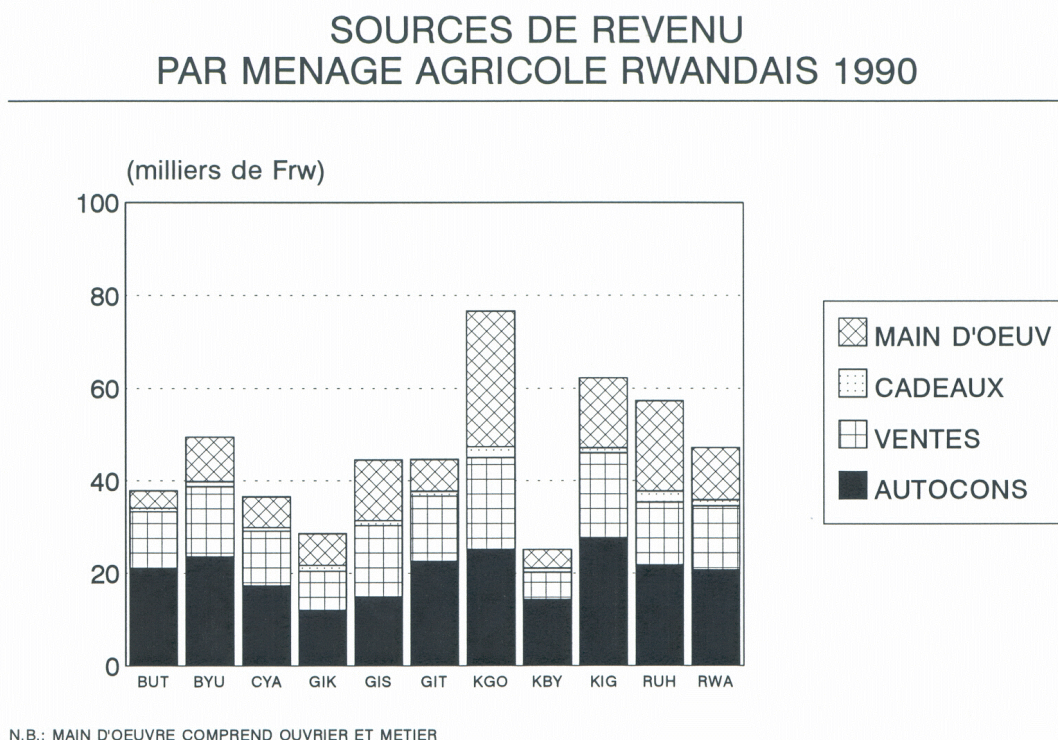


Figure 2.3 summarizes revenue by source for agricultural households in the nation, showing that subsistence agriculture is still by far the largest source of revenue for farm families.

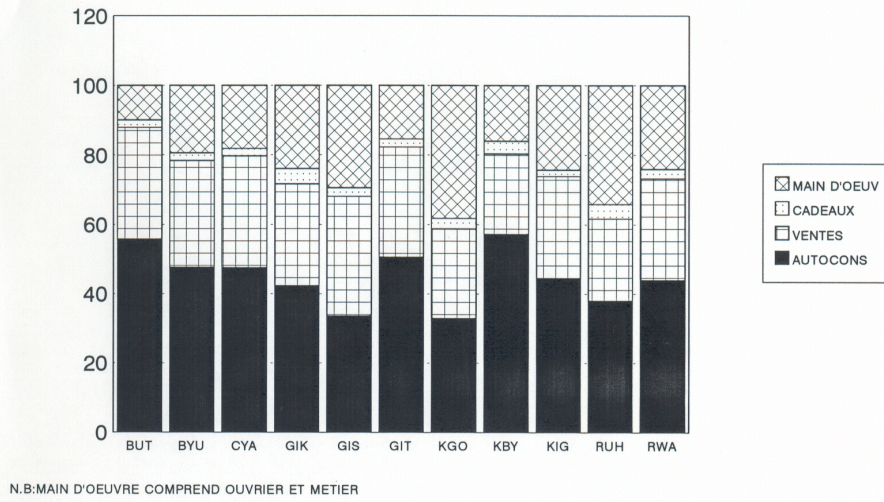
Table 2.11  
NET HOUSEHOLD REVENUE BY SOURCE (PERCENTAGE) BY PREFECTURE  
(INPUT COSTS ALLOCATED PROPORTIONALLY TO OWN CONSUMPTION AND NET SALES)

	PREFECTURE											RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH		
OWN CONSUMPTION	56	48	48	42	34	51	33	57	44	38	44	
NET SALES	32	31	32	29	34	32	26	23	29	24	29	
GIFTS RECEIVED (NET)	2	2	2	4	2	2	3	4	2	4	3	
LABOR SALES	10	19	18	24	29	15	38	16	24	34	24	
NET REVENUE	100	100	100	100	100	100	100	100	100	100	100	

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

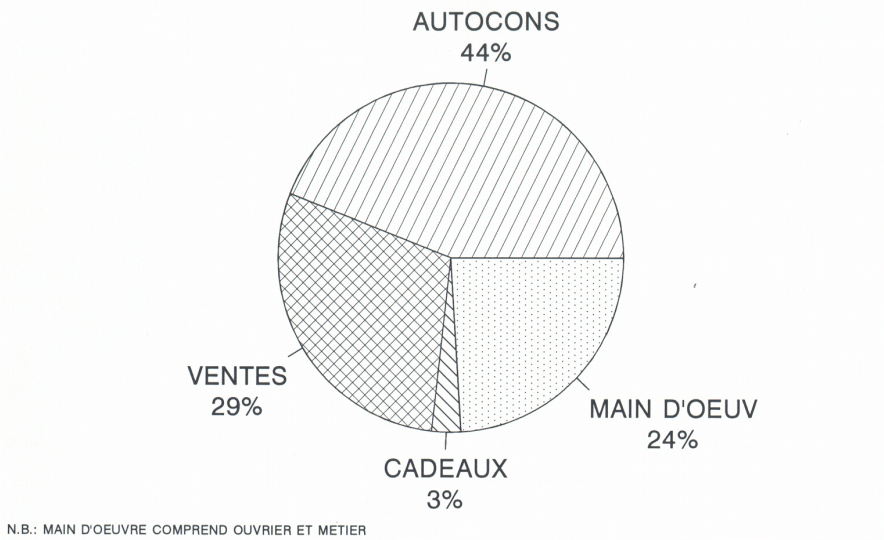
**Figure 2.2**

**SOURCES DE REVENU EN POURCENTAGE  
PRODUCTEUR AGRICOLE RWANDAIS 1990**



**Figure 2.3**

**SOURCES DE REVENU  
PRODUCTEUR AGRICOLE RWANDAIS 1990**



### 3. Net Value of Purchases and Gifts Given

As mentioned in the discussion of Tables 2.5 and 2.6 above, some households buy and sell the same product during the year. For some households and some products, gross purchases are larger than gross sales, indicating negative net sales. As was state above, when calculating household revenues, negative net sales are considered to be zero. Negative net sales are, of course, positive net purchases. Tables 3.1 and 3.2 report net purchases and net gifts given away, respectively. Note that in these two tables, negative net purchases (net sales) have been considered to be zero. It is evident from Tables 2.5, 2.6, 3.1, and 3.2 that for some products the aggregate value of rural transferrals (net sales plus gifts given away) is less than the aggregate value of rural acquisitions (purchases plus gifts received). This reflects two phenomena. First, prices paid for purchases for consumption are higher than prices received by producers. This is entirely normal since traders need to be compensated for the risks they face (storage losses, thefts, price declines) and for the costs of assembling, storing, transporting, and distributing products. Second, significant quantities of some products are imported informally from neighboring countries. This second phenomenon is discussed in more detail below.

### 4. Rural Exports

Exports by the rural sector are calculated as:

$$\begin{array}{r} \text{sales} \\ + \text{ gifts given} \\ - \text{ purchases} \\ - \text{ gifts received} \\ \hline = \text{ net exports} \end{array}$$

The term "net exports" is preferred here because it is very likely that one region buys one product while another sells it. Net exports refer to the difference between total exports and total imports. For example, it is possible that Rwanda exports beans to Burundi while importing them from Zaire. **This method of estimating net exports does not permit distinguishing between different means exporting nor the final destination of the exports. Exports may be to the urban sector, to neighboring countries, or more distant countries.** The exports may be official or informal. Exports may be transported by truck, head, bicycle, or boat. The mode of export and final destination of these crops are interesting questions, but answering them would require another (probably more costly) study.

Table 4.1 shows the computation of rural net exports for selected goods. The table shows that for some goods, purchases are larger than sales, meaning that net exports are negative. Negative exports are, of course, imports. A previous study on the bean and sorghum transactions of rural households in 1986 also found that these two food crops are imported (Loveridge, 1989). This study was followed by complementary studies on traders, which confirmed the imports of

these products (Loveridge et Ngirumwami, 1987; Ngirumwami et Loveridge, 1987; Ngirumwami, 1989). A study by Ngirumwami (1989) found that Zaire and Uganda are large suppliers of agricultural imports. Results from 1990 confirm what was found on beans and sorghum in 1986. Table 4.1 also shows that cassava is imported in large quantities by the rural sector. Products exported in large quantities are potatoes, sweet potatoes, and cooking bananas.

Table 3.1  
MEAN NET VALUE OF AGRICULTURAL PRODUCT PURCHASES  
(FRW per household)

	PREFECTURE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
BEANS	1770	3250	1968	2059	3087	1722	871	1627	2388	3461	2283
PEAS	19	64	97	96	176	113	67	140	42	165	95
PEANUTS	47	91	12	12	36	123	221	1	87	19	67
SOYBEANS	106	24	91	44	5	68	12	7	16	2	39
SORGHUM	1119	1303	471	1658	1078	241	498	1537	672	1128	945
MAIZE	20	125	381	17	488	6	7	132	8	476	157
WHEAT		33	1	15	3			9	6	113	19
FING. MILLET	2		6	10				10		5	3
RICE	220	32	413	82	312	178	238	3	555	103	221
CASSAVA	331	60	950	192	191	734	120	170	554	109	349
POTATOES	395	565	76	198	1270	526	180	226	953	898	578
SWEET POTATO	851	618	360	751	750	1066	497	848	461	1071	747
TARO	242	7	179	55	12	23	9	14	28	26	60
YAMS	1		2	1		2	1	1	2		1
COOKING BAN.	21	75	18		26	132	516	1	154	27	94
BEER BANANA	163	59	171	600	908	54	208	59	57	191	231
FRUIT BANANA	0	10		12	13	7	11		2	16	7
SORGHUM BEER	853	1075	12	1098	278	64	351	469	49	432	463
BANANA BEER	4886	5293	3006	3999	5132	4998	7655	1350	6917	3131	4790
CASH CROPS	23	0		16	112	24	6	3	18	134	36
BEEF	291	437	404	179	867	772	1136	22	1178	703	630
OTHER MEAT	195	183	247	44	104	154	1153	26	154	185	226
FISH	153	7	1612	24	208	65	283		139	56	210
EGGS	6	4	1	10	6	1	27		6	16	7
HONEY	2	3	3		6	4	44		25	29	12
MILK	117	123	9	17	4	150	165		119	100	89
VEGETABLES	102	107	71	16	119	175	430	13	381	162	166
FOREST PROD.	19	19	32	7	76	15	58	6	44	173	46
FRUITS	7	6	12	10	18	9	53		21	5	13
CATTLE	150	257	31		98	683	220	198	311	388	261
SHEEP		35	10	47	100	16	51	89	54	119	51
GOATS	130	123	95	46	117	134	34	105	74	296	121
PIGS	79	24	82	48	14	1	68		6	16	31
POULTRY	23	78	33	13	12	60	97	9	45	92	48
GIFTS											
OTHER											
TOTAL	12343	14089	10855	11375	15627	12321	15287	7077	15528	13847	13096

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 3.2  
MEAN NET VALUE OF AGRICULTURAL PRODUCT GIFTS GIVEN  
(FRW per household)

	PREFECRE										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
BEANS	66	182	67	5	105	117	143	72	157	226	120
PEAS	14	4	13	9	6	8	6	33	2	31	12
PEANUTS	1	11				7	33		10		6
SOYBEANS	1	0	14	14		41					8
SORGHUM	0	113		2	7	13	20	13	59	29	28
MAIZE	13	46	61	11	154	11	50	108	12	165	60
WHEAT		5		5	4	1		10		24	5
FING. MILLET			7					7		20	3
RICE	52										6
CASSAVA	22	17	45	2	12	37	56	31	31	33	28
POTATOES	5	13	20	12	164	4	6	5	1	191	43
SWEET POTATO	156	145	142	220	145	168	148	114	105	425	179
TARO	4	2	35	6	10	7	6	8	23	32	13
YAMS						0			1		0
COOKING BAN.	2	34	35	2	9	19	309		30	23	40
BEER BANANA	16	39	10	10	5	7	257	3	22	13	33
FRUIT BANANA		0	0	2	0		24	0	2	0	2
SORGHUM BEER	149	641	5	304	103	133	382	124	229	402	253
BANANA BEER	396	695	820	227	517	1777	4908	307	2165	1608	1336
CASH CROPS											
BEEF											
OTHER MEAT											
FISH											
EGGS											
HONEY											
MILK											
VEGETABLES											
FOREST											
FRUITS											
CATTLE							220				17
SHEEP											
GOATS											
PIGS											
POULTRY						2					0
GIFTS											
OTHER											
TOTAL	898	1948	1273	831	1241	2352	6570	835	2848	3221	2193

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 4.1  
NET RURAL TRANSACTIONS BY PRODUCT AND TRANSACTION TYPE  
(Total for all agricultural households, physical units)

PRODUCT	SALES	GIFTS GIVEN	PURCHASES	GIFTS RECEIVED	NET EXPORTS
BEANS (t.)	12993	4388	73545	4374	-60537
PEAS (t.)	614	199	2241	305	-1733
PEANUTS (t.)	932	106	939	60	39
SOYBEANS (t.)	773	239	1207	251	-446
SORGHUM(t.)	20991	1816	45218	3163	-25574
MAIZE (t.)	4366	3211	7206	2365	-1995
CASSAVA (t.)	41553	4389	64178	2517	-20753
POTATO (t.)	97915	5482	49794	2536	51067
SWEET POTATO (t.)	53666	16065	43352	7418	18961
COOKING BAN. (t.)	44777	7344	15406	4606	32110
BEER BANANA (t.)	56097	10415	58403	5605	2505
FRUIT BANANA (t.)	6899	534	2367	417	4649
BANANA BEER (l.)	205229	33617	3551	6391	228904
SORGHUM BEER (l.)	64606	13073	7174	8864	61640
CATTLE (a.)	111	16	32	25	70
SHEEP (a.)	250	21	56	20	195
GOATS (a.)	567	47	116	66	432
PIGS (a.)	160	9	43	12	114
POULTRY (a.)	559	82	326	122	194
AGRIC. LABOR (p.d.)	21497		33130		-11634
UNSKILLED LAB.(p.d.)	14902		8087		6815
SKILLED LABOR (p.d.)	39952		1870		38082

Notes:

- 1) Units of measurement: t.=metric tons; a.=thousands of animals (of any age); l.=thousands of liters; p.d.=thousands of person days (of any age and of either sex).
  - 2) The term "net household transactions" means that for each household only the net result of all transactions is included. For instance, if a family has bought 2 kg of beans and sold 10 kg of beans, this is considered as one net sale of 8 kg of beans. Gross transactions are reported in Appendix Table 1.
  - 3) Beer purchases are probably underestimated due to the social nature of beer consumption.
  - 4) See Table 2.8 for definitions of skilled and unskilled labor.
- Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Large quantities of beer bananas appear to be exported in the form of beer, but these figures should be interpreted carefully, since it is likely that some family members were reluctant to reveal the true quantities of their beer purchases in bars and at neighbors' houses. Nevertheless, it is quite well known that some regions send large quantities of traditional beverages to the urban areas of Kigali. Thus, it is reasonable to assume that the rural sector exports these beverages, but that the statistics on beer exports in Table 4.1 likely overestimate true exports. The problems associated with estimates related to beer making is discussed in more detail below.

Note also that the exports of animals in Table 4.1 are slightly overestimated, since the numbers include only purchases of live animals, not purchases of meat. Thus the true rural exports must be below those reported in Table 4.1. According to the results in Table 3.1, an

average agricultural household spent 856 FRW for beef and other meat in 1990 (including slaughtering expenses). According to Table 2.5, an average agricultural household earned 2,163 from the net sales of animals and meat in 1990 (including those households that did not sell) and used 512 FRW for the purchases of animals (including those households that did not purchase). Since the total purchases of meats and animals are less than the income earned from the sales of animals, it is clear that the rural sector exports substantial quantities of animals.

It is possible to compute probable imports of certain agricultural products by the urban sector via a somewhat theoretical exercise. The basic data are estimates of urban demand in 1985 by Minot (forthcoming, chapter 5), who analyzed data from the "National Household Budget and Consumption Survey" (ENBC, see MINIPLAN, November 1988, for details on data collection methods). The Ministry of Planning (MINIPLAN) assumed that the number of urban households was 55,971 in 1985 (MINIPLAN, August 1990, p. 11). According to the 1991 census, the National Census Bureau (December 1991, p. 30) counted 91,517 urban households. Assuming an urban growth rate of 10%, the number of urban households in 1990 was 83,197, or 49% more than the 1985 MINIPLAN estimates. Assuming the demand per household has not changed between 1985 and 1990 (a questionable assumption but the best at hand), the 1985 MINIPLAN estimates can be inflated by 49% to get the level of urban demand in 1990. Deducting urban demand from net rural exports provides an estimate of the net exports of the country. These computations are presented in Table 4.2. The urban demand in 1985 probably is slightly overestimated partly because it does not consider agricultural production in urban areas. On the other hand, the census only includes the indigenous population. The table suggests that urban demand for potatoes exceeds rural net exports, but given the way demand in 1990 was estimated and the large standard errors of estimates in columns A and B, it is difficult to say whether or not there are exports to other countries. Since the estimates of Rwandan exports in the last column of Table 4.2 are very rough, the analysis that follows uses numbers on rural exports only.

Table 4.2  
NET EXPORTS OF SIX AGRICULTURAL PRODUCTS FROM RWANDA  
(Thousands of metric tons, theoretical calculation for 1990)

	URBAN DEMAND 1985 (A)	URBAN DEMAND 1990 (A*1.49)	NET EXPORTS FROM RURAL AREAS 1990 (B)	NET EXPORTS FROM RWANDA 1990 (B-A*1.49)
BEANS	9.6	14.3	-60.5	-74.8
SORGHUM	8.5	12.7	-25.5	-38.2
CASSAVA	10.2	15.2	-20.8	-36.0
POTATO	37.2	55.4	51.1	-4.3
SWEET POT.	7.3	10.9	19.0	8.1
BANANAS	11.8	17.6	39.3	21.7

Note. Column A is from Minot (forthcoming). The table does not include the products used in beer production. Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990.

Table 4.3 shows the degree of commercialization for 12 agricultural products. If only unprocessed products are included, the potato appears to be the most highly marketed food crop. If one also includes processed products, there is reason to believe that banana and sorghum surpass potatoes (see "Digression on beer" below). Rwanda imports sorghum and cassava despite their relatively high degrees of commercialization. This indicates that markets are heavily influenced by demand, not simply supply considerations.

Table 4.3  
PERCENTAGE OF CROP MARKETED--12 MAJOR CROPS  
(metric tons and %)

CROP	PRODUCTION	NET SALES	PERCENTAGE SOLD
BEANS	205908	12993	6.3
PEAS	11036	614	5.6
PEANUTS	8392	932	11.1
SOYBEANS	20675	773	3.7
SORGHUM	141835	20991	14.8
MAIZE	95973	4366	4.5
CASSAVA	264952	41553	15.7
POTATOES	285032	97915	34.3
SWEET POTATO	819277	53666	6.5
COOKING BANANAS	602794	44777	7.4
BEER BANANAS	1916746	56097	2.9
FRUIT BANANAS	256452	6899	2.7

Note:

1) Does not include sorghum and bananas sold in the form of beer.

2) Column "NET SALES" is the grand total of the net sales of all rural households.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 4.1 Rural Availability and Self-sufficiency

By using the estimates of production and net exports, one can estimate the levels of rural availability and self-sufficiency for each product. Rural availability is simply the difference between production and net exports. The degree of self-sufficiency is computed by dividing the rural availability by production. The results of these calculations are presented in Table 4.4. Note that alcoholic beverages are not included in these calculations.

Table 4.4  
RURAL AVAILABILITY AND THE DEGREE OF  
RURAL SELF-SUFFICIENCY FOR 12 CROPS  
(metric tons and %, respectively)

	PRODUCTION (1)	NET EXPORTS (2)	RURAL AVAILABILITY (1-2)	DEGREE OF SELF-SUFF. (1)÷(1-2)
BEANS	205908	-60537	266445	77%
PEAS	11036	-1733	12769	86%
PEANUTS	8392	39	8353	100%
SOYBEANS	20675	-446	21121	98%
SORGHUM	141835	-25574	167409	84%
MAIZE	95973	-1995	97968	98%
CASSAVA	264952	-20753	285704	93%
POTATOES	285032	51067	233965	122%
SWEET POTATO	819277	18961	800316	102%
COOKING BANANA	602794	32110	570684	106%
BEER BANANAS	1916746	2505	1914242	100%
FRUIT BANANAS	256452	4649	251803	102%

Note: Sorghum and bananas sold in the form of beer are not included. See "Digression on beer" below.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 4.2 Digression on Beer

Purchases of beer are probably underestimated, because of the social aspects of beer consumption. Unfortunately it is difficult to guess to what degree of the figures are underestimated. Taking the estimates on beer purchases at their face value and using the conversion factors (3.41 kg of bananas and 0.11 kg of sorghum per liter of banana beer and 0.36 kg of sorghum per liter of sorghum beer) for small beer brewers found in Hagblade (1987, pp. 73-74) yields an estimate of 780,563 metric tons for net exports of bananas and an estimate of 47,369 metric tons for net exports of sorghum in the form of beer. The comparison between the latter number and the estimated imports indicates that while rural Rwanda is a net importer of dry sorghum, it becomes a net exporter of sorghum when exports in the form of beer are included. In other words, rural Rwanda imports dry sorghum, processes it (together with a portion of its own sorghum production) into beer, and exports beer.

Using Hagblade's conversion factors for small producers and the above estimates for beer sales, the percentage of sorghum marketed increases to 47% and the percentage of beer bananas marketed increases to 39%. This would mean sorghum and beer bananas are more highly marketed than other agricultural products.

Using Hagblade's conversion factors and the above estimates for banana and sorghum exports in the form of beer yields rural availability of 1,133,678 metric tons and the degree of self-sufficiency of 169% for beer bananas. For sorghum, the numbers are 120,040 metric tons and 118% respectively.

### **4.3 Flow of Products**

Figure 4.1 summarizes what can be drawn from the data on production and transactions of rural households and what is known about the Rwandan economy based on other sources. Despite the importance of domestic rural-urban transactions, we now know that trade between Rwanda's rural sector and neighboring countries are important for satisfying unmet needs in both rural and urban areas. In exchange, neighboring countries with less developed marketing and manufacturing systems get not only selected foods, but also manufactured products. Some of these products are imported to Rwanda from distant countries and re-exported to final consumers in neighboring countries.

### **5. Characteristics of Households by Income Level**

The preceding discussion provided an overview of revenue and expenditure of Rwandan households by geographic and social position. The perspective of the analysis now changes to compare characteristics of households with different income levels. One might be tempted to use total household revenue as a key variable in analyzing family conditions. A problem with this approach is that households are of different sizes: a one-person household earning 45,000 FRW per year clearly has a different standard of living than a household of 4 people with the same revenue. Revenue must therefore be adjusted by the number of persons in the household. Similarly, needs differ depending on age. To account for these differences, the concept of adult equivalent (AE) is adopted here.

The concept of adult equivalents is based on the observation that energy needs vary with age and sex. At certain ages, children need more energy than adults; at other ages they need less. The ENBC provides the following conversion factors for calculating adult equivalents (MINIPLAN, 1988, page 18).

Figure 4.1 Probable Flow of Products

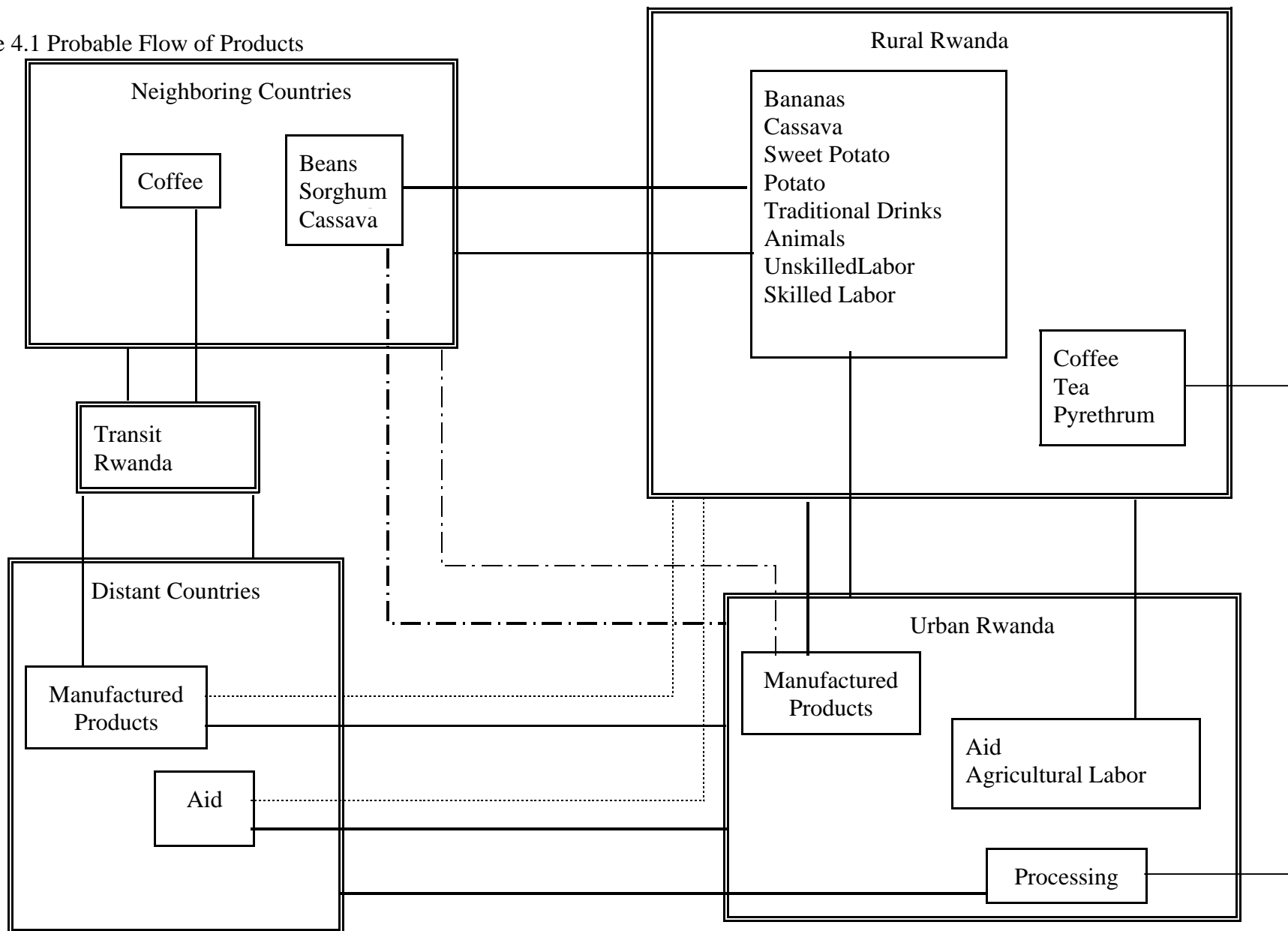


Table 5.1  
CONVERSION FACTORS FOR CALCULATING  
ADULT EQUIVALENTS

AGE	SEX	
	MALE	FEMALE
<1	0,41	0,41
1- 3	0,56	0,56
4- 6	0,76	0,76
7- 9	0,91	0,91
10-12	0,97	1,08
13-15	0,97	1,13
16-19	1,02	1,05
20-39	1,00	1,00
40-49	0,95	0,95
50-59	0,90	0,90
60-69	0,90	0,80
>70	0,70	0,70

Source: MINIPLAN, 1988

Conversion factors presented in Table 5.1 were used to calculate the number of adult equivalents for each household. The key variable in the following analysis is household revenue per adult equivalent. Four categories of household revenue per adult-equivalent were established by sorting all households in the sample by this variable, and determining logical categories by examining the listing. The categories were chosen so that the cut-off points were at places where the intervals between adjacent households were quite large. The lowest category includes households with revenue per adult equivalent below 5,000 FRW, the second category those between 5,000 and 7,000 FRW, the third those between 7,000 and 12,000, and the fourth those with revenue per adult equivalent above 12,000.

Table 5.2 shows the percentage of households that fall into each category in each prefecture. Each prefecture has households in each category, but the distribution between categories varies. This provides some interesting insights. For instance, households in Kibuye were the poorest on average (Table 2.9). Table 5.2 shows Kibuye has fewer households in the highest revenue per adult equivalent category than any other prefecture. This makes Kibuye's average the lowest, even though it is Gikongoro that has the largest percentage of households in the poorest category.

Table 5.2  
HOUSEHOLD REVENUE CATEGORIES BY PREFECTURE  
(Percent of households in each revenue category)

	PREF										RWANDA
	BUT	BYU	CYA	GIK	GIS	GIT	KGO	KBY	KIG	RUH	
REVENUE/ADULT EQ.											
<5000	32	21	32	52	23	20	9	47	15	16	25
5000 - 7000	18	22	23	18	16	16	16	25	21	28	20
7000 - 12000	32	27	32	19	33	34	28	24	29	29	29
>12000	18	31	12	10	29	30	47	4	36	27	25
RWANDA	100	100	100	100	100	100	100	100	100	100	100

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 5.1 Revenue per Adult Equivalent and the Head of Household

The sex of the head of household is related to household revenue. Table 5.3 shows that, on average, households headed by women are poorer than those headed by men. Of female-headed households, 35 percent belong to the lowest revenue-per-adult equivalent category, whereas only 22 percent of male-headed households are in the poorest group.

The unsurprising result that higher education is associated with higher income is shown in Table 5.4. The reason for this association may be either that higher income helps to pay for education, or that a higher level of education helps people to earn more, or both.

Tableau 5.3  
GENDER OF HOUSEHOLD HEAD BY HOUSEHOLD INCOME

	SEX	
	MALE	FEMALE
REVENUE/ADULT EQ.		
<5000	22	35
5000 - 7000	20	22
7000 - 12000	31	21
>12000	27	21
RWANDA	100	100

Source: DSA Revenue/Expenditure Survey, 1990

Table 5.4  
EDUCATION OF HOUSEHOLD HEAD BY HOUSEHOLD INCOME

	LEVEL OF EDUCATION					
	no schooling	some primary	primary completed	post-primary (CERAI..)	some secondary	secondary completed
REVENUE/ADULT EQ.						
<5000	31	21	16			
5000 - 7000	23	18	17	10		
7000 - 12000	27	35	27	17	33	
>12000	20	26	39	73	67	100
RWANDA	100	100	100	100	100	100

Note: Few observations for education beyond post-primary.  
Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 5.2 Income and Land Use

Rwanda is the most densely populated country in Africa. Thus one of the biggest constraints in Rwandan agriculture is the area available for planting. Given that constraint, it is interesting to investigate how cultivated area and its allocation among crops is related to household revenue per adult equivalent. Tables 5.5 and 5.6 show the choice of crops in ares (hundredths of hectares) and in percentage of household land area for different categories of revenue. When interpreting these tables, one should consider seasonal changes in the area allocated to some crops (such as beans, sorghum, maize). Tables 5.5 and 5.6 only represent the second season of the year<sup>3</sup>. Table 5.5 shows that households in the highest revenue category (per AE) have, on the average, 62% more land under cultivation than the poorest households. The same two tables also show that the poorest households grow more trees than other households. This seemingly illogical result is related to the poor quality of land in Kibuye and Gikongoro, where poor households are most numerous (Table 5.2). Note that the poorest households devote a large proportion of their land to sweet potatoes, whereas better-off households grow more bananas.

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<sup>3</sup> During the first agricultural season of 1990, DSA introduced many new surveys. Since getting familiar with new questions takes time, enumerators were not required to measure all the fields of all households interviewed. Therefore, the fields were measured for only every other household in the sample during the 1990 first season. Since lower sample size reduces reliability, only results for the second season are reported here.

Table 5.5  
 MEAN ALLOCATION OF LAND BY HOUSEHOLD INCOME  
 SECOND AGRICULTURAL SEASON 1990  
 (Ares per household, including area not planted)

	REVENUE/ADULT EQUIVALENT				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEAN	5.1	7.2	7.0	11.2	7.6
PEAS	2.1	2.0	1.7	1.2	1.7
PEANUTS	.1	.3	.3	.5	.3
SOYBEANS	1.1	1.1	2.2	1.5	1.5
SORGHUM	6.5	9.2	8.4	13.1	9.3
MAIZE	1.5	2.3	2.9	2.9	2.4
WHEAT	.8	.4	1.2	.2	.7
FINGER MILLET	.2	.2	.2	.1	.2
RICE	.1	.0	.4	.3	.2
CASSAVA	3.5	5.2	5.6	7.2	5.4
POTATOES	1.6	1.3	1.9	1.9	1.7
SWEET POTATO	8.3	8.6	8.7	8.1	8.4
TARO	1.4	2.2	2.3	2.8	2.2
YAMS	.0	.1	.1	.2	.1
BANANA	10.0	13.6	16.4	23.7	16.1
FALLOW	15.1	14.9	14.6	24.8	17.3
FOREST	12.7	6.2	8.4	10.9	9.6
PASTURE	2.6	3.7	2.6	3.7	3.1
COFFEE	2.5	3.7	4.8	6.1	4.3
VEGETABLES	.3	.3	.5	.5	.4
FODDER PLANTS	.1	.4	.3	.7	.4
FRUIT TREES AND AVOCADO	.2	.2	.3	.3	.2
TEA	.1		.8	1.1	.5
PYRETHRUM AND QUINQUINA	.1	.1	.2	.1	.1
YARD AND BUILDINGS	2.3	2.6	2.9	3.6	2.9
NOT CULTIVABLE	.0	.2	.2	.2	.1
OTHER CROPS	.2	.2	.5	.3	.3
TOTAL AREA	78.6	86.4	95.3	127.2	97.2

Note: Because of missing information, this table represents only 1178 households instead of the sample of 1208 found in other tables in this document. The weights used to construct this table were inflated to adjust for the reduced sample size.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 5.6  
MEAN PERCENTAGE ALLOCATION OF LAND BY HOUSEHOLD INCOME  
SECOND AGRICULTURAL SEASON 1990

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	6.5	8.3	7.3	8.8	7.8
PEAS	2.7	2.3	1.8	0.9	1.7
PEANUTS	0.1	0.3	0.3	0.4	0.3
SOYBEANS	1.4	1.3	2.3	1.2	1.5
SORGHUM	8.3	10.6	8.8	10.3	9.6
MAIZE	1.9	2.7	3.0	2.3	2.5
WHEAT	1.0	0.5	1.3	0.2	0.7
FINGER MILLET	0.3	0.2	0.2	0.1	0.2
RICE	0.1	0.0	0.4	0.2	0.2
CASSAVA	4.5	6.0	5.9	5.7	5.6
POTATOES	2.0	1.5	2.0	1.5	1.7
SWEET POTATO	10.6	10.0	9.1	6.4	8.6
TARO	1.8	2.5	2.4	2.2	2.3
YAMS	0.0	0.1	0.1	0.2	0.1
BANANA	12.7	15.7	17.2	18.6	16.6
FALLOW	19.2	17.2	15.3	19.5	17.8
FOREST	16.2	7.2	8.8	8.6	9.9
PASTURE	3.3	4.3	2.7	2.9	3.2
COFFEE	3.2	4.3	5.0	4.8	4.4
VEGETABLES	0.4	0.3	0.5	0.4	0.4
FODDER PLANTS	0.1	0.5	0.3	0.6	0.4
FRUIT TREES AND AVOCADO	0.3	0.2	0.3	0.2	0.2
TEA	0.1	0.9	1.2	0.4	0.0
PYRETHRUM AND QUINQUINA	0.1	0.1	0.2	0.1	0.1
YARD AND BUILDINGS	2.9	3.0	3.0	2.8	3.0
NOT CULTIVABLE	0.0	0.2	0.2	0.2	0.1
OTHER CROPS	0.3	0.2	0.5	0.2	0.3
TOTAL	100.0	100.0	100.0	100.0	100.0

Note: Because of missing information, this table represents only 1178 households instead of the sample of 1208 found in other tables in this document. The weights used to construct this table were inflated to adjust for the reduced sample size.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 6. Flow of Goods and Income

How households at different income levels get their income and how they use it to acquire basic necessities is now explored. Agricultural production is obviously a very important source of revenue for agricultural households. The means of production influence and are influenced by the resources available to households. Table 6.1 shows the value of production per household for some important products, and Table 6.2 reproduces the same information in

percentage terms. Prices used to value the production are the producer prices reported in Table 2.1. The value of production increases with the revenue per adult equivalent for all products except for finger millet, but the rates of these increases vary from one product to another. For the households in the lowest revenue category, the mean value of all the products in Table 6.1 represents 23% of that for the households in the richest category. For coffee, the mean value of production in the poorest category as a percentage of that in the richest one is 11%, and for potatoes, it is 12%. In the poorest household category, the value of sweet potato production is 56% of that in the richest category, although households in both categories use nearly the same amount of land for the crop. This indicates that soil fertility is a big problem for the poorest households that grow sweet potatoes. Table 6.2 shows that despite the low sweet potato yields for the poorest households, sweet potatoes remain their most important crop in terms of value of production. Sweet potatoes are not the most important crop for households in other categories. This tendency is probably attributable to the fact that sweet potatoes produce more calories per hectare per year than any other major crop grown in Rwanda (see, for example, Loveridge 1989, p. 68).

Table 6.1  
VALUE OF PRODUCTION BY CROP AND HOUSEHOLD REVENUE LEVEL  
(FRW per household, net of seeds)

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000- 7000	7000 - 12000	>12000	
BEANS	1766	3124	3909	7724	4183
PEAS	196	279	368	439	325
PEANUTS	78	246	284	1264	474
SOYBEANS	248	306	734	1046	605
SORGHUM	676	1262	1593	4039	1919
MAIZE	568	722	1068	1726	1040
WHEAT	114	105	291	193	184
F. MILLET	35	40	48	38	41
RICE	12	50	322	717	290
SWEET POT	3654	5178	5925	6503	5349
CASSAVA	1339	2432	4252	7299	3927
POTATO	435	1109	1803	3753	1815
TARO	336	660	873	1022	733
YAMS	8	22	39	48	30
COOK. BAN	1420	2020	3226	6578	3382
BEER BAN.	2490	4076	6640	10841	6148
FRUIT BAN	362	610	1158	2167	1104
COFFEE	667	1680	3365	6063	3033
TOTAL	14402	23922	35899	61458	34580

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 6.2  
PERCENTAGE OF VALUE OF PRODUCTION FROM EACH CROP BY HOUSEHOLD INCOME

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000-7000	7000-12000	>12000	
BEANS	12.3	13.1	10.9	12.6	12.1
PEAS	1.4	1.2	1.0	0.7	0.9
PEANUTS	0.5	1.0	0.8	2.1	1.4
SOYBEANS	1.7	1.3	2.0	1.7	1.7
SORGHUM	4.7	5.3	4.4	6.6	5.5
MAIS	3.9	3.0	3.0	2.8	3.0
WHEAT	0.8	0.4	0.8	0.3	0.5
ELEUSINE	0.2	0.2	0.1	0.1	0.1
RICE	0.1	0.2	0.9	1.2	0.8
SWEET POT	25.4	21.6	16.5	10.6	15.5
CASSAVA	9.3	10.2	11.8	11.9	11.4
POTATO	3.0	4.6	5.0	6.1	5.2
TARO	2.3	2.8	2.4	1.7	2.1
YAMS	0.1	0.1	0.1	0.1	0.1
COOK. BAN	9.9	8.4	9.0	10.7	9.8
BEER BAN.	17.3	17.0	18.5	17.6	17.8
FRUIT BAN	2.5	2.5	3.2	3.5	3.2
COFFEE	4.6	7.0	9.4	9.9	8.8
TOTAL	100.0	100.0	100.0	100.0	100.0

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 4.1 above reported the level of agricultural exports to the urban sector and other countries, but it is also interesting to explore how goods are exchanged within the rural sector across families with different levels of revenue. Table 6.3 reports **total** quantities exchanged between households in different categories of revenue per adult equivalent, whereas Table 6.4 shows the same numbers in terms of exports per adult equivalent. As in Table 4.1, negative signs indicate imports (from other categories or elsewhere) and positive signs indicate exports (to households in other revenue categories, other countries and/or to the urban sector). The most interesting crops are those for which the signs change across different revenue categories, in particular, sweet potatoes, cassava, and beer bananas. The poorest households are net buyers of sweet potatoes, potatoes, and cassava, but they are net sellers of beer bananas and agricultural labor. In the highest revenue category, transactions go in the opposite direction for these goods.

Tables 6.3 and 6.4 underscore the importance of sweet potatoes for the poorest households. They are net buyers of this product even though they use as much land for it as do households in other revenue categories and a much larger percentage of their farmland than households in other categories. Clearly, poorest households prefer the sweet potato because of its energy content. This point is explored further below.

Table 6.3  
TOTAL RURAL EXPORTS BY HOUSEHOLD INCOME

	REVENU/ADULTE EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS (t.)	-16382	-12697	-23227	-8232	-60537
PEAS (t.)	-301	-319	-472	-641	-1733
PEANUTS (t.)	-86	-67	-141	332	39
SOYBEANS (t.)	-338	-180	174	-103	-446
SORGHUM(t.)	-7526	-5227	-10737	-2083	-25574
MAIZE (t.)	-1484	-932	-1652	2072	-1995
CASSAVA (t.)	-13344	-10407	-13238	16237	-20753
POTATOES (t.)	-5718	6617	14793	35375	51067
SWEET POTATO (t.)	-13679	-915	6331	27225	18961
COOKING BANANAS (t.)	2067	415	-985	30613	32110
BEER BANANAS (t.)	14750	4487	-1450	-15283	2505
FRUIT BANANAS (t.)	742	686	1603	1618	4649
BANANA BEER (l.)	16075	29305	72165	111359	228904
SORGHUM BEER (l.)	12417	14230	26831	8162	61640
CATTLE (a.)	-4	12	30	31	70
SHEEP (a.)	37	37	76	46	195
GOATS (a.)	80	51	120	182	432
PIGS (a.)	3	28	51	31	114
POULTRY (a.)	51	37	123	-18	194
AGRIC. LABOR (p.d.)	4254	3169	350	-19407	-11634
UNSKILLED LABOR (p.d.)	2840	2053	3639	-1717	6815
SKILLED LABOR (p.d.)	2560	4148	6942	24432	38082

Units of measurement: t.=metric tons; a.=thousands of animals (of any age); l.=thousands of liters; p.d.=thousands of person days (of any age and of either sex). See Table 2.8 for labor definitions.  
Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 6.4  
RURAL EXPORTS PER ADULT EQUIVALENT BY HOUSEHOLD INCOME

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS (kg)	-9.9	-10.7	-12.9	-7.2	-10.2
PEAS (kg)	-.2	-.3	-.2	-.5	-.3
PEANUTS (kg)	.0	-.1	-.1	.2	.0
SOYBEANS (kg)	-.2	-.2	.1	.0	-.1
SORGHUM(kg)	-4.2	-4.2	-6.0	-1.3	-4.0
MAIZE (kg)	-.7	-.8	-.9	1.3	-.3
CASSAVA (kg)	-7.5	-7.9	-7.2	12.4	-2.4
POTATO (kg)	-3.6	3.3	5.6	20.0	6.5
SWEET POTATO (kg)	-8.7	-2.6	5.1	19.1	3.7
COOKING BANANAS (kg)	3.0	-.8	-.1	22.9	6.4
BEER BANANAS (kg)	19.2	7.7	-2.6	-16.4	1.5
FRUIT BANANAS (kg)	.5	.8	1.0	1.6	1.0
BANANA BEER (litres)	8.7	21.3	37.6	83.0	38.6
SORGHUM BEER (litres)	6.9	9.2	16.0	5.9	9.8
CATTLE (heads)	.0	.0	.0	.0	.0
SHEEP (heads)	.0	.0	.0	.0	.0
GOATS (heads)	.0	.0	.1	.1	.1
PIGS (heads)	.0	.0	.0	.0	.0
POULTRY (heads)	.0	.0	.1	.0	.0
AG. LABOR (p. days)	2.4	3.0	1.5	-12.2	-1.5
UNSKILLED LABOR (p.days)	1.4	1.6	1.8	-.3	1.1
SKILLED LABOR (p.days)	1.4	3.1	3.3	15.3	5.8

Note: p. days = person days. See Table 2.8 for labor definitions.  
Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Inputs that improve soil productivity are a major hope for Rwandan agriculture. To date, most Rwandan farmers have not begun to use such inputs. Table 6.5 shows that the use of chemical fertilizers and pesticides is negligible. This is probably caused by lack of inputs adapted to local conditions, lack of varieties responsive to inputs, and/or problems in availability. The last point may be the main reason why the poorest household do not use chemical inputs to increase their yields: how can they pay for those inputs when they don't have enough money to buy food? Note that Table 6.6 shows that own consumption is the largest expenditure for households in all revenue categories, but that in poorest households, its share of the budget is largest.

Table 6.5  
PURCHASES OF AGRICULTURAL INPUTS BY HOUSEHOLD INCOME  
(FRW per household)

	AG. LABOR	FERTILIZE.	PESTI- CIDES	FODDER	TOTAL
REVENUE/ADULT EQ.					
<5000	493	8	10	2	512
5000 - 7000	897	6	47	1	950
7000 - 12000	1620	8	92	2	1721
>12000	6770	11	147	22	6951
RWANDA	2503	8	76	7	2594

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 6.6  
SOURCES OF NET REVENUE BY HOUSEHOLD INCOME  
(percent, net of input purchases)

	REVENUE/ADULT EQ.			
	<5000	5000 - 7000	7000 - 12000	>12000
OWN CONSUMPTION	52.6	52.2	48.8	36.1
NET SALES	25.6	28.9	34.3	28.6
NET GIFTS	4.4	2.9	2.8	2.3
AGRIC. LABOR	9.3	6.9	3.9	1.5
UNSKILLED LABOR	4.1	2.9	2.9	2.0
SKILLED LABOR	4.0	6.1	7.3	29.6
TOTAL	100.0	100.0	100.0	100.0

See Table 2.8 for labor definitions.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 7. Food Availability and Income

Tables 7.1 to 7.5 help us understand food security in agricultural households with different revenue (per adult equivalent) levels. Table 7.1 reports the total availability of the 12 major crops by level of revenue. (Production less net exports equals rural availability. See Table 4.4.) Rural availability per adult equivalent is obtained by dividing the totals in Table 7.1 by the number of adult equivalents in rural areas in each revenue category. Rural availability per adult equivalent is presented in Table 7.2. Using this information and conversion factors found in MINAGRI (1987, pp. 51-52) and MINAGRI (1988, pp. 5-10) availabilities per adult equivalent in terms of calories, proteins, and lipids can be computed. Results of these calculations are shown in Tables 7.3 to 7.5. MINAGRI (1988, p. 16) also gives estimates of daily nutritional needs per adult equivalent: 2,100 kilocalories, 59 grams of protein, and 40 grams of lipids. This information allows computation of the percentage of needs covered by major crop, which in turn gives an idea of households' food security in each revenue category.

The last line of Tables 7.3 through 7.5 shows the percentage of needs covered by the 12 major crops. The reader should bear in mind that households also consume other foods. According to the "National Survey on Household Budgets and Consumption" conducted in 1983, the 12 crops shown in the Tables 7.3 to 7.5 provide 96% of calories, 95% of proteins, and 50% of lipids consumed in rural Rwanda (MINIPLAN 1988, vol. 4, p. 47).

Assuming that food consumption habits in rural areas have stayed relatively constant between 1983 and 1990, the information in Tables 7.3 to 7.5 lead to the conclusion that overall, Rwanda's rural areas cover nutritional needs in terms of calories and proteins, but that availability of lipids is not sufficient. It is also evident that a large proportion of the rural population suffers from severe food deficiencies. Given that 1990 was a more or less normal agricultural year, we can assume that these deficiencies are **chronic** for a large proportion of the population. It is most probable that some households did not provide correct information on their production and transactions (either by omission or commission), and that many of these households were classified as being in the poorest category, but the information presented here fits so well with what is observed in the field and with other studies that there is reason to believe that the data collection errors are small. For example, an ongoing study by DSA in collaboration with UNICEF (Tardif-Douglin and Rwamasirabo, forthcoming) measured the anthropometric characteristics of a sample of 1,939 Rwandan children under five years old in rural areas and found that 52% of them showed signs of chronic malnutrition by international standards.

Table 7.1  
RURAL AVAILABILITY OF 12 MAJOR CROPS BY HOUSEHOLD INCOME  
(metric tons)

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	37925	43156	79156	106208	266445
PEAS	2013	2238	4148	4370	12769
PEANUTS	433	950	1604	5366	8353
SOYBEANS	2477	2269	7112	9263	21121
SORGHUM	20625	24423	45888	76472	167409
MAIZE	14977	14382	30259	38349	97968
CASSAVA	37732	46893	95250	105830	285704
POTATO	22932	28484	67697	114851	233965
SWEET POT.	155793	160991	258400	225133	800316
COOK. BAN.	61254	71635	168391	269403	570684
BEER BAN.	181352	251409	604330	877151	1914242
FRUIT BAN.	20387	27877	76776	126763	251803

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 7.2  
 AVAILABILITY OF 12 MAJOR CROPS BY HOUSEHOLD INCOME  
 (kg per adult equivalent)

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	23	34	43	81	46
PEAS	1	2	3	3	2
PEANUTS	0	1	1	4	1
SOYBEANS	2	2	4	7	4
SORGHUM	12	18	25	54	28
MAIZE	10	13	17	29	17
CASSAVA	21	35	49	86	49
POTATOES	14	23	35	79	39
SWEET POT.	95	136	156	177	142
COOK. BAN.	39	54	92	205	100
BEER BAN.	103	196	332	698	340
FRUIT BAN.	12	21	41	102	45

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 7.3  
 AVAILABILITY OF ENERGY FROM 12 MAJOR CROPS BY INCOME  
 (kilocalories per day per adult equivalent)

	REVENU/ADULTE EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	187	284	357	669	379
PEAS	10	17	22	30	20
PEANUTS	2	4	6	31	11
SOYBEANS	16	20	40	69	37
SORGHUM	100	154	206	451	231
MAIZE	90	111	148	254	153
CASSAVA	59	98	137	241	136
POTATOES	22	36	55	125	61
SWEET POT.	282	401	461	525	420
COOK. BAN.	86	118	202	451	219
BEER BAN.	227	430	729	1532	747
FRUIT BAN.	17	30	59	147	65
TOTAL	1158	1803	2559	4765	2616
% OF NEEDS COVERED BY THE 12 CROPS	55%	86%	122%	227%	125%

Note: Does not include minor crops or animal products. The energy content of beer bananas is assumed to be the same as that of cooking bananas. Calories are lost when beer bananas when made into beer (from 801 to 196 kcal/kg), but this loss is the producer's choice. Although many producers choose to lose a large proportion of caloric availability by transforming their bananas into beer, 801 kcal/kg are considered available here.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 7.4  
 AVAILABILITY OF PROTEIN FROM 12 MAJOR CROPS BY INCOME  
 (grams per day per adult equivalent)

	REVENUE/ADULT EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	12	18	23	43	24
PEAS	1	1	1	2	1
PEANUTS	0	0	0	1	0
SOYBEANS	1	2	3	6	3
SORGHUM	2	4	5	11	5
MAIZE	2	3	4	7	4
CASSAVA	0	1	1	1	1
POTATOES	0	1	1	3	1
SWEET POTATO	4	5	6	7	6
COOKING BANANAS	1	1	2	4	2
BEER BANANAS	2	4	6	14	7
FRUIT BANANAS	0	1	1	2	1
TOTAL	27	40	55	102	57
% OF NEEDS COVERED BY THE 12 CROPS	47%	68%	93%	173%	97%

Note: Does not include minor crops or animal products. The protein content of beer bananas is assumed to be the same as that of cooking bananas. Proteins are lost when beer bananas are made into beer (from 7 to 1 gr/kg), but this loss is the producer's choice. Although many producers choose to lose a large proportion of available proteins by transforming their beer bananas into beer, 7 kcal/kg are considered to be available here.  
 Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

Table 7.5  
 AVAILABILITY OF LIPIDS FROM 12 CROPS BY INCOME  
 (grams per day per adult equivalent)

	REVENUE/ADULTE EQ.				RWANDA
	<5000	5000 - 7000	7000 - 12000	>12000	
BEANS	1	1	2	3	2
PEAS	0	0	0	0	0
PEANUTS	0	0	1	3	1
SOYBEANS	1	1	2	3	1
SORGHUM	0	0	0	1	0
MAIZE	1	1	2	3	2
CASSAVA	0	0	0	0	0
POTATOES	0	0	0	0	0
SWEET POTATO	0	1	1	1	1
COOKING BANANAS	0	0	0	1	0
BEER BANANAS	1	1	2	3	2
FRUIT BANANAS	0	0	0	0	0
TOTAL	4	6	9	18	10
% OF NEEDS COVERED BY THE 12 MAIN CROPS	10%	15%	22%	45%	25%

Note: Does not include minor crops or animal products. The fat content of beer bananas is assumed to be the same as that of cooking bananas. Beer bananas lose virtually all of their lipids when made into beer (from 2 to 0 gr/kg), but this loss is the producer's choice. Although many producers choose to lose these lipids by transforming their bananas into beer, 2 gr/kg are considered available here.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990

## 8. Conclusions

Rwandan agriculture is not yet very market-oriented: 63 percent of the value of production does not leave its place of production. The share of subsistence agriculture in the total revenue of farm households is 44 percent. Agricultural labor markets in Rwanda appear to be quite active. Labor is the most important agricultural input purchased by producers. Labor sales are also an important source of revenue: agricultural, unskilled, and skilled labor account for 24 percent of the revenue of agricultural households in Rwanda.

Even though Rwandan agriculture is not very market oriented, trade with neighboring countries contributes in an important way to the food security of rural Rwandans by making more food accessible. Trade also allows participating countries to specialize in products that are economically most profitable under local conditions. The governments of the region should employ policies that facilitate such trade.

Overall, enough calories are available in rural Rwanda to meet the energy requirements of the population. However, it appears that the availability of protein and lipids do not cover the country's needs.

Although the total calories available are sufficient to feed the population, many households do not obtain adequate levels of calories. The poorest households are on average well below that which they need in caloric terms. These households acquire much of their food on the market, and are very dependent on sweet potatoes. To improve the nutritional situation of the poorest farmers, research should seek to improve yields of sweet potatoes or provide farmers with alternative crops that can produce more calories per hectare than sweet potatoes.

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## Appendix 1

Appendix Table 1  
GROSS RURAL TRANSACTIONS BY PRODUCT AND TRANSACTION TYPE  
(Total for all agricultural households, physical units)

PRODUCT	SALES	GIFTS GIVEN	PURCHASES	GIFTS RECEIVED	NET EXPORTS
BEANS (t.)	16962	6161	77513	6147	-60537
PEAS (t.)	716	208	2343	314	-1733
PEANUTS (t.)	1037	117	1044	70	39
SOYBEANS (t.)	1086	278	1520	289	-446
SORGHUM (t.)	27407	1991	51634	3338	-25574
MAIZE (t.)	4791	3732	7631	2886	-1995
CASSAVA (t.)	46757	4755	69381	2883	-20753
POTATOES (t.)	102988	6311	54867	3365	51067
SWEET POTATO (t.)	58757	17438	48443	8790	18961
COOK. BANANAS (t.)	46319	7724	16948	4986	32110
BEER BANANAS (t.)	60189	10659	62496	5848	2505
FRUIT BANANAS (t.)	7123	534	2591	417	4649
BANANA BEER (l.)	214186	44223	12507	16997	228904
SORGHUM BEER (l.)	66661	16874	9229	12666	61640
CATTLE (a.)	148	17	69	26	70
SHEEP (a.)	289	22	94	22	195
GOATS (a.)	690	53	239	71	432
PIGS (a.)	202	9	85	12	114
POULTRY (a.)	650	101	417	140	194
AGRIC. LABOR (p.d.)	23500		35133		-11634
UNSKILLED LABOR (p.d.)	15174		8359		6815
SKILLED LABOR (p.d.)	42631		4549		38082

Units of measurement: t.=metric tons; a.=thousands of animals (of any age); l.=thousands of liters; p.d.=thousands of person days (of any age and of either sex). Note that beer purchases are probably underestimated due to the social nature of beer consumption. See Table 2.8 for labor definitions.

Source: DSA Revenue/Expenditure Survey, rural Rwanda, 1990