Ecology of Food and Nutrition
An International Journal

Aims and Scope

***Ecology** of Food and Nutrition* is an international journal of the nutritional sciences. It particularly emphasizes foods and their utilization in satisfying the nutritional needs of mankind, but extends also to nonfood contributions: to obesity and leanness, malnutrition, vitamin requirements, and mineral needs.

The scope is broad, and the content wide, so that culture prohibitions, traditional usages, marketing and transport problems, additives and food quality are also areas for consideration.

Many of the contributors are trained in nutrition, nutritional sciences and food technology. Others represent the behavioral sciences, human geography, and food industry and its critics. Such problems as taste, flavor and texture are as germane to this journal as interactions between nutrition and disease, nutrition and physical fitness, problems of pregnancy and age, of contaminants and standards of purity.

An anthropologist may consider food utilization in a particular culture, a lawyer may write on regulations and enforcement, but an enzymologist may describe enzyme inhibitors. No nutrient stands by itself, no food is complete by itself, and even a chemically defined diet becomes indefinite in the whole complex of alimentation and metabolism. This journal has an ecological perspective, and includes contributions by ecologists in general and human ecologists in particular.

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GURU-FATTENING SESSIONS AMONG THE MASSA

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Among the Massa of Northern Cameroon and Chad, men 15 to 35 years of age undergo two types of fattening sessions, one individual, the other collective. Ethnographic and anthropometric data on both were gathered between 1976 and 1985, and quantitative food consumption surveys were carried out in 1976 and 1980. The individual sessions result in one of the highest caloric intakes recorded in a non-experimental situation. The collective ones provide the male part of the population with a diet above normal requirements. Symbolic as well as biological aspects have to be taken into account in assessing the results. Besides its nutritional and possible physiological impact on the participants, the contribution of this institution towards the biological fitness of the Massa as a whole may be questioned. While it may partially deprive specific groups of access to food it can be credited with genetic, social, cultural and psychological benefits at the level of the population.

KEY WORDS: Cameroon, Chad, male population, ritual fattening, obesity, anthropometry, calorie intake, prestige, cultural integration, biological fitness, psychological well-being

INTRODUCTION

Different societies value fatness in different ways. The Massa of Chad and Northern Cameroon are one of the few contemporary populations which prize overweight among males and in which it can be studied as a positive asset, which is not the case in modern urban societies. Common sense views fat people as objects of ridicule; scientific knowledge associates overweight with increased mortality (Society of Actuaries, 1979; Bray, 1988); degenerative disease (Miller and Mumford, 1971; Simopoulous and Van Itallie, 1984); and psycho-social consequences (Stunkard and Mendelson, 1967; Apfelbaum and Igoin, 1973; Aimez, 1979). These negative attitudes may be linked to the rather unique historical situation of man in the privileged western world in which he eats too much and exercises too little (Stini, 1980, 1981). Accumulating stores of fat is, however, an adaptive trait stemming from the old feast-and-famine cycle, and some contemporary societies may in fact hold different views from those spread by dominant urban civilisation (Massara, 1980; Brown and Konner, 1988).

In many cultures, heavy female figures associated with fecundity are valued both aesthetically and sexually. This attitude dates from paleolithic times, as attested by the ample hips and breasts of the Willendorf Venus and other prehistoric figurines. It is a conspicuous feature in the XVth century Orient (Nefzaoui, 1964), as well as in Polynesia (Connelly and Hanna, 1978). The systematic fattening of young women in order to increase their sexual attraction and ability to bear children can be observed in many places. It is still practised in Mauritania as well as among the Saharan Tuaregs and in Tunisia (see Laplantine, 1981, on the Hajba, and Pagezy, 1983, on care given to the primiparous mother among the Ntomba of Zaire.) There are biological grounds for such treatment. Stini (1981) points out the originality of

the female body, " . . . distinguished by proportions of fat and lean tissues different from the male . . . becoming significant factors in reproductive success." This is not the case for men.

There are fewer examples of social institutions aiming at intentional fattening of both sexes but they have been observed in Polynesia, for example, in Puka-Puka (Beaglehole and Beaglehole, 1938) and on Mangaia Island (Lavondès, 1975), as well as in Africa among the Ibo, Ekoi, Efik, Ibibo and Annang (Malcolm, 1925; Talbot, 1976; Brink, 1983).

Overfeeding of males on an individual basis is more common and is the case with many traditional chiefs in Africa, since they are symbols of tribal prosperity. However, differential fattening of males as a group is rare if we except the conspicuous case of the Sumo wrestlers of Japan, and the Massa of Northern Cameroon and Chad who possess a specific institution to induce it: the *guru*, to which this paper is devoted.

General Background

The Massa, numbering about 250,000 individuals, dwell on the banks of the Logone river some two hundred and fifty kilometres south of N'djamena, the capital of Chad. The study was carried out in the village of Kogoyna, in the county of Bougoudoum, Préfecture of Mayo Danaye, in the Northern Province of Cameroon. The village is populated by Southern Massa, who lead a traditional style of life compared with the Northern Massa who have been involved for more than 20 years in a modern rice-producing project.

The Massa practise agriculture, fishing and herding (de Garine, 1964b; 1980). Compared to other African savanna populations, they enjoy an acceptable diet, the daily average intake over a year being 2400 kcal and 90 g of protein (Koppert, 1981; de Garine and Koppert, 1988). However, they live in a Sudano-Sahelian zone that undergoes annual rainfalls ranging from 550 to 950 mm with sharp variations from one year to another. In addition to irregular precipitation and droughts, the area is characterized by heavy flooding from July to October, which may also damage crops. The Massa, who consider themselves herders and fishermen, are reluctant farmers. This adds to the environmental constraints they endure with the result that, on average, they cultivate a small acreage (0.4 hectares per adult) of food crops, too little to satisfy their needs (de Garine, 1964b). Their only access to cash is through the irregular income derived from cotton growing and fishing. Having to fulfil the requirements of a costly bridewealth system (de Garine, 1980), they do not devote systematically their income to buying the missing food stores, with the result that they constantly face a seasonal pre-harvest cereal shortage (de Garine and Koppert, 1988; 1990).

The restricted dietary period usually lasts about one month, resulting in an average weight loss of about 2 kg. In bad years, such as 1980 and 1985, it can reach 7 kg, and is experienced as a dramatic period of hunger (de Garine and Koppert, 1988). Famines have often occurred in the area. Until the beginning of the century they resulted in children being sold to better-off Fulani neighbours. Oral literature reflects food anxiety, and eating abundantly remains a concern in daily life.

Cattle are the Massa's most valued asset, but their main use is not as food. They are used socially as bridewealth (ten cows must be given to the father-in-law in order to obtain a wife), and to provide opportunity to develop a prestigious system of cattle lending. In a more original manner, cattle and milk are the focal points of a complex institution, the guru, consisting in prestigious fattening sessions enabling

male individuals to demonstrate a valued physique and an esteemed social role, while taking care of the herd and participating in recreational activities.

There are two types of fattening sessions (Figure 1). One is collective (the guru), the other (the *guru walla*) is individual and results in one of the highest caloric intakes ever recorded in a non-experimental situation (Table I). In this paper we shall use the term guru to designate the institution and *gurna* for the participants in the collective guru. *Gor walla* designates the candidate of the individual guru.

FIGURE 1 Left — participant in the individual *guru* (B., 103kg); right — participant in the collective *guru*.

TABLE I

Examples of schedule and feeding bouts of S. during two days in the 4th week of a 2-month fattening session (*guru walla*), 7–14 September 1976, village of Kogoyna, Massa, North Cameroon

Day	Hour	Sorghum loaf	Relish	Sorghum porridge mixed with water	with milk	alone	Gruel	Total consumption	Activities
		g/day							
1st	05.10								Milking cows
	05.55								Washing
	06.10	710	278a					988	Eating
	08.00								Defecating
	08.10			1,298				1,298	Eating
	11.50				1,174			1,174	" (vomited)
	16.00								Defecating
	16.05				1,572			1,572	Eating
	19.10					150		150	Eating
	19.20								Defecating
	20.10						1,310	1,310	Eating
	21.52	813	213b					1,026	Eating
	22.45								Defecating
	23.15				1,328			1,328	Eating
	23.45				1,650			1,650	Eating
	04.00					37		37	Eating
	04.10								Defecating
	04.15			1,250				1,250	Eating
Daily total =		1,523	491	2,548	5,724	187	1,310	11,783	

7th	06.03						1,634	1,634	Eating
	06.42								Milking cows
	07.06	800	243c					1,043	Eating
	08.02					236		236	Eating
	08.05								Defecating
	08.30			1,730				1,730	Eating
	11.12				1,911			1,911	Eating
	14.19			2,316				2,316	Eating
	16.19				1,961			1,961	Eating
	18.01						1,804	1,804	Eating
	19.26	850	210d					1,060	Eating
	21.13			2,106				2,106	Eating
	21.30								Defecating
	23.22				1,443			1,443	Eating
	02.50			1,410				1,410	Eating
	04.30				1,392			1,392	Eating
Daily total =		1,650	453	7,562	6,707	236	3,438	20,046	

Composition of relishes	a	b	c	d
Dried fish	×	×		
Fresh leaves	×	×	×	×
Butter			×	×
Salt	×	×	×	×

The focus of this article is the nutritional effects of the institution and some of the questions it elicits in terms of biological adaptation. The general practices are briefly described, reference being made to some of the sociocultural aspects touched upon in previous publications (de Garine, 1964a; 1964b; 1980; 1984a; 1984b; Garine and Koppert, 1988).

Methodology and Field Problems

This paper, the fruit of collaboration between an anthropologist and a nutritionist, is part of a longitudinal study of the food system of the Massa of Cameroon which began in 1976. General ethnographic data on the Massa have been gathered through participant observation, interviews, questionnaires and the analysis of oral literature since 1958. Data on food intake and related anthropometric measurements, as well as nutritional and anthropologic aspects of food production and consumption, social organisation and symbolic systems in relation to food were obtained during 28 months of field work in 1976, 1980, 1983, 1985, and 1988 (Koppert, 1981; de Garine and Koppert, 1988).

Data on food intake were chiefly gathered in 1976 over a calendar year (January to December) and in 5 months of 1980 (September-January). The year 1976 was a plentiful one so far as food was concerned, and 1980 was a difficult one.

The village of Kogoyna, on which the guru study centred, consists of 57 compounds and, at the time of the study, counted 327 inhabitants. A group averaging 20 males participated in successive guru sessions which took place from 1976 to 1980. This activity was interrupted until 1986 for mourning reasons and because of lack of appropriate drums. In 1976 participants from the village of Kogoyna, and those of the camps of Dabana-Kélé and Grum, respectively neighbouring quarters of the villages of Nouldayna and Massa Kuduwayta, were included in the study, neighbouring communities that constantly mingle in daily life as well as for the guru sessions. In 1980 the study was limited to the Kogoyna camps.

In 1976 only one participant to the individual guru was observed in Kogoyna and one other who lived in the village of Grum, which remained accessible during the flood period, at the precise time this practice takes place.

Anthropometric measurements, weight, height, mid-arm circumference and triceps skinfold thickness, were taken according to techniques proposed by Jelliffe (1966). Subjects were weighed in their underwear (pants) on scales accurate to 100 g. Height was measured to the nearest 0.1 cm. Mid-arm circumference was measured half-way up the left arm with a non-expanding tape accurate to 1 mm. Triceps skinfold was obtained using a Harpenden caliper at the same point as the upper arm circumference, accurate to 0.1 mm. Food intake was measured by weighing the food on a scale accurate to 1 g. In the case of the individual guru studied, it was possible to weigh all ingredients before and after cooking over a period of one week (7-14th August 1975). For the remainder of the fattening sessions intake was evaluated by questioning the participant. For the collective guru all food eaten in each of the three camps studied was weighed during a week. Individual rations were calculated by dividing the prepared meal by the number of persons present. Food eaten outside the camp was evaluated through daily questioning of the participants. In both cases, knowledge of the capacity of the cooking vessels utilised increased the validity of the evaluation of the food eaten away from the camps. In 1980 the food of the collective guru was weighed over a week both in and outside the camp before and after cooking. The results are expressed *per capita* assuming that all the gurna take an equal share. At the village level, male adults

constitute a coherent sharing group. For study purposes average individual intakes were assumed to be equivalent and were obtained by dividing the common food ration by the number of consumers.

Analyses were made of the main staple, red sorghum (*Sorghum caudatum*). For nutrient composition of other foods taken FAO food composition tables (1968) were used.

RESULTS

The Individual Fattening Sessions

General description. The guru walla, literally the "guru of the leisure period corresponding to the second part of the rainy season" takes place between August and October; it lasts about two months. The Massa language is clear as to the aim of the practice: one does not "enter" the guru walla, one "eats" it (*ti guru walla*). It is actually an intensive fattening session, organized on the initiative of the head of a household, generally a father wishing to give a boost to his son. It provides him opportunity to demonstrate his own prosperity in terms of "conspicuous consumption" during the period of the year when cereals are scarce; sufficient quantities of red sorghum must be available and enough lactating cows in order to feed the candidate. The participant (gor walla — "child of the walla") is sent to a "godfather" (*payna*) who may be a relative on his father's or his mother's side, an affine (in the case of S., his sister's husband) or even a friend. He may stay in his father's house or his own home but he should reside in a friendly household where he will nonetheless feel compelled to respect the heavy unpleasant feeding discipline imposed.

The host provides an empty hut where the gor walla spends most of his time in seclusion, often naked. He is supposed to come outside only to defecate and to milk his cows, usually under the supervision of his godfather to ensure that nothing materially or magically dangerous comes close to him. One of the host's wives is in charge of feeding the guest, offering him abundant quantities of cereal flour, mostly red sorghum prepared in a variety of ways, milk and a share of items, such as the relishes, which are part of the family diet, plus other delicacies especially obtained for him. Among the Massa the basic dish (*funa*) is sorghum flour mixed with salted, boiling water into a thick porridge moulded into oval-shaped loaves. Diluted with water or milk, or consumed with a relish, they constitute the gurna diet (Figure 2). The gor walla is forbidden to smoke, to drink alcohol, to chew kola nuts, to eat sour foods and to have sexual intercourse.

A rather painstaking gorging period begins, lasting about two weeks. The candidate is first supposed to cleanse his bowels and make room in his stomach for his forthcoming heavy intake. He is administered bitter roots of the desert date (*Balanites aegyptiaca*) and other wild trees (*Gardenia erubescens, Swartzia madagascarensis, Sterculia Sp.*) to make him vomit, and is made to ingest sour milk, or water mixed with fingermillet flour (*Eleusine coracana*) or bulrush millet flour (*Pennisetum Sp.*), all of which induce heavy diarrhea. He is then offered the meat of a chicken or a goat which has been killed ritually, in order to become as fleshy as they were. Thereafter he receives food about eleven times per day from 6 o'clock in the morning until 4 o'clock at night (am). The general feeding sequence is as follows:

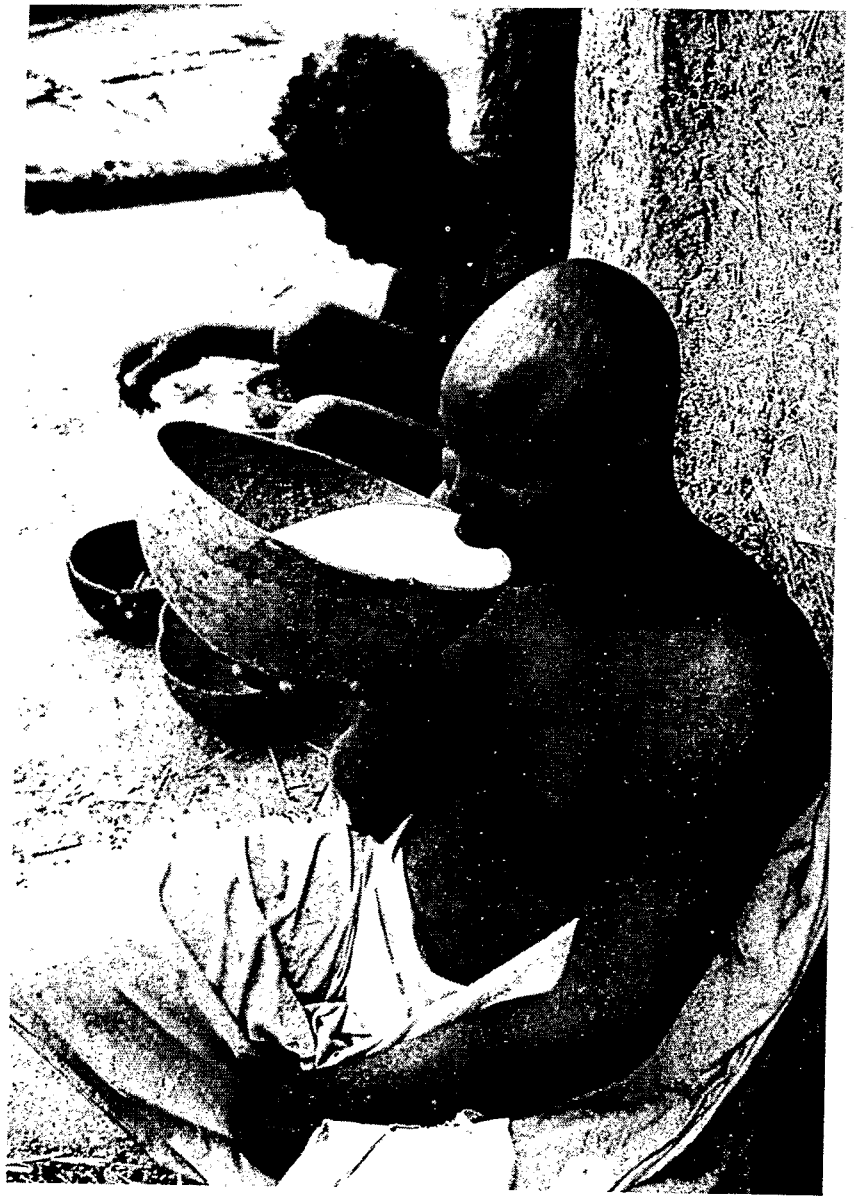

FIGURE 2 S. gorging on milk at the end of the fattening session, November 1976.

06.00 to 07.00 h.	Porridge made from sorghum loaf leftovers mixed with water
08.00 to 09.00	Porridge made from sorghum loaf leftovers mixed with water
10.00 to 11.00	Porridge made from sorghum loaf leftovers mixed with water
11.00 to 12.00	Thick sorghum paste and relish
13.00 to 14.00	Milk, or sorghum loaf mixed with milk
15.00 to 16.00	Porridge made from sorghum loaf mixed with water
16.00 to 17.00	Porridge made from sorghum loaf mixed with water, or milk
18.00 to 19.00	Sorghum loaf and relish
19.00 to 21.00	Porridge made from sorghum loaf mixed with water
21.00 tp 24.00	Porridge made from sorghum loaf mixed with water, or milk
01.00 to 04.00	Milk or gruel of sorghum flour mixed with milk

The feeding bouts are punctuated by a good deal of vomiting, farting, defecating and urinating. The "patient" has to remain idle in order to save energy and grow fat more quickly. Eating is compulsory, he is urged to eat until he is on the verge of vomiting. During the first days he feels sick and has to remain very still with his head erect in order to avoid bringing up what he has ingested. He may even be asked to swallow back what he has spilled. He then gets used to overeating. The whole operation is considered to be painful, dangerous both physically and magically, and should not be performed in front of strangers.

Food intake. We were able to observe the session of one candidate, to weigh his food intake night and day during one week and to estimate it by observation and questioning for the rest of the two-month period. Detailed weighing of the food consumed took place during the 4th week of the two-month session, when the gor walla was already accustomed to his diet, at the point where, as the Massa say, "the food (which is purposely bulky) had made room for itself" in the participant's body. Thus little vomiting occurred during this food-weighing period (see Table I).

The actual amount of food consumed is remarkably high, about 13 kg of processed food. It is supposed to make the body heavy and enable it to acquire a specific silhouette, with a protruding stomach, thick buttocks and a layer of fat harmoniously distributed over the rest of the body. These remarkable intakes are above the obesity induced experimentally by Sims *et al.* (1968a, 1968b, 1973). S., our subject, ingested over 13,000 kCal per day during the week of food quantification (Table II). His diet during the two months of his fattening session did not falter

TABLE II
Weight (g) of food items consumed by S. (18 year old male) during one week of a 2-month fattening session (*guru walla*), 7–14 September 1976, Kogoyna, North Cameroon

Day	Sorghum flour	Milk	Fresh fish	Dried fish	Fresh vegetables	Butter	Food kCal	Energy kJ
	g/day							
1	2,655	3,446	0	87	158	0	12,188	50,994
2	2,687	2,924	41	0	178	0	11,565	48,387
3	2,525	3,169	123	0	0	0	11,183	46,789
4	2,914	2,908	0	0	238	0	12,317	51,534
5	3,391	3,171	0	0	195	0	14,166	59,270
6	3,852	3,251	0	0	204	0	15,749	65,893
7	3,927	3,913	0	0	191	42	16,823	70,387
Average	3,136	3,255	23	12	166	6	13,422	56,157

and is likely to have averaged at least 10,000 kCal per day. The American volunteers observed by Sims *et al.* ingested from 7,000 to 10,000 kCal over a period of two hundred days, which is longer than the two-month session undergone by S., but the Americans only doubled their daily energy intake whereas the Massa gor walla ingested about four times more kilocalories than in usual daily life (Figure 3)

FIGURE 3 S. at the end of the fattening session, December 1976, 93kg.

The diet consisted of the Massa "superfood" [Jelliffe, 1967], red sorghum (*Sorghum caudatum*) and milk, which is the most highly valued animal product, as well as animal proteins (from fish and meat) and fat, all of which are prized elements in the diet. If we examine the nutrient composition of the regimen, we find that the subject receives mainly energy (from the sorghum flour), animal and vegetable proteins (from milk and sorghum), lipids (from milk) and calcium, phosphorous and iron (from sorghum and millet). Qualitatively, the main modification compared with the normal diet is the animal proteins and fats contained in the milk. (Table III).

The Massa perceive the whole process as a dangerous one. The fattening period in the host's compound should not exceed two months and must be finished before the stems of the red sorghum harvest are cleared from the fields in October, and before the seasonal increase in temperature makes the participant perspire indoors, for fear that he might die. The host has a heavy responsibility. Not only must his guest be provided with food galore and increase weight rapidly. He is also considered very vulnerable to sickness and bewitching by jealous people, good reasons for him to remain secluded. At the end of the two-month period, the gor walla is free to go back to his own compound or to join the collective gurna camps. Most often he goes visiting, well adorned and sprinkled with flour and milk. He attends social occasions in a wide range of villages and shows off his new figure, displaying his beauty and the prosperity of those who have helped him to achieve it. He is a striking sight, having gorged on food at a time when other villagers were hungry.

Weight variations. The anthropometric results are spectacular (Figure 4). The second participant, B., was kept indoors for two and a half months. His body weight went from 75 kg on 2 August to 109 kg (Figure 1) on 15 October, an increase of 34 kg, 45% of his initial weight. He was so heavy that he had to use a walking stick to lift himself from a sitting to a standing position. The case of S., the first subject, is more complicated. He first attended the collective guru and had already increased his weight from 64 kg on 30 May to 76 kg on 7 September, when his seclusion period began. By its end, 19 October, he had reached 85 kg. He went on overeating instead of parading and, at the end of our field mission, on 5

TABLE III

Average nutrients in the daily diet consumed by S. (18 year old male) during the 4th week of a 2-month fattening session (*guru walla*), 7–14 September 1976, Kogoyna, North Cameroon

		Sorghum flour	Milk	Fresh fish	Dried fish	Fresh vegetables	Butter	Total
Energy: (kCal)		10,631	2,571	23	53	99	45	13,422
(kJ)		44,480	10,757	96	221	414	188	56,157
Animal proteins	g	0	124	4	7	0	0	135
Vegetable proteins	g	216	0	0	0	7	0	223
Fat	g	97	156	0	2	1	5	261
Carbohydrates	g	2,399	176	0	0	20	0	2,595
Fibre	g	72	0	0	0	4	0	76
Ash	g	63	26	0	2	5	0	96
Calcium	mg	941	4,655	22	440	607	0	6,665
Phosphorus	mg	9,972	3,092	47	320	204	0	13,635
Iron	mg	490	33	0	2	7	0	532

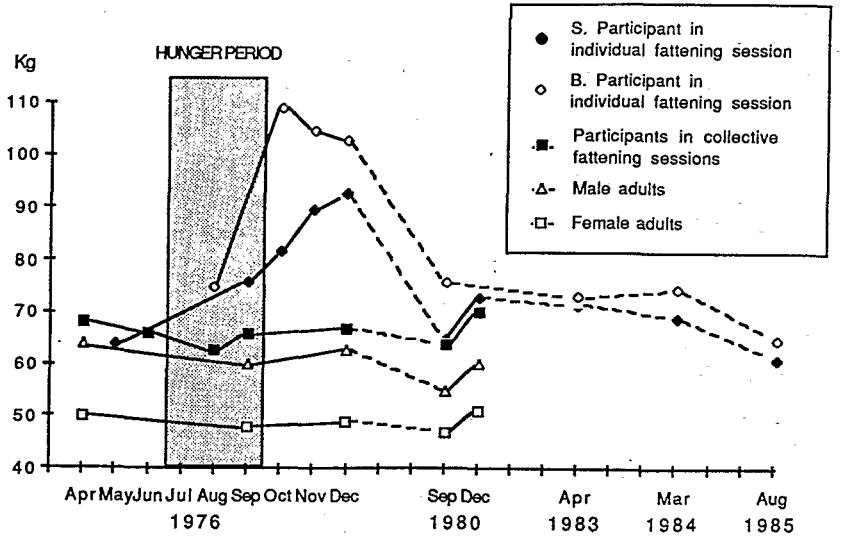

FIGURE 4 Body weight fluctuations of gurna participating in fattening sessions and non participating adult villagers among the Massa of Kogoyna (Cameroon).

December, he weighed 93 kg (Figure 3), an increase of 29 kg in 7 months, also 45% of his initial body weight. Both participants doubled their skinfold values (Table IV).

B. lost 6 kg in one and a half months, from 109 kg on 15 October to 103 kg on 5 December. We were unable to witness S's weight decrease. Four years later, in October 1980, when we again visited the village both B. and S. were back to their initial size and weighed 76 and 65 kg respectively.

The guru walla has the obvious effect of allowing the participant to sail through the general shortage period. The Massa profess that attending the guru walla has durable effects and that once they have been fat, the gor walla will, when given the opportunity, increase their weight more easily than other individuals. We have no evidence to back this view, but it is in line with remarks of Faust *et al.* (1978) regarding the effect of diet on the number and size of fat cells and the significance of these cells in development and treatment of obesity, suggesting that there is a positive correlation in the child. The Massa would thus appear to be attempting to induce the same result among adult males. All we can say is that in October 1980, S., who had gone back to his original body weight and was attending the collective guru after the hungry rainy season, increased in weight twice as fast as the other participants. He put on 10 kg in three months on the same diet but both of the former gor walla lost as much weight as other adults during the 1985 food shortage. S. went down to 61 kg (Figure 5) and B. to 65 kg.

S., who was an adolescent of 18 years and weighed 64 kg in May 1976 when he underwent the guru walla, weighed 72.6 and 68 kg respectively in 1983 and 1984 at similar periods of the year, and might be considered to have increased the set point of his body weight. This would be in line with Massa views, according to

TABLE IV
Anthropometric measurements of two participants in the *guru walla* over one decade, 1976–1985, Kogoyna, North Cameroon

Subject	Date	Height m	Weight kg	Arm Circumference (cm)	Skinfold measures Triceps (mm)	Biceps (mm)	Subscapular (mm)
S.							
1976	30.05	1.80	64	28	8.6	4	10.8
	30.08	1.80	75	29	14.6	6.2	14.6
	07.09	1.80	76	29.5	16.8	8	15.8
	15.10	1.80	82	31	23	9.8	26
	05.11	1.80	89	–	–	–	–
	11.11	1.80	90	–	–	–	–
	19.11	1.80	90	–	–	–	–
	05.12	1.80	93	34	–	10.8	29
1980	15.09	1.80	65	26.5	8	2.8	10
	09.12	1.80	73	27.5	8.9	2.8	11.9
1983	28.04	1.80	73	29.9	7	–	–
1984	26.03	1.80	69	29	6.3	3.0	–
[a]1985	21.08	1.80	61	25	3.3	2.8	–
B.							
1976	02.08	1.82	75	31	8.6	3.6	9.4
	15.10	1.82	109	36	–	9.8	21
	11.11	1.82	105	–	–	–	–
	19.11	1.82	104	–	–	–	–
	05.12	1.82	103	35.5	21	6.6	21
1980	28.10	1.82	76	30	6.1	3	9.5
1983	28.04	1.82	78	31.4	6.1	–	–
1984	26.03	–	74	30.5	5.4	3.1	–
1985	21.08	–	65	27.4	3.5	2.3	–

[a]Severe shortage period.

which the guru walla is supposed to give a permanent physical boost to the young men who take part in it.

Scope of the guru walla. Participants in the guru walla represent a small proportion of the male population. During our year of study (1976), the village of Kogoyna counted only one participant and the neighbouring village of Grum another. At festive gatherings in 1980 it was possible to record at most ten of them. We believe that for the whole county of Bougoudoum there must not have been more than 15 to 20 candidates from a total population of 10,000 individuals. In 1988 the proportion was similar. This small number does not seem to be a consequence of disaffection due to cultural change but probably has more to do with the high investment involved. Interviews of the male population show that less than 10% have attended the guru walla, and only a handful have done so more than once in their lifetime, although such a practice is recommended.

The guru walla, which cannot be dissociated from the collective guru, should not be considered a lonesome pursuit of fatness. The gor walla spends most of the rainy season in seclusion and sexual abstinence. He starts his fattening period before the early red sorghum blossoms and is supposed to return home before the stalks are

FIGURE 5 S. during the hungry rainy season of 1985, 61kg.

harvested (which might suggest a symbolic parallel). Once he returns home, he leads a much more active life, dresses beautifully, parades and dances on every social occasion and is at last allowed to take sexual advantage of his admired image. In most cases he joins the collective guru and appears as a star among the other participants. He is considered prosperous, handsome and, once he has lost some of his fat and become more mobile, a dangerous wrestler. In this respect the guru walla should be interpreted as a preparatory stage to the collective guru. Some of

the participants explicitly acknowledge the fact that they have undergone a prior session in order to overtake a wrestling champion in size and beat him during the coming year. This aspect of the ritual is also referred to in oral literature. It should be stressed, however, that although the guru walla may appear as a preparatory stage to wrestling through the increase in body weight of the contestant, he will be considered fit for competitions only after he has lost some of this excess weight. In the meantime he is judged to be short-winded and likely to hurt himself if he falls.

The Collective Fattening Session

General description. The aim of the collective guru is for the participant to take care of the cattle, and consume milk and sorghum porridge in order to achieve physical fitness, practising activities which will display that peak condition: grooming, singing, dancing and wrestling. Tending to the herd is, in itself, a prestigious occupation, as cattle form the basis of most status-conferring activities.

There are three seasonal categories: the first is the *guru sarmana*, "guru of a species of wild grass" (*Echinochloa stagnina*). This type of guru lasts from October to the end of February. The second is the *guru fata*, "guru of the sun," "of the hot season." It is also called "*guru wayna*, guru of the jujube tree" (*Zyziphus jujuba*), because it corresponds to the flowering period of this species. It lasts until the first rains in May. The third is the *guru tlagamna*, "the guru of the compound's fence" from May to July, corresponding to the main agricultural (weeding) period. Then the individual guru walla takes over for the lucky few involved. When it ends, a new cycle of collective guru begins. The Massa are therefore provided with an incentive to give attentive care to their cattle all year round. It is necessary to have lactating cows available, and the owner must be ready to divert, for human use, some of the milk usually intended for feeding the calves.

There are no restrictions based on kinship or residence with regard to participation in the guru. Although most members of a camp belong to the same patrilineal lineage, there can be relatives in the matrilineal line, or affines or friends from neighbouring, or even remoter villages. People may go to the village of their "best friend" (*banan wolla*), who is not necessarily a kinsman. In all events, they will have to conform to the strict discipline enforced by the guru camp chief and adopt a behaviour which contrasts conspicuously with the normally anarchic attitude of the Massa in daily life.

The main obstacle to partaking in the guru is mourning: it is forbidden to attend the guru for a whole year following the death of a close relative (in the paternal and maternal lines). Singing, dancing, flute and drum playing, as well as drinking milk are all forbidden during this period of *gudolta*.

Scope of the collective guru. The collective guru is open to all males above 10 years of age. There is no upper limit but most participants are between 15 and 30 years old. All men do not take part in the sessions each year. In 1958 we estimated the percentage of participants at about 7% of the adult male population. Evaluations made in 1976 and 1980-81 were similar. In the village studied intensively (Kogoyna), we counted between 20 and 30 gurna, of whom 6 were less than 15 years old. In 1980 and 1983, about 50% of the participants recorded in 1976 were again attending the collective guru, but the other 50% were new adepts. Systematic interviews showed that, in the course of their lives, most males have taken part several times in the collective guru, the exceptions being very low-ranking individuals, migrants, ex-slaves or people who are not completely fit,

physically or mentally. In practice, any average person can spend from two to six months (usually most of the dry season) at the guru. Some may spend even more time and some repeat the experience yearly.

It generally appears as a democratic institution in which most males have participated more than once in their life. Being "popular" is as important as being wealthy, it is conducive to borrowing cows or being invited to a collective guru camp.

Food intake. The nutritional results are less spectacular than in the guru walla but they concern a much larger group of participants.

The feeding schedule of the gurna is different from that of the villagers and is attuned to cow milking as follows:

05.00 h	Thick sorghum porridge, leftovers from the previous day's supper
06.00	Cow milking
07.00	Snack, maybe some fish
06.30 to 09.00	Some gurna visit their homes and have a snack
12.00	Sorghum porridge mixed with the morning's milk, if available, otherwise served with water or relishes. About half gurna take some food in their homes
17.00	Snacking in the village with friends
18.00	Cow milking
19.00	Sorghum porridge mixed with some of the evening's milk, also thick sorghum porridge with relishes. Half gurna snack in the village
20.00	Sorghum porridge mixed with milk or water, according to availability.

Twice a day the gurna receive the normal staple food from their family, *funa* — sorghum loaf, and occasionally some relish. This staple, as well as the milk, is shared collectively by those present in the camp at mealtimes, the most conspicuous feature of the system. However, the gurna also eat outside the camp, in their own or neighbours' homes at mealtimes and, as a rule, take every available opportunity of snacking. They are expected to appear keen for food.

We were able to measure what the gurna ingest inside the camp. What they eat outside, in the village, has been estimated. In the three camps, milk and sorghum are the basis of the diet, with a rather sharp increase during the crop period. Fish is present in the diet, except during the second part of the rainy season when the rivers flood. The Massa, who use traditional fishing techniques, are unable to catch fish in the extensive inundated zone or in the deep waters of the river beds. Fortunately, at the same period, the high milk yield of the cattle helps to make up for inability to fish. Apart from this period, the food consumed in the guru camp is sufficient to cover nutritional needs, the energy intake (close to 3,500 kCal/day yearly average) is above the amount recommended by WHO/FAO/UNU (1985). If we add this amount to what is also eaten in the village, we reach rather high intake figures. It was observed that, on the average, the gurna only eat outside the camp every two days, which must be taken into account in assessing the daily intake figures.

In 1976, at all periods of the year, the diet of the gurna was more abundant than that of non-participating villagers of the same age (Table V). Nutritional benefits from the guru are noticeable as regards animal proteins during the rainy season, due to the high milk yield at that period. The harvest brings a large increase in the diet of both food energy and animal proteins, due to consumption of fish. Conversely, the lower amount of animal proteins taken during the dry season is the result of the poor milk yield.

TABLE V

Average daily food intake (g) in three *gurna* cattle camps (Kogoyna, Dabana-Kele, Grum), 1976, North Cameroon

	Intake/person/day							
	Milk		Sorghum Porridge		Fish	Meat	Food Energy	
	Morning	Evening	Morning	Evening			kCal	kJ
	g							
1st period N = 17 February–May	523	504	727	975	72	0	3,264	13,656
2nd period N = 22 June–September	737	932	0	803	0	46	2,488	10,409
3rd period N = 19 October–November	905	876	1,122	1,113	160	18	4,725	19,769
	722	771	616	964	77	21	3,492	14,610

Actually, milk is the original feature of the diet and the gurna consume most of the village's production (Table VI). It provides more animal proteins and far more lipids, a nutrient conspicuously low in the normal Massa diet. If the data are aggregated to obtain some annual averages, the following figures are obtained; the guru provides about 1,100 kC and 38 g of animal proteins per day above the ordinary usual diet (3,000 kCal), which means that the gurna widely exceed their nutritional needs according to WHO/FAO/UNU standards (*loc. cit.*) (Table VII). As compared to the villagers, the high level of vitamin A they consume probably comes from butter and milk, which also provide riboflavin and calcium. Iron is obtained from the large quantities of red sorghum consumed. The higher intake of vitamin C by the villagers is possibly due to increased consumption of vegetable relishes prepared by the women to accompany ordinary meals.

In 1980, after a bad rainy season, the benefit from the guru diet was higher than that obtained in 1976: 1,400 kCal and 57 g of proteins (Table VIII). It should be kept in mind that the Massa as a group score well nutritionally in comparison with other Sudano-Sahelian groups. According to WHO/FAO/UNU standards (*loc.cit.*), the villagers cover their nutritional needs and the gurna are constantly above them (Koppert, 1981).

Anthropometry. The anthropometric results are limited to height, weight, arm circumference and the subscapular skinfold, which are the most reliable data obtained in the field. Fifteen groups from the village of Kogoyna were measured at various periods of the year during 1976, 1980 and 1983 (Table IX). They do not all represent the same sample, as some individuals were not available for observation at every period. In most samples, height and weight are correlated as well as weight and arm circumference (Table X). Fewer significant differences were found than had been expected, but this is a consequence of the small size of the sample and high variance in the measurements, which were not always taken by the same experimenter.

Seasonal variations of the data are present in each type of population but they are not significant statistically, especially as regards 1976, which was a good year so far as food was concerned. In 1980 significant differences in skinfolds and arm

TABLE VI
Daily amount of milk drunk per capita by *gurna* as compared to other male villagers, 1976, Kogoyna, North Cameroon

	Average/g/person/day					
	Dry season February–May		Rainy season June–December		Harvest season October–December	
Gurna	N = 17	1,027	N = 22	1,669	N = 19	1,781
Villagers	N = 27	34±99	N = 27	89±160	N = 27	17±76

circumferences were observed between the end of the shortage period (October) and the abundance period (December) among the gurna, but not among the villagers; the gurna appeared to catch up faster. Taken as a whole, the gurna were constantly heavier than the villagers (Figure 4). Weight correlated with skinfolds in 1976 and with height and arm circumferences in December 1980. However, the anthropometric measurements do not reflect the sizeable nutritional advantage mentioned above and its conversion into fat. The gurna may become more muscular than the villagers, as suggested by their avowed specific activities.

Time schedule and energy expenditure. It was not possible to carry out a detailed energy expenditure study of the gurna. The data collected bear on the general schedule of individuals over half-day periods, enough to visualise them roughly as active, mildly-active or inactive people. Although these observations do not allow physiological interpretation, they are sufficient for a qualitative comparison of the activities of the gurna with those of the villagers (Table XI).

The time schedules show clearly the influence of seasonal tasks. When the time comes for house-building, both villagers and gurna participate; the same applies to agricultural tasks. The gurna do not appear to have much more leisure time than the villagers, nor do they have more outside contacts, as we originally thought. The main difference lies in activities related to cattle and fishing. The gurna concentrate on the cattle and the villagers on fishing. Data available are not sufficiently precise to corroborate the traditional Massa opinion that the gurna spend a large portion of their time dancing and wrestling, or the hypothesis that these high energy-consuming activities play an important part in keeping down their fat stores and making them more muscular. They are far from expending as much energy as do European sportsmen on training and competition. A good Massa wrestler seldom competes more than ten times per year and the intensive dancing sessions rarely exceed twenty. In order to provide an estimation, it could be assumed that a gurna spends at most one month per year in active behaviour, hardly enough to melt away the caloric surplus he should be steadily storing. In this respect the guru and especially the guru walla appear to offer good opportunities to verify hypotheses concerning "luxus consumption" (Ravussin *et al.*, 1985; Miller and Mumford, 1971).

The small anthropometric differences between gurna and villagers of the same age group are likely to be accounted for by the fact that the collective guru consists in a succession of temporary sessions in which most Massa males have participated. It should therefore be interpreted as a democratic practice which provides a nutritional advantage to all the masculine population between 15 and 40 years of age

TABLE VII
Average daily energy and protein consumption of *gurna* and other male adult villagers (15–39 years old) 1976, Kogoyna, North Cameroon

	Average period		Shortage period			Crop period			Yearly average N = 19		
	February–May N = 17		June–September N = 22			October–December N = 19					
		Protein (g) animal	vegetable		Protein (g) animal	vegetable		Protein (g) animal	vegetable		Protein (g) animal	vegetable
Gurna in camp												
kCal	3,264	53.0	48.0	2,488	66.0	22.0	4,725	102.0	63.0	3,492	74.0	44.0
kJ	13,656			10,409			19,769			14,610		
Gurna in village												
kCal	564	10.0	13.0	736	7.0	17.0	600	9.0	14.0	633	9.0	15.0
kJ	2,359			3,079			2,510			2,648		
Total												
kCal	3,828	63.0	61.0	3,224	73.0	39.0	5,325	111.0	77.0	4,125	83.0	59.0
kJ	16,016			13,489			22,279			17,259		
Male adult villagers	N = 27			N = 27			N = 27			N = 27		
kCal	3,090	57.0	71.0	2,970	30.0	70.7	3,090	47.0	73.0	3,050	45.0	72.0
kJ	12,928			12,426			12,928			12,761		
Gurna food advantage												
kCal	738	6.0	−10.0	254	43.0	−32.0	2,235	64.0	4.0	1,075	38.0	−39.0
kJ	3,087			1,062			9,351			4,495		

TABLE VIII
Comparison of per capita nutrient intakes, *gurna* and villagers, harvest period, October–November 1980[a], Kogoyna, North Cameroon

		Gurna N = 12	Villagers N = 154	*Gurna* benefits
Energy: (kCal)		3,990	2,559	1,431
(kJ)		16,694	10,706	5,987
Protein	g	149	92	57
Fat	g	95	32	63
Carbohydrates	g	676	516	160
Fibre	g	18	22	4
Ash	g	32	22	10
Calcium	mg	2,398	773	1,616
Phosporus	mg	4,252	3,502	750
Iron	mg	127	33	94
Retinol	ug	2,017	491	1,526
β-Carotene	ug	2,790	2,350	440
Thiamine	mg	288	249	41
Riboflavin	mg	440	132	208
Niacin	mg	114	27	87
Vitamin C	mg	19	43	−24

[a]An unfavourable year.

and keeps them fit. It helps growing adolescent subjects, often involved, to reach their total physical development.

DISCUSSION

Nutritional Aspects

Against a background of food insecurity and recurrent seasonal food shortage, the collective guru provides noticeable nutritional benefits to the individuals taking part in it. It allows them constantly to accumulate moderate fat stores which can be expended during the hungry and busy rainy season. During the same period it gives the participant access to a diet in which food energy and proteins are more abundant. ... But does it deprive the other biological categories of the population?

Comparison with a similar society undergoing the same environmental stresses and differing only in that it does not practise the guru would help to enlighten this point. Observation of their neighbours, the Moussey, might answer this question. Not only do the latter live close to the Massa, they possess the same technical assets, reach more or less the same nutritional level and have only recently taken to cattle herding and the guru. Therefore the Moussey villages of Bigui and Goulmounta, which do not practise the guru, may be compared with the Massa village of Kogoyna, which does.

Does this institution provide a specific advantage to the Massa as compared with their neighbours? Analysing the 1983 figures, Froment (1984) observed that, considered as a whole, there are no significant differences between the Massa and the Moussey masculine populations. Does the fact that the gurna have privileged access to milk and large amounts of sorghum have a negative influence on the nutritional status of other categories of the population? Froment showed that among the Massa the difference between generations in height, weight, arm circumference and

TABLE IX
Anthropometric indices among *gurna* and other adult male villagers, 1976–1983, of Kogoyna, North Cameroon

	Sample number	Date	N =	Height mm	Weight kg	Arm circumference (mm)	Subscapular skinfold (mm)
Gurna	1	01.05.76 A[a]	13	1753.5±16.8	68.1±2.3	280.8±4.7	8.3±0.3
	2	30.05.76 A	12	1739.6±19.0	65.8±2.1	283.8±5.7	8.5±0.6
	3	21.06.76 A	13	1755.6±20.0	65.7±1.7	279.6±5.6	9.0±0.4
	4	02.08.76 L	10	1729.0±33.3	63.3±3.0	269.0±6.9	9.2±0.7
	5	01.09.76 L	17	1739.4±15.7	66.0±1.8	277.4±4.8	8.3±0.4
	6	31.12.76 H	13	1750.0±25.9	67.3±2.4	283.1±6.4	8.7±0.6
	7	21.09.80 H	7	1798.9±32.3	64.1±3.1	262.1±8.3	6.4±0.4
	8	09.12.80 H	11	1792.4±19.1	70.4±2.3	293.2±3.6	8.1±0.4
	9	28.04.83 A	17	1780.9±10.7	66.5±1.3	287.8±4.3	6.3±0.7
Adult male villagers	10	10.04.76 A	18	1735.4±11.6	64.2±1.3	277.3±3.6	7.1±0.2
	11	02.09.76 L	12	1721.3±13.7	60.3±1.7	269.0±4.8	6.9±0.3
	12	03.12.76 H	19	1723.9±10.6	62.6±1.4	280.5±3.5	6.8±0.2
	13	05.09.80 L	8	1728.8±12.0	55.4±2.3	265.0±9.2	6.7±0.4
	14	18.12.80 H	13	1740.0±12.1	60.6±1.7	268.1±6.5	7.3±0.3
	15	24.04.83 A	51	1759.3± 7.4	61.3±1.0	279.9±3.3	5.1±0.3

[a]General availability of food: L = Low, H = High, A = Average.

TABLE X

Statistical analysis, anthropometric measurements, gurna and other adult male villagers, same age categories, 1976–1983, Kogoyna, North Cameroon

Year	1976 all periods	1980 September	1980 December	1983 April
Height	NS[a]	NS	*	NS
Weight	**	*	**	**
Arm circumference	NS	NS	**	NS
Subscapular skinfold	***	NS	NS	NS

[a]Significance levels of *t*-test: NS P>0.05, S* 0.01<P<0.05, HS** 0.001<P<0.01, VHS***P<0.001.

TABLE XI

Time schedule of *gurna* and other male villagers (16–39 years), during three main periods of the year 1976, Kogoyna, North Cameroon[a]

	February–May		June–September		October–December		Average	
	Gurna Villagers		*Gurna* Villagers		*Gurna* Villagers		*Gurna* Villagers	
	N = 17	N = 27	N = 22	N = 27	N = 22	N = 27	N = 19	N = 27
	%							
Activity								
Cattle tending	20	4	35	5	29	9	28	6
Fishing	8	24	0	29	12	28	7	27
House building, basket work	33	33	1	5	6	8	13	15
Cultivation	0	1	33	38	2	2	12	14
Outside contacts	13	13	18	12	19	28	17	18
Leisure	22	19	11	11	27	23	20	18
Other activities	4	6	2	0	5	2	4	3

[a]Figures may not add to 100% due to rounding.

subscapular skinfold is more conspicuous (and statistically significant) than among the Moussey (Table XII). Although the Massa men are taller and heavier than the Moussey between 20 and 34 years of age, the reverse is true between ages 35 and 64, when the Moussey men score better than the Massa. This shows that the Massa, although they have undergone fattening sessions, revert to a rather lean body type once they have passed the age of taking part in the guru. When they reach the 35 to 64 year range, they seem to have a lower physical status than the Moussey.

With respect to the female populations, Froment observed that the Massa women are shorter, lighter and have a smaller arm circumference and subscapular skinfold than their Moussey counterparts, especially among those 35 to 64 years of age (Table XIII).

Many factors are involved in explaining the lower physical score of the Massa women as compared to the Moussey, such as the division of labour, women's status, and food availability as a whole. It must be admitted, however, that among the Massa the categories of the population who do not partake in the guru institution

TABLE XII

Anthropometric comparison of Massa and Moussey male age groups, 1983, North Cameroon[a]

		20–34 years	35–64 years	*t*-test[b]
Massa		N = 21	N = 24	
Height	cm	178.2± 4.8	174.3± 6.0	*
Weight	kg	67.3± 5.8	58.7± 6.4	***
Arm circumference	mm	296.4±12.9	274.7±16.0	***
Subscapular skinfold	mm	5.7± 2.7	4.7± 1.1	NS
Moussey		N = 29	N = 20	
Height	cm	175.1± 4.8	174.4± 5.9	NS
Weight	kg	62.7± 5.7	60.6± 7.4	NS
Arm circumference	mm	283.1±16.2	272.9±24.0	NS
Subscapular skinfold	mm	5.2± 1.5	5.5± 1.4	NS

[a]Adapted from Froment, 1984.
[b]NS P>0.05
S* 0.01<P<0.05, HS** 0.001<P<0.01, VHS*** P<0.001.

TABLE XIII

Anthropometric comparison of Massa and Moussey female age groups, 1983, North Cameroon[a]

		Massa (A) 20–34 years N = 25	Massa (B) 35–64 years N = 10	Moussey (C) 20–34 years N = 29	Moussey (D) 35–64 years N = 17
Height	cm	163.0± 5.6	158.6± 5.3	164.5± 5.9	163.4± 6.5
Weight	kg	50.4± 5.9	42.8± 6.4	53.7± 5.8	53.5± 7.8
Arm circumference	mm	263.8±18.7	247.4±16.9	270.2±16.0	279.9±24.4
Subscapular skinfold	mm	8.6± 3.3	8.0± 4.1	9.8± 3.8	11.3± 4.8
		t(A)×(B)[b]	*t*(C)×(D)	*t*(A)×(C)	*t*(B)×(D)
Height	cm	*[c]	NS	NS	NS
Weight	kg	***	NS	NS	***
Arm circumference	mm	*	NS	NS	***
Subscapular skinfold	mm	NS	NS	NS	NS

[a]Adapted from Froment, 1984.
[b](A)×(B) = Massa 20–34 yrs × Massa 35–64 yrs, etc.
[c]Significance levels of *t*-tests; NSP>0.05, S* 0.01<P<0.05, HS** 0.001<P<0.01, VHS*** P<0.001

seem to have lower anthropometric values than corresponding groups among the Moussey. The fact that the Massa as a whole enjoy a slightly better-balanced diet than the Moussey, consuming more animal proteins (fish and milk), suggests that the effect of the guru on the food distribution system of the Massa may bear some responsibility for the lower nutritional status of some of the population.

Is this institution, therefore, contributing to the biological success of the Massa as a population? In terms of natural selection, it may not matter much whether the older part of the population is partially deprived of certain foods, but what benefit

is there in overfeeding young men as would-be warriors when there are no more wars to be fought? Their physical fitness is not used for productive activities from which everyone benefits, other than herding, which is a low-energy activity anyway. Is there any biological justification to possible jeopardization of the fitness of the women, and indirectly that of their children, who bear the bulk of the reproductive capacities? As a matter of fact there is a high incidence of child mortality among the Massa: in 1980 in Kogoyna it was 46% (of which 11% were abortions and still-births [Koppert, 1981]). Among the Moussey, in 1977, in the village of Gobo the figures were 26% and 3%. But interpreting this as a cause of the difference is only a hypothesis, as so many factors are responsible for child mortality. It should also be noted that these figures are not completely comparable as the data concerning the Massa were gathered in the field and those for the Moussey were compiled from records of a rural dispensary.

Genetic Aspects

The benefit derived from the guru by the Massa population may well be genetic, by breaking the isolation of the residential group and putting potential genitors in peak condition, making them desirable mating partners.

Indirectly, it makes for careful attendance to the cattle, which represent the possibility of securing a wife through the traditional bridewealth payment. Directly, as acknowledged by the participants, it enables them to multiply their opportunities for sexual intercourse. Training activities in the camp are unambiguous in this respect. Songs focus on favourite cows and mistresses. Dancing, grooming and wrestling activities are directed towards eliciting admiration from the population and love from the female portion.

It is difficult to ascertain whether successful gurna have a more numerous descendance than the rest of the population. According to traditional rules, illegitimate children belong to the husband, who takes on the responsibility of bringing them up. When the time comes he provides the bridewealth for the marriage of a son and receives it for the wedding of a girl. In the latter case, however, he is obliged to offer one animal (*puta yuna*, "the cow of the penis") to the true genitor. If he fails to comply, the young bride will be barren and soon divorced by her husband, so, in practice, acknowledging illegitimate children is an economic loss in the case of a girl. An illegitimate boy will not be favoured by his official father when the time comes for him to need bridewealth in order to get married. This is one of the reasons it is extremely difficult to identify illegitimate children and verify objectively whether the gurna have more offspring than other males. The hypothesis is raised that young men taking part in guru sessions outside their residential exogamic group are provided with opportunities to meet women with whom they can have sexual affairs. This is abundantly suggested by gurna biographies which refer to many successes and the fact that they met their wives while participating in guru camps or in social festivities outside their own village. However, the time schedule data show that the gurna do not have more external contacts than ordinary villagers who also frequently take part in festivities outside their community. The gurna's advantage seems to be that they appear as more desirable sexual partners than ordinary villagers.

A complementary hypothesis may be raised. The gurna, by spending most of their time, and especially their nights, outside their households, allow freedom to the female members of their own family group and sexual opportunities for other attractive visiting men. This view is reinforced by the general loose attitude of the

Southern Massa towards sex, which is conspicuously demonstrated by a system of official lover-mistress relationships (*banna/ciletna*) paralleling the ties established by marriage. Most wives have official lovers acknowledged by their husbands who, in turn, are the sweethearts of other married women. In this respect the guru institution can be regarded as contributing to the biological success of the Massa as a whole, not only by providing desirable males in peak physical condition with opportunities to spread their genes but also by allowing more sexual freedom to the women. In both cases it contributes to increasing the genetic variability of the population and ultimately its viability and fertility, although the negative aspect exercised by sexually transmissible diseases has to be recognized.

What use is there in increasing, by means of the guru, the circle of sexual partners and providing the highest rate of mating opportunities to the best genitors (according to cultural criteria) if the mothers are underfed as a consequence of the same institution? Are the benefits of the guru, as we have already suggested, purely socio-cultural, symbolically rewarding but hardly contributing to the biological adaptation of the population?

Limitations of Biological Data

Nutritional and anthropometric data are all we can use to assess biological fitness associated with the collective guru. Demographic data on a population where no valid census is available make it difficult to draw conclusions between increased longevity and the guru practice. The equipment available in the field did not allow us to conduct investigations on work capacity and other physiological measures associated with fitness.

In relation to the individual guru walla, it was not possible to investigate the physiological aspects of the fattening process such as potential "luxus consumption" or negative effects such as those occurring among Sumo wrestlers (Kuzuya, Akanuma and Kosaka, 1975), or to demonstrate whether being overweight in a society where it is valued carries less pathological consequences than in modern urban civilisations.

However, crude and fragmentary as they are, observations of the guru walla draw attention to an exceptional fattening performance obtained in non-experimental conditions and should be considered preliminary to more detailed and precisely focused studies. They also point to the need for close collaboration between the social and biological sciences if a satisfactory multi-level explanation is to be found for such a complex phenomenon as the Massa fattening sessions.

Psychocultural and Biological Aspects

This paper does not focus on the socio-cultural (emic) aspects of the guru and its symbolic significance, which is high. Some of these aspects, however, indirectly contribute to the biological adaptation of the Massa population and should be briefly mentioned.

The guru is a multi-purpose institution, something like what M. Mauss (1950) would have called a "*fait social total*," mobilising many areas of the Massa culture. It is centred on the most valued asset of the culture — the lactating cow — giving access to most prestigious activities. It encourages eating the best food (especially milk) in a society where satisfying nutritional needs is not always easy and is subject to sharp seasonal variations (Garine and Koppert, 1988). It values fatness as a sign of strength and equanimity and as an element of beauty. Being overweight is also

seen as an attribute of economic prosperity and supernatural protection, bestowing a feeling of well-being. In psychosociological terms, the guru is a rewarding experience, enabling participants to reach a higher physical and social status than in normal life and training them during the sessions to be disciplined and good natured, thus favouring social integration. It provides members of the older generation, who have themselves been gurna, with the opportunity to help the younger generation by enhancing their physical and social status. At the same time, the elders reinforce their own economic prestige within the society. It expresses cohesion between the male age strata and egalitarian tendencies rather than a concern about establishing a limited permanent elite. In the framework of a rapidly modernising nation such as Cameroon, the guru remains, for the Massa, one of the last devices for self-appraisal according to genuine cultural values.

More specifically, it might be considered that, by providing the gor walla with a choice diet during the food shortage period, the Massa society is attempting to challenge symbolically the hazardous food situation, and to comfort itself by asserting the fact that prosperity and nutrition are dependent as much on cultural factors (which can be controlled) as on blunt ecological constraints (which cannot). The paradoxical organisation of the institution, aimed at providing food abundantly to those who do not need it most, even during the shortage period as far as the guru walla is concerned, instead of favouring the vulnerable groups who physiologically require it, is well in line with man's tendency to fulfil his cultural goals at the expense of his optimal biological adaptation (Durham, 1976; Ruyle *et al.*, 1977). But we should not be too hasty, and discard the guru as a pleasurable cultural activity having no positive effect on the reproductive success and biological fitness of the population considered as a whole. If it seems to penalize the nutritionally vulnerable groups, it is at the same time well accepted by the women, who appreciate the "bloom" of their brothers, sons and lovers, which confers a feeling of well-being to the whole society.

Lately physiologists have been focusing on stress, its physiological consequences and on psychosomatic interference. They suggest that mental threats are not without physical consequences, although objective biological measurements are not yet available to demonstrate it with a high degree of specificity (Harrison, 1982a; 1982b; James *et al.*, 1985; Jenner *et al.*, 1987). If this is true, the reverse also applies. One might be tempted to hypothesise that, besides the immediate nutritional benefits it confers on the participants and notwithstanding its hypothetical detrimental effects on the women and older generations, the guru could appear as a practice which keeps the gurna and, possibly, those who are proud of them (most of the society) in high spirits, dynamic and prone to social contacts and communications. In contrast, many other groups of Northern Cameroon have surrendered their cultural pride to the overwhelming "Fulani-Muslim" civilisation, have a dull social life and are in demographic decline (Podlewski, 1966, 1971; Garine, 1978). This not the case for the Massa.

Would it be adventurous to imagine that their guru institution, by boosting cultural values, comforting them in the face of natural environmental threats, diminishing social stress, and creating a general feeling of psychological well-being, may ultimately have a positive influence on the biological fitness of the whole Massa population?

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THE DIETARY HABITS OF A GHANAIAN FARMING COMMUNITY

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This case study examines the specific techniques associated with household food processing and meal preparation, and the consumption patterns of the food farming people of Ayirebi, near Akyem Oda in southeastern Ghana. Changes and continuities in household dietary patterns are noted. Such micro level ethnographic studies of food processing and consumption are relevant for effective policy recommendations on development planning, particularly in light of current socioenvironmental and economic crises in Africa.

KEY WORDS: diet, ecology, change, food preparation, Ghana, West Africa

INTRODUCTION

Food economy is one of the most significant sectors of a nation's economic development plan. Every society has developed indigenous ways of conducting activities connected with meeting food requirements. How food is acquired, which foods are selected for consumption, how they are prepared for eating, who eats them, with whom, when, how and in what quantity they are eaten, all constitute practices developed throughout the history of a society as it adapts to its social and physical environments (Okere, 1983; Fieldhouse, 1986). Social, cultural, technological, economic and ecological factors or pressures all interact to influence dietary behaviour significantly. The idea that food habits are among the oldest and most deeply entrenched beliefs of many cultures and therefore extremely difficult to change may not be wholly accurate (Omolulu, 1972). Food habits are dynamic and adaptive in nature. Even when people show a preference for or a tendency to cling to traditional foods and reluctance to substitute new staples for the old, such preferences or choices as not restricted. Dietary habits are subject to constant evolution, and spontaneous change may be observed at any time (Lewicki, 1974; Harris and Ross, 1987).

Lewicki (1974) has pointed out that West African foods in medieval times (before the 15th century AD) consisted of locally produced root crops, cereals and vegetables (yam, sorghum, millet, beans, watermelon, peas, date palms, onion, garlic), seeds of wild grasses and fruits of trees. Animal husbandry (poultry, sheep, goats and beekeeping), hunting and fishing provided meat, milk, honey and fish for household consumption. The local food crops, rich in carbohydrates, protein, minerals and vitamins, had been domesticated from wild species in the savannah and tropical forest zones of West Africa. The introduction of South Asian crops (plantain, banana) and American plants (cassava, cocoyam, maize, sweet potato, groundnuts [peanuts], coconut) in the 16th century AD rapidly displaced cultivation of many local edible plants and produced basic changes in the household food economy (Johnston, 1958). Traditionally, yam, sorghum and millet were the most