Agricultural Policy, Crop Failure and the 'Ruriganiza' Famine
(1989) in Southern Rwanda: a Prelude to Genocide ?

by

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Development Economics

DISCUSSION PAPER

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Abstract of the paper

The paper analyses the agricultural policy of the Habyarimana regime, which ruled Rwanda from 1973 to 1994. Econometric analysis of rural household survey data is used to investigate the effects of the 1989 crop failure in southern Rwanda on children's health status. The paper shows that children in southern Rwanda are chronically malnourished, more then in other prefectures of Rwanda. It is shown that the 1989 crop failure developed into famine and the causes of this development are investigated. It turns out that the Habyarimana regime did not respond to early warnings of famine conditions and pretend it did not know what was going on. The relationship between this non-response to famine, agricultural policy in general and the 1994 genocide is demonstrated.

Agricultural Policy, Crop Failure and the 'Ruriganiza' Famine (1989) in Southern Rwanda : a Prelude to Genocide ?

"Rwanda is clearly at a crossroads, in that the old strategy is no longer viable : the vision of a nation of self-sufficient peasants, meeting through their labor alone their needs for food and shelter , leading tranquil and meaningful lives centered around the local community, unbeholden to the world without, that vision is no longer sustainable."

World Bank, Rwanda Agricultural Strategy Review, 1991, p.1

1. INTRODUCTION

In the second half of the eigthies, Rwanda entered a period of economic decline. Food production per capita decline, low coffee and tea prices , unfavourable weather conditions, unsolved refugee questions, demographic growth, mounting corruption and political unrest characterise this period. With the fall of the Berlin Wall, western donors began to demand democratization, also in Rwanda. On top of a drought and a local crop failure in 1989 came a rebel invasion in late 1990. These rebels were the offspring of the 1959 Tutsi refugees who had not been allowed to return to Rwanda. The government argued that «Rwanda did not have enough land to settle the former refugees » (MRND decision, 1986). In the subsequent years, Rwanda experienced a growing demand for democratisation both from oppostion parties within the country, from the donor community and from the rebels. From 1990 to 1993 a series of battles occurred between the rebels and the government forces, the latter winning these battles with the support of French paratroopers. A peace agreement was signed in Arusha in 1993. Hard

core MRND supporters however did not accept power sharing with the rebels and had already begun preparing large scale massacres of the civilian Tutsi population from the beginning of the civil war.

It is in this context of growing political and economic unrest that a nation-wide rural household survey was conducted by the Rwandan Department of Agricultural Statistics (DSA) and Michigan State University under the direction of Dan Clay. The first round of this survey took place from October 1988 till March 1989 (the 1989a season), the second round took place from April 1989 till September 1989 (1989b). This was repeated in 1990 and 1991. The survey thus contains data from a sesaon before the 1989 local crop failure (which took place in 1989b), from the crop failure season itself and from two seasons following the local crop failure (1990a and 1990b). Since the civil war broke out in October 1990, the survey also has data from two seasons following this outbreak (1991a and 1991b). The 1989b crop failure was 'local', i.e. limited to the southern prefectures (especially Gikongoro). The civil war could also be labelled ' local ' , at least in the time frame covered by the survey (the 1991b season ran till September 1991) because the battles were restricted to the northern prefectures (especially Byumba and Ruhengeri).

In fact, the above mentioned survey consisted of several parts : an agricultural survey (6 rounds 1989-1991), a market transaction survey (4 rounds, 1990-1991), a coffee survey (1992, covering the three previous years) and a health survey (3 rounds, one in 1991 and two in 1992). The sample size is 1248 households, representing 78 clusters (one cluster in one sector of one commune) of 16 households per cluster. This method yields a nationally representative sample. In the present study, these surveys will be linked together to obtain one large dataset with detailed information on household members, health, agricultural production, land, livestock, and market transactions. The outcomes of these surveys can be compared to the 1984 national household survey (which used another sample) to get a picture of changes over time.

The main objective of the paper is the study of the 1989 crop failure. For this purpose, we will use agricultural data on production and consumption and data on the nutritional status of children in Rwanda. It is generally accepted that height for age is a good indicator of long-run child nutritional status. Low height for age, compared to an international standard is an indicator of chronic malnutrition. We will study the determinants of the nutritional status in Rwanda and relate it to the 1989 crop failure, the ruling agricultural policies, the civil war and the subsequent

genocide. Recently, genocide scholars have argued that more attention should be given to study the links between famine and genocide (Jonassohn, 1999). It is the purpose of this paper to relate the agricultural policy of the Habyarimana regime and the 1989 famine with the genocide. In doing so, we want to combine the tools of economic analysis with the passion for human rights. The content of the text is as ordered as follows : part two of the text discusses the characteristics of the rwandan peasant economy, part three describes the 1989 food crisis and entitlement failure. . In part four, we discuss the causes of the famine and relate these to agricultural policies. Part five presents the econometric analysis of children's nutritional status and part six links the famine with the genocide.

From the data, and this should be stressed, it wil become that we are not dealing with a famine that killed several thousand people in the course of a few months. In terms of mortality, we cannot talk of a real famine. If however we consider famine as a prolonged period in which a serious food crisis breaks down the fabric of society, the word *'famine'* applies to southern Rwanda in 1989. We are dealing with a creeping agricultural crisis, the result of several years of hardship in which households have depleted resources and cannot cope anymore with another crop failure.

2. AGRICULTURE IN RWANDA

2.1. The income of Rwandan households

Fully 93% of Rwanda's population live in rural areas and nearly all rural households are engaged in farming. On average, households cultivate 0.89 hectare of land, the vast majority of these landholdings being owner operated. Beans, sorghum, sweet potatoes and casssava are the main food staples and bananas, potatoes and coffee the main cash crops. Farming is labor intensive, women's labor is particularly important in food crop production and men's labor is crucial in cash crop production and animal husbandry. Hoes and machetes are the basic farm implements ; animal traction is nonexistent. Marginal lands once set aside for pasture or left in long fallow are

now taken into cultivation. Rural informal and formal credit markets are severely underdeveloped.[1]

According to Bart (1993), the Rwandan peasantry has set up an inventive and efficient agricultural system.[2] This system, that has managed to avoid famine most of the time, is a complex mixture of food and cash crops, cultivated on slopes and in valleys, combined with some small livestock (and cattle for the richer peasants) and some income from beer brewing, other business activities or an off-farm income. The chosen mix being the result from personal, household, local and climatic characteristics. Between the altitude of 1500m and 1700m, we find the ideal conditions for many crops, explaining the high population densities found on this altitude level. Clay et al. (1995) have calculated that two thirds of the cultivable land in Rwanda is cultivated. The rest consists of fallow land, pasture and woodlot. Half of Rwanda's cultivated fields are intercropped and 56% of these grow bananas in association with food crops such as beans, sorghum and sweet potatoes.[3] Intercropping appears to be a response to land scarcity, as it is practised more often by households with relatively few land per person. Less intercropping occures in high-altitude areas where few or no bananas are grown. In terms of shares of land, the main crops are bananas (26%), beans (17%), sweet potatoes (11%), cassava (9%), sorghum (9%) and mais (7%).

Two-thirds of bananas grown are beer bananas, making beer brewing an important source of cash income for Rwandan households. Bart (1993) reports that this income varies between 500 and 3000 RWF per month, representing on average 50 liters per household per month. For owners of large banana fields, this amount can be much higher. In my own calculations with the DSA data set , I found that beer sales represent on average 10% of gross household income, the equivalent of 5800 RWF per year and totalling 267 liters sold. If we only take the beer selling households (78%), average gross beer income is 7500 RWF, representing 13% of gross income.

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[1] Clay, D., Reardon, T., Kangasniemi, J, Sustainable Intensification in the Highland Tropics : Rwandan Farmers' Investments in Land Conservation and Soil Fertility, Economic Development and Cultural Change, 1998, p. 363.

[2] Bart, F., Montagnes d' Afrique, terres paysannes, le cas du Rwanda, 1993.

[3] Clay, D., Promoting Food Security in Rwanda through sustainable agricultural productivity : meeting the challenges of Population pressure, Land Degradation and Poverty, International Development Paper no. 17, Michigan State University, Departements of Agricultural Economics and Economics, chapter 3, p.16.

Table 1: Average gross income and the sources of income (1990), n=1182

Gross income per household		Sources of income at the household level (in %)						
RWF	US$	(1) subsistence cons. of crops	(2) crop sales	(3) beer	(4) livestock		(5) off-farm	(6) transfers
					cons.	sales		
55.945	700	54.0	8.6	10.4	3.4	5.1	14.7	3.8

(1) includes crop consumption from own production
(2) includes sales of all crops (food, domestic cash crops and export crops)
(3) includes the sales of artisanal brewed beer (banana and sorghum been)
(4) includes livestock and livestock products consumed from own production and sold
(5) includes income from skilled&unskilled off-farm work and from business activities other than beer sales
(6) includes all kinds of gifts of food, beer and livestock received

Source: Author's calculations from DSA data set.

Next to income from beer sales, the average Rwandan household has income from crop production for own consumption (54% of gross income), from crop sales (8.6% of gross income), from livestock and livestock products 8.5%, from off-farm activities (14.7%) and from transfers (3.7%). On average, monetary income - the sum of beer sales, crops sales, livestock sales and off-farm income - per household is about 38.9% (8.6+10.4+5.1+14.7) of total gross income, some 21.768 RWF per year.

2.2. Land scarcity and population pressure

It is well-known that the average size of the Rwandan farm is very small. In 1984 it was 1.2 ha per household and decreased to 0.89 ha per household in 1990. This is a reduction of 25% over just 6 years. Since these are averages, it means that many peasants have less then 0.7 ha, the generally accepted minimum size needed to feed the average household. Population density in Rwanda in 1990 was 300 persons per square kilometer, the highest in Africa and one of the highest in the world.

Kangasniema (1998) states that economic theory does not have a clearcut answer on the relationship between agriculture and commercialization under population pressure. On the one hand, declining farm size pushes farmers to cultivate and sell crops that have high returns per

acre of land and to buy those crops that have only low returns to the scarce resource.[4] On the other hand, the existence of transaction and transportation costs and the associated failures in the markets for food and other products may make households subsistence-oriented. Only empirical research can find out what farmers actually do.

Farms are not only small in Rwanda, but also highly fragmented. Blarel a.o (1992), using a 1987-1988 World Bank Survey data set of 232 households, found that 40% of farms have 8 or more parcels. In their regressions however, neither farm size nor farm fragmentation seem to have a negative effect on land productivity.[5] Place and Hazell (1993), using the same World Bank data set, found that Rwandan peasants invest – defined as short term improvements (continued mulching or manuring) or long term improvements (planting trees, trenching, destumping or green fencing) – more in land when they have secure rights on their land.[6] But this does not mean that yields on these fields are higher. Place and Hazell at least did not find a productivity increasing effect of land rights. They point out that other constraints can be more binding such as technology , credit and fertilizer.

The findings of both Blarel a.o and Place and Hazell are not confirmed in a study by Byiringiro and Reardon (1996) who used a much larger (nationally representative) 1990-1991 data set of 1248 rural households. They find a strong inverse relationship between farm size and land productivity and a positive relationship between farm size and labor productivity.[7] Small farms invest twice as much per hectare in soil conservation compared to large farms. Byiringiro and Reardon show that erosion severely reduces farm yields in Rwanda.

Several reports published by a research team from Michigan State University show a clear and dramatic decline in yields of all major crops between 1984 and 1991. As a result of this decline and of population growth, per capita food production dropped by 25%. Half of the farmers in the DSA data set report declining productivity. The fact that 1984 was considered to be a modest

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[4] Kangasniemi, J., People and Bananas on steep slopes : Agricultural Intensification and Food Security under Demographic Pressure and Environmental Degradation in Rwanda, Ph.D Disseration, Department of Agricultural Economics, Michigan State University, 1998, p.127.

[5] Blarel, B.,Hazell, P., Place, F., Quiggin, J., The Economics of Farm Fragmentation : Evidence from Ghana and Rwanda, *The World Bank Economic Review*, Vol. 6, no. 2, p. 252.

[6] Place, F and Hazell, P, Productivity effects of Indigenous Land Tenure Systems in Sub-Saharan Africa, *American Journal of Agricultural Economics*, February 1993, p.14-15.

[7] Byiringiro, F. and Reardon, T., Farm Productivity in Rwanda : the effects of farm size, erosion, and soil conservation investments, *Agricultural Economics* 15, 1996, p. 132-135.

drought year suggests that the observed decline in production between 1984 and 1989-1991 was real.[8] The report also states that the decline for tubers, the main providers of calories for the poor, is particularly strong. Half of Rwanda's farmland suffers from moderate to severe erosion. Regional differences are outspoken : the Northwest (Gisenyi prefecture) agroecological zone produces twice as much output per unit of land as the Southwest (Gikongoro and Cyangugu prefecture).

The driving force behind declining land productivity, soil erosion and declining per capita incomes is population growth. Peasants are forced to cultivate marginal unfertile lands, often on steep hill sides. Boserup (1965) has argued that agricultural innovation is spurred by decreasing productivity. She argues that as land becomes scarcer, peasants will adopt shorter fallow periods, apply more fertilizer and work the land more intensively. This process will allow the peasantry to avoid the malthusian trap over population growth and hunger.

From a survey of 14 case studies, Wiggins (1995) has concluded that that the Boserupean model of population-induced agricultural intensification is a correct representation of evolving realities in the African countryside.[9] He argues a.o. that farmers have seized opportunities to grow new crops as marketing becomes more attractive as a result of better roads. Platteau (2000) however considers this picture too optimistic and points at several constraining factors, especially at the technological level.[10] He argues that intensification has proceeded at a very slow pace relative to population growth, in spite of improved access to markets. Interestingly, Platteau considers Rwanda a perfect illustration of this distressing possibility :

> « *Population growth has reached extemely high levels without giving rise to major technical progress susceptible of providing a decent livelihood to the growing number of peope living on the land.* »

2.3. Food crops, coffee and banana beer

The effect of population pressure on crop choices and land use in Rwanda has been analysed by Kangasniemi (1998). Using the 1989-1991 nationally representative farm household survey I will also use, he finds that Rwandan farmers prefer to keep and even expand their banana holdings.

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[8]   Clay, D. et al., Promoting Food Security in Rwanda, ibidem, Michigan State University, chapter 3, p. 34.
[9]   Wiggins, S.Changes in African Farming Systems between the mid-1970s and the mid-1980s, *Journal of International Development*, vol.7, n°6 ,1995, pp.807-848

In fact, under population pressure, farmers prefer to grow bananas, brew and sell banana beer. With the money, the farmers buy food crops and finance other expenditures. Bananas are popular because they are not only a source of monetary income, they also provide income the whole year round, a significant difference with e.g. coffee. Bart (1993) writes that banana cultivation is not labour-intensive, is socially very important and provides protective cover against erosion. All these factors combine to make bananas the most important and most preferred crop for Rwandan peasants. Clay et al. (1995) add that the farming practises needed for higher yields require more labor then other crops. The brewing activity of course is also labor-intensive.

Kangasiemi (1998) argues that the exchange strategy (production of banana beer for consumption of beans) is the preffered strategy by the Rwandan farmer to cope with population pressure :

> « Multivariate analysis that controls for agroclimatic and other factors shows that in Rwanda's banana zone, households with less land per adult equivalent sell more beer bananas per hectare. In this respect bananas are different from any other major crop, including coffee. This suggests that Rwandan farmers are not substituting food crops for cash crops to cope with land scarcity caused by population growth. While households with less land per person are not making any dramatic transition to cash crops either, they clearly prefer to keep their bananas and to rely on the exchange of banana beer for food. ' Food first' is not their strategy of achieving food security. » (p.133)

The main argument in support of the economic rationale behind the exchange strategy is simple : it can be computed that the cash revenue from a hectare of beer bananas sold as beer would on average have bought 1446 kilogram of beans (Kangasniema, p.157). This is 72% more than the estimated average national bean yield. This shows that, at the relative prices and yields that prevailed in 1990, the strategy of exchanging banana beer for beans succeeds in substituting labor for land and in improves the food entitlements of those engaged in the exchange strategy.

The importance of the brewing of banana beer is such that 80% of Rwanda's rural households get more cash from bananas than from coffee or any other sigle crop, and that, for 41% of the households, bananas are a more important source of cash than all other crops combined.

Clay et al. (1995) report that sweet potatoes are the single most important source of calories for Rwandans. Sweet potatoes have more calories per-kilogram than potatoes or cooking bananas.

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[10] Platteau, J.Ph., Institutions, Social Norms and Economic Development, Harwood, 2000, ch. 2, p.26.

Except for high-altitude areas, where potatoes grow best, only bananas produce more calories per-hectare than sweet potatoes. Sweet potato production is not labor-intensive, compared to bananas beer production or potatoes and it is less demanding of soil quality and moisture.

2.4. Regional differences in 1990

Table 2

Prefecture	average land size per hh	average gross y per hh	monetary* income as % of gross y	Altitude (m)	Rain (mm)	Distance to paved road (km)
Ruhengeri	0.79	65.443	40	2115	1124	11
Butare	0.81	39.134	37	1660	1120	14
Buymba	1.01	63.702	41	1888	919	17
Cyangugu	0.66	33.878	41	1917	1567	30
Gikongoro	0.89	30.376	39	1917	1556	28
Gisenyi	0.45	51.175	45	1946	1313	9
Gitarama	0.92	53.828	38	1630	1070	15
Kibungo	1.35	113.170	37	1469	733	18
Kibuye	1.16	32.757	33	2100	1275	66
Kigali	0.95	70.513	38	1581	822	31
Rwanda	0.89	55.954	39	1802	1126	22

N=1146

* Monetary income is the sum of income from crop sales, beer sales, livestock sales and off-farm income.

In terms of gross household income, the southern prefectures of Butare, Gikongoro and the eastern prefectures Kibuye and Cyangugu are poorer than the northern, central and western prefectures. Compared to Ruhengeri and Kigali prefectures for example, average gross household income in the southern prefectures is only half. This has not much to do with the size of the farm : farms in Rwanda are very small everywhere (with the possible exception of Kibungo prefecture). Regional differences in household income are better explained by soil fertility and productivity, suitability of the soil for high yielding crops (such as sweet potatoes in the north), access to public infrastructure (such as roads and markets), availability of off-farm jobs, the price of coffee and tea for regions growing these crops. We come back to regional differences in the next section, where we discuss the food crisis that struck southern Rwanda in 1989.

3. THE FOOD CRISES AND ENTITLEMENT FAILURE OF 1989

3.1. The entitlement to food

Farmers will use part of their production of food crops for own consumption. A. Sen calls this the *direct entitlement* of food the farmer has. When the farmer also earns a wage, produces cash crops, receives transfers or has another source of income which he can use to buy food, the farmer has an *exchange entitlement* in Sen's terms. Most farmers have a combination of direct and exchange entitlements to food. A farmer producing beans has a direct entitlement to beans. An increase in the price of beans will not endanger the direct entitlement of the bean producer. Farmers who are not producing beans will see their exchange entitlement to beans decreased when, ceteris paribus, the price of beans increases. This allows us to stress the importance of relative prices in the conservation of a farmer's exchange entitlements. As 80% of Rwandan peasant households are net buyers of beans, the price of beans is very important.

Taking a look at direct entitlements first, we note that beans, bananas, potatoes and sweet potatoes are the major food crops for Rwandans. Bananas are often used to brew beer and thus give acces to exchange entitlements. Coffee is an export crop and also gives acces to exchange entitlements. In 1989, production of beans and sweet potatoes declined sharply in Gikongoro. Since sweet potatoes are the most important crop in Gikongoro (in contrast to Rwanda as a whole were bananas are the most important crop), this decline caused *a severe loss of direct entitlement to food*. Together with the production of sweet potatoes, the production of beans declined as well with 50 % in both seasons (see figure 2). Importantly, both figures 1 and 2 show that the production decline in 1989 was a local and not a country-wide phenomenon. The value of production in Rwanda declined gradually over the years (as did the quantity of bananas produced), but there was no sudden decline in 1989. That yeat even shows a upsurge in the national value of production.

In contrast to direct entitlment failures, which can occur as a result of bad weather, rain, crop disease, drought or other calamnities, exchange entitlement failures depend on relative prices and thus on market forces. The entitlement approach focusses on *starvation* and not on famine

mortality. People starve when they cannot command enough food. As Sen indicates, many famine deaths are the result of epidemics, but this is not of our interest here. People will more easily become victim of sickness or desease when they lack adequate food consumption. The command over food a peasant has, by means of his direct and his exchange entitlements over food is thus at the centre of our attention. *The production decline in seasons 1989a and especially 1989b in Gikongoro (and parts of Butare) prefecture (see figure 1) are evidence of direct entitlement failures.* This affects consumption if households are not able to compensate for this trough purchases of food on the market. In the next sections we will see whether exchange entitlement failures were also part of the peasant situation.
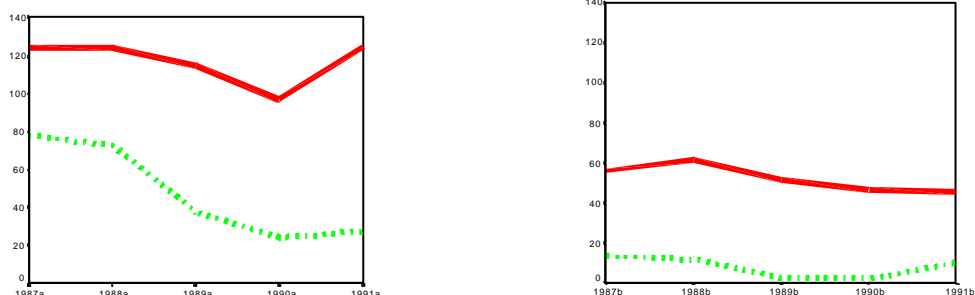
Figure 1: Value of production over ten seasons in RWF (1987 a season prices)
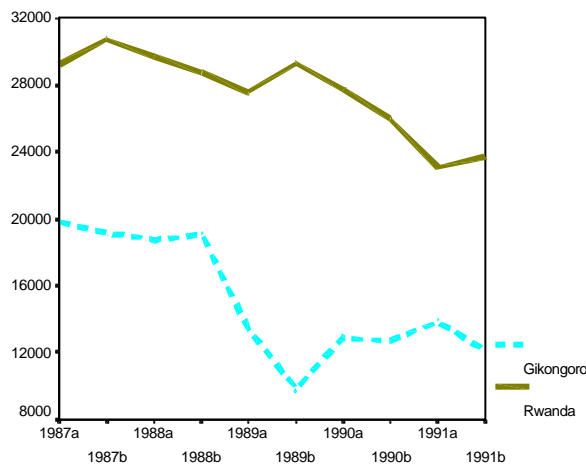
source : author's calculations from DSA dataset

Figure 2 : Production of major crops in Rwanda and Gikongoro in average kilograms per household per year/season

Production of beans

Production of bananas
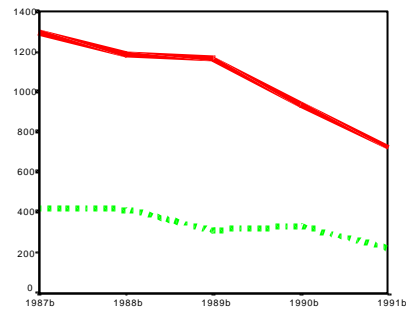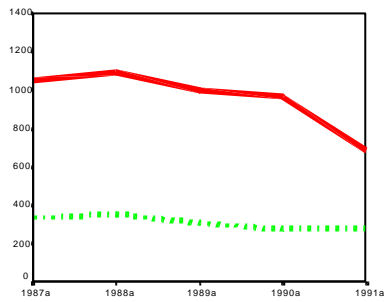
Production of sweet potatoes
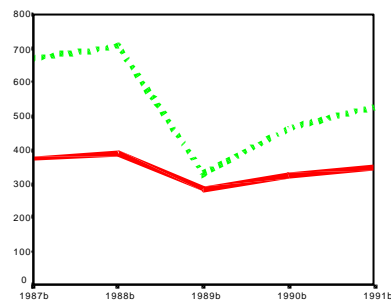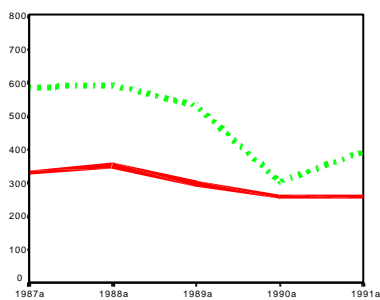
Production of coffee
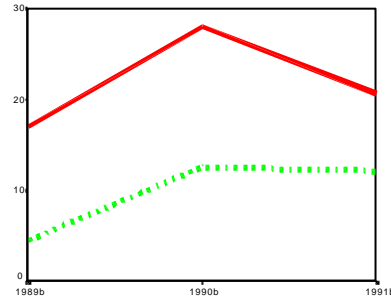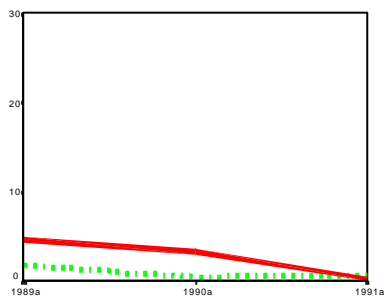
Legend : full line _____ for Rwanda, dotted line ------ for Gikongoro
Left-hand graphs are for the first season (October-March), right-hand graphs are
for the second season (April-September)

In order to detail the relative importance of different food items consumed by Rwandan households, we look at table 3. It is shown that, in terms of value, beans , bananas and sweet potatoes were the most important crops in the Rwandan diet in 1990. Together they constitued 67% of the average crop consumption per month in the 1990a season. Very few meat is

consumed, wheras large quantities of banana beer were consumed. The later took 20% of total consumption in Rwanda, 15% in Gikongoro and 7% in Ruhengeri. Table 3 also shows other regional differences, in particular the importance of potatoes in the Ruhengeri diet and sweet potatoes in Gikongoro.

Table 3: Consumption data per household per month (season 1990a)*

	Rwanda			Gikongoro			Ruhengeri		
Crops	*kg*	*value*	*%*	*kg*	*value*	*%*	*kg*	*value*	*%*
Beans	21.96	869.62	26	8.54	354.59	22	24.36	946.04	25
Potatoes	16.85	282.74	8	8.89	155.71	9	59.55	833.82	22
Peas	0.99	49.50	1	1.33	66.56	4	1.58	79.11	2
Mais	12.69	288.82	9	4.07	92.67	6	18.52	421.69	11
Manioc	16.43	281.45	8	3.70	67.32	4	3.30	71.14	2
Bananas	42.14	715.54	21	2.17	39.87	2	15.16	290.73	8
Sweet potatoes	46.70	683.22	20	51.27	726.33	44	46.08	629.80	16
Sorghum	6.37	190.54	6	4.84	141.40	9	19.05	549.55	14
Total of 8 crops		3360.9			1644.4			3821.8	
Meat		181.3 (48.7)**			69.76 (67.7)**			207.16 (42.1)**	
Banana beer (liter)	28.22	889.05 (15.6)***		9.73	311.38 (20.9)***		10.63	340.41 (30.1)***	
Adult equivalents		4.90			4.59			5.09	
Consumption of 8 crops, meat and beer per ae per month		904.33			441.29			858.42	

* quantities are the sum of production in season 1990a minus kg sold and given to others plus kg bought and received from others. Prices are average market prices in RWF per kg in season 1990a for Rwanda and in the prefectures of Gikongoro and Ruhengeri. Percentages is the percent of the total value of 8 crops.
** % households with no meat consumption
*** % households with no consumption of banana beer

3.2 Some Exchange entitlements[11]

3.2.1 Coffee versus beans

Export crops are another way to secure one's living in a peasant economy. In Rwanda, peasants had three main ways to earn some monetary income : selling crops on the market , brewing beer or performing off-farm labor. Now, we concentrate on the export crop, coffee. Table 4 shows the evolution of coffee cultivation over several years. For the whole of Rwanda, about half of the peasants were cultivating coffee in 1989. On average, they held about 150 coffee trees. Over three years, this number stayed about the same, but the income from coffee dropped by one third. The regional differences (not in the table) are sharp : households in Gikongoro doubled their number of trees between 1989 and 1991 only to end up in 1991 with half of the coffee income compared to 1989. Wether this investment strategy was the right one, remains to be discussed. Altough peasant investment behaviour is not the main topic of this chapter, we need to look at the value of coffee in relation to other crops in section (5.1.2) of this chapter. The hopes of *'a good coffee harvest '* expressed by farmers in discussions with NGOs on the crisis, however have not come out. In Butare, coffee income also dropped sharply over three years time, but peasants did not invest in new coffee trees.

Table 4 : Coffee production over several years, household level averages

	1989	1990	1991	89-91%
% households doing coffee	46.7			
number of coffee trees	149	155	154	+3.3
kg sold	48.3	48.4	34.1	-29.3
coffee income (RWF)	6038	4846	3932	-34.8

Coffee was Rwanda's most important export crop and was responsible for high state revenue in the late seventies (see chapter 2). For the farmer, coffee is a source of monetary income. As long as the producer price of coffee is high, the farmer has an economic incentive to grow coffee.

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[11] We deal with coffee and livestock in this section. For Rwanda as a whole, the exchange entitlement of banana beer is important as well, but coffee and livestock are more important than bananas in Gikongoro. In addition, famine researchers also study the exchange entitlement of the agricultural wage. However, I only have data on wages from the 1990 and 1991 seasons and thus not during the crop failure season. Wage data from 1990 and 1991 do not show entitlement failures for wage earners.

When that price decreases, he may want to replace coffee with other crops. Bananas and beans are the major competitors of coffee for land allocation in the peasant household. By decree, coffee trees may not be intercropped, neglected, abandoned or destroyed. As can be observed from figure 3, the price of coffee was fixed by the government, first at 122.5, then 125, then 100 and later at 115. The relative price of coffee versus beans (indexed) however has schown a severe decline between 1986 and 1993. Where 1kg of coffee would buy the farmer 1kg of beans in 1986, the farmer needed 3kg of coffee for 1kg of beans at the end of 1993. It is not surprising then, that towards the end of the eighties, farmers started ripping out coffee trees, an act forbidden by penal law. Table 4 on coffee production already showed that the average coffee income in Rwanda decreased by 1/3 in the course of 3 years (1989-1991). This general decline was due to decreased production per tree, but masked big differences between prefectures. Gikongoro prefecture is a case in point : average coffee income decreased by 50%, but the number of trees had more then doubled in the 1989-1991 period. This means that Gikongoro farmers had invested heavily in new trees, which only bear fruit after three years.[12] From the scarce but relevant literature on hunger in Gikongoro in 1989, we retain that peasants tell investigators that they will starve next season when the next coffee harvest fails :

> *«Everybody's eyes are focussed on the coming coffee season. When it is good, they can survive, when not, they will die.»* [13]

As for the famine months of the 1989b season, coffee farmers in Gikongoro and in the whole of Rwanda experienced a sharp exchange entitlement failure versus beans. The 1989b price shock of beans and the (subsequent) loss of exchange entitlement however was only the beginning of a more serious decline of exchange entitlements in the 1991a season and thereafter The price of coffee remained at the 115 level till the beginning of the genocide (April 1994).

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[12] These investment figures are analysed in detail in the chapter 2, where I discuss the data on the coffee economy.

[13] Les Retombées de la Famine dans les Préfectures de Butare et de Gikongoro, Bureau Social Urbain, Caritas, Kigali, Février 1990, p. 17.

Figure 3: The price and the exchange entitlement of coffee

Rwanda

Gikongoro
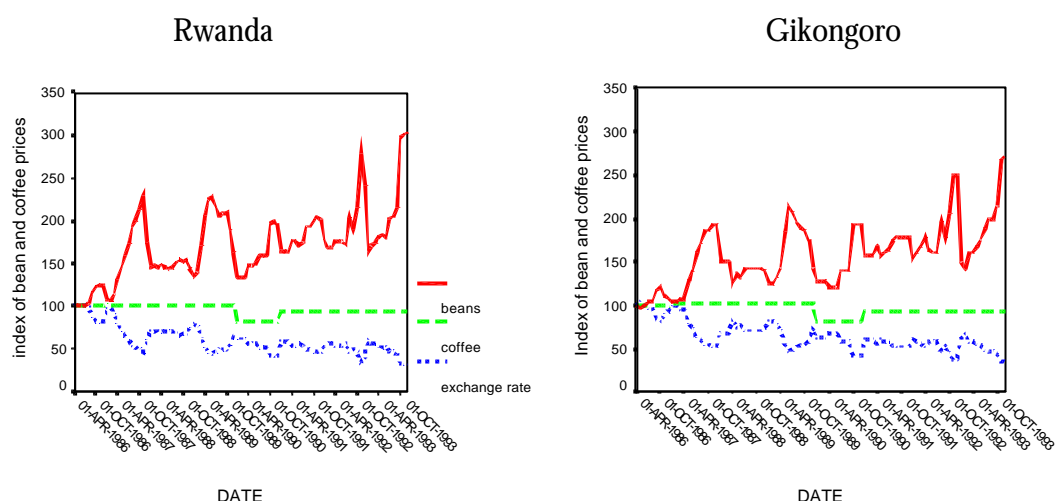
3.2.2 Livestock versus beans

Table 5: Average livestock holdings over several years, in TLU 's (*)

	1989	1990	1991	% change 89-91	%households without livestock 89	90	91
Ruhengeri	0.82	0.84	0.79	-3.6	20.3	17.1	26.0
Butare	1.19	0.88	1.06	-10.9	36.6	44.8	49.0
Byumba	1.04	0.95	0.93	-10.5	35.5	39.1	47.3
Cyangugu	0.31	0.32	0.20	-35.4	42.7	53.9	58.4
Gikongoro	0.84	0.78	0.65	-22.6	24.7	39.3	43.8
Gisenyi	0.83	0.87	0.76	-8.4	32.8	35.3	35.3
Gitarama	0.97	0.94	0.97	0.0	40.8	44.9	46.9
Kibungo	0.77	0.79	0.78	+1.3	30.4	28.3	21.7
Kibuye	1.24	1.21	1.29	+4.0	22.1	25.6	27.9
Kigali	0.93	0.94	1.02	+9.6	30.1	23.1	26.6
Rwanda	0.91	0.86	0.86	-5.4	32.0	35.1	38.4

(*)   Tropical livestock units for Rwanda are calculated as cattle 1; pig 0.25; goat 0.17; sheep 0.17;
     1140 other hh were surveyed in three rounds 1989-1991.

Table 5 shows that Rwandan households, on average, have decreased their livestock holdings during the three years of the survey. During this period, household livestock holdings (in tlu's) declined on average by 5.4%. The decline in the southern prefectures, Gikongoro and Cyangugu was much larger than in other prefectures. Gikongoro prefecture has the highest percentage of households who lost all livestock between 1989 and 1991, namely an increase of 77% of

households without livestock (the Rwandan average being 20% increase). Kibungo, Kibuye and Kigali prefectures on the other hand have seen an increase in the number of households holding livestock over this period..

With incomplete risk markets - entailing interdependence of production and consumption decisions – a production input such as livestock can be an important asset which helps protect the consumption of poor people (Ravalllion, 1997, p.1223). It is known from other countries that the value of livestock decreases in periods of famines. Sen for example, writing on the Ethiopian famine (1972-1974) says that the economic distress of the pastoralists was not confined only to the loss of animals (by drought or displacement from traditional grazing land) ,

> *«The exchange entitlement associated with any given stock of animals vis-à-vis grains also fell sharply. It is sometimes overlooked that a pastoralist does not live only by eating animals or consuming animal products like milk. He also exchanges animals for other means of sustenance, chiefly grains.»* [14]

We only have observations on the price of sheep and goats from October 1989 to September 1991, thus missing the high point of the famine in Gikongoro. From figure 4 however, we retain that holders of goats and sheep in Gikongoro got less value for their livestock in terms of beans compared to the Rwandan average. As we have stated several times, the 1989-1991 period is a time of prolonged agricultural crisis in Gikongoro and the livestock data may well be an indication of this. As crops fail because of drought, lack of inputs or plant diseases, peasants are forced to eat or sell (parts of) their livestock in order to survive. When crop failure is a covariate shock (as opposed to an ideosyncratic one), many households sell livestock at the same time, thereby causing a sharp decline in the market price of livestock (Ravaillion, 1997, p.1223). From the livestock data, we cannot say that livestock owners experienced a sharp exchange entitlement loss verus beans.

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[14]   Sen, A., Poverty and Famines, 1981, p. 105.

Figure 4: The price and the exchange entitlement of sheep and goats
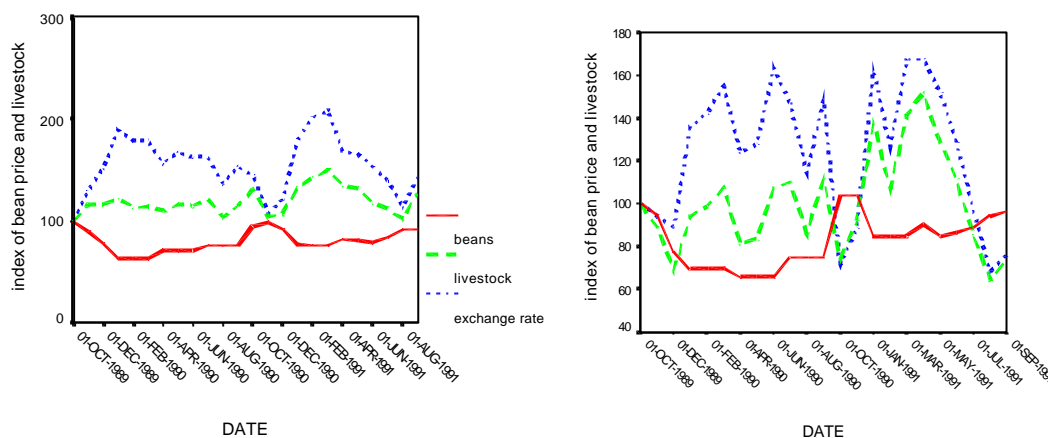
We conclude from this section that coffee producers experienced an exchange entitlement failure relative to beans in the period of the food crisis. This came on top of a direct entitlement failure. The price of coffee continued to decline after 1989, making the exchange rate of beans versus coffee not particularly low in 1989 compared to other years. In general, what we observe is in fact very close to Sen's observations on the Ethiopian famine (1972-1973). Sen observed that the peasant population in Wollo starved to death without substantial rise in food prices.[15] The peasants experienced a direct entitlement failure and could not command food at the market by lack of purchasing power. As Amartya Sen (p. 101) writes

> *«The biggest group of destitutes in the Wollo famine came from the agricultural background, and indeed were farmers – both tenants and small land-owning cultivators. The entitlement decline here took the form of <u>direct</u> entitlement failure without involving the market in the immediate context. The output – typically of foodgrains – was severely reduced, and this led to starvation in a direct way. In so far as the Ethiopian farmer eats the food grown by the family without becoming involved in exchange to acquire food, the immediate influence affecting starvation is the decline of the food grown and owned by the family, rather than the fall in the total food output in the region as a whole. The distinction is important, since the Food-Availability-Decline-approach would focus on the latter variable. The hunger of the Wollo peasant had a more direct origin.*
> *But, of course, once his own crop had failed, the Wollo peasant would have tried to get hold of food trough the market <u>in so far</u> as he could have exercised market command. But since the agricultural failure also amounts to a collapse of his <u>source</u> of market command (namely his income), he was not in a position to supplement his reduced food output by market purchase. The Wollo agriculturalist could not provide much effective demand for food in the market, and despite widespread starvation the food prices in Dessie and elsewhere recorded very little increase.»*

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[15]   Sen, p. 69.

As for peasants in Gikongoro, crop production of the household farm is indeed the major source of the household income (up to 70%) and household consumption. Only off-farm labour (which is in short supply) and the sale of livestock products are sources of purchasing power that are independent of agricultural output. The sale of beer (which depends on the supply of bananas and sorghum) and crops on the market is not independent of agricultural output. High bean prices in the beginning of the 1989b season (April-June 1989), can therefore be an indication that households still had some cash to command food in the market. The absence of (very) high bean prices in subsequent seasons (1990-1994) therefore may then be an indication that households on the one hand produced more beans themselves and on the other hand had no resources anymore to command beans in the market.

4. THE CAUSES OF FAMINE IN SOUTHERN RWANDA

4.1. Food import and export policy

The central political idea concerning agriculture and indeed the central issue of Habyarimana's regime was food self-sufficiency. In numerous speeches the president stressed the importance of food self-sufficiency. This had to be reached by increased agricultural production. In a 1984 speech before heads of state of Africa and France, in Bujumbura, Habyarimana expressed this as follows :

> *"In Rwanda, food self-sufficiency has always been the primary objective of our development effort. Given the periodic famines which regurlarly afflicted us in the past, our population density considered the highest in Africa, and our extreme shortage of arable land, we have had no option but to intensify food production. Living constantly at the very edge of subsistance, the Rwandan peasants has had no other choice, and desired no other choice than to dedicate his efforts to increasing the production of food…"* [16]

We remark that the vision of Habyarimana concerning the choices and the preferences of peasants as far as crop production is concerned, is completely opposite to empirical research findings by Kangasniemi (1998) as we reported in section (2.3) of this chapter.

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[16]   World Bank, Rwanda, Agricultural Strategy Review, 1991, p.12.

Every four years, a general development plan was presented in which nation-wide production targets for the main crops were outlined and where the problems to increase production were addressed. For Habyarimana, the main method to increase production was to work more and to work harder. In economist's terms, to apply more labour to the land. In a 1987 speech Habyarimana said that his policy of food self-sufficiency should not be equated with autarky. He said he realized that Rwanda could not produce all the food it needed. [17] But, in stead of food imports, it was better to rely on food aid, Habyarimana said. The latter namely does not bring the balance of payment out of equilibrium. Food aid, he added, should be sold above the price of locally produced crops, in order not to reduce the production incentives of the peasants.

In a 1991 report (p.12) on Rwanda's agricultural strategy, the World Bank writes that

> "*The Second Republic has been characterized by the vision of an inward-looking, non-importing, autonomous approach to food self-sufficiency, at both the national and the farm level. In the case of the latter, subsistence rather than market production has usually been encouraged.* "

Although the Habyarimana regime embraced the vision of a self-sufficient agrarian nation, Rwanda was far from self-sufficient. In a June 1989 report, an official of the Ministry of Agriculture published the results of a small survey of informal border trade conducted in April and May 1989. He shows that Rwanda appears to export substantial manufacturing goods, potatoes small-stock, poultry and vegetables to the surrounding countries, and that it is at the same time an important importer of cooking oil, beans, sorghum, bananas, sugar and maize. [18]

This survey can be complemented with official trade statistics. Table 6 shows that Rwanda imported food for a average annual value of 40 million US dollar during the eighties. Rwanda exported food for 90 million dollar yearly.

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[17] Habyarimana, J, Discourse at the first encounter with public servants, January 30, 1987.
[18] Ngirumwami, J.L., Ministry of Agriculture, Résultats de l'enquête Commerce Frontalier au Rwanda, June 1989. No case of re-export was found by the author, indicating that all import was meant for domestic consumption.

Table 6 : Value of Food Imports and Exports in million US dollar*

	Imports	Exports
1981	37,3	67,4
1982	42,8	69,3
1983	37,4	60,6
1984	48,5	62,9
1985	63,3	68,7
1986	53,4	160,1
1987	38,5	121,5
1988	36,8	91,2
1989	41,0	104,7
1990	46,7	88,6

* **Source** : UCTAD Trade Statistics, 1992 yearbook.

These results indicate two things : first, the vision of the Rwandan leadership did not correspond with reality : Rwandan agriculture was not self-sufficient, there was a large volume of cross border trade. Second, trade continued at the time of the crop failure, meaning that there was no nationwide shortfall in agricultural production, as documented by the production statistics of the rural household survey (see earlier sections). Table 6 shows us even that the value of food export doubled in the second half of the eighties, compared to the first half. This remarkable upswing in food exports is for the moment unexplained, but coincides with a sharp decline in export earnings from coffee. Food exports could have been used to partly offset the decrease of these coffee export earnings. At the same time, imports of food in the second half of the eighties remain at the same level as in the first half. These import figures show 1988, the year before the crop failure to be the year with the lowest value of food imports in the decade. This has to do with the 'name ' that was given to the years 1987 and 1988 by the Habyarimana regime. 1987 was called the year of food self-sufficiency and 1988 the year of the protection of the income of the peasants. Gatete (1996) writes that the Rwandan government had banned all food imports in 1988.[19]

According to the Agricultural Strategy Review (World Bank, 1991), it is this informal trade (read illegal cross-border trade) that is believed to be responsible for the import of beans that

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[19]   Gatete, C., Food Security and Food Aid in Rwanda, *Wihogora*, June 1996, p. 2.

eliminated the food shortage in Southern Rwanda. [20] "*Informal trade*" means that under normal conditions the imports of crops such as beans, sorghum and bananas are officially banned. A division in the Ministry of Commerce was responsible for assessing the needs for imports based on a projection of national production and consumption. This division only used data on official imports which became available two weeks after arrival in the country. The division does not make any projections on consumption or production and does not have information on unofficial (informal) imports from neighbouring countries. [21] Nevertheless it is estimated that in 1986, a fairly good crop year, unofficial imports accounted for 50% of the beans and sorghum sold on Rwanda's markets. If the division anticipates food shortages, a complex process of import licensing was set in motion. During the 1989 crop failure, the World Bank writes (1991, p.25), the Commerce Ministry decided to authorize ten importers to import beans from Uganda when the price had reached 60 RWF. This was a too late to prevent starvation and emigration. The reduction and surely the banning of imports of course is detrimental to a farming population that, under the pressure of population growth, concentrates efforts on high value crops. The exchange strategy (banana beer for beans) that we have discussed earlier on, is only viable when beans are in effect imported into Rwanda. In the absence of imports, the exchange strategy is useless and farmers have to grow subsistence crops themselves.

As with licensing in general and under famine conditions in particular, large profits and speculation from the side of the traders and from the side of the license giving authority are possible. Import policy in Rwanda under the Habyarimana regime was managed by S. Rwabukumba, member of the Akazu and brother of Agathe Kanziga, the wife of the president. He headed the powerful company ' *La Centrale* ' which was in charge of official import into Rwanda. At the same time this person, who had not even finished his secondary school, was in charge of the foreign currency division of the National Bank. Since import cannot occur without foreign currency, Rwabukumba sat in a key position. ' *La Centrale* ' did not import basic foods needed by the Rwandan population, but imported high quality products for the Rwandan elite. Well-informed people knew that ' *La Centrale* ' did not pay import or export taxes. [22] Both the

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[20] World Bank, Ibidem, p. 26.
[21] World Bank, Ibidem, p. 25.
[22] Reyntjens, F., Testimony, Cour d' Assisen, Brussels, April 20, 2001.

non-food and food imports for the elite took up a large part of the foreign currency. As Bézy argues, the food that was imported was destined for:[23]

- the expatriates from industrialized countries, to allow them to continue their food habits
- the growing number of tourists
- interns in schools who benefited from non-traditional food
- the national elite who lived a european-style of live
- the whole of the urban population (5%) who had introduced milk powder, tomato concentrate, imported cooking oil, far , sugar and rice (whose domestic production remained too low) into its eating habits.

Reading the 1987 speech of Habyarimana in which he pleaded for import restriction, one gets the impression that the Rwandan peasantry had to produce more food in order for the Rwandan elite to continue its import of luxury products, both food and non-food. Indeed, each dollar that is saved on import of basic foods can be used for something else. Additional information, found in numerous articles of the journal *Kinyamateka,* seems to validate this statement : between June 1989 and December 1989, Kinyamateka published several articles in which they revealed that government authorities embezzled public funds on a large scale. A.Sibomana, priest and editor of *Kinyamateka* put it this way :

> *« Rwanda was a country which still had the reputation of being well run, ruled by a sort of 'enlightened despot', Juvénal Habyarimana. But you don't become an honest man just by knowing how to quote French poetry to President Mitterrand. Juvénal Habyarimana and his people were plundering the country while the peasants were starving. We had evidence that he or his wife were diverting funds allocated to buying food for the population to import luxury items instead, for example televisions which were sold at vastly inflated prices. We also had information on drug trafficking. »[24]*

4.2. A malfunctioning food marketing system

Accroding to Pottier (1993), OPROVIA, the leading Rwandan agency in food marketing, intervened only to a limited scale in food markets.[25] It was OPROVIA's task to assure price stability, especially for beans and sorghum. The Rwandan government however expected that OPROVIA could be run as a profitable business, which was not possible when OPROVIA had to buy surpluses in the post-harvest period above the market price and sell from its stocks in any

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[23] Bézy, F., Bilan d'un régime, 1962-1989, Louvain-La-Neuve, 1990, p. 13. The author also refers to J. Nzisabira, dans Bulletin des Séances, ARSOM, XXXIV, n° 4, 1987, p. 641.
[24] Sibomana, A., Hope for Rwanda, p. 25.

hungry period below the market price. According to Pottier, OPROVIA's struggle became acute following the bad harvests from 1988 and the drought in 1989 :

> *"The impact of the 1988 harvest failures, caused by excessive rainfall, was unusually harsh since the authorities had banned all food imports that year; 1988 being Rwanda's Année de l' Autosuffisance !"[26]*

In fact, as we earlier saw, 1987 was decreed to be the year of food self-sufficiency, not 1988. But this does not make a big difference. Food imports were low in either year, since the president wanted to keep the balance of payments under control. One could say that Habyarimana was a conservative and parsimonious accountant. The 1988 slogan was «the year of the defense of the peasant income». For 1989, the slogan was «The year of rural self-organisation». The latter meaning that the peasants should not wait until the administration comes to help them, but take matters into their own hands.

According to Pottier, it is exactly the policy of food import minimization that made it impossible for Rwanda to re-supply its food stocks at the time of the 1988 bad harvest. This is one reason why, one year later in 1989, food stocks where almost empty. Official inquiries revealed that the Rwandan Government was setting OPROVIA an impossible task. OPROVIA's impasse, Pottier writes, was proof that no real progress had been made since the drawing up of agreements with the EC in 1982. The second report of the Interservice Commission warned, with regard to Rwanda's internal food trade :

> «*I has been noted that even when food is abundant, the shops and silos belonging to the cooperatives and communes remain poorly stocked, even though these structures are theoretically the most appropriate for supplying all of the country's communes. It is therefor a matter of urgency that all the serivices concerned (ministeries , OPROVIA and agricultural projects) to decide how best the decentralized stockage system could be activated in the interest of a nationwide distribution of foodstuffs »[27]*

The government of Rwanda nevertheless continued to believe that OPROVIA will take the initiative for inter-regional food commerce. (Rapport, p.23) The expectation, Pottier argues, that OPROVIA could raise the funds required for effective inter-regional distribution of surpluses in times of crisis is unrealistic. In fact, the contrary was true, there were signs of gross neglect towards the very apparatus for state-controlled marketing :

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[25] Pottier, J., Taking stock, Food Marketing reform in Rwanda 1982-1989, *African Affairs*, p. 6 and p. 15.

[26] Pottier, J., ibidem, p. 15. During the Habyarimana regime, every year was given a slogan. 1988 was called the year of food self-sufficiency.

[27] Republic of Rwanda, Rapport sur la Situation Alimentaire de notre Pays, Ministry of Agriculture, Octobre 1989, translation by J.Pottier, ibidem, 1993, p. 20.

> *«The Rwandan governement still needs to reimburse OPROVIA the promised 28.000.000 RwF it lost in 1988 after selling at artificially low prices the sorghum it had bought too dearly in 1986.»* [28] And , *«The Rwandan government should reajust the agricultural prices at which it bought from OPROVIA in 1989 to ensure that this organisation in future can reduce the losses it must incure.»* [29]

There is also an information problem in the game : one can argue that the population, through the speeches of Habayrimana (restriction of import), can start believing that future public stocks of grains or other crops will be low and that the government will not be able to intervene in the case of a crop failure. This information problem may lead to high expected prices.[30]

Relying on this discussion of OPROVIA, we argue that the Rwandan elite never really cared to set up a functioning food marketing system. Pottier (1993, p. 27) is right on the mark when he writes that

> *«It may even be fair to suggest that the slow progress – in food marketing – was yet another illustration of how policy makers tend to regard improved nutritional status as the by-product of agricultural strategies rather than a goal in its own right.»* [31]

This is exactly what we have been saying when discussing the peasant ideology of the Habyarimana regime in another paper of the author : the regime considered the peasants as producers (of food and coffee), not as consumers.[32] The leadership did not equip OPROVIA with the means to succesfully secure access to food for the destitute; it did not pay back debts; it banned food imports and increased food exports; it professed to secure the income of the peasants and considered the application of more labor to agriculture as the solution.

4.3. Agricultural policy under Habyarimana

In 1991, the World Bank writes that

> "*A localized crop failure like that of 1989 in Butare and Gikongoro brings in train forced emigation abroad of several thousand, a large number of children dropping out of school , and deaths from starvation*"
> [33].

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[28] Republic of Rwanda, Compte-rendu de la Réunion tenue au Minagri en date du 02/05/1989 sur la situation alimentaire du Rwanda en Avril 1989, Ministry of Agriculture, p. 4.

[29] Republic of Rwanda, Compte-rendu, p. 4.

[30] I refer to Ravallion, M., Markets and Famines, 1987 for an exploration of the price effects of information.

[31] Pottier, ibidem, p. 27.

[32] Verwimp, P., Development ideology and Genocide, *Journal of Genocide Research*, November 2000.

[33] World Bank, Rwanda Agricultural Strategy Review , 1991, p. 1.

The direct cause of this crop failure was a severe drought in Southern Rwanda. A prolonged period of drought had started in 1984 and reached its climax in 1989. Rwandan peasants have developed capacities to deal with food crisises. The Gikongoro population however was already very poor and vulnerable to adverse schocks. In 1989, they were at the limits of their resources. The incapacity of the peasants to cope with the crop failure were due to the absence of credit, of fertilizer, the anti-erosion practices, tax policy and the general neglect of the prefecture. Again, these elements are closely linked to explicit policy choices. We discuss them one by one. Although peasants contributed vasts amounts of savings to the well-known Banques Populaires, very few loans were given to peasants. Half of the loans were given to traders and businessmen whereas this group only made up 14% of the people with deposits at these banks. [34]

Under Habyarimana, Rwanda was the country in the world that used the lowest amount of fertlizer per capita.[35] Again, this has to do with the import restrictions but also with the distribution of the available fertilizer. The regime wanted to restrict its use for industrial crops only (tea and coffee). The absence of fertilizer is cited by a peasant in the IWACU film as one reason for the incapacity to cope with the crop failure.

The Habyarimana regime undertook a massive and nation-wide anti-erosion effort. The regime obliged all peasants to dig ditches on their plots. Ditches were considered the best means of combating erosion. Peasants who refused to do this were fined, just as in the case of neglect of the coffee trees. Guichaoua (1991) who interviewed farmers in 1989, reports that farmers resented the harsh labour requested in the nationwide ant-erosion policy of digging ditches. No doubt erosion was one of the main problems of the country given that peasants have to cultivate the slopes of hills. However, as Kangasniemi (1998, p.174) writes, Rwanda's anti-erosion campaign was rigid and simplistic, leaving no room for local physical conditions (rainfall, soil type, slope) indigenous practices, and household specific economic circumstances (crops, livestock).

A Belgian brother in the north of Rwanda, specializing in agriculture had developed an alternative way of combating erosion. He taught the peasants to construct radical terraces. When

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[34]   I refer to Uvin and to IFAD for this.

the author visited the brother in his home in Byumba in August 2000, a very large area was covered with radical terraces. During the interview the brother related his story :

> *«From the beginning of his arrival in Rwanda (1972) I believed that intensive agriculture was thé solution to the countries problem. Government policy under the Habyarimana regime however was build on extensive agriculture. The government believed that production would increase if all available land would be taken under cultivation. In order to prevent erosion on the hills, the regime obliged the population to dig ditches, which was very unpopular among the peasants and which did not work. From 1977 onwards I practised radical terracing on 10 ha of land. Donors and engineers showed some enthusiasm but the Ministry of Agriculture remained sceptic. In 1985 Habyarimana visited the project in Byumba and was delighted by the results. However, he remained silent upon my requests to implement my techniques on a larger scale. My fields were namely more productive then the fields without radical terracing. In 1987, I wrote a very critical report on the functioning of the communal agricultural officials (they were doing nothing but commanding and bully the peasants). I believes that Habyarimana saw the report because from 1988 onwards the president himself encouraged peasants to adopt radical terracing in his speeches.«*[36]

The brother did not have to oblige the peasants to adopt radical terracing, they came to him to learn the technique by themselves.[37] The contrast with the mandatory erosion techniques decreed by the regime could not be greater : upon the beginning of the democratisation process (1989-1990) and the decrease in power of the MRND, peasants neglected the maintenance of the anti-erosion ditches or destroyed the ditches.[38] This also resembles the treatment of the coffee trees. Peasants started to rip them out, even before 1991, although this was prohibited by law.

While the absence of credit and fertilizer, the mandatory coffee cultivation, the umuganda policy and the anti-erosion measures where not confined to the prefecture of Gikongoro (indeed they were nation-wide policies), their cumulated effect may exhaust a population that is on average poorer than in other prefectures. While peasants all over Rwanda suffer from mismanagement and bad policies, it are always the poor who are hit most. Under normal weather conditions, a poor population may just be able to survive despite bad government policies. The occurance of a drought may unveil their vulnerability to crop failure and famine.

In line with Habyarimana's ideology of a hard working and moral peasant population (discussed in the first part of the disseration) , Habyarimana tried to reduce the production of beer bananas and the consumption of banana beer. It is worth noting that Habyarimana discouraged the

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[35] World Bank, Rwanda, Agricultural Strategy Review, 1991, p.
[36] Interview in Byumba, September 6, 2000. This text is a summary of the part of the interview that discussed agriculture.
[37] This means that, according to the Belgian Brother, farmers in Byumba adopted radical terracing. Nduwayezu (1990) in contrast, writes that no Rwandan farmer adopted radical terracing. For several reasons, the brothers' testimony is much more credible than Nduwayezu's affirmation.

cultivation of bananas, even though bananas produce a very high yield per acre, and despite the fact that a large domestic banana market existed in Rwanda.[39] In a 1979 speech, he is very explicit about that:

> "Despite the opposition and the misunderstanding that I have seen in this question, I remain convinced that the extension of the wine banana and, in certain regions, the appropriation of land for its cultivation, are a great handicap for development and for the food equilibrium of the population. The "myth of the banana tree" must disappear as well as the myth of the "nice corners" and that of the burning of bushes so-called regenerating effect"[40].

The regime considered beer drinking anti-social and beer brewing wasteful (Kangasniemi, 1998, p.142). For the farmer household however, as we have seen in section two, beer brewing and selling is very important for food security. Pottier (1992) writes that Habyarimana wanted to reduce the cultivation of bananas because he believed occult rituals were being performed in the banana plantations. A more economic and down-to-earth approach however, suggests that bananas are a direct competitor to coffee, a cash crop that was strongly promoted by the regime.

Habyarimana's main argument for high food prices was the protection of peasant revenue. While that argument made sense from a producers' point of view, it is nonsense once you acknowledge that the majority of the population were net-buyers (as opposed to net-sellers) of beans and other staple food. Because the Habyarimana regime only looked at the peasantry as producers of food and of cash crops, it never acknowledged that many peasants were net-buyers of beans (and of food in general). Net-buyers depend on the price of food for their survival and it does not need to be stressed that they benefit from low instead of high bean prices. The policy of import restriction was continued in 1988 *"to preserve the income of the peasant* ".

In that respect, it needs to be said that an agricultural policy of food-selfsufficiency at the national, regional, local and household level is, among other things, an anti-pastoral policy. As Amartya Sen has argued before, pastoralists do not live of their cattle alone. They engage in trade, they exchange cattle products for food crops. If you want every family to grow all the food it needs for its own consumption at its own farm, a pastoral way of life is impossible. Pastoralists namely do not cultivate. To repeat an expression by G.Kayibanda : « *The Tutsi must also cultivate* « .

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[38] Ntezilyayo, A., L'agriculture, une priorité dans la reconstruction nationale in A. Guichaoua, ibidem, p. 324.
[39] Little and Horowitz, *ibidem.*
[40] Habyarimana, J, Speech at the opening of the 1980 new year, 1979, p.135.

5. CHILD MALNUTRITION : AN ECONOMETRIC ANALYSIS

5.1 Data on child malnutrition in Rwanda

We use data from the 1992 Demographic and Health Survey. 1933 children between 0 and 60 months were surveyed three times between December 1991 and August 1992. The data include antropometrics of child and mother, disease and vaccination information, community health infrastructure and use of health care. 858 of these children came from households that were included in a agricultural research project undertaken by Michigan State University (the rest of the 1933 children came from households who were not part of the agricultural survey). The demographic data are panel data (first round in 1991, second and third round in 1992), but the collection of economic and agricultural data did not take place in 1992. For that resaon, we are only using the 1991 cross-section with demographic, agricultural and economic data.

Table 7 : prefectural averages of antropometric indicators

Prefecures	n = 1933			n = 858		
	n	haz	whz	n	haz	whz
Ruhengeri	207	-2.18	0.64	100	-2.24	0.73
Butare	211	-2.04	-0.49	100	-2.38	-0.40
Byumba	197	-2.21	-0.06	80	-2.40	0.15
Cyangugu	153	-2.17	0.02	61	-2.56	-0.05
Gikongoro	122	-2.40	0.17	50	-2.62	0.14
Gisenyi	223	-1.97	0.06	99	-1.96	0.03
Gitarama	228	-2.14	-0.05	104	-2.00	-0.13
Kibungo	182	-1.68	-0.36	89	-1.55	-0.40
Kibuye	154	-1.77	-0.02	71	-1.62	0.04
Kigali	256	-1.68	-0.17	104	-1.82	-0.18
Rwanda	1933	-2.00	-0.037	858	-2.07	-0.01

haz : height for age z-score, whz : weight for height z-score

Table 8: Malnutrition, in percentage, n=1933

z-scores	heigt for age	weigth for height
above -2 (not malnourished)	47.7	94.4
-2>x>-3 (moderately malnourished)	27.6	4.4
below -3 (severely malnourished)	24.7	1.2

Height for age and weight for height are generally accepted as good indicators of the nutritional status of children.[41] The first is a measure of long-run nutritional status. Children with low height compared to their age are stunted which is considered as an indication of chronic malnutrition. Growth retardation generally occurs between 6 months and 2 years of age.

> *Though a stunted child may have some cath up growth, for the most part, a child whose growth has faltered in the first two years of life will be on a different growth trajectory during the rest of his/her life. (Alderman, 1993)*

52% of the children in our sample are smaller then the ' standard ' child of the same age. It is then no surprise that wasting (low weigth-over-age z-score) is less of a problem in Rwanda. More then half of the children are indeed relatively small, meaning that their body has adapted to low levels of food intake. Since the body is relatively small, it is easier to have a ' normal ' weight over height observation. The z-score measures the deviation of each antropometric outcome from a standard series of antropometric outcomes.

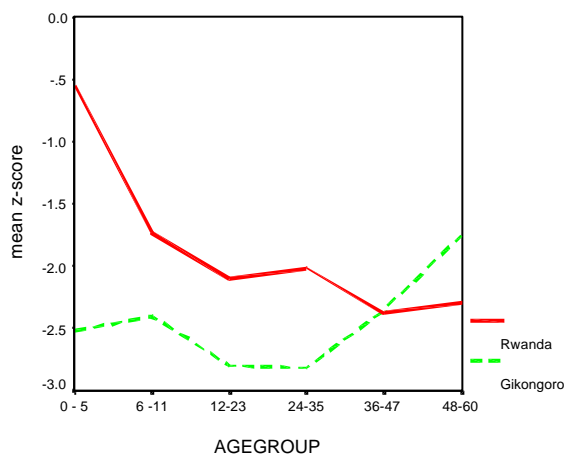**Figure 5: Height-for-age for 1933 children in Rwanda compared to Gikongoro**

Figure 5 suggests a negative correlation between age and the height-for-age z-score in Rwanda. The older the young child gets, the worse its z-score. *For Gikongoro, such a correlation seems not to exist.*

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[41] Thomas, D., Public Policy and anthropometric outcomes in the Côte-d'Ivoire, *Journal of Public Economics*, 1996, p. 156.

Another way to look at this negative relationship is the following. In Gikongoro Prefecture, babies younger than 23 months show a very low z-score, meaning they face a severe degree of chronic malnutrition. The price of beans in Gikongoro reached its highest point during the month of June in 1989. We consider this month to be the high point of the famine in Gikongoro. The first round of the nutrition survey was run in the month of December 1991, meaning that 30 months separate the period of the survey from the high point of the famine. We add to that the information that babies start to be exposed to food other that mother's milk from the age of six months onwards. From this age onwards they are no longer shielded from price variations in the staple food. We split the 1933 children in the sample in two groups, the first born before and the second born after the price shock of beans. We then investigate whether the observed difference in z-scores for both groups of children between Gikongoro and the other prefectures is significant or not. The group that experienced the price shock was at the time of the survey 36 months or older. We use three categories of malnutrition, the first having a z-score higher then -2, which contains children that are not malnourished. The second category is for moderately malnourished children with z-scores between –2 and –3 and the last category is for severely malnourished children with z-scores below –3. In table 9, we test whether the distribution of children over these 3 categories differs significantly between Gikongoro and the other prefectures.

Table 9: Distribution of malnutrition

Age	ha-z-score	Rwanda		Gikongoro	
		#	%	#	%
< 36 m	above -2	607	55.5	26	38.8
	-2>x>-3	268	24.5	18	26.7
	below -3	216	20.0	23	34.5
> 36 m	above -2	307	37.4	21	41.2
	-2>x>-3	260	31.7	13	25.5
	below -3	254	30.9	17	33.3

Table 9 (con.): Chi-Square tests for Chronic Malnutrition for children <60 months of age

Age		Value	df	Asymp.Sign. (2-sided)
< 36 months	Pearson Chi-Square	11.043	2	0.004
	Number of Valid Cases	1094		
> 36 months	Pearson Chi-Square	0.964	2	0.617
	Number of Valid Cases	821		

The Chi-Square test in table 9 suggests that the distribution of the z-scores of children above the age of 36 months does not differ between Gikongoro and the rest of Rwanda. For children below the age of 36 months however, this difference is significant, Gikongoro has much more children in category 3 (severely malnourished) than Rwanda as a whole. We did not find a significant result for any of the other prefectures. This is new evidence for the observation that the 1989 crop failure was not a single-peak famine, but was rather an episode in an enduring period of hunger, a period that continued in the early nineties. For many peasant families in Gikongoro, the 1989 crop failure was not the end point of a period of drought and hunger, but rather the beginning of an even worse period. Given the anthropometric evidence, it appears that older children have withstood the crop failure whereas children born after June 1989 in Gikongoro suffered the most. The latter had mothers who consumed less food than needed during the pregnancies of these children, resulting in lower weight at birth and started of their lives under bad food conditions. From figures 1 and 2, we observe that food production in Gikongoro after 1989 never reaches pre-1989 levels.

5.2. Explaining children's nutritional status

**Table 10a: Regressions of antropometric indicators for children
0 to 60 months of age, Height-for-age score is dependent variable, n=820**

	Regression 1 OLS	Regression 2 2SLS	Regression 3 2SLS	Regression 4 OLS
Child characteristics				
age of child (in months)	-0.0800 ***	-0.0768 ***	-0.0749 ***	-0.0719 ***
	(0.000)	(0.000)	(0.0000)	(0.000)
age squared	0.0008 ***	0.0008 ***	0.00076 ***	0.0007 ***
	(0.000)	(0.0001)	(0.0003)	(0.000)
sex	-0.0009	-0.0225	-0.0072	0.0043
	(0.993)	(0.8441)	(0.9512)	(0.970)
characteristics of mother				
age	-0.0011	-0.0051	-0.0057	0.0017
	(0.889)	(0.5523)	(0.5180)	(0.845)
body mass index	0.0381 *	0.04155 **	0.04375 **	0.03310
	(0.056)	(0.0525)	(0.0444)	(0.121)
read and write	0.2240 *	0.1388	0.1137	0.315 **
	(0.061)	(0.3082)	(0.4027)	(0.012)
married	0.547 ***	0.45721 **	0.4452 **	0.508 ***
	(0.002)	(0.0139)	(0.0190)	(0.007)
Household characteristics				
Household size	-0.0018	-0.0538	-0.0608 *	-0.0108
	(0.537)	(0.1541)	(0.0861)	(0.725)
livestock (tlu)			IV	-0.0068
				(0.908)
farm size (acres)		IV	IV	0.00239 **
				(0.017)
log farm output (FRW)	0.261 ***	0.5841 ***	0.6303 ***	
	(0.002)	(0.0033)	(0.0000)	
distance to health center	-0.00136	-0.00126	-0.00128	-0.0028 *
	(0.332)	(0.3957)	(0.3989)	(0.079)
regional dummy variables				
crop failure affected region	-0.300 *		IV	-0.305
	(0.094)			(0.137)
civil war affected region	-0.297 *		IV	-0.836 ***
	(0.034)			(0.006)
prices				
beans			IV	0.0280
				(0.281)
bananas			IV	-0.0673 *
				(0.060)
potatoes			IV	-0.132 **
				(0.011)
sweet potatoes			IV	-0.0543
				(0.214)
Constant	-4.391 ***	-7.411 ***	-7.831 ***	0.789
	(0.000)	(0.0002)	(0.0000)	(0.583)
Adjusted R²	0.147	0.123	0.128	0.140
N=820				

significant at the 10% level ; ** significant at the 5% level ; *** significant at the 1% level
log farm output is instrumented for in regressions 2 and 3

Variables used in the regressions :

Age of the child in months and its square;
Sex 0 for male, 1 for female ; age of the mother in years ;
Body mass index of the mother is the weight in kilograms divided by the squared height in meters ;
The read/write and the marriage variables are dummies, with 1 for yes anf 0 for no ;
The size of the household is the number of household members ;
Tropical livestock units (tlu's) 1 for cattle, .25 for pigs, .17 for sheep and goats, .10 for chicken and rabits ;
The farm size variable is the area of land cultivated by the household ;

The farm output variable in the regressions for Table10a is the log of the average value of agricultural production over six seasons, from the 1989a sesaon to the 1991b season ; farm output was measured with constant 1987 prices ; 70% of all households with children<5y have reported farm output for 6 seasons. Households from the remaining 30% were included when at least 3 seasons were reported.

The regional dummies are 1 for the region affected by the crop failure (Gikongoro and parts of Butare) and for the region affected by the civil war (Ruhengeri and Byumba).
The price variables are average, deflated prices over six seasons for beans, bananas and potatoes in Table10a and average deflated prices in the child's crucial growth period in Table10b.

Discussion of the results

In previous sections of this chapter, I have documented two facts :

(1) Gikongoro experienced a sharp decline in farm production in 1989, a decline from which the households in that prefecture never fully recovered in the subsequent years. The data show that farm production remained very low in the years 1990 and 1991. Rwanda on the whole however did not experience a sharp decline of farm output in 1989.

(2) The health status of children in Rwanda in December 1991, measured by the height-for-age antropometric indicator was such that ¼ of the children was moderately undernourished and ¼ was severly undernourished. For very young children (under 36 months of age in December 1991) Gikongoro was doing significantly worse than the other prefectures.

We will first discuss the regression results presented in Table 10a. The first regression (Regression 1) adds to the above picture : it shows that the health status of children can be explained by a number of variables of which farm output is one. The regression shows that children from households with a higher farm output (in value terms) have a better health status. We will discuss econometric problems with this regression hereafter, but first look at the results.

In Regression 1, the shape of the height-for-age curve (in figure 4) is confirmed by the significance of both the age variable and the age squared variable. These results on age are a

confirmation of findings in other studies ; this effect is among the best documented effects on childrens nutritional status in developing countries. We do not observe a sex-effect in the height-for-age-z-score.

As far as the characteristics of the mother are concerned, the mother's age does not have an effect on the child's nutritional status. Her body mass (BMI), on the other hand does. As for body mass, a well-fed and robust mother can invest more time and effort in the well-being of her child. The BMI (BMI = weight in kg/(height in m)^2) effect seems reasonable since most activities in child care require a lot of physical effort, especially in developing countries. A strong mother, ceteris paribus, has less difficulties in lifting her child, carrying her child, feeding her child and performing other actvities in the household that benefit the child's health indirectly. At this point it is interesting to look at the results in a paper by A.Bhargava (1997) on the determinants of adult well-being in Rwanda. Bhargava found that low incomes and high food prices reduce the households' energy intakes, thereby forcing the adults to spend additional time resting and sleeping.[42] He also found that mothers from households with a large number of children spent more time working in agriculture. They namely allocate household tasks to children. Bhargava concludes that, since poor nutritional status diminshes adult productivity, larger families might be viewed favorably in Rwanda. Since we do not have time allocation data in our data set, we cannot test for Bhargava's findings directly. The variable on household size proves insignificant in the regression and does not change the effects of any of the other variables.

In order to illustrate the importance of mother's BMI, we can look a little bit closer at the antropometric characteristics of the mothers in our sample. Figure 6 schows the height and the weigth of 520 Rwandan mothers. the average mother in Kibungo prefecture is 6 cm taller than her counterpart in Gikongoro. Since mother's height is not determined by the farm output or consumption of the last couple of years, we are observing here a long term effect of (under) nutrition. Figure 5 shows very well that Gikongoro is in general a poor area, not just in the late eighties and early nineties, but across decades. These mothers were undernourished in the period of their own youth. In terms of heigth, Gikongoro's mothers score exceptionally poor. The

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[42] Bhargava, A., Nutritional Status and the allocation of time in Rwandese Households, *Journal of Econometrics*, 77, 1997.

figure also shows that mothers in Ruhengeri and Gisenyi are doing very well compared to the rest of Rwanda, especially in terms of weight.

Figure 6: Average heigth (in cm) and weight (in kg) of mothers per prefecture
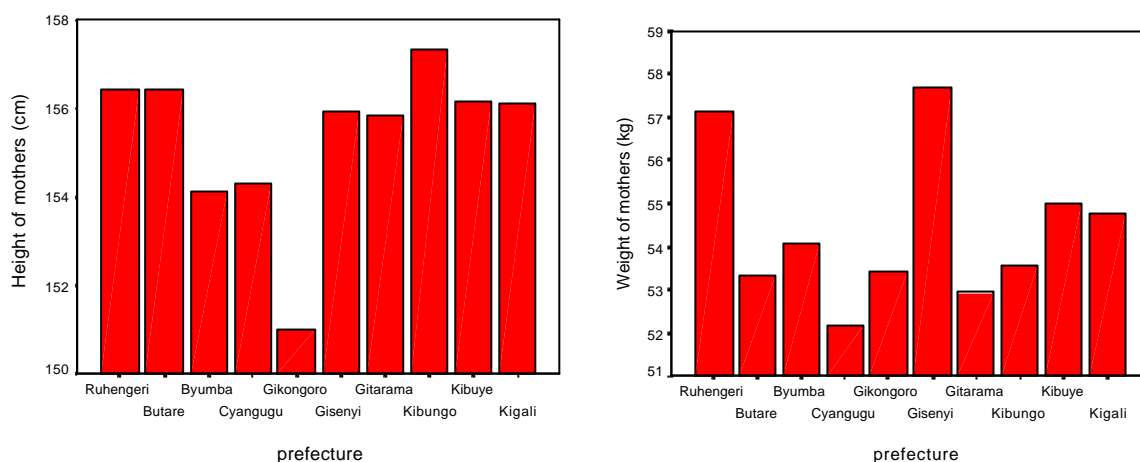
Having a married mother is better for the child's long term health compared to having a non-married mother. Ideally, one would have data on intra-household distribution of food, to test for this directly, but in the absence of this, we can only observe the effect of the marriage variable on children's nutritional status.

Another characteristic of the mother benefits the child's long-term nutritional status, i.e. literacy. A mother who can read and write is generally better informed about the practices of child care. She can read the users application of medicin, she may have an informed knowledge of child feeding practices, she may be more alert towards early signs of child illness, seek early assistance. The literacy variable is significant in Regression 1.

Two regional dummies introduced in the model, namely one dummy for the region affected by the crop failure and one dummy for the region affected by the civil war both prove significant. The civil war in the north of Rwanda (Ruhengeri and Byumba prefectures) has a negative effect on the health status of children living in that region. This is also true for children living in the region of the crop failure (Gikongoro and parts of Butare prefecture). Since we already observed

the effect of farm output on child health (through the farm output variable), it means that in both regions child health is influenced by a region-specific characteristic. In the north, civil war negatively influences child health, whereas for Gikongoro, the region specific effect is also negative. The latter effect, combined with the linear effect of farm output on child height-over-age, suggests that the total effect of the crop failure in Gikongoro was non-linear. This supports the thesis that the 1989 season was particularly bad for child health and thus supports our view of a crop failure that developed into famine. Caution should be paid to these findings, however. The latter effect may be suffering from multicollinearity, a problem we now turn too.

There is problem of endogeneity in Regression 1. This occurs when it is not possible to treat one or more explanatory variables as given or exogenous. In such cases, it can be argued that some of these explanatory variables are correlated with the equation's error term. As a result the OLS estimator is biased and inconsistent.[43] The problem in fact is that a number of observable and non-observable explanatory variables that are correlated with farm output and with health status are missing in Regression 1. When one does not correct for this, one misinterpretes the effect of farm output on health. The observed effect of farm output is not reflecting the cause of a good or a bad health status, but merely the consequence of differences in observed and non-observed assets and endownments (land, cattle, household size,…). The solution to this requires an alternative estimation method. To derive a consistent estimator, it is necessary that our model is identified. For this identification, we use so called instruments or instrumental variables. An instrumental variable is a variable that can be assumed to be uncorrelated with the models error term, but correlated with farm output. When we allow for an arbitrary number of instruments, the estimator is sometimes referred to as the generalized instrumental variables estimator (GIVE), also know as the two-stage least squares estimator (2SLS).

The 2SLS procedure allows one to obtain the same estimator in two steps, both of which can be estimated by least squares. In the first step, the endogenous variable, farm output is regressed on all instruments. In the second step, the original model (with height-for-age as dependent variable) is estimated while replacing the endogenous variable (farm output) with its predicted value from the first step.

This procedure is performed in Regressions 2 and 3. In Regression 2, farm output is predicted with one instrumental variable (farm size). The results prove to be similar as those of Regression 1 with age, age squared, mother's BMI, the marriage dummy and the predicted farm output showing a statistically significant relation with the child's health status. The literacy variable looses its significance. Because the two-stage-least-squares estimation method was used, the estimators in regression 2 are consistent.

We can use the estimated coefficients in Regression 2 to calculate the effect of farm output on child health in Gikongoro, keeping all other variables on the country mean. This means we calculate

$$\frac{\hat{H}}{A} = a + b_1 \ln \overline{O}_R + b_2 \overline{X} \qquad and \qquad \frac{\hat{H}}{A} = a + b_1 \ln \overline{O}_G + b_2 \overline{X}$$

with height-for-age at the left hand side, O for farm output, R for Rwanda and G for Gikongoro ;

$$since \ \frac{\hat{H}}{A} = -2.07; b_1 = 0.5841; \ln \overline{O}_R = 9.9775 \ and \ \ln \overline{O}_G = 9.2452$$

This means that $b_1 \ln \overline{O}_G - b_1 \ln \overline{O}_R = -0.42$

The result indicates that the average haz-score (child chronic malnutrition or stunting) for Rwanda (–2.07) goes down by 20% (-0.42/-2.07) when all variables except farm output are set on the country mean and farm output in Rwanda is replaced by mean output in Gikongoro. This result thus gives the pure effect of farm output in Gikongoro (relative to Rwanda) on child nutritional status.

In regression 3, the 2SLS method was used again, but this time 8 instrumental variables were used to predict farm output. In the first step, farm output is predicted by area of land cultivated,

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[43] We refer to Verbeek, M., A Guide to Modern Econometrics, John Wiley and Sons, 2000, Chapter 5 for an elaborate discussion of the endogeneity problem and the econometric ways to deal with it.

livestock, two regional dummies and four prices. In the second step, the predicted value of farm output from the first step is used as regressor to estimate height-for-age. Again, the results of the estimation are similar to regressions 1 and 2, but the significance of the predicted value of farm output has increased a lot compared to regression 2, thereby confirming the validity of our results. The negative effect of household size, observed in regression 2 is now significant (at the 10% level).

An additional regression was performed using all instrumental variables as explanatory variables in an OLS-regression thereby omitting farm output as a regressor. This is regression 4. In this regression, mother's BMI looses its significance. The literacy variable and the distance to the health centre become significant, effects we did not observe in regressions 2 and 3. This means that there is some kind of multicollinearity going on between farm output, literacy and distance to a health centre. Farm output is picking up some of the effects of literacy and distance. Since I have tried to deal with multicollinearity in the course of the four regressions discussed in this section, we should not overestimate the problem caused by these effects. The civil war dummy is now very significant and the significance of the other regional dummy has decreased. New is the effect of prices. Increased prices of bananas and potatoes have a significantly negative effect on the child's nutritional status. Both these crops are essential in the Rwandan household economy and the Rwandan diet.

The livestock variable, measured as the 3-year average holding of livestock (in tropical units), does not have a significant effect on the nutritional status of children. This result is somewhat surprising as we have seen that in Rwanda, households saw their livestock holdings decrease in the 1989-1991 period. This decrease in livestock is either the result of sales or of direct consumption of livestock.[44] Sales can be used to purchase food. This means that household consumption, in the short run, may have benefitted from a decrease in livestock holdings.

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[44] Neglecting loss or death of livestock.

Table 10b: Regressions of antropometric indicators for children 6 to 60 months of age, Height-for-age score is dependent variable, n=627

	Regression 5 OLS	Regression 6 2SLS	Regression 7 2SLS	Regression 8 OLS
Child characteristics				
age of child	-0.0422 **	-0.0534 **	-0.0497 **	-0.0039
	(0.034)	(0.0128)	(0.0216)	(0.133)
age squared	0.0003	0.0004	0.0004	0.0003
	(0.249)	(0.1346)	(0.1818)	(0.271)
sexe	-0.0695	0.0986	-0.0803	0.102
	(0.577)	(0.4493)	(0.5425)	(0.439)
characteristics of mother				
age	0.00126	-0.0017	-0.00139	-0.0045
	(0.893)	(0.8586)	(0.8878)	(0.648)
body mass index	0.0326	0.03723	0.03363	0.0313
	(0.143)	(0.1184)	(0.1574)	(0.189)
read and write	0.198	0.1439	0.1873	0.319 **
	(0.142)	(0.3386)	(0.2097)	(0.025)
married	0.471 **	0.40513 **	0.38466 ***	0.430 **
	(0.016)	(0.0470)	(0.0609)	(0.036)
Household characteristics				
Household size	-0.01916	-0.0534	-0.04808	-0.0153
	(0.568)	(0.2129)	(0.2303)	(0.673)
livestock (cruc) (tlu)			IV	-0.0837
				(0.210)
farm size (acres)		IV	IV	0.0025 **
				(0.027)
log farm output (cruc) (FRW)	0.199 **	0.4451 **	0.37148 ***	
	(0.023)	(0.0346)	(0.0263)	
distance to health center	-0.00187	-0.0018	-0.00159	-0.0024
	(0.235)	(0.2565)	(0.3371)	(0.169)
regional dummy variables				
crop failure affected region	-0.134		IV	-0.125
	(0.498)			(0.570)
civil war affected region	-0.327 **		IV	-0.511 **
	(0.041)			(0.049)
prices				
beans (cruc)			IV	0.019
				(0.341)
bananas (cruc)			IV	-0.044
				(0.207)
potatoes (cruc)			IV	-0.076 *
				(0.070)
sweet potatoes			IV	0.012
				(0.737)
Constant	-4.272 ***	-6.333 ***	-5.6052 ***	-1.689 *
	(0.000)	(0.0019)	(0.0009)	(0.064)
Adjusted R²	0.054	0.047	0.047	0.052
N=627				

significant at the 10% level ; ** significant at the 5% level ; *** significant at the 1% level
log farm output is instrumented for in regressions 2 and 3

Variables used in the regressions :

Age of the child in months and its square;
Sexe 0 for male, 1 for female ; age of the mother in years ;
Body mass index of the mother is the weight in kilograms divided by the squared height in meters ;
The read/write and the marriage variables are dummies, with 1 for yes anf 0 for no ;
The size of the household is the number of household members ;
Tropical livestock units (tlu's) 1 for cattle, .25 for pigs, .17 for sheep and goats, .10 for chicken and rabits ;
The farm size variable is the area of land cultivated by the household ;

In the regressions for Table 10b, the farm output variable is the average value of agricultural production in the seasons that are crucial in the child's growth path, meaning between the 6th and the 23rd month. If, for example, a child was 40 months old at the time of the survey (December 1991), he are she was born in september 1988. This means that the period March 1989 through September 1990 was the crucial period, which corresponds with the agricultural seasons 1989b, 1990a and 1990b. The same reasoning applies to the number of livestock (in tlu's) and the price variables for the regressions in Table 10b.

The regional dummies are 1 for the region affected by the crop failure (Gikongoro and parts of Butare) and for the region affected by the civil war (Ruhengeri and Byumba).
The price variables are avergage deflated prices in the child's crucial growth period in table10b.

In table 10b, we have tried to dig a little bit more in the farm output data. From the literature, learn that from a nutritional point of view, the child goes through its most crucial months between the 6th and the 23rd month after birth. We then asked whether we could find a significant effect of farm output on the child's health status *during this period*. Ideally we should put the output variable in this crucial period in a regression with the average output over the six seasons (as was used in table 10a regressions). The multicollinearity problems however were evident, and instrumenting did not help, since we could not find good instruments for farm output in the child's crucial period. That is why we used only farm output in the crucial period in the regressions reported in table 10b. Since children below the age of 6 months are protected from the nutritional environment by their mothers (they only get brestfeeding), these children had to be left out from the regressions in table 10b. The results of the regressions 5 to 8 are roughly the same as those of regressions 1 to 4, this being not surprising, since we used the same estimation methods and only slightly different variables. Prices were taken during the child's crucial nutritional period, just as the number of livestock. We observe that farm output - in the crucial period - has a very significant effect on the health status of the child. A number of other variables (mother's BMI for example) are not significant anymore at the 10% level. Observe also the significance of the regional dummy in the region with civil war (norhtern Rwanda). This

variable, as in table 10a seems to be picking up effects that are not picked up by the farm output variable. The crop failure region dummy does not show an extra effect for that region, probably due to the low number of observations of children from Gikongoro between 6 and 23 months of age during the crop failure. As for the prices of staple foods in the crucial period is concerned, only the price of potatoes has a negative and significant effect on the child's health status.

6. ON FAMINE AND GENOCIDE

6.1. Political economy background

According to the peasants interviewed in a documentary film (details in appendix 2), the 1989 famine was worse than others because one could not even leave one's children with the neighbours. During earlier famines, peasant families showed more solidarity towards each other's misery. « *Rich families would take in children of poor families* « a woman said. The film also mentions 4 cases in which peasants killed thieves in 1989 without intervention of the judicial authorities. Taking policing in their own hands was a precursor of much worse violence 5 years later. The reasons for the breakdown of solidarity at the end of the eighties may be found, we believe, in the duration of the agricultural crisis. If one family has a food problem during a few weeks in a specific year, it is not difficult for the neigbours to help this family, but when an entire region experiences a crisis for several years in a row, it is not surprising that after a few years people have no surplus left to share with others. And the rich lived in Kigali.

Moreover, the mentioned documentary (see appendix 2) also shows how peasants complained that fertile land had been occupied by "the rich". The peasants say that the communal authorities gave fertile land that previously belonged to the peasants, to a group of wealthy people in order to establish a large scale tea-plantation.[45] Peasants were forcibly removed from their land without compensation. The wages earned on the tea plantation only covered part of the nutritional needs of peasants families. Removal of peasants from their land with little or no compensation also occurred in other places in Rwanda, e.g. in Gisovu commune, Kibuye prefecture, also for a tea-

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[45] IWACU, ibidem.

plantation and again in Gikongoro for a large scale "development project". The latter project earmarked land for wealthy people from Kigali as well as for some foreigners.

Interestingly, Pottier argues that the elite in the Habyarimana regime, consisting of Hutu from the North of Rwanda, value land in a special way. When they took power, in 1973, Pottier writes, their ambition was to restore their own pre-Tutsi culture – a culture dominated by powerful landowners (abakonde) who attracted clients (abagererwa) through land.[46] The institution of ubukonde, restricts access to land and creates political and economic ties between patrons and clients. Ubukonde, Pottier argues, is important for understanding food and development policy, because the young Hutu state intervened in 1961 to authenticate and legitimate its existence.

6.2. From crop failure to famine : the non-response of the Habyarimana regime

The crop failure that struck several communes in Butare and Gikongoro prefectures in 1989 was the result of a five year period of drought (starting in 1984) from which the region never really recovered. The drought was so severe in 1989 that the roots of crops turned into ash. Crop failure however does not have to lead to famine. Indeed, there are numerous cases in which crop failures do not cause hunger. Several circumstances can avert famine. If a population has other sources of income outside farming, famine can be averted by importing food through usual market mechanisms. The population affected by crop failure will buy the necessary food items on the market. Policy measures averting famine are well-kwown. The government can temporarily employ people in public works (India), the government can hand out food aid to vulnerable people, the government can allow aid organisations to hand out food, to name just a few policy measures. The literature on famines and real life cases also advise governments to stop taxing poor people struck by crop failure. Governments are advised to stop levying taxes during famines, requering mandatory labour dues, and school fees. These measures will not avert

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[46] Pottier, p. 29.

famine, but will help to ease the burden of a crop failure. None of the aforementioned measures were taken by the Habyarimana government in 1989.[47]

It is this non-response to famine that should be investigated. Devereux (1993) writes that non-response to famine (not giving food aid nor taking other measures to avoid famine) is to allow a '*Malthusian final solution*' to happen, namely to equilibrate population with resources. In the introductory chapter, I demonstrated some Malthusian influences in the thinking of Rwanda's governing elites. Here however, I first address the motivation behind the non-response. For as we have seen, man-made famine can be intentional or non-intentional. Whereas the direct cause of the crop failure in Southern Rwanda was a long lasting drought, the relationship between crop failure and famine is far more complex. The underlying reasons for a crop failure to develop into a famine are identified by a political economy analysis (see sections 3.2, 4.1, 4.2,4.3 ,6.1). When actual starvation occurs on a more or less grand scale, immediate measures can be taken to relief the starving population. I will now discuss the reasons for non-intervention.

The Rwandan government did not react to the crop failure, it did not provide food or other aid and thus allowed a crop failure to develop into famine. The height of the famine occurred in June 1989, when the price of beans rose to 60 RWF per kilo. The regime did not mention the famine, no government agency or ministry studied it or reacted to it. Only in March 1990, after the publication of a documentary film about the famine, the government started providing food aid. Although famine conditions became evident from March 1989 onwards, government disbursed aid only one year later. The makers of the documentary film we mentioned earlier, IWACU, a non-governmental cooperative organisation, made the film explicitly to prove that famine existed in the country. [48] The government was indeed denying that famine existed. The refusal to accept that famine struck Southern Rwanda had everything to do with the ruling principle of food self-sufficiency. Acknowledging that famine existed would have been the same as saying that Rwanda could not feed itself, the latter being the cornerstone of Habyarimana's regime. Famine was the ultimate proof that a policy of food-self-sufficiency at the household, communal and national level did not protect households and regions from famine. The

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[47] The 1990 report of the Caritas Social Bureau states that (p.26) it would be useful to suppress several mandatory taxes such as the personal tax, the tax on cattle, diverse contributions to the MRND, to the communal projects,…and voluntary contributions to the Red Cross, the Church and so on. The fact that this NGO is giving this advice, is a serious indication that these taxes continued to be levied during the period of the famine.

government thus refused to acknowledge that its policy had failed.[49] In order to prevent the outside world from getting information about the famine, the government tried to prevent journalists to enter the famine region and to write about it. A Belgian journalist was told by security chief Augustin Nduwayezu not to write articles which irritated the highest authorities.[50] The government did not accept aid from foreign governments or international organisations.[51] This strategy may be wise if one wants to avoid disruption of domestic production, but then one should provide relief from domestic sources, meaning organising food transport from food surplus to food deficit regions. As we have shown, by the time of the famine in Southern Rwanda, Northern and Eastern Rwanda were not experiencing a decline in food production. Nevertheless, no transport of food was organised.

Besides not wanting to admit policy failures in the face of the stated self-sufficiency objectives, the non-response of the Habyarimana government also had other reasons. A second reason for the regime to passively allow the population to starve was that the people living in the famine struck region had never been in favour of Habyarimana. The president was considered as a man from the North who had shown no interest in the improvement of the living conditions of the population in Southern Rwanda including Butare and Gikongoro. Moreover, in the presidential elections held in December 1988, in which officially 99% of the population voted in favor of the sole candidate, Habyarimana , the population of Gikongoro had voted en masse against the president.[52] According to one of our interviewees, a long term and well-informed resident of Gikongoro, this result awoke the anger of the president. Nsengiyaremye (1992) writes that the elections were falsified : in Gikongoro, the préfet did not even count the votes, but declared that Habyarimana got 100% of the vote, which was the target set by Habyarimana's supporters.[53]

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[48] Iwacu, personal conversation, Kigali, August 12, 2000.

[49] During one interview, a respondent told the author that the Rwandan bureaucrats under Habyarimana were used to tell their superiors only the things that pleased them, hiding real problems. While this attitude may have retarded the reaction of the regime, one cannot conclude from this that the president was uninformed about the famine.

[50] Prunier, G., The Rwanda Crisis, History of a Genocide, 1995, p. 87-88.

[51] Iwacu, personal conversation, Kigali, August 12, 2000.

[52] Interview, Kigali, August 13, 2000. Unofficial results say that 78% to 90% of the population voted against Habyarimana in December 1988. Another informant told us that the Gikongoro population already voted against the president in the 1978 election.

[53] Nsengiyaremye, D., La Transition Démocratique au Rwanda (1989-1993) in Guichaoua, A., Les Crises politiques au Burundi et Rwanda (1993-1994), Université de Lille, 1995, p. 242.

In addition, it is known that during his regime people from the south (Hutu as well as Tutsi) did not get promoted in the administration. All senior posts went to people from Habyarimana's own region. Fr. Nzamurambaho for example, a popular politician from Gikongoro and a former minister of Agriculture wanted to present himself in the November 1988 legislative elections. He was removed from the list of candidates without any explanation. The president, everybody knew, only wanted people who depended on him and who were completely loyal to him. [54]

Thirdly, the famine-struck prefectures, Gikongoro and parts of Butare, and especially the part of both these prefectures that was used to be called Nyaruguru, had a large Tutsi population. Several sources indicate that, by 1989 or even earlier, president Habyarimana was informed of the probability of a military invasion of Rwanda by the FPR. This can be documented as follows : in May 1989, at the summet of Nyagatare, the president of Uganda, Museveni, told Habyarimana that he had better solve the refugee problem if he wanted to avoid a military attack. [55] All over Uganda people were talking about it and one can assume that Habyarimana's secret service also monitored the build up of the rebel movement. The year before, in 1988, Tutsi in the diaspora had held a major conference in Washington DC. One of the conclusions of this conference was the desire and the right to return. As early as 1987, Tutsi leaders in the diaspora were fundraising for an invasion.[56] The embassies of Rwanda in Kampala, Nairobi, Addis-Abeba and Washington had warned the Rwandan government of the preparations for an invasion.[57] In 1989, at the high point of the famine in Southern Rwanda, a fraction of the FPR made an abortive attack in north Rwanda. Ogetunnu writes that Habyarimana's intelligence service had several officers from the FPR on its payroll in order to sow division inside the FPR. This means that even before the famine was under way, Habyarimana knew of the build up of FPR forces in Uganda.

Therefore, the question is whether information on an upcoming civil war influenced the decision not to intervene in Gikongoro in 1989. Had Habyarimana already made up his mind in 1989, to consider the Tutsi inside Rwanda as accomplices of the FPR and thus as enemies of his regime ? In the event of an FPR attack, Habyarimana may have anticipated that young Tutsi from Rwanda

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[54]   Nsengiyaremye, D., ibidem, p. 242
[55]   Nsengiyaremye, D., ibidem p.247 and interview, Kigali, August 14, 2000
[56]   Adelman, H. and Suhrke, A., The Path of a Genocide: the Rwanda Crisis from Uganda to Zaire, Transaction Publishers, 1999
[57]   Nsengiyaremye, D., ibidem, p. 247

would join the FPR forces (which eventually happened). The author interviewed several survivors from the genocide in Gikongoro who confirm that a number of young men from Gikongoro joined the FPR before the 1990 attack.[58] Moreover, the regime's leadership considered Gikongoro prefecture quasi-lost to the FPR as it would be very easy to penetrate the prefecture through Nyungwe forest from Burundian territory. There is an extra reason related to this war strategy. If Habyarimana anticipated an upcoming civil war, he would preserve the country's food stocks (however small or large they may have been) for his own soldiers. Indeed, why feed a population in the south that did not favor him in the first place and of which a number were potential FPR-soldiers when at the same time food would be needed for the Hutu army.

6.3. The 1989 famine as a prelude to the 1994 genocide

When one combines the different elements discussed in the previous sections, namely the peasant and self-sufficiency ideology, the populist approach to population growth, and the reaction to the crop failure , then the following picture emerges.

Severe drought causing crop failure in southern Rwanda in 1989, by itself did not lead to famine. Famine only occurs when governments allow it to take place. It is my thesis in this chapter that the Habyarimana government knowingly allowed a crop failure to develop into famine in southern Rwanda in 1989.

We have seen that the peasantry can only escape the malthusian trap of high population growth and declining agricultural productivity when governments promote technological innovations. The Habyarimana government has never done so. The regime's advice to the peasants was to apply more labor to the already degraded soils, as if the Rwandan farmers where not numerous enough to work the land.

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[58] Interview, Kigali, October 12, 2000.

As a result of the mismanagment of agriculture, peasants were oriented towards subsistence production, a situation in which they were highly vulnerable to crop failure and direct entitlement loss. We have seen that a policy of food-selfsufficiency is anti-pastoral. Pastoralists do not cultivate crops to secure their living. And, empirical research has shown that cultivators do not want to grow only food to secure their food-security. Apart from tea and coffee, the government nevertheless relied on a policy of cultivation of all available land to achieve higher food production. Once all the land was put into cultivation, peasants were unable to keep food production and population growth in balance because no attention was paid to technological innovation, fertilizer use, credit and market development. The forcefully promoted and monitored cultivation of coffee was not beneficial anymore to the peasants from the end of the eighties onwards ; they preferred to grow cash crops for the domestic market such as bananas for the production of beer, a choice the Habyrimana regime opposed.

In contrast to the peasant-friendly rhetoric, we have seen that the agricultural policies benefitted the commercial and political elite. Very few funds – expressed as a fraction of government budget - were invested in agriculture. Altough 50% of the deposits in the Banques Populaires came from peasants, they were only receving 10% of the loans. We have shown that the Habyarimana regime never cared to set up a functioning food marketing system. The access to food was considered a local and personal problem, to be settled by patron-client relationships. This attitude, together with the officially sanctionned slogan of food-self-suffiency, led the regime to deny and neglect the famine in southern Rwanda in 1989. As K.Jonassohn (1999) has recently argued that

> *"In the present stage of the world's development, the presence of serious starvation in a group is one of the first sure signs that this group has been singled out for victimization "*

The refusal to assist a starving population does not only hurt young men and potential soldiers, but also women and children. A strategy of preventing food aid may then be genocidal. To be sure, for lack of documents, I cannot prove this strategy or the genocidal intent of the refusal to provide food aid. Some evidence, advanced by *Kinyamateka*, indeed points at self-enrichment and embezzlement of government funds destined to buy food. Is this explanation incompatible with a political, strategic or genocidal motivation ? I do not know. In any case, the story of the crop failure in southern Rwanda gives ample evidence that the Habyarimana regime knowingly allowed famine to occur. According to my research, Habyarimana's agricultural policy, in

particular its ideological underpinnings, its political motivations and its economic consequences for the Rwandan peasantry are an important part of a process that eventually led to genocide.

When, after a revealing documentary produced by IWACU in February 1990, president Habyarimana visited the famine-prone region in March 1990, he told the press that his administration had hidden this event for him, that he was not aware that famine was occuring in Rwanda. Granting that the president's aides did not tell him everything, we believe that he lied at this point. From our interviews in Kigali with close collaborators of the former president, we know that he received detailed intelligence reports twice a day about everything that happened in the country. It is highly unlikely that the highest authority was not aware of a famine that struck large areas in two prefectures and caused the emigration of 10.000 citizens to Burundi and Tanzania.[59]

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[59] Discussing the credibility of Habyarimana, one should not forget that only 7 months after his denial of famine conditions, in October 1990, the same president, Habyarimana, organised massacres in Mutura and Kibilira (documented in a report of FIDH, an organisation of international human rights groups, 1993). The targets of these local massacres were the local Tutsi, known for their pastoral way of living. We should also keep in mind that the same president later on organised a fake attack on Kigali in order to draw in more French troops and that the same president imprisoned 10.000 Kigali citizens, mainly Tutsi, on ch arges of conspiracy with the FPR. It is the same president, Habyarimana, who denied to the press and to diplomats that massacres occurred in Rwanda in 1990, 1991 and 1992 in which about 2.000 Tutsi were killed.

APPENDIX 1 Figure A1 : Famine struck region in Butare en Gikongoro Prefectures
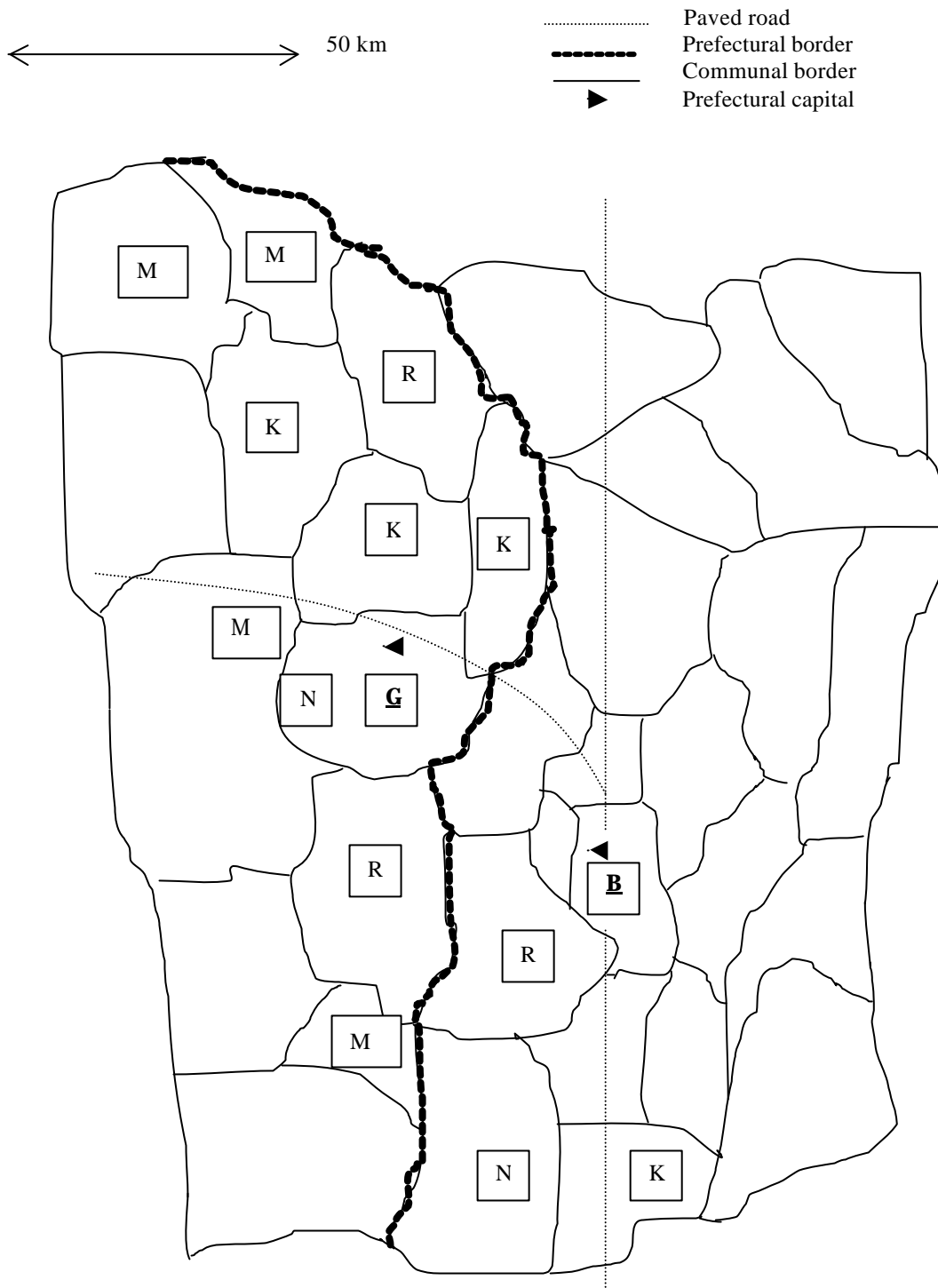
Most struck communes are indicated with their first letter: **in Gikongoro**: Mubuga, Rwamiko, Nyamagabe, Kinyamakara, Mudasomwa, Karama, Karambo, Rukondo, Musango, Muko; **in Butare** : Nyakizu, Runyinya, Kigembe

APPENDIX 2

Published sources documenting famine in Southern Rwanda

One of the most interesting examples of the documentation of the food crisis in southern Rwanda is a film. In February 1990, a group of researchers working with IWACU, a cooperative organisation working in the rural areas, produced a film, *"Haguma Amagara"* which means *"you only live once"*. The film was a response of this grass-roots organisation to the silence of the Habyarimana regime. Since the regime refused to acknowledge the famine, which in February 1990 was already going on for more then eight months, IWACU decided to film the evidence. The film shows poor peasants in southern Rwanda having nothing to eat, showing markets without products, peasants deconstructing their houses to sell the parts for food, peasants migrating to other parts of Rwanda and to Burundi, hungry children and mothers, adult males who are telling the film-maker that they are to weak to work. The film indeed documents hunger in southern Rwanda in the 1989-1990 period. We come back on interviews with peasants in this documentary when we discuss the causes of the famine.

Apart from the film, several Rwandan organisations have documented the food crisis and have published reports on it. The author was able to trace three valuable reports. These reports were published over a period of more than two and a half years. The first was written by the Social Bureau of Caritas in Kigali.[60] The report cites administrative and communal sources documenting hunger and starvation in several communes of Butare (Nyakizu, Runyinya) and Gikongoro (Nyamagabe, Karama). It counts the number of death people due to starvation by commune: 5 in Karama, 30 in Nyakizu and 107 in Nyamagabe. On top, 2.316 people had left Nyakizu to find food or work elsewhere. (p.3) In Runyinya commune, about one hundred children had left school and 500 in Karama. Many husbands had temporarily migrated. Crops were stolen at night and several cases of suicide had been reported.(p.11) Peasants also report the absence of solidarity among neigbours. (p.19) In Gikongoro, peasants hoped that the next coffee harvest would be good, if not they would starve to death (p.16-17). The Caritas report concluded that there was nothing to eat anymore in the south, peasants were already eating the leaves and the roots of their plants. Peasants had sold their belongings at low prices to secure some cash.

The second report was written by staff of the grass-roots NGO called CCOAIB, but the author could not get hold of this report [61] The third was a report on a local agricultural survey of 300 households in several communes by the Agricultural Development Project in Gikongoro. This project was run by the Ministry of Agriculture. [62] This report stated that 25% of the surveyed households were indigent and that female headed households suffered more. Two of the reports used the word *'famine'* to describe the food crisis in Southern Rwanda and the third spoke of starvation.

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[60] *Les Retombées de la Famine dans les Préfectures de Butare et de Gikongoro*, Bureau Social Urbain-Caritas, Kigali, Février 1990, 26 p.

[61] Twizeyimana, P., and Uwimana, V., *Portrait de la Pénurie alimentaire actuelle au Rwanda. Dévoilement d'une famine cachéé sous la verdure*, CCOAIB, Kigali, Novembre 1989, 43 p. Several attempts to get a copy of this report in Rwanda failed.

[62] Gascon, J.-F., Pauvreté a Gikongoro, Résultats de l'enquête réalisée aupres des ménages indigents, Projet de Development Agricole de Gikongoro, Document de travail, n.156, Juin 1992, 62 p.

Kinyamateka, the most important independent newspaper in Rwanda, also published information on the food crisis in 1989. The newspaper's articles infact made the famine known to the Rwandan public. André Sibomana, editor of the newspaper in 1989, expressed it as follows :

> « *In 1989, a terrible famine struck the south of the country. There was a natural explanation for this phenomenon, but the authorities did nothing to improve the situation. Worse still, I had evidence that part of the government's assistance which was intended for the population at risk had been diverted. It was a scandal. I decided to publish this information. We were threatened and we were called liars, until I published photographs which were overwhelming. This had an immediate effect. Readers wrote in to express their satisfaction : at last the truth was being told.* »[63]

APPENDIX 3 : Figure A3 : Value of Production in 10 seasons

	87a		87b		88a		88b		89a	
	prod	%p	prod	%p	prod	%p	prod	%p	prod	%p
Ruhengeri	26775	40	23020	43.2	29377	32.7	21164	50.9	27770	44.5
Butare	31285	35.6	30707	37.9	27111	39.4	30168	41.2	24627	46.3
Buymba	29323	40	35121	28.6	28142	37.8	30474	36.0	26012	50.5
Cyangugu	24833	45.8	25240	36.9	25447	36.1	24550	39.8	21699	60.0
Gikongoro	19796	62.7	19137	64.3	18744	65.5	19043	59.5	13347	81.3
Gisenyi	23710	59.1	20137	71.2	26934	53.6	17799	73.6	22771	60.2
Gitarama	33396	25.4	38733	21.4	33271	25.9	34245	27.5	33639	25.8
Kibungo	35617	15.7	39722	14.5	34305	19.0	39361	11.9	38661	24.2
Kibuye	25803	55.4	15584	78.6	29583	48.2	14906	75.6	20064	63.5
Kigali	35419	26.8	47539	22.9	38964	23.0	44777	30.9	40727	21.7
Rwanda	29171	39.3	30702	40.1	29684	37.1	28693	43.5	27589	45.8
N	1073		1089		1076		1075		1211	

Production for these 10 seasons is the value of total production of 8 crops : bananas, potatoes, sweet potatoes, beans, mais, peas, sorghum and manoic.
%p is the percentage of households that has a value of production lower then 2/3 of the mean value of production in Rwanda in 1987a. This mean value was 19.447 RWF.

	89b		90a		90b		91a		91b	
	prod	%p	prod	%p	prod	%p	prod	%p	prod	%p
Ruhengeri	22030	66.9	26636	57.0	24089	56.3	28499	48.8	21937	59.7
Butare	27612	48.7	22760	55.5	24484	55.2	16399	66.9	20697	59.6
Buymba	31073	42.9	31003	44.9	33185	42.2	-	-	-	-
Cyangugu	22910	57.3	19492	63.2	17604	69.5	19571	71.4	17299	68.9
Gikongoro	9853	86.2	10014	86.2	12699	81.9	13848	83.5	12102	80.7
Gisenyi	14036	80.0	22855	64.1	15839	73.4	17761	69.8	14215	76.9
Gitarama	38299	25.9	32070	29.3	32879	29.1	25845	45.1	31268	40.3
Kibungo	52659	22.1	44268	27.1	39231	22.1	34216	34.1	32380	32.3
Kibuye	11123	82.3	17866	64.1	11846	89.4	16855	73.3	11624	85.9
Kigali	52922	18.2	41386	24.7	37629	28.8	30635	38.5	37186	30.7
Rwanda	29247	50.9	27691	49.5	25935	52.4	23072	57.1	23687	56.3
N		1202		1230		1230		1038		1022

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[63] Sibomana, A., Hope for Rwanda, Conversations with Laure Guilbert and Hervé Deguine, Pluto Press, English-language edition, 1999, p.22.

APPENDIX 4 : Insights from the model of the peasant household

The model of the peasant household provides a good framework to discuss the effects of changes in food prices. This is important for the topic of this paper, as we have seen that the Habyarimana government believed that high food prices offer an incentive for producers to produce more food. With the help of our household model, we can judge the effects of such a policy of high food prices on the production and consumption decisions of peasants.

One possible application of the household model is found in the human resource development literature. Households obtain consumption not only from marketed goods, but also from goods which are produced at home using household labor. As Udry and Bardhan (1998) state, one's utility may depend on a vector of consumption goods c and on health, which depends on c and on time spent at home «producing» health.[64] The household problem, then, can be written as

$$Max \, u \, (c_a, c_m, H)$$
$$\text{w.r.t} \quad c_a, c_m, H \geq 0$$
$$\text{subject to}$$
$$p_m c_m + p_x x = p_a (q_a - c_a) + w(L^c + L^F + L^O - L)$$
$$L = L^c + L^F + L^O$$
$$H = H(c, L^c)$$

where L^c is household labor devoted to producing health. The separation property is maintained with respect to production on the farm, but the production of health depends on preferences. The effect of prices on consumption can be written as

$$\frac{\partial c_a}{\partial p_a} = \left.\frac{\partial c_a}{\partial p_a}\right|y* + \frac{\partial c_a}{\partial y*}\frac{\partial y*}{\partial p_a}$$

$$\qquad\qquad (1) \qquad\qquad (2)$$

(1.1)

(1)   is the direct effect on consumption for given income

(2)   is the profit effect

Since we are especially interested in the health effects of (in)sufficient consumption, we are looking at

$$\frac{\partial H}{\partial p_a} = \frac{\partial H}{\partial c_a}\frac{\partial c_a}{\partial p_a} + \frac{\partial H}{\partial L^c}\frac{\partial L^c}{\partial p_a}$$

(1.2)

Working out (1.1) yields

$$\frac{\partial c_a}{\partial p_a} = \frac{\partial c_a}{\partial p_a}\bigg|U* + \left(q_a - c_a\right)\frac{\partial c_a}{\partial y*}$$ (1.3)

(3)   (4)   (5)

(3)   is a pure substitution effect and is negative

(4)   is the marketed surplus (+) or decifit (-)

(5)   is the income effect and is positive (assuming c_a is a normal good)

Furthermore,

$$\frac{\partial L^c}{\partial p_a} = \frac{\partial L^c}{\partial p_a}\bigg|U* + \left(q_a - c_a\right)\frac{\partial L^c}{\partial y*}$$ (1.4)

And, substituting (1.3) and (1.4) in (1.2), yields

$$\frac{\partial H}{\partial p_a} = \frac{\partial H}{\partial c_a}\left[\frac{\partial c_a}{\partial p_a}\bigg|U* + \left(q_a - c_a\right)\frac{\partial c_a}{\partial y*}\right] + \frac{\partial H}{\partial L^c}\left[\frac{\partial L^c}{\partial p_a}\bigg|U* + \left(q_a - c_a\right)\frac{\partial L^c}{\partial y*}\right]$$

A health demand function can be directly derived from the household model. The demand for health, as expressed in several antropometric measures such as height for age, weight for height and weigth for age depends only on the price of basic food crops, child characteristics and community factors.

Assuming that p_a is the price of beans, the derivation makes clear that peasants who do not produce beans (e.g. landless peasants) will see their consumption of beans decline as a result of the price increase. The effect on bean producers is less clear, it can be either positive or negative, depending on the effect of the price increase on the marketed surplus $(q_a - c_a)$:

$$\frac{J(q_a - c_a)}{Jp_a} = \frac{Jq_a}{Jp_a} - \frac{Jc_a}{Jp_a}\bigg|_{U^*} - \left(q_a - c_a\right)\frac{Jc_a}{Jy^*}$$ (1.5)

           (6)   (7)   (8)   (9)

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[64]   Udry, C and Bardhan, Development microeconomics.

(6) is a production incentive and is positive

(7) is a pure substitution effect and negative (postive when we consider the –sign)

(8) is the marketed surplus

(9) is the income effect and is positive (negative when we consider the –sign)

the effect of p_a on the marketed surplus depends thus on the sign and the size of (8) and (9) versus (6) and (7). If the income effect is very large and stronger than the combined effects on production and substitution, then the overall effect on the marketed surplus is negative.

In a land scarce environment, such as Rwanda, peasant's capacity to grow their own food decreases and they need to purchase food on the market. A price increase of beans lowers bean consumption of landless peasants and peasants who do not produce enough beans for their own consumption.[65] For landed and bean producing peasants, the effect depends on the income elasticity of bean consumption. If this is very large, peasants may produce more beans, not for the market but for their own consumption.

The model of the peasant household as outlined above shows that price policies to « preserve the income of the peasant » or « to increase bean production » may effect (parts of) the peasantry in the opposite way. The policy of high bean prices only benefits wealthy, landed elites who can afford to produce beans for the market. Landless peasants will suffer from high bean prices.

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[65]   Ravallion, M., Famines and Economics, *Journal of Economic Literature*, 1997, p. 1213.

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