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Original Research

Early Growth and Reproductive Performances of Horro Cattle and thier F_1 Jersey Crosses in and around Horro-Guduru Livestock Production and Research Center, Ethiopia

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Abstract

A cross-sectional survey, an assessment of recorded data and measurements of different traits were conducted to determine the reproductive and early growth performances of Horro cattle and their F_1 Jersey crosses of the study area. The mean(SD) total farmland, cropland and grazing land holdings of individual smallholder householders were 3.6±3.16, 2.86±2.51 and 0.81±0.89 respectively, while the mean(SD) livestock species holding were 17±11.66, 2.9±3.98,2.9 ±4.83, 1.8±1.66 and 9.3±8.97 for cattle, sheep, goats, equine and poultry respectively. Anestrous, repeat breeder, endo-metritis and dystocia were the main reproductive health problems which were found to occurs with the proportion of 21.1%, 19.7%, 5.6% and 1.4%, while the remaining 52% attribute to non pregnancy in cows due to voluntary waiting period, post partum period and lack of AI service. The overall mean age at first service across both production sites(on station and on farm) was 48.85 months for local Horro and 33.25 months for Horro-Jersey F_1 Crosses, where as the mean (SD) NSPC for Horro and Horro-Jersey crossbred heifers was found 2.1±1.09 and 1.7±0.94 respectively. Breed of animals had high significance effect at ($P < 0.001$) on AFS and AFC. The mean birth weight of Horro and Horro-Jersey crossbred calves was 17.5±2.25 and 18.2±2.03 kg respectively. Calf birth weight was significantly ($P<0.001$) influenced by breed and sex, season and year of birth of a calf. The mean (SD) body weight measure of Horro calves at six, twelve, eighteen and twenty four months age is found to be 69.8±31.19, 117.7±22.65, 129.4±24.82 and 150±23.56 Kg respectively. While, their respective counterpart Horro-Jersey F_1 crossbred calves were found to weigh 64.42±10.18, 136.6±27.97 and 145.1±22.27 kg mean(SD) body weight at six, twelve and eighteen months of ages respectively.

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INTRODUCTION

Despite the country's high livestock holding, great potential and sustained development efforts to get the subsector moving forward, productivity has remained low and still subsistence oriented in Ethiopia. A number of interrelated, complex and dynamic economic, technical, policy and institutional challenges have hampered the subsector (Yoseph *et al.*, 2003). Reproductive performance is often a major determinant of biological and economic efficiency of livestock production in the tropics. Production of milk also depends heavily on reproductive performance of cows (Kiwuwa *et al.*, 1983).

Dairy production systems and dairy cattle productivity are highly complex, risk-prone and diverse spatially and socially. Reproductive efficiency of dairy cows is influenced by different factors including: gene, season, age, production system, nutrition, management, environment and disease (Shiferaw *et al.,* 2003). Abortion, infertility and sub-fertility are also some of the major problems recorded in many farms in urban and peri-urban areas in Ethiopia (Yoseph *et al.*, 2003). Therefore, accurate evaluation of the reproductive efficiency of indigenous stocks and their crosses in different production systems is essential for the

development of appropriate breeding strategies (Negussie *et al.,* 1998).

In Ethiopia, mainly crosses of zebu with Holstein-Friesian cattle have been used for milk production for decades (Alberro, 1983; Bekele *et al*., 1991). However, in Western Oromia, only few research works have so far been conducted on reproductive and production performances. Particularly to the best of my knowledge, no research work was conducted concerning the comparison of Horro cattle and their crosses under on-farm condition. This particular study is therefore, carried out to with the objective of determining early growth and reproductive performances of Horro cattle and their F_1 Jersey crosses under on-station and on-farm production condition.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in Oromia Regional State, Horro-Guduru Wollega zone, in Horro Guduru Livestock Production and Research Center of Wollega University and the surrounding smallholder householders' farms. The Research Center is located at about 300 km west of Addis Ababa. The geographical coordinates of the study area is 09º29´N and 37º26´E, at an altitude of approximately 2296 m.a.sl. The area has one long rainy season extending from March to mid-October (Olana, 2006). According to the (2010/11) annual report of Guduru District, the monthly mean temperature varies from 14.9^0C to 17.5^0C and annual rainfall ranging from 1000 – 2400 mm.

Study Animals

The animals considered under this study were: Horro and Horro-Jersey F_1 crossbred cows and heifers, and their male and female calves in the Research Center and the surrounding smallholders' farms. The Horro cattle breed has traditionally been used for draft power, milk and meat production in low-input production systems. The breed is classified as an intermediate (Sanga-Zebu) characterized by a fine skin and uniform brown color which is lighter around the muzzle and on the flanks, abdominal floor and perineum and in between the hind legs (Alberro and Haile-Mariam, 1999; Rege and Tawah, 1999).

Herd Management

There were about five groups of animals in the herds on station. The groupings were made based on breed, age and sex of the animal and stage of production of the animal. Pregnant cows and heifers were separated into maternity pens during night and supplemented with concentrate and conserved forage grasses during the last tri-minister of pregnancy. The natural pastures are dominated by (*Hyparrhenia*, *Andropogon* and *Trifolium)* species where improved forages such us Rhodes, Napier grass and some other leguminous forages are also cultivated.

On smallholders' farm, animals were allowed to graze on natural pasture of communal grazing lands during the day, year round and stub-grazing is also the major feed substitute during early to mid dry season of the year. Lactating cows, calves, crossbred animals and draft oxen were supplemented with native and improved forage grass hay and/or crop residues, kitchen waste leftover and mineral salt in the morning and in the evening.

Data Collection

The source of data on reproductive performances of on-farm animals were collected from record books while data on growth performance was taken by heart-girth measurement of male and female calves grouped based on their age grouped to six, twelve, eighteen and twenty four months age. For the smallholder households' animals, the same parameters were collected by an interview.

Statistical Analysis

Reproductive parameters like age at first service (AFS), age at first calving (AFC), calving interval (CI), days open (DO), Birth weight (BWt), lactation length (LL), lactation milk yield (LMY) and calf growth performance was analyzed with the Procedure General Linear Model (GLM) in SAS (SAS, 2002).

Statistical Model Used For Data Analysis

Estimation of Calves Growth Performance

$Yij = \mu + Bi + Cs + Am + eimj$

Yij = is the ij^{th} observation of a trait in question (growth performance)

μ = is the overall least square mean

Bi = is the effect of i^{th} Breed of calve (1= Horro, 2= Horro-Jersey cross heifer)

Cs= is the effect of s^{th} sex of calves (1= male, 2= female)

Am= is the m^{th} age of calve (6, 12, 18 and 24 months)

eismj = random error [which was assumed N (0, δ^{2e})]

RESULTS AND DISCUSSION

Land and Livestock Holding

Guduru district is characterized by crop-livestock mixed farming system, where livestock form the integral component of crop production. Of the different livestock species raised in the area cattle is produced in large number followed by poultry. The mean herd size for cattle was about 17.0±11.67. The mean (±SD) population size of the different livestock species found in the current study was

much higher than the average holdings of some livestock species (oxen, cows, sheep and goats) reported by Gryseels and Goe (1984). However, the average holding of sheep found in the current study is far lower than the average flock sizes ranging from 10.7 to 15.0 reported at Debre Berhan and Ada'a areas (Gryseels and Anderson 1983; Mukasa-Mugerwa *et al.*, 1986).

The total landholding per household in the area is about 3.6 ha. Of the total per household land owned by smallholder household, the largest proportion is allocated for crop production followed by grazing land. Significant differences (P<0.001) were also observed among the individual farmers in landholding (Table 1). Even though, grazing land shifts to crop cultivation, more pastureland is still available in the study area compared to other highland areas of Ethiopia, (0.5 to 5 ha in the central highlands) reported by Gryseels *et al.* (1984).

Table 1: The mean of farmland holding, grazing animals TLU of small holder house holders.

Variables	Mean ±SD	Range
Landholding per household (ha)	3.6±3.16	0 to 21
Crop land (ha)	2.9±2.52	0 to 16
Grazing land (ha)	0.8±0.89	0 to 5
Herd size (TLU)	13.8±9.05	2.8 to 65.1
Different species owned		
Cattle	17 ±11.67	4 to 87
Sheep	2.9 ±3.99	0 to 15
Goats	2.9 ±4.83	0 to 21
Equines	1.8 ±1.66	0 to 6
Poultry	9.3 ±8.97	0.38
Honey bee colony	6.6 ±16.40	0 to 100

TLU = Tropical Livestock Unit

Husbandry and Management

Cattle breeding, Husbandry and Management

At smallholder households' level; AI, natural service and/or both methods were used for cattle breeding where 93.2% respondents prefer artificial insemination (AI) to natural mating. However, due to inaccessibility of AI service, the need for breed improvement through AI service gets inefficient. The proportion by which only natural service was used were 63.8% where both natural and AI services was used by 36.2% respondent householders. Only 24.1% (n = 15) of households use bulls from their own herd while 74.9% (n= 43) of them depend on their neighborhoods' bull service.

To detect heat signs accurately, the dairyman must have a basic understanding of the estrous cycle of the cow. The greatest limiting factor to successful fertilization & reproductive performance is associated with detection of estrus (Radostitis *et al.,* 1994). About 54.1% respondents reported that heat detection of breeding cows and heifers were mainly the concern of family heads followed by other family members (37.8%). Herders also play their own role in heat detection. About 52.8% (n=39) of participants in the current study believed that they have basic understanding of heat detection, where 18.9% (n=14) had an opinion that they have excellent understanding and about 27.0% (n=20) have poor understanding.

Table 2: The proportion of different breeding and cattle husbandry methods used.

Breeding variables	No of Household	Proportion (%)
Methods of Breeding		
AI only	-	-
Natural mating only	43.0	63.8
Both AI and natural mating	27.0	36.2
Source of Breeding Bull		
Own	15.0	25.9
From neighbors	43.0	74.1
Breeding Methods Preference		
AI service	54.0	93.2
Natural mating	2.0	3.4
No response	2.0	3.4
Heat Detection		
Family head	40.0	54.1
All family members	28.0	37.8
Herders	5.0	6.8
Knowhow About Heat Detection		
Excellent	14.0	18.9
Satisfactory	39.0	52.7
Poor	20.0	27.0

Feed Sources and Feeding System

The main sources of livestock feeds of the study area are natural pasture (grazing), crop residues, crop aftermaths and in some cases cultivated forages. Feed supplements such as grass hay, crop residue, kitchen waste leftover (Diky/Local name for local brewery and liquor residue), concentrate, green chops of (Napier grass, vernonia (*Vernonia amygdalina*), *Sesbania sesban*) and salt are also commonly used. Similar results were reported in literature (Anteneh, 1984)

Young calves in the study area are not allowed to graze until they are three months of age. They are either kept separate in groups or tethered. During this time, calves are provided with some feeds like hay and kitchen wastes during the dry season, and weeds and green chopped grass during wet season.

More than 98.7% farmers own private grazing lands. Private grazing lands were protected from animals at the end of the main rainy season to allow good pasture growth and use it efficiently during the dry season. Hay and crop residue supplements are used during the dry and wet season when grazing pasture is not sufficient. Some farmers also provide commercial concentrates (for their crossbred cows), local brewery and liquor byproducts and improved forages like sesbania (*Sesbania sesban*), elephant grass (*Pennisetum purpureum)*, rhodes grass (*Chloris gayana)*, oat grain and vetchs.

Reproductive Performances

Age at First Service, Number of Service per Conception and Age at First Calving

A total of 205 animals (133-local Horro and 72-Horro-Jersy crossbreds) of which 108 animals were from on-station and 97 from on-farm were used for the study. The overall mean age at first service across both production sites (on-farm and on-station) was 48.9 months for local Horro (n=133) and 33.3 months for Horro-Jersey F_1 crosses (n= 2). According to results found in the current study, site of production has no significant effect on NSPC, but breed of heifers had high significant influence on AFS (P< 0.01).

The average age at first service (AFS) found were longer for local Horro while it is found to be shorter for Horro-Jersey crossbred heifers. The mean AFS obtained in the current study is longer than the 20.1 months reported for crossbreds reared at Addis Ababa milk shed and the 29.6 months reported for crossbreds at the central highlands of Ethiopia (Yoseph, 1999; Yoseph *et al.*, 2003). The longer AFS for local Horro as compared to crossbreds obtained in the current study agree with results reported by Albero and Haile-mariam (1983) and Mukasa-Mugerwa (1989). No significance difference was observed between heifers reared under on-station and on-farm management.

Breed had significant (P<0.01) influence on NSPC (Table 3). The NSPC was longer for the indigenous Horro compared to the Horro-Jersy crossbred heifers. Though not significant there was a tendency that heifers reared under on-station management had less number of services per conception. Azage *et al.,* (1989) and Goshu (1983) also reported that crossbred cows required less NSPC than local cows. The influence of breed on NSPC obtained in the current study is in disagreement with the non-significant influences of breed reported in literature (Giday, 2001).

First calving marks the beginning of a cow's productive life. Age at first calving is closely related to generation interval and, therefore, influences response to selection. In the current study, AFC was significantly influenced (at least at P<0.05) by both breed and management system. It was shorter for crossbred heifers by about 18 months than which was recorded for local Horro heifers. Heifers reared under on-station management also reached AFC at about 42 months that which was actually shorter by about 3 months than for the indigenous Horro heifers were.

The 42.2 months for AFC of Horro-Jersey crossbred heifers reported in the current study is comparable to the record (41.4 months) reported for Asella herd by Million *et al.* (2006) and the 40.6 months record reported by Shiferaw *et al.* (2003) for crossbred dairy heifers in different dairy production systems in central highlands of Ethiopia. It is, however, shorter than the 48.5 months AFC reported for heifers at Holetta herd; and longer than the 37.5 months reported for crossbred heifers raised at Debre Zeit (Million *et al.*, 2006). The average AFC (59.73 months) for Horro heifers found in the current study is much higher than the 35.1 months reported by Albero (1983) for East African Zebu; the 50 months reported by McDowell (1972) for Horro breed and the 53 months reported by Mukasa-Mugerwa (1989) for the central highland zebu. However, it is in line with the 58.3 months reported for smallholder crossbred dairy heifers in Zimbabwe by Masama *et al.* (2003) and the 58.6 months for non-descript breed in India reported by Singh and Raut (1980).

Table 3: Mean and level of significance for AFS, NSCP and AFC under on-farm & on-station management.

Sources of Variation	Number of Heifers	Mean ±SD and Level of Significance		
		AFS	NSPC	AFC
Breed		***	***	***
Horro	133	48.9 ±8.20	2.1 ±1.10	59.7 ±10.22
Horro-Jersy cross	72	33.3 ±10.90	1.8 ±0.94	42.2 ±11.45
Location		Ns	Ns	*
On-station	108	43.5 ±11.19	1.9 ±0.91	55.0 ±14.05
On-farm	97	43.3 ±12.62	2.1 ±1.19	51.9 ±12.82

AFS = Age at first service, AFC= Age at first calving, NSPC = Number of service per conception, ***= highly significant at P<0.001;**= Significant at P<0.01; * = significant at P<0.05; Ns= Non significant.

Among reproductive constraints, the occurrence rate of repeat breeder (19.7%) found in this study was much higher than the 5 to15% reported by Puntam (1986) and Tigre (2004) but slightly lower than the 21.8% the rate reported by Mekonnen (2000). In discussions held with key informants, it was learnt that lack of awareness on heat detection, inaccessibility and inefficiency of AI service, sub-prominent heat sign of local cows and scarcity of energy feeds for both breeding bulls and cows were the main factors influencing the reproductive performances of breeding cows in the area. About 8% occurrence of dystocia was reported in literature (Tadesse, 1999) where local zebu cows are used as dam, however, the prevalence rate of dystocia identified in this study was only about 1.4%, which might be because of the fact that most smallholders use natural mating to sire same breed that might minimize the occurrence of fetal over size.

Table 4: Common reproductive health problems reported and their prophylactic measures.

Major reproductive problems and their treatments	Number of respondents	Proportion (%)
Major reproductive problems reported		
Post partum period	4	5.6
Voluntary waiting period	5	7.0
Anestrous	15	21.1
Endometritis	4	5.6
Dystocia	1	1.4
Un-availability of AI	9	12.7
Repeat breeder	14	19.7
Uncertain about the causes	19	26.8

The prevalence rate of endometritis reported in this study (5.6%) is much lower than the 18.7% reported by Oumer (2003) and the 19.6% reported by Gebremariam (1996). Higher incidence rates ranging from 34 to 67% were also reported in literature (Ruder *et al*., 1990). The variation among the prevalence of endometritis reported in the current study and others might probably be due to differences in management systems and/or due to differences in prevalence of the disease itself.

Birth Weight, Calving to First Service and Calving Interval

The overall mean birth weight of Horro and Horro-Jersey crossbred calves was summarized in Table 5. Birth weight was significantly (P<0.001) influenced by breed, sex of calf, season of birth and year of birth of calf. The average birth weight of Horro calves found in the current study is in close agreement with the 18.3 kg birth weight reported for calves of same breed before 29 years by Kiwuwa (1983) and slightly lower than the 19.3kg reported by Kebede and Galal (1982). However, it is above the on-station birth weight values reported for the N'Dama cattle of West Africa (Fall *et al.* 1982). Male calves at birth were heavier than their female contemporaries were, while calves born during rainy season were found to be heavier than those born during the dry season were.

Table 5: Means (SD) of birth weight of Horro and Horro-Jersey crossbred calves as influenced by breed, sex of calf, season of birth and year of birth.

Sources of variation	N	Mean±SD and level of significance
Breed		***
Horro	305	17.5 ±2.25
Horro-Jersy	384	18.2 ±2.03
Calf sex		***
Male	343	18.2 ±1.88
Female	346	17.6 ±2.37
Season of birth		***
Rainy season	412	18.0 ±2.01
Dry season	278	17.8 ±2.12
Year of birth		***
2003	42	17.4 ±2.47
2004	187	18.4 ±2.20
2005	111	18.9 ±1.44
2006	95	17.5 ±1.61
2007	62	18.4 ±1.51
2008	56	17.0 ±1.12
2009	49	17.0 ±1.27
2010	50	16.8 ±1.20
2011	38	17.3 ±1.43

***= highly significant at P<0.001;**= Significant at P<0.01; * = significant at P<0.05; ns= Non significant.

The mean birth weight (18.2) of Horro-Jersey crossbred calves found in this study is lower than those reported for crossbred calves in other parts of Ethiopia by Kiwuwa *et al.* (1983), in Côte d'Ivoire by Letenneur (1983), in Malawi by Agyemang and Nkhonjera (1986) and in Tanzania by Said *et al.* (2001). Nevertheless, crossbred Horro calves are heavier than the N'Dama-Friesian and the N'Dama-Jersey crossbred calves in Gambia at birth.

The mean (SD) number of days from calving to first service of Horro cows is indicated in Table 6. Season of last calving did not have significant influence both on days from calving to first service and days open. Nevertheless, cows calved during dry season had shorter length of time from calving to first service and shorter days between calving to conception. Dam parity significantly (at least at P<0.05) influenced length of days to first service and days open.

The length of days from calving to first service has shown a tendency to increase from second to third parity thereafter it decreases. A result found during the current study on calving to first service is completely higher than results reported on the same parameter (Gebregziabher *et al*., 2004). The authors reported about 43.1 (4.65) days from calving to first service in Horro and 120.4 (11.34) days for Boran cows at Bako Research Center. The overall mean calving to first service obtained in the current study is also higher than the 162.5 days reported by Emebet and Zeleke (2007) on different dairy production systems in the Eastern lowlands of Ethiopia.

Table 6: Mean ±SD number of days from calving to first service (Cal-FS) and days open (DO) and the effect of season of last calving and dam parity on Cal-FS and DO.

Source of variation	Mean ±SD and level of significance for:			
	Number of cows	Calving to first service	Number of cows	Days open
Season of last calving		Ns		Ns
Rainy season	100	383.4 ±170.15	88	432.4 ±187.38
Dry season	49	369.1 ±158.87	45	412.7 ±183.99
Parity of calves' dam		***		*
2	53	349.5 ±173.88	55	407.3 ±187.65
3	46	442.0 ±167.97	44	479.6 ±206.16
4	35	382.6 ±137.67	34	417.4 ±156.74
5	13	263.8 ±127.72	9	290.0 ±83.44

***= highly significant at $P<0.001$;**= Significant at $P<0.01$; * = significant at $P<0.05$; ns= Non significant

The mean ±SD number of service per conception (NSPC) and calving interval (CI) and the effects of last calving season and dam parity on NSPC and CI are indicated on Table 8. Mean calving interval obtained in the current study was about 668 days (≈22 months) ranging from 506 to 735 days (≈16.9 to 25 months). In the current study, season of last calving did not influence CI. Though no significant difference ($P>0.05$) between those cows which calved in dry season (i.e. cows whose last calving was in dry season) had shorter CI. CI was significantly influenced ($P<0.01$) by dam parity. Mature cows which were in their 4^{th} and 5^{th} parities had shorter CI. The shorter calving intervals at later parities may be due to a function of selective culling against repeat breeder cows. Similar result of shorter calving interval for parity 5 and above was reported for HF and Gir crosses (Hirooka and Bhutyan 1995). Shorter calving interval for parity six and above was also reported on crossbreeding HF with local breed at Debre Zeit (Million, 1997).

The postpartum anestrous interval is an important trait in determining the calving interval and calving rate of a herd (Ababu, 2002). The mean calving interval of Horro cows found in the current study is much higher than the mean calving intervals reported for other indigenous breeds of Ethiopia and Horro breed itself at other locations (Mekonnen, 1994). The authors reported values ranging from 439 to 509 days (≈25 to 27 months). However, the mean CI obtained in the current study is within the range of 12 to 27 months, reported by Mukasa-Mugerwa (1989) for Zebu cattle and the 658 days (≈ 22 months) reported by Agyemang *et al.* (1997) for N'Dama cows in the Gambian traditional husbandry system.

Table 7: Mean (SD) number of service per conception (NSPC) and calving interval (CI) and their level of significance.

Source of variation	Means (SD) and level of significance for:			
	Number of cows	NSPC	Number of cows	CI
Season of last calving		Ns		Ns
Rainy season	131	1.53 ± 0.74	120	710.4 ±192.70
Dry season	69	1.52 ±0.65	60	659.6 ±144.20
Parity of calves' dam		Ns		**
1	35	1.54 ±0.65	-	-
2	64	1.73 ±0.82	68	675.9 ±159.40
3	50	1.42 ±0.60	67	735.4 ±186.14
4	38	1.39 ±0.67	38	685.9 ±189.07
5	13	1.30 ±0.63	07	505.7 ±94.34

**= Significant at $P<0.01$; * = significant at $P<0.05$; ns= Non significant

Growth Performance of Horro and Horro-Jersey F_1 Calves

The mean±SD body weight measure of Horro calves at 6-, 12-, 18- and 24-months of age are indicated in Table -8. Height girth and live-weight of the experimental animals were significantly (P<0.05) influenced by breed at 6-, 12-, and 18-months of age. However, it was not possible to compare the pure Horro and the Horro-Jersey F_1 crosses at 24-month of age due to absence of data for the later at this particular age.

Sex had no significant (P>0.05) effect on either of the parameters at 6-, 12-, and 18-months of age. Nevertheless, sex significantly (P<0.05) influenced both girth height and live-weight measured at 24-months of age. Though not significant, male calves were heavier than female until their eighteen months of age and they also grew faster than their female counterparts. However, at 24-months of age females were significantly heavier than males.

Table 8: On-station mean (SD) girth height and live-weight of Horro and Horro-Jersey F_1 crossbred calves.

Variables	6m		12m		18m		24m	
Girth (Cm)	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**
Breed		Ns		*		*		
HH	**8**	88.5 (14.11)	36	109.5(7.01)	20	113.3 (7.33)	44	119.2(6.86)
(J x H)	**33**	87.6 (5.42)	15	115.4 (7.7)	49	118.0 (6.22)	Na	
Sex		Ns		Ns		Ns		**
Female	**20**	86.6 (6.18)	23	117.0 (16.99)	26	136.0 (13.12)	28	121.9(5.42)
Male	**21**	89.0 (8.81)	28	112.7 (8.79)	43	117.3 (8.15)	16	114.5(6.68)
Body Wt (Kg)								
Breed		Ns		*		*		
HH	**8**	69.8 (31.19)	36	117.7 (22.65)	20	129.4 (24.82)	44	150.0(23.6)
(H x J)	**33**	64.4 (10.18)	15	136.6 (27.97)	49	145.1 (22.27)	Na	
Sex		Ns		Ns		Ns		**
Female	**20**	62.9 (10.77)	23	117.0 (16.99)	26	136.0 (13.12)	28	158.6(20.5)
Male	**21**	68.0 (19.8)	28	128.3 (30.28)	43	143.3 (28.38	16	134.9(21.3)

LH= Local Horro calves, (HxJ)= Horro-Jersey cross calves, n= no of calves; na= data not available, **= Significant at P<0.01; * = significant at p<0.05; Ns= Non significant

Average daily weight gain of calves was higher during the first six months of age, thereafter decreasing as the age of calves advances. Under similar management Horro calves were found to grew faster than the Horro-Jersey crossbred calves up to six months of age (290g/head/day vs. 257g/head/day, respectively). However, after six months of age the Horro-Jersey crossbred calves grew faster than the local Horro calves. The average daily weight gain found for Horro calves from birth to 6 months (290g/head/day) is lower than the 305g/head/day reported by Mulugeta (1991) for same breed at Bako Agricultural Research Center.

The F_1 crossbred calves grew at 0.329kg/head/day to attain a mean weight of 136kg at one year, while Horro calves grew at 0.278kg/head/day to attain about 117.7kg mean live-weight in one year age. The mean weight of calves at two years of age in the current study seems to be less than the mean weight of calves at eighteen months of age. The reason for the lower mean body weight of the two sex groups at twenty-four months of age is attributed to the un-availability of Horro-Jersey crossbred calves at this age.

To sum up, the demographic pressure in Ethiopian highlands and the severe reduction of available grazing lands and livestock per capita show the urgency to identify and implement research alternatives compatible to the environment that enhance livestock productivity. This paper revealed that knowledge of local livestock practice and productivity is a preliminary necessity for addressing adequate recommendations at local level and that herd monitoring is an appropriate tool to achieve this objective.

The solution to prevailing reproductive performance constraints must essentially encompass selection of better indigenous heifers, controlled cross breeding and reproduction management, and animal health. Farmers must be educated and sensitised on the availability of alternative feed resource basis, better livestock management and health care practices. Recommendations that require higher investment include research on on-farm and on-station feeding and alternative feeding, and use of AI service practices for improving the growth and reproductive performance and rationalisation of breed improvement practices.

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