Journal of Experimental Research

SEPTEMBER 2025, Vol 13 No 4

Email: editorinchief.erjournal@gmail.com
editorialsecretary.erjournal@gmail.com

Received: Nov., 2025
Accepted for Publication: Dec., 2025

CROSSBREEDING OF GERMAN BROWN X N'DAMA AT IBADAN – I - MORTALITY OF PUREBREDS AND THEIR CROSSBREDS

Nwosu I. C[11].

[1.] Department of Animal/Fisheries Science and Management, Faculty of Agriculture and Natural Resources Management, Enugu State University of Science and Technology (ESUT), Enugu, Nigeria.

***Author for Correspondence:** irenkemnwosu@gmail.com;

ABSTRACT

Mortality rate of purebred German brown and N'dama and their crossbreds was examined for the period 1978 – 1985. The data was obtained from crossbreeding programme carried out at the Teaching and Research farm of University of Ibadan, Oyo State. The genotypes studied were purebred German brown represented as GBP, purebred N'dama as NDL, 75% N'dama crossbreds (NDB1), 50% N'dama crossbred (GBND), 37.5% N'dama crossbred (GBB2) and 25% N'dama crossbred (GBB1). Average mortality rates between 1978 – 1985 showed that mortality rate significantly ($P<0.05$) increased from low to high with increasing exotic inheritance. NDB1 had 7.17%, GBND had 13.14% which were significantly ($P<0.05$) better than GBB2 with 28.4% and GBB1 with 30.13% and even the purebred NDL with 22.13% mortality rates. The purebred GBL died most with 37.04%. The result suggest that crossbreds of higher exotic gene inheritance (GBB1 and GBB2) died more than crossbreds of lower exotic inheritance (NDB1 and GBND). Hence adaptability to the local environment was better with increased gene proportion of the crossbreds to the indigenous N'dama cattle.

Key words: Mortality rate, Purebreds genotypes, Crossbred genotypes

INTRODUCTION

Cattle production in this hot humid region faces a lot of problems, some of which are trypanosomiasis, streptothricosis, intestinal endoparasites and respiratory diseases. The high humidity prevalent in this hot humid region compared to the other regions has been shown to be a predisposing factor to disease infection in the tropics by Obi (1984). It is then believed that successful cattle production in this region requires good choice of cattle type and types that can tolerate the inimical effect of these diseases. Trail (1981) in his review of cattle production potentialities across ecological belts in the tropics south of the African Sahara, suggested the choice of trypanotolerant breeds for cattle production in this hot humid region of Africa.

Earlier, ILCA (1979) attempted evaluating the different breeds found in this zone and ranked them in order of tolerance as follows – N'dama, Muturu and others (which include N'dama crosses with other Zebu breeds and in Nigeria, the Keteku. This view agrees with earlier research report of Lloyd (1971) that among the indigenous breeds, the N'dama and Muturu showed higher resistance to streptothricosis which was supported by Oduye (1973).

The extent of its spread and survival in the West and Central African sub-regions has interested most tropical cattle researchers. This prompted the documentation of a complete survey of trypanotolerant livestock found in West and Central Africa by ILCA though its production has been under traditional management in areas of introduction (ILCA 1979). However, the N'dama breed has small adult size, exhibit slow growth rate and poor milking ability (ILCA 1979) in comparison to improved breeds.

Crossbreeding is one of the tools used in livestock improvement. It combines both additive and dominance effects in genes in the hybrids. The improvement could be to enhance the production of the hybrids in terms of milk yield, growth, fertility or to make the hybrids adapt better to the local environment or any combination of the above characters as desired. Thus effort was made at improving these productive traits and at the

same time retaining its adaptive trait through crossbreeding with the exotic German Brown. German Brown is a type of cattle which falls under the broad name of Brown Swiss.

Hollon and Branton (1973) and McDowell and McDaniel (1968) reported that crosses were less susceptible to disease infestation than their purebred parents. However, Flamigni (1959) partly agrees and reported poor performance contribution in Vom while at Ibadan the F1 crossbred performed better than the N'dama parents. This indicates improvement of traits of the local White Fulani and N'dama when crossed to exotic Friesian and German Brown.

It is in the light of the foregoing that effort was made at investigating the outcome of the crossbreeding exercise carried out at the University of Ibadan between German Brown, also known as Brown Swiss and N'dama with the viewing of comparing the genotypic effect on disease tolerance and survivability of the genotypes.

MATERIALS AND METHODS

The data used were extracted from the cow performance records at the University of Ibadan Teaching and Research Farm dual purpose herd.

The farm lies at the smooth stretch plane of about 200m above sea level at longitude 3°54'E and latitude 7°26'N. Ibadan is located in South-West Nigeria in the humid forest zone and is characterized by high temperature, high humidity, and an annual rainfall of 1250-1800mm with peaks in June and September. The dry season periods extends from November through March with an average temperature of 29.6°C (Ebozoje 1992).

The University of Ibadan farm received its first stock of Brown Swiss (BS) from the German Government 1969 as good gesture. In 1973, additional stocks were imported to meet the increasing demand for meat and milk and their products and research activities.

The crossing of the BS cattle with the N'dama (N'd) started in 1974. The crossbreeding programme was undertaken to incorporate breed tolerance to trypanosomiasis, endemic disease in humid tropics which causes sleeping sickness. Several crossings involving direct, reciprocal and backcrosses of varying degrees were in the process of developing trypanosomiasis-tolerant genotypes. The genotypes are as follows:

GBP (German Brown born locally or imported)	133
NDL (N'dama born on the farm)	63
NDB1 (Mating of N'dama females to F1 males; 75% N'dama gene)	55
GBND (Pooled F1 and F2; 50% N'dama gene)	23
GBB2 (5/8 GB x 3/8 ND; NDB1 females mated to GB males; 37.5% N'dama)	30
GBB1 (3/4 GB x ¼ ND; mating of GB x GBND; 25% N'dama gene)	40

Management practices

The composite and parent breeds were on range depending mainly on availability of grasses to meet their nutrient requirements. However, feed supplementation with dry brewers' grain and concentrates of approximately 10 - 14% crude protein and 11-13KJ of energy were made available to the animals once a day at the rate of 2kg $100kg^{-1}$ of body weight.

Routine management practices were carried out including flushing, deworming, spraying against endo- and ecto-parasites, vaccination against rinderpest, pluero-pneumonia, black quarter, septicaemia, antrax, foot and mouth diseases and weekly weight recording. Lactating animals were milked twice a day (morning and evening) and yield recorded per cow.

The calves were weaned at six months and at about two years, heifers were exposed to bulls for breeding purposes. Date, number of services per conception, calving rate, nature of calving and number of calving were recorded for each cow as well as birth weight, weekly weight recording, weaning weight. After calving, claves were allowed to suckle their dams for the first 48 hours and then transferred.

Data Collection and Statistical Analysis

The data covered the period (1970-1988) and included cattle genotypes totaling336 individual animal records; 130 GBP, 62 NDL, 23 GBND, 34 GBB1, 29 GBB2 and 46 NDB1. Each

animal was traced from its date of birth to the date of loss and the cause of loss noted. For the estimation of yearly mortality rate, the period between 1978 – 1985 was chosen, because all the genotypes had fair chance of representation and the variance between them minimal. T-statistics was used to test significant differences between means.

The yearly mortality rate was calculated as the number of dead animals alive within the same year expressed in percentage. The average yearly mortality rate was calculated as the total yearly mortality rate divided by the total number of years.

Mortality rate was also looked at between the ages of 0 – 6 months, 6 – 12 months, 1 -2 years, 2 – 3 years and 3 years and above within genotype. Mortality rate at these ages was taken as the percentage dead to the total number of animals alive at that age. Herd extinction was studied and death as a method of extinction was compared to other methods pooled together within genotype. The values were compared with chi-square test at 5% level of significance. The comparison was for 2 genotypes at a time.

The causes of death were studied. Due to lack of confirmatory tests on pathogens that led to death as well as observed health disorders, causes of death in broad terms were categorized to areas of disease attack.

RESULT

The study was carried out in stages, the first was to determine the cause of exit the herd within genotype shown in Table 1. It is evident that very significant ($P<0.01$) and ($P<0.001$) differences exist in GBI and GBL/NDL as well as GBB1 respectively. There were non-significant ($P>0.05$) differences for most of the crossbreds (NDB1, GBND, GBB2, F1, F2).

TABLE 1: PERCENTAGE DEATHS, CULLS, SLAUGHTER, TRANSFERS AND SALES WITHIN GENOTYPE

YEAR	GBP	NDL	NDB1	GBND	GBB2	GBB1
Deaths	77.6	76.6	56.5	52.9	60.0	79.5
Culls	9.5		21.7	23.5	8.0	12.8
Slaughter	7.8	8.5	17.4	2.9		
Transfer	4.2	2.1		5.9		2.6
Sale	3.0	12.8	4.3	14.7	32.0	5.1
Chi-square	20.35	13.3	0.8	0.1	1.0	13.6
of deaths	***	***				***
vs others						

** =P<0.01When death was considered alone, Table 2 below shows the percentage mortality at birth within genotype.

TABLE 2: PERCENTAGE MORTALITY AT BIRTH

ITEM	GBP	NDL	NDB1	GBND	GBB2	GBB1
NO	98	62	46	23	29	39
DEATHS	7	2	-	-	1	1
%	7.37b	3.32ab	0.0a	0.0a	3.45ab	2.56ab

Row percentage with the same letter do not differ significantly ($P>0.05$) between genotypes

Crossbreds NDB1 and GBND were significantly (P<0.05) better than purebred German brown (GBP), however, this difference was not maintained as crossbreds (GBB2 and GBB1) were not significantly (P>0.05) different from GBP. In addition, the crossbreds did not differ significantly (P>0.05) from the purebred local N'dama when death is considered as a pathway of exiting the herd.

Furthermore, mortality in the first six months of birth showed that only GBND maintained this significant (P<0.05) difference over all other genotypes (Table 3).

TABLE 3: PERCENTAGE MORTALITY BETWEEN 1 -6 MONTHS

ITEM	GBP	NDL	NDB1	GBND	GBB2	GBB1
NO	88	60	46	23	28	38
DEATHS	21	14	10	3	8	8
%	23.86b	23.33b	21.74b	13.04a	28.58b	21.05b

Row percentage with the same letter do not differ significantly (P>0.05) between genotypes

Table 4 below showed crossbred GBND and NDL maintained this positive significant (P<0.05) difference over other genotypes.

TABLE 4: PERCENTAGE MORTALITY BETWEEN 6 – 12 MONTHS

ITEM	GBP	NDL	NDB1	GBND	GBB2	GBB1
NO	67	46	36	20	20	30
DEATHS	14	6	2	1	3	7
%	20.89b	13.04ab	5.56a	5.0a	15.0b	23.33b

Row percentage with the same letter do not differ significantly (P>0.05) between genotypes

However, at adulthood, that is equal or above three years, all the crossbreds and purebred N'dama were significantly (P<0.05) better than the purebred German brown.

TABLE 5: PERCENTAGE MORTALITY AT ADULTHOOD (≥3 YEARS)

ITEM	GBP	NDL	NDB1	GBND	GBB2	GBB1
NO	38	29	24	16	13	13
DEATHS	20	2	5	-	-	4
%	52.63b	6.90a	20.83a	0.0a	0.0a	30.77a

Row percentage with the same letter do not differ significantly (P>0.05) between genotypes GBL – GBB1 and between F1 andF2

Generally, Table 6 below showed the average yearly mortality rate by genotype between the period 1978 – 1988. Crossbreds GBND and NDB1 had positive significant (P<0.05) difference over crossbred GBB2 and purebred NDL which in turn were significantly (P<0.05) better than crossbred GBB1 and purebreds GBL, these were significantly (P>0.05) not different from each other.

TABLE 6: AVERAGE YEARLY MORTALITY RATE BY GENOTYPE BETWEEN 1978 – 1985

GENOTYPE	NO	MEANS …….1978 – 1985……	STANDARD DEVIATION
GBP	42	37.04c	17.11
GBB1	12	30.13bc	18.56
GBB2	12	28.40b	15.93
GBND	14	9.57a	7.04
NDB1	16	7.17a	5.83
NDL	33	22.74b	10.57

Column means with the same letter do not differ significantly (P>0.05)

To have a clearer understanding of this trend of improved adaptation to the local environment with increased N'dama inheritance are Figures 1 and 2 below.

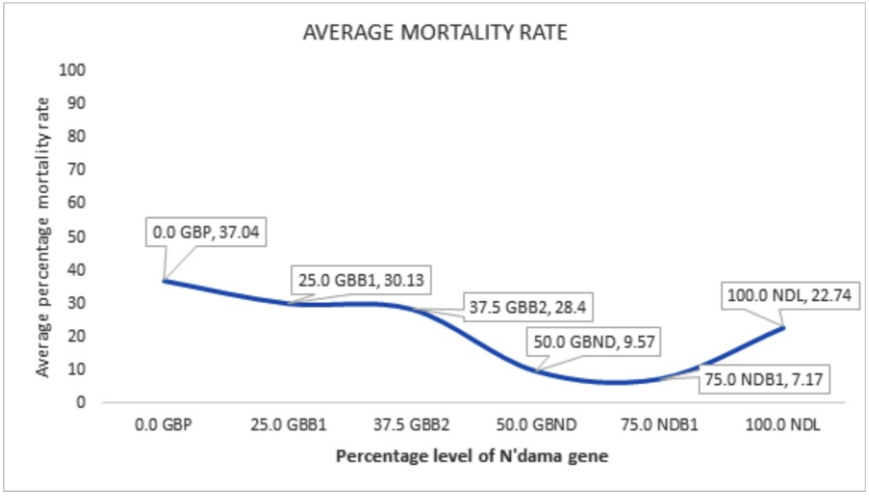

Fig. 1: line graph of average percentage mortality rate by genotype

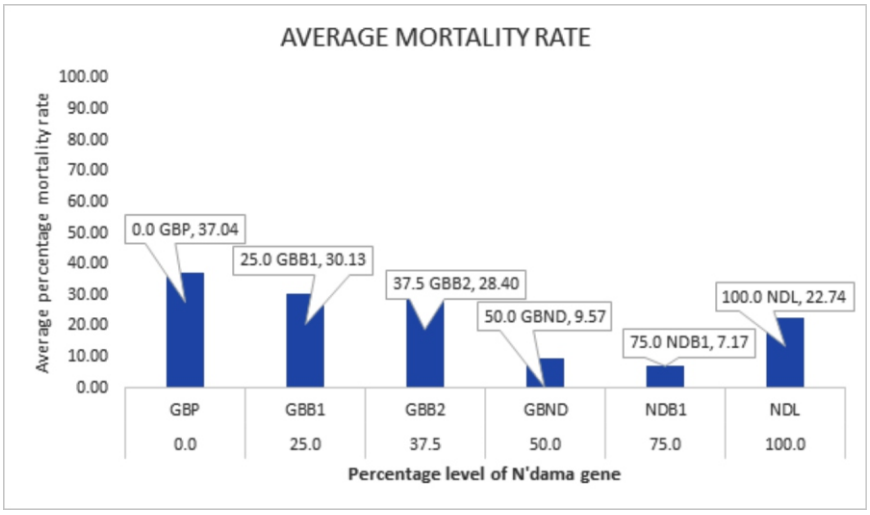

Figure 2: Bar graph of average percentage mortality rate by genotype

From Figs. 1 and 2 above, there was progressive improvement of adaptation to the local environment from 25% to 75% N'dama crossbreds with the downward reduction in average mortality rate from 30.13% to 7.17% accordingly. The best been NDB1 and GBND crossbreds with 50% and 75% N'dama gene which had 9.57% and 7.17% mortality rates respectively. These were better than the local N'dama with 22.74% mortality rate.

DISCUSSION

The mortality in one year, estimated as number dead within the year as a percentage of the genotype total, showed that purebred N'dama born on the farm (NDL), 75% N'dama crossbred (NDB1) and 50% N'dama crossbred (GBND) had 13.4%, 5.56% and 5% mortality percentages respectively thus they survived better than their crossbred counterparts; 37.5% N'dama crossbred (GBB2) and 25% N'dama crossbred (GBB1) which had 15% and 23.3% respectively and the purebred German brown which had 20% mortality rate. By adulthood (3^+ years), all the crosses survived similarly ($P>0.05$) like the purebred N'dama but significantly ($P<0.05$) better than the exotic German brown.

The average yearly mortality rate from 1978 – 1985 shown in Table 6 also revealed that crossbred NDB1 and GBND with 7.17% and 9.57% respectively had superior survival advantage ($P<0.05$) over purebred N'dama and other crossbreds and purebred German brown cattle. This supports the work of Flamigni (1959) that at Ibadan the F1 crossbred of N'dama performed better than the N'dama parents and he suggested improvement of traits of the local White Fulani and N'dama when crossed to exotic Friesian and German Brown. Diack *et al* (2004), further said that survival rate to one year (i.e., 90.0 % for the Jersey x N'Dama (J x N) and 71.2 % for the Friesian x N'Dama (F x N)) proved satisfactory in the local environment in the tropics, supporting works of Awobajo (2009), Hollon and Branton (1973) and McDowell and McDaniel (1968) that crosses were less susceptible to disease infestation than their purebred parents.

Accordingly, the superior survival rate of NDB1 and GBND similar to local N'dama, (even better when the average yearly mortality rate is considered) may indicate that as the proportion of N'dama inheritance increases (50% GBND – 75% NDB!) in contrast to GBB2 and GBB1 (37.5% - 25% N'dama inheritance) the more resistance to tropical disease infestation the animals become. ILCA (1979) in their evaluation of the different breeds found in the humid tropics of Africa ranked some cattle types in order of tolerance to diseases found in this zone and more especially trypanosomiasis as follows – N'dama, Muturu and others (which include N'dama crosses with other Zebu breeds and in Nigeria, the Keteku. This view agrees with earlier research report of Lloyd (1971) and Obi (1984) that among the indigenous breeds, the N'dama and Muturu showed higher resistance to streptothricosis which was supported by Oduye (1973). In addition, Trail (1981) suggested the choice of trypanotolerant breeds for cattle production in the humid region of Africa may offer the window of improvement for livestock production. In this regard the increased gene proportion from N'dama for these crossbreds (NDB1 and GBND) may have conferred on them higher tolerance to diseases of the Ibadan environment thus improving their survival rate.

CONCLUSION

The study concludes that mortality rate was lower for the crossbreds than purebred German brown and partially lower than the local N'dama when crossbreds of 75% and 50% N'dama inheritance are compared to the local N'dama. Furthermore, increasing N'dama inheritance confers better adaptation to the crossbreds as exemplified by the progressive lowering of mortality rate with increasing N'dama gene. For instance, average yearly mortality rate progressively decreased from crosses with 25% to 75% N'dama inheritance; GBB1 (25%) to GBB2 (37.5%) to GBND (50%) and finally NDB1 (75%).

REFERENCES

Awobajo OA. (2009). Survivability of n'dama crossbred calves in sub-Sahara region of Africa. *Animal Research Production Advances*. **5(4):** 238-242.

Diack A, Sanyang FB and Corr N. (2004). Survival, growth and reproductive performance in F1 crossbred cattle produced and managed on station in the Gambia. *Livestock Research for Rural Development. Vol. 16, Art. #70.* Retrieved October 4, 2025, from http://www.lrrd.org/lrrd16/9/diac16070.htm

Ebozoje MO. (1992). Preweaning performance of West African Dwarf Goats and West African Dwarf x Maradi half-bredgoats in Ibadan, Nigeria. Ph.D. Thesis, University of Ibadan, Nigeria. 239p.

Flamingni A. (1959). Cattle in Mayumbe. Bull. Agric. Congo Belge. 50:77

Hollon BF and Branton C. (1973). Health and viability of purebred Holsteins compared to crosses among Brown Swiss, Jersey and Red Sindhis. *J Dairy Sci*. **56:** 309.

ILCA (1979). Trypanotolerant livestock in West and Central Africa – Vol 1. General study and Vol. II. Country studies. ILCA, Monograph II. Addis Ababa.

Lioyd DH. (1971). West Africa: Bovine streptothricosis. Span. 14:1

McDowell RE and McDaniel BT. (1968). Inter-breed mating in dairy cattle. II Herd health and viability. *J. Dairy Sci*. **51:** 1649.

Obi TU. (1984). Clinical and epidemiological studies on peste des petits ruminants (PPR) in sheep and goats in southern Nigeria. Ph. D. Thesis, University of Ibadan, Nigeria. Unpublished.

Oduye OO. (1973). Some aspects of bovine cutaneous streptothricosis in Nigeria. PhD. Thesis, University of Ibadan, Nigeria. Unpublshed.

Trail JCM. (1981). Merits and demerits of importing exotic cattle compared with the improvement of local breeds. *British Soc of Animal Prod Occasional Publ*. **4:** 191.