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DAIRYING BY SETTLED FULANI WOMEN IN CENTRAL NIGERIA AND SOME IMPLICATIONS FOR DAIRY DEVELOPMENT*

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Introduction

1. The importance of women's contribution to the pastoral eono— my of nomadic and semi—nomadic Fulani was described by Hopen (1958), Stenning (1959) and Dupire (1962). According to these studies, milk — either consumed at home or exchanged for grain —was the Fulani's main source of subsistence, and the women were responsible for milking, processing and marketing milk, and for obtaining grain for family consumption.

2. Meanwhile, most Fulani cattle—keepers in Nigeria have settled or practise transhumance from a fixed home base (van Raay 1975). With the reduction of tsetse fly population in parts of the subhumid zone (defined as the area between the 1000 and 1500 mm isohyets) as a result of increased land clearing for farming, wildlife hunting and chemical control (Bourn 1983), these areas offer relatively favourable~conditions for year— round cattle keeping (cf. Blench 1985). In the last few decades, an increasing number of Fulani have been moving into and settling in the subhumid zone, usually close to or in the midst of crop farming communities (Okali & Milligan 1981). Most of the Fulani have also taken up farming, but their cattle herds remain their major source of livelihood. Cattle and dairy products are sold to traders and farmers in the zone, the majority of whom do not keep cattle. It is estimated by Bourn and Milligan (1983) on the basis of aerial surveys that there are now more than four million cattle kept in the subhumid zone of Nigeria, where cattle—keeping Fulani constitute about 5% of the rural— based population of the zone.

3. The Subhumid Zone Programme of the International Livestock Centre for Africa (ILCA) is studying the production systems of settled agropastoralists in central Nigeria in order to find ways of increasing livestock production. Preliminary investigations suggested that poor nutrition, particularly in the dry season, was the greatest constraint on increased cattle productivity. Because the Fulani herds were regarded as primarily dairy herds, design and testing of innovations were initially aimed at increasing milk production.

4. At the rural markets in central Nigeria, as in the more northerly areas of Nigeria and Niger described by Hopen, Stenning and Dupire, the milk sellers are exclusively women. Nevertheless, it could not be assumed without verification that the household economy of settled agropaatoralistm in a mubhumid area in the l980a is identical with that of nomadic pastoral—ists in semiarid areas in the 1950s. Therefore, the present economic role of women in the mgropamtoral households was investigated, with a focus on the dairy enterprise.

Methods

5. The research was conducted in the vicinity of Zonkwa (9°47'N, 8°l7'E), where the researcher resided. This rural town lies 180 km southeast of Kaduna in Kaduna State. The study area receives about 1300 mm annual rainfall concentrated in n six— month wet season. The investigation was in two parts:

   1) a qualitative study of household economic activities and decision—making (to be referred to hereafter as the 'decision—making study') commenced in December 1981, and

   2) a quantitative study of production, consumption and males of dairy products ('dairying study') commenced in February 1984. The field work ended in January 1985.

   Results of a preliminary analysis of aggregated data are presented here to make findings quickly available.

6. For the decision—making study, eight settled Fulani households were initially selected from those which were or had been collaborating with ILCA in cattle herd production monitoring since 1979. Selection was made according to household type (married broth:rs with families, father and married son with families, simple polygynous family, simple monogamous family*) and, as ultimate criterion, the readiness of the household members — particularly the dairywomen, i.e. the women who processed and sold milk — to accept the frequent presence and inquisitive—

* These were identified by the previous socio—economimt with the SHE as the household types among the Fulani collaborating with ILCA in the area (Okali, perm. comm.). The preliminary analysis of data presented here does not differentiate according to household type.

ness of the foreign researcher. Economic activities and interactions within the households and with the rural community were observed, and conversations and unstructured interviews were held with household members (men, women and older children). As the study proceeded, household compositions changed as family units combined or divided and as individuals moved in or out, were born or died. Of the 16 dairywomen originally in the study, 13 were still in the households after two years and 2 additional women had joined the households. At the same time, the researcher had become acquainted with friends and relatives of the women in the case study households.

7. By the time the dairying study was being planned, the researcher had a sufficiently thorough understanding of the milk processing and marketing procedure to be able to design a scheme for weighing dairy products with the least possible interference in the women's work patterns. More important yet, a sufficiently good personal rapport had been established with some women such that they were willing to do the numerous daily weighings, reveal the amount of milk dilution they practised and disclose their exact dairy earnings. The 11 women included in the dairying study were selected according to

   1) location: near rural hamlet of Abet 20 km from Zonkwa and 15 km from a tarmac road, versus within 7 km of Zonkwa and 1 km from a tarmac road;

   2) presence of a family member able and willing to record the dairy product weights and earnings; and

   3) willingness of the women to participate in the study.

8. As can be seen in Table 1, the 11 women were in 10 households, S from the original decision—making study plus 5 additional households. In the latter, observations and interviews concerning economic activities and decision—making were carried out during the year of dairy recording. Where the number of dairy—women per household is larger than the number of wives per household head in Table 1, other relatives (mother, daughters— in—law, sister—in—law) of the household head were also processing and selling milk. Two of the 11 women were co—wives; in

the other three polygynous families, only the first wife was included in each case. Each wife, together with her children, inhabited a separate house within the compound and operated a separate dairying enterprise.

9. Each of the 11 women recorded production, dilution, consumption and sales of dairy products for six successive days every four weeks for a total of 13 four—week 'months'. The women themselves, assisted by their children, learned to read the scales and record the weights and earnings. Although the Fulani spoke Fuifulde at home, the recording form was in Hausa, the second language of the Fulani and the language which the children learned to read in school and which two of the women had learned to read in adult education classes. Two other women, without schoolchildren available to help them, learned to read and write numerals so they could do the recording; they memorized the order in which the weights were to be recorded on the form. The women were eager and quick to learn the new skills.

10. At the end of the dairying study, each woman was asked about expenditures she made on dairying inputs, livestock, herd inputs, foodstuffs and food preparation, and about sources and amounts of income gained from non—dairying activities. This was done by means of a structured questionnaire on a year—recall basis with appropriate disaggregation of the continuous earnings and expenditures. The household heads were questioned separately about expenditures on the cattle herd. Cattle purchases and sales, including price of animals anti reasons for purchase or sale, were recorded by ILCA as part of the herd production monitoring.

11. The quantitative data on dairying, other incomes, and expenditures is derived from the 11 women and 10 households involved in the dairying study. Description of division of labour and control over inputs, products and revenues of production is based on data from the 8 original households in the decision—making study and the 5 additional households included when the dairying study was commenced. The total of 13 households were

Table 1: Some characteristics of the settled Fulani households* studied in the Zonkwa area of central Nigeria (Dec. 1981 — Jan. 1985)

House—hold No.	Loca—tion	Herd size (head of cattle)	Household size (persons)	No. of wives! hh head	No. of dairy women	Included in study of decision—making (woman)*	Included in study of dairying (no. of yrs)
1	Abet	69	15	3	4	2	—
2	Abet	45	8	1	2	2	—
3	Zonkwa	16	8	1	2	2	—
4	Abet	37	15	1	3	3	A
5	Abet	47	10	2	2	3	B/C
6	Abet	38	12	1	2	3	D
7	Abet	42	11	1	2	3	E
8	Zonkwa	42	11	1	2	1	F
9	Zonkwa	34	7	2	2	1	C
10	Zonkwa	42	8	1	1	1	H
11	Zonkwa	61	8	2	2	1	I
12	Zonkwa	20	9	1	1	3	J
13	Zonkwa	87	13	3	3	1	K
0		44.6	10.4	1.5	2.1		

* A household is defined here as all persons living in the same group of buildings and associated with one herd of cattle managed by the household head. A compound may contain one or more households, each with a separately managed herd. A household may contain one or more family units which may or may not share cooked food. Household Nos. 1—3: status as of beginning of decision—making study; Household Nos. 4—13: status as of beginning of dairying study.
**The 11 women are designated with the letters used in Table 2.

not deliberately selected as a representative sample of a population larger than that with which ILCA had been collaborating (30 households). The following information is provided as basis for comparison of the 13 households and herds with others in the area. According to aerial surveys in the subhumid zone of Nigeria, average herd size in the Gwari/Katab area in which Zonkwa lies was 50 head of cattle in the dry season and 69 head in the wet season, and average herd size in the zone as a whole was 55 and 68 head in the dry and wet seasons, respectively (Bourn & Milligan 1983). In a marketing survey of 100 settled Fulani households near Kachia 40 km northwest of Zonkwa con—

ducted in 1983, average herd size was 51 head of cattle, average household size was 9.6 persons and average number of dairy— women per household was 1.9 (Nweke & Okali, pers. comm.). Table 1 shows the corresponding averages for the 13 households referred to in this paper.

Herd management and milking

12. Herd management was a male domain. The women generally had little influence on such decisions as selection of grazing sites, length of grazing day, supplementation of cattle diet, veterinary care, or breeding, all of which could influence milk yield. However, the women were involved in most decisions concerning cattle offtake. Animals which belonged to a woman or her children were never sold, slaughtered or transferred to another herd without the woman's consent, and she generally participated in discussions concerning the necessity to dispose of cattle belonging to her husband.

13. Milking, like herding, was usually done by men and boys. The cows were milked only in the morning. The calves were allowed to suck to stimulate milk let—down, and suckled again after milking. The older calves accompanied the grazing herd and could suckle during the day. The younger ones, which were kept at the camp during the day, were allowed to suckle in the evening before all calves were separated from their dams overnight. The calves were not given supplementary feed.

14. Milking was started usually within a week after the cow had calved but was sometimes delayed until weeks or even months after calving, depending on the condition of the cow and calf. Decisions whether or not to milk a cow were also made at times of feed scarcity. The herd manager and milkers made these decisions; a wife felt she had a say in the matter only if the cow belonged to her or her child by a former husband. However, the women were clearly interested in the survival of their and their children's calves, and tended to rely on the judgement of the milkers as to whether a cow was producing enough to be milked.

15. The milkers, i.e. the men and boys, determined how much milk was extracted and how much was left forthe calves. The women felt they could exert little influence on their husbands but somewhat more on their children to milk more intensively and they encouraged their children to help with the milking. When insufficient male labour was available, girls helped their fathers with the milking. None of the women in the households studied had milked cows since marriage. All of the women said that, if they were to milk, they would extract more milk than the present milkers did. They felt they would be allowed to do some milking if they wished, but they did not because they had too much other work in the mornings. None of the men objected to the idea of their wives helping to milk, but most of them felt it would not be good for the herd if only the women milked, because insufficient milk ~,ould be left for the calves. The women interviewed knew of onlyj two households among the settled Fulani in the Zonkwa area in which married women were involved in milking the cows.

Allocation and utilisation of milk

16. The amount of milk each woman received from the herd depended not only on the level of milk offtake but also on the number of women in the household, their relationship to the household head, and the pattern of cattle ownership. In the polygynous households, the milk from cows belonging to the household head was most commonly distributed equally among his wives. Only one man allocated milk from his animals according to need, i.e., according to the number and age of each wife's children. Other women living in the household, e.g. mother or divorced Sister of the household head, were also allotted a small share of milk from his animals if these women had no milking cows of their own. If the milk from specific cows belonging to the man was given to specific women — and this was not always the case —the man periodically changed the allocation of cows to ensure milk distribution as he saw fit.

17. A woman was entitled to receive all milk extracted from cows which belonged to her or which she was holding in trust for

her children by a former husband. However, in one case where the first wife owned 12 cattle including 3 milking cows and the second owned no cattle in the herd, the first wife waived this claim for the sake of good relations. Thus, a woman could determine whether she received less milk than that to which she was entitled, but was dependent on the decision of others as to whether she received more than her entitlement. Inmost cases, a woman also received all milk from animals which her husband had given to their mutual children. Thus, a woman with more children (particularly sons, who were more likely to be given cattle than daughters) generally ended up receiving a larger amount of milk from the total herd than did a co—wife with fewer children. In summary, each woman had a right to receive some milk from the total household herd but had little influence on the portion allocated to her unless she or her children owned cows within the herd.

18. The amount of milk a settled Fulani woman in the area could expect to receive was first calculated on the basis of productivity data from the 30 herds monitored by ILCA. Average herd size was 46 head of cattle; 23% were lactating cows, and a daily mean of 0.7 kg milk was extracted from each (Otchere 1984a). Thus, in an average household including 2 dairywomen, each woman would receive 3.7 kg milk per day as a mean over a year. As it turned out during the year of the dairying study, the average amount of milk received per woman actually was 3.7 kg per day, varying between women from 2.8 to 4.2 kg per day. The least milk was extracted in the late dry season (February/March) when each woman received an average of 1.8 (range 0.9 to 3.0) kg per day; the most milk was extracted in the early wet season (May/June) when each woman received an average of 5.8 (range 4.1 to 8.4) kg per day. To be exact, this wax the a— mount extracted from the cows but, especially in the wet season, the youths arid children drank fresh milk at the herd during milking, so that only an average of 5.3 kg milk were actually received by the women.

19. Each woman decided independently how much of the milk which she received was consumed at home, how much was offered for

sale, the form of consumption and sales, and the rate of dilution. *Nono* (skimmed sour milk) and butter were the most common dairy products consumed and sold. Whole milk, either fresh or soured, was rarely sold and, then, only on special request by customers. However, about 20% of the milk consumed at home was whole fresh milk rather than skimmed sour milk. Cheese (a soft white cheese usually cut into squares and fried for selling) was occasionally made by a few women in the Zonkwa area, but none of the women participating in the dairy recording were making it at the time, and most said they did not know how to make it.

20. Over 60% of the butter made by the 11 women was sold and less than half of the liquid milk was sold. Of all milk allocated to the 11 women, 49% was consumed as milk and butter by family and guests. Milk provided these settled Fulani with less than 10% of their energy requirements (assuming an energy content of 700 kcal/kg milk and a daily energy requirement of 2300 kcal per adult equivalent), although a higher proportion of their protein needs. The greatest part of total nutritional requirements was derived from cereals, mainly sorghum, millet, maize and rice, which formed the basis for all major dishes in these households, and to a lesser extent from tubers.

Milk processing and marketing

21. The milk was brought from the herd as early as 8 a.m. in the dry season and as late as 11 a.m. in the wet season. It was left to stand in a covered calabash bowl until the following morning, usually around 7 a.m., when the cream was skimmed off. Every second day (or, when cream quantities were small, every third day) the collected cream was poured into a bottle—shaped gourd, which was then plugged, most commonly with a shelled maize cob. The women or one of her daughters, with both hands around the neck of the gourd, shook it up and down for 10 to 20 minutes (the cooler the air temperature, the quicker the process) until small globules of butter began to form. Then the contents of the gourd were emptied into a bowl and agitated with a t—shaped stick twirled between the palms of the hands.

The butter was removed with the hand from the buttermilk, gently squeezed to remove excess liquid, and placed in a bowl in which batter was collected over several days. Sometimes, the newly—made butter was washed in water before being added to the collection. The buttermilk, including the water which had been added to rinse out any cream remaining in the gourd, was usually added to the skimmed soar milk. This had coagulated but was stirred briskly with the t—shaped stick to a liquid of uniform consistency.

22. The women normally sold milk every second day (in the dry season, sometimes only every third day), the some day as butter was made. After adding the buttermilk and water, they removed the milk intended for the family that day and took the rest to market. On non—selling days, they took scoopfuls out of the calabash bowl of skimmed sour milk to serve to family members and guests. The milk was often mixed into a thin porridge for drinking. Butter for home consumption wax removed, when needed, from the bowl of collected butter and melted to be used as a sauce over groin—based dishes.

23. Besides the decision us to the amount of dairy products consumed at home and the amount sold, there were four major in which the women could influence the amount of income generated from the milk allocated to them:
    1) diluting the milk;
    2) selling the milk together with prepared cereal foods;
    3) selling milk and butter directly to consumers instead of to intermediaries; and
    4) selling milk and butter on larger markets instead of in the neighbourhood of their homes.

24. The soar milk (nono) was diluted somewhat with the buttermilk which included water added during the butter—making process. Much greater dilution was achieved by adding a mixture of water and kuka, a thickening agent made from the acid pith of baobab (*Andansonia digitata*) fruits*. The water came from shallow

* The pith of the kuka fruit is rich in vitamins B1 and C, can be mixed with water to serve as a refreshing drink, and is also used to treat intestinal disorders (von Maydell 1983).

wells or streams and was not boiled before use. Dilution was greatest in the late dry season when milk offtake was at its lowest level: in February and March over half of the measured liquid sold as *none* consisted of water and *kuku* (see Figure 1). The effect of dilution on the price received by the women per kg of actual milk in the *none* is shown in Figure 2. The rate of dilution varied greatly between women: for example, in March the women selling in Zonkwa were all receiving about 0.40 to

0.50 Naira* per kg liquid but between 0.75 and 1.10 Naira per kg actual milk in the liquid sold as *nono.* The women, all of whom sold mainly to regular customers, explained that they diluted to the extent accepted by their customers. Also the Fulani families drank the diluted milk: on the morning of a selling day, the water and *kuka* mixture was combined with the sour milk before the family's share was removed.

25. The most common way of consuming sour milk in northern and central Nigeria is in a mixture with mashed *fura,* a kind of spicy dumpling made usually of millet. Usually, some sugar is also added to the mixture. When the women sold their *nono* together with fura, they earned about one—third more per measure of diluted *nono* than if they sold the *nono* alone. Furthermore, the women who sold with *fura* diluted the milk more than did those who sold without *fura,* so that the gains per kg of actual milk sold were even greater. These gains were in addition to those the women made by processing purchased grains into *fura* and by reselling sugar with the *nono-fura* mixture. Three—quarters of the sour milk sales by the 11 women were in combination with *fura.*

26. The women who received larger amounts of milk made *~aau* for sale less regularly than did the women receiving smaller a—mounts of milk. More *~uaa* was made in the dry season, when milk offtake was lower, than in the wet season. When few cows were being milked in the household herd, a woman sometimes purchased *none* from more fortunate Fulani women and resold it

* The official exchange rate in 1984 was 1 Naira to 1.30 US dollars.

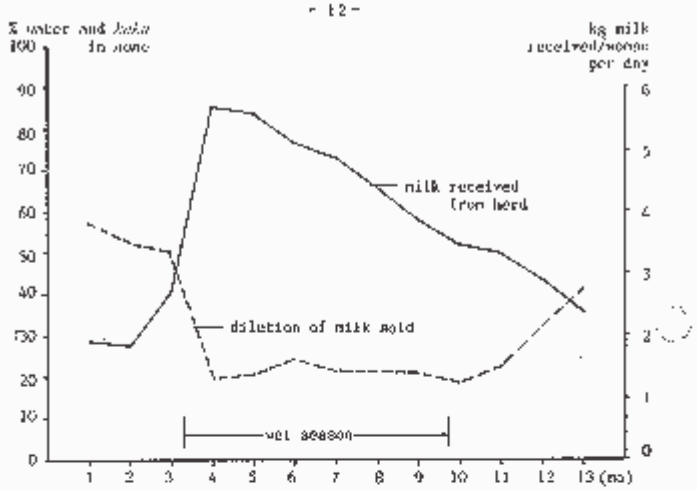

Figure 1: Comparison of amount of milk received from herd and dilution of nono sold; average of records kept by 31 settled Fulani women in central Nigeria (February 1984 - January 1985)

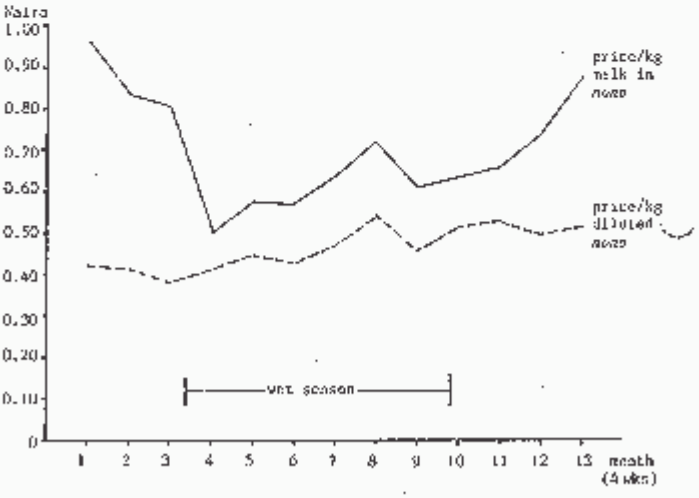

Figure 2: Effect of dilution with water and kaka on price received per kg actual milk in liquid sold as nono for mixture with fura

with self-made *fura* at a gain. The woman in the dairying study who received the smallest amount of milk bought *nono* throughout the year from other women in her neighbourhood and resold it with her fura in Zonkwa.

27. *fura* preparation (pounding grains to flour, cooking, kneading, forming the fura balls) is demanding in terms of time and energy. The kneading of the heavy cooked mass of *fura* with mortar and pestle is particularly strenuous work. On the morning of a selling day, the women spent two to three hours (simultaneous with other household work) preparing *fura*.

28. The women could also generate more incomefrom their dairy products when they sold at larger town markets and sold directly to consumers, instead of selling on the nearest village market or in the rural neighbourhood, or selling to intermediaries — other Fulani women who resold nono with their own *fura* or resold butter and none on more distant, larger markets. The five women living 15—20 km from Zonkwa sold their dairy products mainly at the local village market and in farm compounds within about 3 km of their homes. When they travelled to Zonkwa to make a special purchase, e.g. of cloth, they sometimes took butter to sell but never milk because it would have spilled in the taxi—bus on the rough road leading to the town. In the wet season, butter was sold regularly by one of the five women and occasionally by the others to a Fulani woman who bought on the village markets and sold in a town about 30 km away where the price of butter was about 25% higher. The six women living 5—7 km from Zonkwa sold relatively little to the neighbouring farm—people, and took most of their butter, milk and *fura*, into Zonkwa to sell. They often travelled by taxi—bus along the tarmac road passing through their settlement to Zonkwa. Almost all of their dairy sales were directly to consumers; only when they were unable to sell in town (e.g. during the few days before and after childbirth, or when a woman orher child was ill) did they sell to intermediaries who fetchedthe milk from the Fulani compounds. On account of the good roadand relative proximity of the town market, the women livingclose to Zonkwa were better able to sell their dairy productsat higher prices than could the women in the farming hamlet area.

Women's earnings

29. Most of the dairy earnings were in cash (sometimes on credit); the women seldom exchanged silk directly for grains and when they did, much of the grain was used to make *fura* to sell. On average, dairy earnings constituted roughly one—third of total cash income (2500—3000 Naira per year) derived from the cattle herd. The largest portion of cash income from the herd was gained by cattle sales by the men; a small amount was also earned by selling manure to farmers. However, it is significant that dairy earnings provided a regular income whereas the larger sums of money from livestock sales were available to the household only at lengthy and irregular intervals.

30. Figures 3 and 4 show the monthly pattern of dairy product sales and earnings per woman as an average of the 11 women who participated in the dairy recording. The importance of butter in their dairy enterprise is striking. Butter accounted by weight for 8.5% of total dairy products sold, but brought 35% of total cash income from dairying. Because butter was so valuable, the women demanded extremely high prices from customers requesting whole milk. However, butter earnings were low in the dry season. The butter had to be collected over two or three weeks at this time of year until a suitable quantity was available for selling (preferably a full *mudu,* a metal bowl which held somewhat more than 2 kg butter) and was then not as fresh and did not command as high a price as in the wet season (8—10 Naira per *mudu)* when butter could be accumulated more quickly. When the women sold butter in smaller quantities than a full *mudu,* they did not receive as high a price per kg. Therefore, in the dry season, butter tended to be consumed more at home in small quantities: only about 30% of the butter made in the latter half of the dry season (January —March) was sold, whereas 60— 80% of butter made in the wet season was sold.

31. *lone* which was sold together with *fura* accounted for half of total cash income from dairying. The women did not sell a significantly larger percentage of milk they received from the herd it! the dry as opposed to the wet season but, by selling a

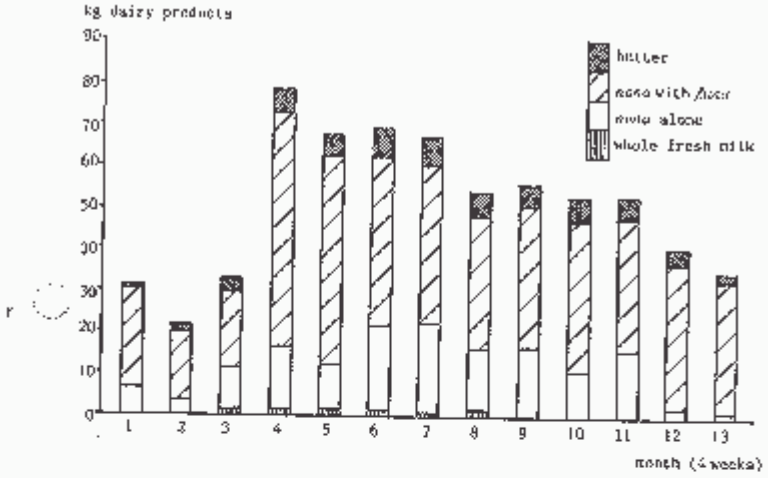

Figure 3: Monthly pattern of dairy product sales by a settled Fulani woman in a rural area in central Nigeria (February 1984 - January 1985). Average of data recorded by 11 women.

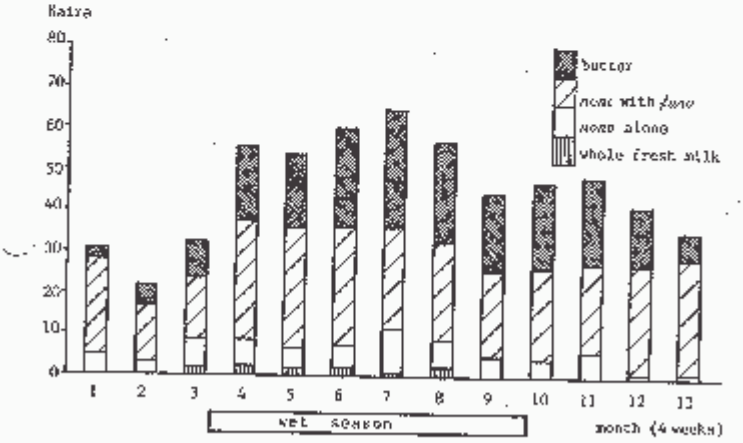

Figure 4: Monthly pattern of dairy earnings by a settled Fulani woman in a rural area of central Nigeria (February 1984 - January 1985). Average of data recorded by 11 women.

greater proportion of the milk with *fura* and diluting the milk to a greater extent, they could partially compensate for the lower milk offtake from the herd and the lower butter earnings in the dry season, and thus achieved a more balanced distribution of earnings over the year than would have been the case otherwise. During the six—month dry season, the women managed to obtain 40% of their total annual dairy earnings.

32. Earnings from other sources than dairying were significant. Somewhat less than half of the total cash earnings of these settled Fulani women was gained through dairying, almost one quarter through food processing* (mainly *fura* but also fried bean cakes) and about one fifth through animal sales (cattle, chickens, sheep and goats, in order of cash earnings). Additional minor income came from petty trading in kerosene (two women in this study, but other Fulani women in the area also traded in palm oil, sugar and salt), selling ginger (a major cash crop grown by farmers in the area and, since recently, also by several settled Fulani men and a few Fulani women),and selling bran to local farmwomen (for use as pig feed). The Fulani women claimed they had to seek sources of income in addition to dairying because they were not receiving enough milk to satisfy their needs.

Women’s expenditures

33. The women had control over the revenues from their economic activities. They did feel obliged to use part of their dairy earnings for small daily or weekly food purchases such as fruits, vegetables or seasonings to supplement the cereals bought by the husband, but felt they could use their non—dairy earnings for their private rather than household needs. Therefore, it sometimes occurred in the late dry season, especially if a man stopped milking most of the lactating cows, that a woman asked her husband to give her money to buy ‘things for the soup’, even though she had non—dairy earnings. In any case, the men

* Net earnings after subtracting costs for ingredients, which were usually bought each time the previous batch of processed food had been sold.

were expected to provide the grains. The women spent almost one third of their total cash income on foodstuffs for the fair— ily and over one tenth as payment for grain—grinding in the small diesel—operated mills in the villages or in Zonkwa. In order to reduce food expenditures, the women kept kitchen gardens with a variety of vegetables, spices, and shrubs anti trees bearing edible leaves and fruits. Five of the women trail additional small plots planted to okro, cocoyam or rice.

34. Each woman purchased goods and supplies needed for her own hut and dependents, including cooking utensils, kerosene, toiletries and medicines. Utensils specifically for their dairy work and supplies such as the additive *kuka,* as well as the serving bowls and spoons for *nono-fura,* entailed annual costs equivalent to 4% of annual earnings from dairy plus *fura* sales. Of the women's non—food expenditures, the largest were for clothing (in addition to that bought by the household head for his wives and children) and for enamel pots for display in the women's homes. Over the year of dairy recording, four of the women purchased chickens, three purchased sheep and two purchased goats. Investment in small ruminants was described as a means of accumulating enough capital to obtain cattle. Two of the women bought one head of cattle each in that year. The cattle and sheep belonging to a woman were kept in the herd managed by her husband, except in the case of women without sons of working age (about 6 years and above). These women's cattle and sheep were kept in the herd managed by her father or brother. The goats were given to non—Fulani neighbours to tend, and the offspring were shared between owner and caretaker. Table 2 shows the livestock holdings of the women towards the end of the dairying study.

35. The women made very little contribution (less than 2%) towards annual expenditures for livestock husbandry (ropes and pegs, fencing materials, veterinary treatment, hired herders, supplementary feed, etc.). Even the women who owned several cattle in the herd made no other contribution to herd expenditures than the occasional bag of *kanwa* (traditional mineral supple—

Table 2: Livestock holdings of eleven settled Fulani women in central Nigeria, December 1984.

Woman	Cattle in household herd	% of household herd owned by woman*	Cattle elsewhere	Sheep	Goats	Chickens
A	0	0	0	0	0	4
B	0	0	2	0	1	3
C	12	25.5	0	3	4	4
D	5	13.2	0	2	0	2
E	30	71.4	0	4	0	6
F	0	0	3	1	1	3
G	10	29.4	0	5	0	12
H	0	0	0	4	5	0
I	0	0	0	0	1	4
J	0	0	0	0	9	3
K	1	1.2	0	4	0	28

* Other women and girls within the household may also own cattle in the herd.

ment). They did not help pay for the agro—industrial by—products (cottonseed cake and wheat bran) which were available in Zonkwa to a limited extent and which some of the husbands were buying as feed supplements. All of the women regarded the herd managers as responsible for meeting livestock husbandry costs, including those which could increase milk production. The women argued that, even if they were to help pay for herd inputs, they could not be sure that they would receive more milk as a result. Several women added that the men's income from livestock was considerably more than their own income from milk, and the men were therefore better able to pay for herd inputs. The men, who bore almost all livestock husbandry expenditures, decided how the inputs were best used. The herd managers expressed primary interest not in high levels of milk offtake but rather in ensuring herd welfare, particularly calf survival and growth but also the survival of weaker adult animals, as a means of at least maintaining but ideally increasing herd size. The herd served as a savings account from which animals could be taken when cash or animals were needed for large ex—penditures such as the purchase of bags of grain, bicycle or

motorcycle, house construction and furnishing, bride price, marriage and child—naming ceremonies, schooling expenses, starting a small business (e.g. tea—shop, trading), or a pilgrimmage to Mecca. As the women themselves pointed out, they and their children benefit from many expenditures made by the household heads. When discussing the relative benefits of milk and cattle offtake from the herd, one woman indicated the mud—brick walls of the dwelling recently constructed to replace her domed grass hut and to her four—poster metal bed with foam—rubber mattress, and commented that these had come not out of her own 'milk money' but rather out of her husband's 'cattle money'. She expressed the opinion that milk was the most important product of the herd as far as the women as individuals were concerned but that livestock sales were more important for the family as a whole.

Implications for dairy development

36. The pattern of resource control and decision—making in the Fulani households studied in the Zonkwa area suggests that innovations requiring cash expenditures for herd inputs to increase milk production are not likely to lead to substantially higher milk offtake and sales. The men who made these expenditures had no influence on milk marketing and use of milk income, and expected little or no contribution from the women towards herd expenditures. As herd managers, the men controlled the allocation of inputs, e.g. feed supplements, to specific animals according to the men's production goals. As milkers, the men also controlled the level of milk offtake from the herd and could thus direct the benefits of any increase in milk production into animal production *pet as.*

37. These findings help to explain the preliminary results of ILCA's experiments in collaboration with settled Fulani in central Nigeria who are purchasing supplementary feeds and/or paying for the establishment of small pastures based on *santhes* species. ILCA originally recommended that only highly pregnant and lactating cows be given the supplementary feeding or grazing in the latter half of the dry season, but most of

the collaborating Fulani also included other, particularly the weak, animals (Taylor—Powell & Suleiman 1984). Milk offtake from the supplemented animals did not increase significantly, but there was a highly significant increase in calf survival rates (Otchere l984b). The trials are still in progress, but there is already a strong indication that the strategic use of the small *Stylosanthes* pastures also decreases weight losses per head in the dry season and improves fertility rates (Bayer 1984). It remains to be seen whether these improvements in herd productivity will actually lead to higher rates of animal offtake from the herds.

38. If additional income is gained from increased animal sales, most of this will accrue to the men, who usually own most of the animals in the household herd. However, the women and children are likely to continue to benefit from expenditures made by the men. Although ILCA's innovations will probably not bring the expected increase in dairy production, they still promise benefits to livestock production and the material welfare of the cattle—keeping families, including the women. It would be a mistake, however, to swing now entirely in the other direction and attempt promotion of beef production to the extent that the dairy function of the herd is neglected. Although it is not a staple food, milk makes an important contribution to the Fulani diet in terms of protein and other nutrients, and excessive emphasis on beef production in development programmes could lead to nutritional deficiencies among the Fulani people (cf. Teitelbaum 1977). The sale of dairy products by the Fulani women also makes this high—protein food available to other, non—Fulani people. Milk sales also provide cash for regular purchase of foodstuffs which give variety to the Fulani diet and supply vitamins to supplement the cereal foods. Finally, milk is the most important source of income which the Fulani women have at their disposal.

39. The findings on dairy marketing by the women also have possible implications for another component of dairy development efforts in Nigeria: the establishment of centres to collect tresh milk from the Fulani and to supply urban dairy plants.

It must first be made clear that no collection centre was close enough to Zonkwa that the women would have considered delivering milk there. However, they expressed no interest in delivering their milk to such a collection centre, were one to be established in Zonkwa, as long as the payment per kg of fresh milk was the same as that offered by the closest dairy plant (120 km distant in Vom). The Vom dairy offered less than one quarter of that which the Fulani women in the Zonkwa area were gaining as a year—round average by processing the milk themselves and selling it as *nono* and butter. Moreover, the Vom dairy did not raise the payment per kg in the dry season, when the women selling in Zonkwa could earn over five times as much by mixing water and *kuka* into the sour milk and selling more of the *nono* with *fura.* The women's own dairying business brought them not only a higher income from the milk but also a more even distribution of dairying earnings over the year than would have been possible by selling to the modern commercial dairy. In addition, the women valued the social contact with their customers and with each other during the four or five hours they spent in the village or town every second day. The supply—demand situation for dairy products is undoubtedly somewhat different in the Vom area close to the large city of Jos, situated on a plateau with relatively high cattle density. Nevertheless, some explanation for the difficulties experienced by the Vom dairy in obtaining milk from the Fulani could probably be found in the existing processing and marketing activities of the Fulani dairywomen in that area.

In Nigeria, the efforts initiated to develop the dairying sector have been primarily geared towards obtaining more milk to be processed by modern and relatively large—scale technology for the urban market. However, where — as in the Zonkwa area —the Fulani women can sell their dairy products at considerably higher prices that those offered for- fresh milk by commercial dairies, and where the rural customers can buy sour milk and butter from the Fulani at lower prices than those of packaged milk and butter from Nigerian dairy plants, milk collection for urban dairies is of interest neither to the Fulani women nor to their rural customers, The women and their customers

could, however, benefit from more efficient and hygienic methods of small—scale dairying and cereal processing, supply of clean water to facilitate hygienic practices, improved roads and transport services, and appropriate transport containers (measured in the scale of tens of litres rather than thousands of litres), so the women could continue to do the milk processing themselves and could sell on more distant and lucrative markets.

Summary and conclusions

41. The most striking features of the settled Fulani households in the Zonkwa area which differed from earlier descriptions of pastoral Fulani economy in Nigeria were:

    1) men and boys rather than women and girls usually milked the cows and could thus control milk offtake rates;

    2) milk provided the households with less than 10% of their dietary energy requirements; their staple foods throughout the year were cereals;

    3) dairy income constituted only about one—third of total cash income from the cattle herd; the largest portion was derived from animal sales;

    4) cereals for family consumption were provided primarily by the men from the proceeds of animal sales or from their own farms rather than by the women from dairy proceeds, and the women very rarely exchanged their milk products directly for grains;

    5) not only was the pastoral production unit as a whole not primarily a dairy enterprise, also the women's subsector was not exclusively devoted to dairying; the women had diversified their income—generating activities to such an extent that only about half of their cash income was derived from the sale of dairy products.

42. The pattern of resource control and decision—making in production and sale of milk and use of milk earnings suggests that, at least in the study area, innovations to improve animal nutrition are likely to result not in substantially higher rates of milk offtake for consumption and sale, but rather in the

production of more animals. In view of the dairy marketing system of the Fulani women and the level of their dairy product prices, a dairy plant could not expect to receive milk from these Fulani herds. Improvement in milk processing and distribution would be better served by improvement in rural infrastructure and by development, in collaboration with the Fulani women, of appropriate technology for small—scale dairying.

These investigations were limited to a few Fulani families living close to one rural town in central Nigeria and cannot pretend to be representative of all Fulani in the subhumid zone of Nigeria, let alone in the country as a whole. However, as a case study, it indicates how different a Fulani household economy and dairy production system can be from that described in the classic literature on Fulani pastoralists. It thus serves as a warning that development programmes in dairy production cannot be based on a generalized (or out—dated) concept of a single system of 'traditional Fulani pastoralism'. Much more knowledge is needed of the existing systems of milk production, processing and marketing in other locations and among other Fulani groups, before development alternatives appropriate to the various situations can be elaborated. In pen—urban areas, the herds may be more milk—oriented; in areas of lower human population density, the herds may be more meat— oriented. Among some Fulani groups the milk sellers may also be the milkers. Fulani groups may also differ in their relationship with neighbouring farmers, in their degree of mobil—ity, or in their desire for consumer goods. These and many other factors, often mutually interactive, will probably result in differences between Fulani groups in their receptiveness to innovations in dairy production.

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