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Clyburn, L. E.

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Grazing Patterns in the Sahel-Sudan Region

An AID/AFR/CWR Technical Staff Paper
by Lloyd Clyburn

March 1974

In its optimum ecological balance the range is dominated *Andropogon* Gayanas[1] or similar perennial grass which in normal growth reaches 6 to 8 feet in height with roots penetrating 6 to 8 feet, deep enough to reach moisture even in successive dry years. Such is the situation today in most of the area protected from excess grazing by the tse-tse fly. For root renewal, a rest-rotation grazing system is required to allow the plant to assimilate nutrients through leaf photosynthesis. When frequent and close grazing removes excessive leaf surface, the plants, for the lack of energy, respond by making successively shallower root penetrations each year, until finally a drought knocks the plant out. The perennial is replaced by a succession of annual species which decrease in production and quality as excessive grazing proceeds. At any time in the sequence, the stools of perennial grass may be killed by the sun's penetration if left uncovered by unseasonal burning. With the soil left uncovered, either erosion (wind and water) sets in, or competitive, worthless shrubs spring up to shade out grass in the future.

Soil containing a sufficient proportion of clay to be reasonably productive is hardened by exposure to the sun, hence water runoff is intensified with prolonged exposure. The removal

(1) Statement applies to areas of annual rainfall of 500 mm and higher

19-026

of the protective grass cover intensifies wind erosion, which feeds on itself as the soil particles moved by the wind cover and destroy more vegetation; hence erosion, which is a function of overgrazing and ends in desertification, is dynamic, as is the process of overgrazing.

Nomadic herdsmen have responded to these phenomena over the past 900 years in the following manner. The height of the dry season finds them as far down against the tse-tse barrier as they can go and survive, a location with permanent water for the cattle, shade for the camp and the best range available, due to high rainfall and good land. In the course of the dry season, the cattle lose a great deal of weight, both from the lack of maintenance levels of nitrogen (protein) and carbonaceous energy sources.

With the first rains of the season the grass springs up and, while it is being grazed to the ground, the rains move northward, and the cattle follow for the new grass, and the herdsmen follow the cattle. The migration continues as long as the grass ahead looks greener than that at hand, until the northern edge of the Sahel rainbelt is reached. When that grass is eaten off, the return to the south begins. This time, the cattle are grazing a crop of grass that grew up behind them on their way north, and they are drinking standing water remaining from the rainy season. Hopefully for the short run, the water holds out long enough to allow the completion of the harvest. Hopefully for the long run, it will not hold out any longer than that, thus forcing the cattle

off before there is severe overgrazing. When they arrive back at their dry season range, hopefully they will find a crop of mature grass that will carry them for eight or nine months to the next growing season.

This annual cycle turns on grass. If anything happens that renders the supply of grass per animal unit drastically smaller than anticipated, then there is likely to be major migrations on longer than annual cycles or even permanent. In 1971-1973, Mauritanian herdsmen took their cattle as far south as Liberia and herdsmen from Niger were reported in Zaire.

The grass supply per animal unit can be reduced by increase in cattle numbers, increase in sheep and goat numbers, increase in farmland hence a decrease in rangeland, grass fires, decrease in rainfall or decrease in range productivity -- usually by all dynamically in concert.

In one typical pattern, cattle numbers build up over a series of years of favorable rainfall. Then, as the numbers continue to increase, the rainfall recedes to average or below, the unit feed supply diminishes. There follow a few years of no growth, effected by early migrations, then a mass exodus. Mali cattle numbers over the past 20 years seem to follow this pattern (Table I, Chart I).

At the present, all factors of range pressure appear to be up, and all seem to be dynamic and mutually self-feeding. There are more people on the range, more sedentary villages, thus there are more grass fires. The cattle numbers in the Sahel states

have increased, probably by 50 per cent over the past 20 years. A decrease in the unit productivity of the range open to grazing in the recent term can be observed by the range scientist (judged by comparing the present ground cover with the climax species, which are known).

In the typical grazing pattern for a 20 km. radius of every village in the Sahel and every one in the Sudan not protected by the tse-tse fly, there are two stages of ecological deterioration:

For about half the radius, or the distance that a goat can range in a day, will be found to be completely denuded of grass cover and severely eroded by both water and wind. For the remainder of the radius, the grass cover will vary from zero up to 50 per cent, made up of low-yielding annual species. This represents the range that can be covered by cattle held by sedentary owners and watered at the village site. The major implication is that the farmer's resource base is being destroyed in front of him. The social system of most farmers includes village residence. Goats, sheep and cattle can range out further than can a farmer to cultivate a crop.

The problem is further intensified by the fact that sheep and goat numbers are increasing at a more rapid rate than are cattle numbers and that the sheep and goat flocks in question are not nomadic but sedentary. The World Bank estimates that there has been no reduction in goat numbers and no more than 10 per cent reduction in sheep numbers in the Sahel during the current drought.

The carrying capacity of the Sahel range was surpassed in 1968, if Malian livestock counts may be accepted as representative (about 25% of the Sahel herd). Apparently, livestock numbers topped out between 1968 and 1970 (Tables I and III). The World Bank estimated that the Sahel was carrying 21 million AU (animal units)[3] at the peak and that there are probably

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(3) AU (animal unit) is equal to one bovine, camel, horse or ass over one year of age, or six sheep or six goats over one year of age.

18 million AU still there. They suggest that the Sahel can carry 15 million AU with "optimal watering facilities and some grazing and fire control".(4) Robinet insists that there must be a balance of animals and water with range.(5)

The Bank proposes that the reduction can take place [only] by there being developed an annual outlet for 638,000 cattle -- they say immature steers to be developed in the Sudan. This scheme bears the merit of increased efficiency through the selective use of high value feed (developed Sudanian rangeland and crop by-products).

The Sudanian range could be developed to provide additional dry season grazing in the present nomadic cycle. This would have the advantage (1) of higher per acre yield expected from higher rainfall and better land, and (2) lower cost per AU for infrastructure, including range management, water development and fire control.

Certainly a grazing program is needed that will reduce the pressure on the range from nomadic grazing to a sustained yield level. Such a program would amount to the host government establishing its territorial priorities for development, then negotiating with the users of the respective areas for their cooperation. The government could offer exclusive grazing rights, fire protection, water where needed, reseeding where appropriate, technical assistance and other appropriate

(4) IDA: Appraisal of Drought Relif Funds Project, Report No. 229 - WA (Washington: IDA, October 24, 1973) Annex 3

(5) A.H.Robinet: L'eau et developpement de l'elevage au Sahel. Courrier de l'Asscciation, No. 23. Jan. 1974 (Brusselles)

technical inputs, which over five to ten years should double the cooperator's net production. The cooperator would be asked to conform to his pro-rata allotment of technical stocking rates and, after two or more years, pay a fee for government services rendered. Such programs work where the users are permitted to provide their own internal management of the project.

First and most important, a massive village range management program is needed. It is needed first because they are destroying the agricultural land base and because provisions must be made for their livestock before projects for the nomadic herds can be implemented. The government-user relations would be the same as in the case of nomadic users. The government would deal with the village chief and elders. The grazing plan would provide for year-round grazing in the allotted area.

Table I

ESTIMATED CATTLE NUMBERS - MALI, 1954-1971

Year	Number (1000s)	% 1954 Estimate	% Annual Increment
1954	3076[1]	100	
1955	3337	111	+ 11.0
1956	3258	108	- 2.7
1957	3260	108	± 0.0
1958	3362	112	+ 4.0
1959	3314	105	- 6.3
1960	3513	117	+ 11.4
1961	3862	129	+ 10.3
1962	3923	131	+ 1.5
1963	4262	142	+ 8.4
1964	4648	154	+ 8.4
1965	4594	153	- 0.7
1966	4773	159	+ 3.9
1967	5213	174	+ 9.4
1968	5350	178	+ 2.3
1969	5350	178	± 0.0
1970	5350	178	± 0.0
1971	4707[1]	157	- 18.0
1972			
1973	4507[2]	150	- 4.5

[1] Source 1954-1971: Paris, SEDES, 1973; Mali, Service de l'Elevage, Rapport Annuel, 1971

[2] Source: IBRD Files (Oches), 1974

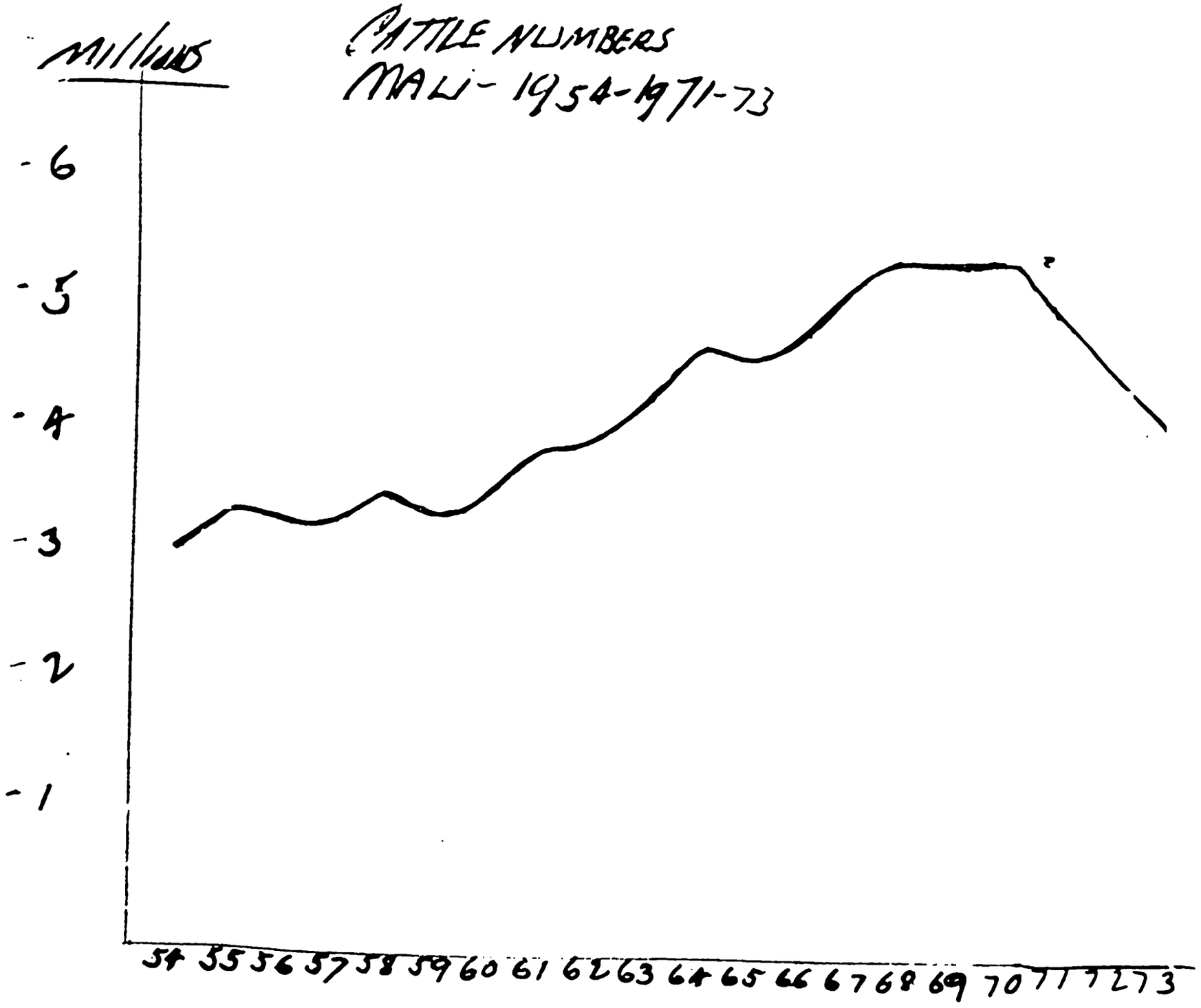
CATTLE NUMBERS
MALI - 1954-1971-73
Millions
6
5
4
3
2
1
54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73

Table II

NUMBER OF CATTLE EXPORTED FOR SLAUGHTER
CHAD, MALI, MAURITANIA, NIGER, UPPER VOLTA
1966 - 1972

	1966	1967	1968	1969	1970	1971	1972
Chad	9,150	8,840	7,550	9,380	13,630	13,350	13,060
Mali	12,010	14,280	10,800	20,600	19,880	17,530	16,150
Mauritania	14,700	15,000	14,670	14,690	14,400	14,500	14,600
Niger	13,490	13,850	14,470	15,060	15,630	16,160	16,630
Upper Volta	10,790	11,680	12,840	10,010	7,370	9,530	8,760
Total	60,140	63,650	60,330	69,690	70,910	71,070	68,750
Index		106	100	116	118	118	115
Percentage Change		+ 6	- 6	+16	+ 2	± 0	- 3

Source: FAO, WS/E 1790

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Table III

IBRD ESTIMATE OF CATTLE, SHEEP AND GOAT NUMBERS

"Before" Drought and Present
(Millions)

	Cattle	Sheep & Goats	Total A.U.	Cattle	Sheep & Goats	Total A.U. (1)
Mauritania	2.1	4.8	2.7	1.5	4.8	2.0
Mali	5.0	10.3	6.3	4.2	10.3	5.5
Senegal	2.8	2.8	3.2	2.4	2.8	2.8
Niger	4.1	3.4	5.2	3.5	8.4	4.6
Upper Volta	2.6	4.1	3.1	2.2	4.1	4.6
Chad	4.5	3.8	5.0	3.4	3.8	4.3
Total	21.1	34.2	25.5	17.2	34.2	23.8
% Change				(-) 18%	± 0	(-) 7%

(1) A.U. = Animal Unit = one bovine over one year of age = eight sheep over one year = eight goats over one year of age.