MOSSI

Origins. Probably from an early cross of Toronké or Burkina Faso Peul Voltaïque sheep with the Djallonké.
Distribution. The Yatenga area of Burkina Faso in the ancient kingdom of Mossi between 13°N and 14°N and 1°W and 3°W. The area covers about 12 500 km^2, has a population of 600 000 people and possibly 120 000 sheep and 190 000 goats. Cattle are about equivalent in numbers to sheep and donkeys and pigs are also kept.
Similar sheep are said to occur from Senegal to Benin.
Ecological zones. Semi-arid with a short rainfall period of about 5 months, most rain (average 550 mm per year in 1973-1984) falling in Jun-Sep.
Management systems. Agro-pastoral. Individual farm sizes are about 9 ha with about one-third of this area cultivated to each of sorghum and millet. Except during the crop growing season sheep are not herded and roam freely over a wide area around the village. At night sheep are housed in small mud brick structures inside the house compound Figure 74. Small ruminants, and sheep in particular, are used specifically as a short term savings medium and flock turnover is very rapid. Sheep are owned by about 90 per cent of households, each with an average flock of 12.4 animals: in the same system only 43 per cent of families own goats, average holding size being 8.8head. Flock structure are related to cash saving and income generating functions with a fairly high proportion of males: females 67.8 per cent (breeding > 10 months 54.5 per cent); males 32.2 per cent; animals under 15 months old account for 49.9 per cent of the flock.

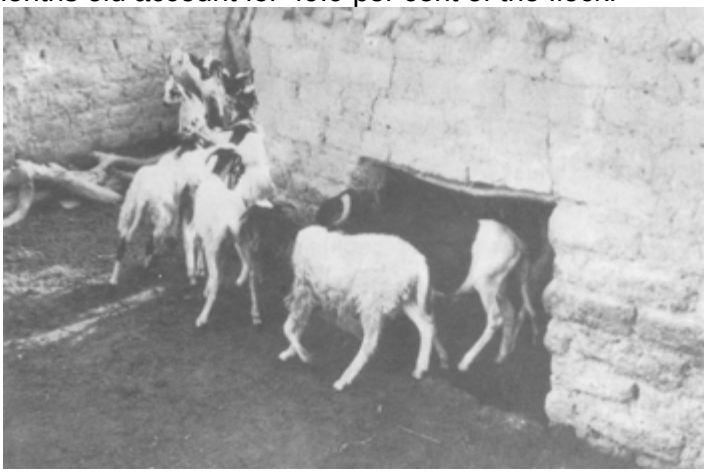

Figure 74: Mossi sheep in the village of You, Yatenga, Burkina Faso being released Flock structures from their night house

Physical characteristics. Small size 50-60 cm. Weight: male 25-30 kg; female 20-25 kg.

Head strong with convex profile.

Horns: present in males, triangular in shape and sprialling backwords then forwads; much lighter and shorter when carried by females. Ears short to medium length and semipendent. Toggles in a small proportion of both

sexes. Males have a mane, a throat ruff and an apron of long hair with the longer hair often extending backwards along the rib cage.

Neck short but fairly heavy. Withers not prominent, higher than tail head. Back short with slight dip. Croup sharply sloping. Legs short, poorly fleshed. Tail thin, descending to hocks or just beyond. Colour usually pied with black forehand or head and neck and white rear (60 per cent); chocolate brown and red sometimes replace the black (7 per cent) and black patches are not unusual elsewhere on the body, especially the lower legs (19 per cent). Coat short to long of soft hair.

Products. Meat.

Productivity.

REPRODUCTION. *First lambing:* 446 ± 86 (s.d.) days (n=16) at You and 470 ± 111 days (n=64) at Kiré in 1983-1985; various studies in Yatenga from 1980-1984 indicate a range of 13.5-15,1months depending on the year. *Lambing interval.* 274 ± 76.0 (s.d.) ; days (n=191) at You and 296 ± 82.4 days (n=237) at Kiré.

Multiple births: very uncommon. *Litter size:* 1.02 ± 0.136 (s.d.) (n=320) at You, increasing from 1.00 at first to 1.04 at fourth and higher parities; similar small litter sizes are recorded by other studies.

Table 39: Weights (kg) of Mossi sheep at You, Burkina Faso, as affected by some indicate a range environmental variables

Variable	Age (days)					
	10	30	90	150	240	365
Overall average	4.0	6.1	10.6	13.6	17.2	21.2
Season of birth						
cold dry	4.6	6.9	11.5	13.3	15.8	21.8
hot dry	3.6	5.6	9.4	13.6	19.1	17.9
rains	3.3	5.5	10.3	14.2	17.1	20.7
post-rains	4.3	6.6	11.4	13.4	16.9	24.4
Year						
1983	4.4	6.9	13.1	15.6	17.2	20.2
1984	4.1	6.5	11.2	13.1	17.2	22.2
1985	3.4	5.0	7.6	12.2	-	-
Parity						
1	3.6	5.4	9.6	12.5	16.3	20.3
2	4.0	6.5	11.0	13.6	18.0	23.3
3	4.1	6.4	11.2	14.3	17.9	20.6
>4	4.1	6.3	10.8	14.1	16.6	20.7
Birth type						
single	4.1	5.9	11.4	15.6	18.8	22.8
multiple	3.8	5.4	9.9	11.7	15.6	19.7
Sex						
female	3.8	5.9	10.2	12.9	16.1	19.8

male	4.2	6.4	11.2	14.3	18.3	22.6

Annual reproductive rate: 1.36. *Fecundity* (=lambs born in year t+l/ewes present in year t): 0.82 in 1983-1984 and 1.46 in 1981-1982.
Births take place all the year round with a peak in Nov following conception in early rains and lowest in Jul-Sep related to conception in late dry season of Feb-Apr.
GROWTH. *Birth weight:* 2.5 kg. *Weight for age:* from a weight of 4.0 kg at 10 days lambs increased to 21.2 kg at 365 days at You; weights were affected to weaning by season and year of birth, by parity, by birth type and by sex, and season and sex effects persisted until 365 days Table 39; weights of females with 1, 2, 3 and 4 pairs of permanent incisors were 22.4, 24.5, 25.3 and 25.6 kg and for males for the first 3 stages were 27.8, 28.2 and 29.0 kg. *Average daily gain:* birth-150 days(weaning) - 87.3, 150-365 - 28.8, birth-365 - 59.2. *Mature weights:* full mouth females varied from 29.1 kg in the cold dry season (Jan) to 23.1 kg in the hot dry season (early Jul).
MEAT. *Dressing percentage:* 40-48 at carcass weight of 10-12 kg.
Research. Field studies and development projects carried out by IEMVT, GTZ, EEC and ILCA have been discontinued.
References. Bourzat, 1980; Ouedraogo, 1984; Wilson, 1987; Bourzat & Wilson, 1989.

VOGAN

Origins. Described essentially by a single author and said to be a cross (?bred inter-se) of Djallonké with Sahel sheep.
Distribution. Confined to southern Togo (and neighbouring Benin) in the vicinity of Vogan, in the Vo, Aneho and Tabligbo districts. In these 3 districts in 1976 there were 118 500 sheep, 92 000 goats, 7000 cattle and 356 000 people in an area of 2620 km^2.
Ecological zones. Sub-humid to humid coastal area with a long unimodal (or weakly bimodal) rainfall pattern.
Management systems. Principally urban where, it is said, the Djallonké is being absorbed by Sahel sheep to produce this cross. Flock sizes average 7 or 8 animals. Animals are grazed under palms or among annual crops where they go under the guidance of the farmer and where, it is claimed, the sheep have been trained to graze only on weeds.
Physical characteristics. Fairly large size 69-73 cm. Weight: male 45 kg; female 40 kg.
Head fairly strong with flat forehead and slightly convex profile.
Horns are triangular in males, almost all of which possess them, loosely spiralled and 30-40 cm long; only 5.6 per cent of females (n=581) carry small horns. Ears are medium long (14 cm), broad and pendent. Toggles are present in 1.9 per cent (n=717) of animals, equally in both sexes.
Neck long. Chest deep but flat. Withers and back rather ridged. Croup sharply sloping. Legs longish and poorly fleshed. Tail long (30-40 cm), with no fat and usually terminating about the level of the hocks. Scrotum split for the bottom third of its length.
Colour usually variable, red and black pied animals being commonest, whole browns next and whole blacks rare. Hair short.
Products. Meat; (milk).

Productivity.
REPRODUCTION. *Multiple births:* common; 62.7 per cent single, 34.4 per cent twin, 2.9 per cent triplet (n=308). *Litter size:* 1.40.
GROWTH. *Birth weight:* 2.26 kg (n=51); single males 2.69, twin males 2.32, single females 2.42, twin females 1.77. w*eight for age:* 40 days-singles 9.6, twins 7.7 kg; 228 days-entire males 30.3 kg; animals supplemented with agro-industrial by products and 17.5 per cent crude protein weighed 43.9 kg at 8.5 months. *Mature weights:* males 40-55 kg (n=29); females 30-45 kg (n=120).
MILK. *Lactation length*: 124 ± 12 days for ewes with singles; 139 ± 15 days for ewes with twins. *Yield:* maximum of 1300 g/d for ewes with singles and 1980 g/d for those with twins, increasing with lactation number and being highest between 19 days and 27 days post-partum, highest yields being obtained at a later stage of lactation in older ewes; total yield (taken by lamb and milked-out) 103.5 kg and 158.7 kg for ewes rearing singles and twins Table 40.
MEAT. *Dressing percentage:* 43.1 at a live weight of 27.6 kg; 45.0 in fattened animals at 43.9 kg live weight. *Carcass composition*: commercial carcass (=hot carcass weight/starved body weight) 43.1 per cent, true dressing percentage (=hot carcass weight/empty body weight) 51.6, liver 1.9, heart 0.6, kidneys 0.3, stomachs and intestines 8.3, lungs and trachea 1.3, skin 6.9, head 6.8, feet 2.5, testicles 1.1;

Table 40: Milk yield of Vogan ewes in Togo

Litter size and Lactation number	Daily yield (kg) in week of lactation								
	1	2	3	4	5	6	7	8	9
Single									
1	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99
2	1.00	1.08	1.18	1.19	1.20	1.20	1.14	1.02	0.95
3+4	1.05	1.12	1.13	1.14	1.16	1.17	1.18	1.02	0.93
Twin									
1	1.14	1.14	1.50	1.38	1.38	1.38	1.28	1.25	1.18
2	1.42	1.60	1.75	1.75	1.75	1.50	1.28	1.19	1.10
3+4	1.90	1.93	2.02	2.00	1.99	1.98	1.90	1.70	1.48

muscle/bone/fat ratio of 66/7/27; hindquarters and shoulders contain 56 per cent of total muscle.
Research. Ecole supérieure d'agronomie, Université du Benin, BP 1515, Lomé, Togo.
References. Amégee, 1983a; 1984a; 1984b; 1984c.

DJALLONKE

Synonyms. Mouton guinéen; mouton nain d'Afrique occidentale; West African Dwarf sheep; Forest sheep.
Origins. More or less trypanotolerant depending on zone and level of challenge.
Sub-types and races. The Kirdi (or Kirdimi or Massa) in northern Cameroon and south-west Chad Figure 75 is a whole black variant of the Djallonké. Also known as the Poulfouli in the far north of Cameroon and many other local and regional names, as for the West African Dwarf goat, are admitted.

Figure 75: Kirdi sub-type of Djailonké sheep at Garoua station, northern Cameroon

Distribution. West Africa from southern Senegal to Chad and south to Cameroon, Gabon and Congo.
Ecological zones. Humid forest zone of West and Central Africa, extending into derived savanna areas and sub-humid zones.
Management systems. Agricultural, urban and agro-pastoral. Owned by many ethnic groups.
NIGERIA. In south-east Nigeria far fewer families own sheep than own goats: 28 per cent of families own 11.4 sheep each (3.2 sheep average over all households) in the range 1-120, modal flock size being 1. Three management types are identifiable as for goats (see West African Dwarf goat, p.108). The percentages of households with different flock sizes are: 0=72; 1-4=14; 5-9=6; 10-19=4; >20=4.
SENEGAL. Djallonké sheep in Senegal are all found in the southern part of the country, in Casamance. Almost all families own either sheep or goats, or both species combined, but within families 60 per cent of men and 40 per cent of women own no sheep or goats: women own 60 per cent of all small ruminants but only 40 per cent of the sheep. Ownership of more than 5 sheep and goats combined is unusual, the average per adult human being 2.5. Only 32 per cent of households own more than 10 sheep and goats combined but these account for some 69 per cent of all small ruminants. Larger flock sizes, particularly in Fulani villages, usually infer accumulation of live capital for exchange for cattle. Integration of the small ruminant enterprise with crop production is achieved through grazing of crop residues in the dry season (Oct-Mar/Apr) and by use of rice strubbles and weedy

regrowth in the paddies (sheep only from Jan-May/Jun), animals often being allowed to roam freely at this period. During the crop growing season sheep and goats are individually attached to pickets or closely herded. Flock structure: females 69.0 per cent (38.9 per cent breed-ding > 1 year indicating a high reproductive rate) about 30 per cent of which are bought in; males 31.0 per cent (4.7 per cent > 1 year showing early offtake of males not to be used for breeding).

TOGO. Numbers of sheep in Togo were estimated at about 600 000 in 1982-1983. About 33 per cent of households (~ 87 000) own sheep. The majority of sheep (34.5 per cent of the national population) are in the extreme north but many of these are of Sahel type or Sahel crosses. In this mainly agricultural country many animals are permanently confined and fed on household wastes and crop residues: individual tethering is also a common practice. Average flock size for the whole country is 7 but it is larger (10) in the north; 43 per cent of flocks are less than 5 head and only 10 per cent are larger than 15. Flock structure: females 65 per cent (50 per cent breeding > 1 year); males 35 per cent.

Physical characteristics. V*ery* small 40-60 cm. Weight: male 25-30 kg; female 20-25 kg.

Strong and broad head, flat forehead, profile slightly bulging in male, wide muzzle. Eyes not prominent.

Horns usually present in males, usually absent in females: fairly well developed in males, wide at the base, curving backwards, outwards and then forwards, maximum curvature usually one and a half spirals; fine and short when present in females. Ears short (10 cm), narrow and usually pendent or semi-pendent. Toggles present only occasionally, about 5 per cent in Cameroon.

Neck long and rather fine. Chest fairly deep. Chest circumference 20 per cent greater than withers height. Withers higher than tail-head but less pronounced than in Sahel-type sheep. Back long in relation to height, usually dished. Croup poorly developed. Legs short. Tail descending to hocks, fairly thick at base but very fine at distal end, approximately 25 cm in length.

Colour usually pied (black forequarters, white hindquarters) or white but some sub-types -- notably the Kirdi -- have been selected for black. Hair short and stiff but males usually, although by no means always, have a heavy mane and apron of long hair with the long hair sometimes extending backwards along the rib cage Figure 76.

Haemoglobin Type A in this sheep confers some resistance to helminths.

Figure 76: Djallonké sheep of the Ghana Forest sub-type (note mane and apron of long hair)

Products. Meat.

Productivity.

REPRODUCTION. *Age at first oestrus:* 250 days (206-322) on station in Côte d'Ivoire. *First lambing:* 464 ± 110 (s.d.) days (n=92) in Senegal traditional system, 572 ± 24.3 (s.e.) days (n=115) on Senegal station; 514 days (n=85) in the range 371-721 days in south Cameroon on a University farm; 350 days (n=10) in Côte d'Ivoire traditional system, 411 days (n=21) on station but in a more comprehensive sample age at first lambing was 431 days (n=112) in a traditional system, 480 days (n=177) in a modified traditional system where breeding was controlled and 494 days (n=224) on a commercial ranch Figure 77; 344 ± 49.3 (s.d.) days (n=36) in range 225-429 days in Kirdi sub-type at Garoua station in north Cameroon, 61 per cent at < 365 days. *Lambing interval:* 267 days (n=101) for first interval and 244 days (n=360) for subsequent ones in Senegalese traditional system; 307 days (n=663) on Senegalese station being shorter at first (305 days) than at subsequent intervals; 230 ± 53.6 (s.d.) days (n=475) in traditional system, 275 ± 75.6 days (n=1095) in controlled traditional, 267 ± 107.5 days (n=1164) on commercial ranch and 208.0 ± 7.36 (s.e.) days (n=213) at National Programme in Côte d'Ivoire; 241 days on Cameroon University farm; births are almost equally distributed over the year throughout the type's range. *Multiple births:* numerous; twins common, triplets more rare (Table 41). *Litter size:* 1.17 in Senegal traditional system and 1.12 on station; 1.17 on Cameroon University farm; 1.15 in various systems in Côte d'Ivoire but 1.25 at National Programme; 1.24-1.53 in Chad; 1.15 on station and 1.49 in a traditional system in Togo; in different studies, season and year of parturition influence litter size but ewe age or parity exerts greatest effect, older ewes having larger litters (1.08 for first and second parities in Senegal traditional system rising to 1.29 for fourth and older parities and 1.12 for early parities rising to 1.21 from third parity in Côte d'Ivoire). *Annual reproductive rate:* 1.33 on Senegal station; 1.56-1.97 in Côte d'Ivoire. *Fecundity* (=number of lambs born in the year/number of ewes joined): 157 to 203 per cent in 1982 to 1986 on Togo station; 168 per cent on Cameroon University farm; 163-204 per cent in various systems in Côte d'Ivoire. *Fertility* (=number of females giving birth/number of females mated): 96 per

cent in Cameroon; 90 per cent in Côte d'Ivoire. *Annual fertility rate* (=number of females giving birth in a year/average number of females in the flock in the year): 136-178 per cent over 4 year period in Togo; average of 159 per cent in 2 year period at Côte d'Ivoire National Programme. *Fecundity:* (=lambs/100 ewes/year): 221 per cent for Djallonké and 231 per cent for Kirdi at Yagoua station in north Cameroon. *Lifetime production:* as many as 12 parturitions recorded in Senegal traditional system with 24.4 per cent of 1051 ewes having lambed once, 21.7 per cent twice, 16.7 per cent 3 times, 11.6 per cent 4 times, 9.2 per cent 5 times and 16.5 per cent 6 times or more; an estimate of 5 lambings per ewe suggested for Senegal station but an average of 3.7 achieved for ewes alive in 1981 and born between November 1974 and January 1977; ewes bought as adults in Cameroon averaged 6.2 lambings at the University farm; "reproductive life" estimated at 4.2 years on Senegal station (24 per cent annual replacement rate); culling age estimated at 6.0-6.5 years at Cameroon University. *Oestrus cycle:* 17.4 days (16-19) on station in Côte d'Ivoire with heat lasting 36 hours (12-60), there being no effects of season on cycle length. *Gestation period:* 148.1-150.2 days on station in Côte d'Ivoire.

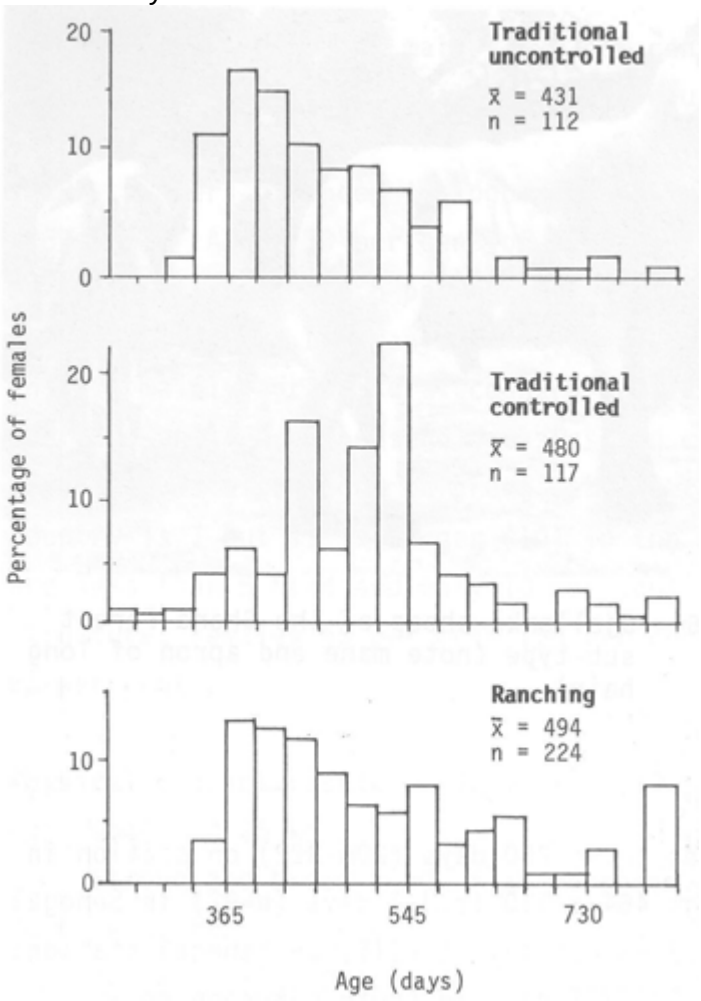

Figure 77: Distribution of ages at first lambing of Djallonké ewes under 3 systems of management in Côte d' Ivoire

Table 41 Multiple births by Djallonké ewes in various West African countries

Country and System	n	Percentage of births		
		Single	Twin	Triplet
Senegal traditional	1020	82.7	17.1	0.2
Senegal station	633	87.9	12.1	0.0
Togo traditional	-	53.7	44.0	2.3
Côte d'Ivoire	-	70.0	29.0	1.0
Chad	-	37-79	20-53	1-10

Heritability of 0.19 estimated for age at first conception, of 0.46 (dam-daughter pairs) for lambing interval, and of 0.26 for litter size in Cameroon. Repeatability (inter- and intra-dam variances) of 0.11 for lambing interval in Senegal. A non-significant positive correlation (0.17) between litter size and lambing interval in Cameroon led to the conclusion that selection for larger litters and shorter intervals would not produce any adverse interactions.

Table 42: Birth weights (kg) of Djallonké sheep from various countries and as affected by a number of variables

Variable		Country and System				
		Côte d'Ivoire		Cameroon	Senegal	Togo
		Traditional	Ranch	Station	Station	Station
Overall average		1.92	1.56	2.15	1.59	1.69
Season:	1	1.90	1.55	-	1.60	1.71
	2	1.94	1.53	-	1.70	1.70
	3	1.93	1.60	-	1.48	1.64
Year:	1	1.90	1.38	-	1.48	-
	2	2.00	1.58	-	1.71	-
	3	1.87	1.60	-	1.54	-
	4	-	1.58	-	1.65	-
	5	-	1.69	-	-	-
Ewe age:	1	} 1.83	1.45	-	1.17	1.29
	2		1.65	-	1.52	1.94
	3	} 1.99	1.64	-	}	1.78
	4		1.60	-	} 1.66	1.82
	5	1.96	1.58	-	}	1.68
Sex:	male	1.97	1.61	2.25	1.66	1.75
	female	1.88	1.52	2.05	1.52	1.62
Type of birth:	single	2.13	1.78	2.40	1.78	1.83
	multiple	1.72	1.35	1.90	1.41	1.54

Note: Seasons and years in different countries do not correspond and ewe age in Senegal relates to parity
GROWTH. *Birth weight:* 1.2-2.5 kg Table 42; at Côte d'Ivoire National Programme there was a linear relationship between ewe weight and lamb birth weight (singles y = - 0.431 + 0.086x, twins y = 0.002 + 0.059x). *Weight for age:* 1 month-4.7, 3-9.6, 5-12.8, 8-15.8, 12-18.0, 18-19.5, 24-21.2 kg in Senegal traditional system; 2 months-6.1, 4-8.7, 6-11.3, 8-13.8, 12-17.9 kg on Senegal station; 1 month-5.1, 2-7.9, 3-10.2, 4-11.7, 5-12.9 kg in Côte d'Ivoire traditional system; selection criteria by the National Sheep Programme in Côte d'Ivoire require males to weigh 13 kg at 80 days, 23 kg at 180 days and 37 kg at 365 days, resulting in v*ery* big sheep for this type Figure 78; 4 months-8.6, 12-16.2, 18-21.2, 30-24.0, 0,54-26.9 kg for Kirdi in Chad; 1 month-4.0, 4-9.6 kg on station in Togo. *Average daily gain:* 0-15 days - 50, 15-30 - 87, 30-120 - 77, 120-180 - 39, 180-365 - 25 g in Senegal traditional system; 0-30 days - 78.3, 30-120 - 57.1 g on station in Togo where affected by month and type of birth, sex and ewe age in the first period and month and type of birth only in the second period; 0-60 days - males 98.3, females 79.1 g at National Programme in Côte d'Ivoire. *Post-partum weights:* primiparous females (464 days) were 20.1 kg (72 per cent of maximum weight), second parity females (731 days) were 22.0 kg, third parity (992 days) were 23.7 kg, and older females were 25.2 kg in Senegal traditional system; all ewes 23.8 kg, affected by year and age of the animal on Senegal station.

Figure 78: Elite Djallonké rams selected on a weight for age basis at the National Sheep Programme station, Bouaké , Côte d' Ivoire

Repeatability of weights (intra- and inter-ewe variances) of 0.22 + 0.07, 0.18 + 0.07 and 0.24 ± 0.08 were obtained at birth, 60 and 120 days for lambs on station in Senegal. Repeatability of ewe post-partum weight in the same environment was 0.57 ± 0.05 and the phenotypic correlations between ewe weight and lamb weight at birth, 60 and 120 days were 0.20, 0.38 and 0.39.
MILK. *Lactation length:* 117 days in Mali; 105 ± 29 days for single bearing ewes and 112 ± 30 days for twin bearing ewes with "limited supplement" in Togo. *Yield*: 87 kg for supplemented ewes in Mali; maximum of 810 g/d and 1200 g/d with lactation yield of 57.4 ± 16.60 kg (n=42) and 86.4 ± 29.21 kg (n=34) for single and twin bearing ewes in Togo. *Composition:* DM 16.5 per cent; fat 6.0 per cent; ash 0.8 per cent; protein 5.4 per cent.

MEAT. *Dressing percentage:* 43.0 at 20.2 kg live weight in Cameroon; 44.1 at 19.5 kg in Côte d'Ivoire; 43.7 at 19.2 kg in Nigeria. *Carcass composition:* normal butchers carcass 43.1 per cent at 20.2 kg live weight in Cameroon, full stomachs and intestines 25.2, liver-kidneys-heart-lungs 4.7, head 8.1, feet 2.8, wet skin 7.3, testicles 0.9, losses (blood and urine) 7.9; 64.0/21.7/14.3 per cent lean/bone/fat in Nigeria.

Research. Institut sénégalais des recherches agricoles, Laboratoire national de 1'elevage et de recherches vétérinaires, BP 2057, Dakar-Hann, Senegal (station research at Kolda and traditional systems research in Kolda area). Projet Petits Ruminants, BP 65, Atakpamé, Togo. Institut de recherches zootechniques, BP 1457, Yaoundé, Cameroun. Societé pour le Développement de la Production Animale, BP 1249, Abidjan 01, Côte d'Ivoire. Programme national de selection ovine, Centre de recherches zootechniques, BP 1152, Bouaké, Côte d'Ivoire.

References. CRZ, 1957; Vallerand & Branckaert, 1975; Rombaut & van Vlaenderen, 1976; Berger & Ginisty, 1980; Dumas, 1980; Evans, Blunt & Southcott, 1983; Fall et al, 1983a; 1983b; Togo, 1983; Amégee, 1983b; 1984d; Deciry, 1987; Francis, 1988; Hadzi, 1988b; ISRA, 1988; Armbruster, 1989; Hadzi, 1989; Thys, 1989.