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Pre-Weaning Growth Performances and Survival Rate of Lambs' in the highlands of Ethiopia

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Abstract

Data collected on 1388 Awassi x Menz 25-50% [1](AM 25-50%), 80 Awassi x Menz 75% (AM[2] 75%) cross breed and 3482 Menz (M[3]) lambs collected from 1993 through 2004 were analyzed for survival and growth from birth to weaning (90 days) at Sheno Agricultural Research Center. AM 25-50% and AM cross breed lambs were significantly (p<0.0001) heavier at birth and weaning: they also grew faster than the local M lambs. Birth weight increased with increasing blood level of Awassi; AM 75% being the heaviest. Indigenous M breed lambs were 19 and 33% lighter at birth compared to the AM 25-50% and AM 75% lambs. Year and season of Birth had significant (p<0.0001) on lamb weight at birth and weaning and pre-weaning weaning weight. Ewe lambing in the main rainy season produced the heaviest birth weight while lambing of short rainy season hand both the highest weaning weight and pre-weaning weight gain (p<0.0001). Birth weight was lowest for parity one, and subsequently increased at parity two through five. Twin born lambs were significantly (p<0.0001) lighter than single born lambs at birth and weaning; 30 and 24% at birth and weaning, respectively. Lambs born from supplemented ewes were significantly (p<0.0001) heavier at birth and weaning and also a gain advantage of 36% was recorded. Lambs born from heavier (>=46 kg) ewes were significantly (p<0.0001) heaver at birth and weaning than lamb born from lighter ewes (<=25.50 kg). The overall mortality rate was 17.49%. However, a significantly higher proportion of lambs died within three days; 46.26% Vs 11.39% at 60-90 days of age. Lambs that were born under 2.5 kg had greater risk of dying (33%) while lambs that were born above 3.5 kg died only 6.63%. Almost similar proportion (17% for M, 19% for AM 25-50% and 14% for AM 75%) lambs died, respectively. Pre-weaning survival rate of lambs were 78, 84, 80 and 86% for main rain, cold dry, dry and short rainy seasons, respectively. Improving birth weight of lambs, cross breeding of Menz local sheep with improved Awassi breed and adjusting lambing in the short rainy season could enable to produce better lambs in terms of birth weight, pre-weaning growth and pre-weaning survival of lambs in the highlands of Ethiopia.

Keywords: Sheep; Crossbreeding; Supplementation; Birth weight; Lamb mortality.

1. Introduction

The pre-weaning traits of sheep which influence flock productivity include birth weight, weaning weight, average daily gain to weaning and weaning rate. These traits are in turn influenced by genetic and environmental factors. For a given breed, influencing environmental factors may include dam parity and type of birth and sex, month and year of birth of young (Terrill, 1966).

Reproduction and survival rate are undoubtedly the most important traits in all systems of sheep production an in all environments. The most important measures of flock's over all productive performance is the number of lambs waned per ewe exposed, which is the product of the production of ewes lambing (fertility), litter size at birth (prolificacy) and survival rate of lambs born to weaning (Lee and Atkins, 1994).

AI-Shorepy and Notter (1998) noted that birth weight has received limited consideration in sheep breeding program, but is a trait of potential economic importance through its effects on pre-weaning growth and hence, increases the economic success of producing slaughter animals. An intermediate optimum has been shown to exist for birth weight; with excessively large lambs liable to dystocia and excessively small lambs at risk of death from hypothermia, starvation, respiratory disease, and other cases. Other researchers (Smith, 1977; Notter and Copenhaver, 1980) found that lamb survival (Finish Landrace crosses) was maximum at birth weights of between 5.2 and 5.5 kg, respectively.

In Ethiopia attempts were made to improve birth weight and weaning weight by crossing the local sheep with that of the exotic ones. According to Tefera work, 1989 birth weight increased from 2.78 kg for local Arsi lambs to 3.2 kg for F_1 (50% exotic) and 3.85 kg for 75% crosses.

Along-term breeding study with the objective of improving different traits in Menz sheep were conducted for the last many years (personal communication). Since then selection and cross breeding programs between exotic (Awassi) and indigenous breed (Menz) were conducted at Sheno Agricultural Research Center, Ethiopia. In here there is voluminous data on lamb pre-weaning growth and survival that has been accumulated

[1] AM 25-50%= Awassi x Menz 25-50%
[2] AM 75%= Awassi x Menz 75%
[3] Menz = An indigenous Ethiopian sheep categorized under Short fat tailed breed (Gizaw, 2007)

for a number of years.

Even if there is little information published on local and crossbred lambs in Ethiopia regarding lamb pre-weaning performance, they are based on small and short lived data sets and therefore are not conclusive; hence, the present investigation was undertaken to evaluate pre-weaning growth and survival of lambs of different genotypes born at Sheno Research Cetner.

2. Material and Methods

2.1. Study Area

Data on lambs pre-weaning performance were collected at Sheno Agricultrual Research Center (ShARC). ShARC is located on the Central Northern Highlands of Ethiopia, 70 km North of Addis Ababa in mixed Barley and Livestock farming area; its altitude is 2800 a.s.l., with pellic vertisol.

Although equatorial (09^o 05'N Latitude), its climate is modified by altitude. Temperatures typically vary from 5 to 18 ^{o}c, frosts are common from October to December, rainfall (>900 mm annually) is bimodality distributed, with short (but unreliable) and long (reliable) rainy seasons in March-April and June through September, respectively. Natural pastures are predominantly Andropognon chrysstachys, Eragrostics Botryodes and Steriatrata.

The bimodal nature of the distribution of rain fall allowed the areas to be classified in to 4 seasons, namely, main rain (June-August), cold dry (September-November),dry (December–February), short rain (March–May).

2.2. Study Animals and Management

Lambs so far used for this study were Menz (indigenous), Crosses; Awassi X Menz 25-50%, Awassi X Menz 75%. Growth and mortality data from 1993-2004 G.C. of the above breeds were used to analyze birth weight, weaning weight, pre-weaning daily gain and mortality.

All animals were grazed during the day (8 h) and penned at night. At lambing born lambs and dams were weighed and lambs ear tagged. Their respective dams from birth suckled all lambs up to weaning (85-95 days). All flocks were vaccinated and treated against the diseases that are prevalent around Sheno.

Ewes in supplemented group were offered commercial concentrate (200-300 g/h/d) during late pregnancy and/or suckling up to weaning. All sheep in the center were offered natural pasture or hay made of Oat during critical periods (when grazing was very low) regardless of age, sex, breed and experimental group.

2.3. Statistical Analysis

Lamb performance for birth weight (BWT), weaning weight (WWT), average daily gain (ADG) from birth to weaning were analyzed by General Linear Models procedure (SAS, 2009). While mortality (a binomial trait-alive or dead at 3 months of age was calculated by chi-square procedures.

The statistical model included the fixed effects of breed (3 levels), Parity (5 levels), Years (12 levels), Season of birth (4 levels), Lamb sex (2 levels), Type of birth (2 levels), Lamb birth weight and post partum ewe body weight category (3 levels), Ewe/ dam feeding conditions (2 levels). Lamb mortality was calculated only for born alive, Birth weight, Weaning weight, Average daily gain and mortalities of lambs as dependent variables.
Pre and post weaning growth performances were adjusted by the following formulae (Inyangala et al., 1992).

$$\text{Adjusted weaning weight (kg)} = \frac{90(w2\text{-}w1)}{D} + w1$$

Where, W2 = weight at a given age
W1 = birth weight
D = number of days between weighing date and date of birth

$$\text{Average daily BW gain up to weaning (g)} = \frac{(AWWt - BWT)}{90}$$

Where, BWT = Birth weight
AWWT = Adjusted weaning weight at 90 days

For all traits analyzed, effects fitted to statistical models are summarized as under:
Model:

$$Y_{ijklmnop} = \mu + b_i + s_j + t_k + y_l + Sn_m + p_n + tr_o + dppwt_p + e_{ijklm}$$

Where;
$Y_{ijklmnop}$
= the body weight and average daily weight gain of the n^{th} lamb
μ= the overall mean
b_i= the fixed effect of the ith **breed** (i = 1-3, 1 = Pure Menz, 2 = Awassi x Menz 25-50%, Awassi x Menz 75%.
s_j = the fixed effect of the jth **sex** (j = 1 or 2, 1 = male, 2 = female)
t_k = the fixed effect of the kth **type of birth** (k = 1 or 2, 1 = single, 2 = twin)

y_l = the fixed effect of the l^{th} **year of birth** (l = 1-12, 1 = born in 1993, 12 = born in 2004)
sn_m=the fixed effect of the m^{th} **season of birth** (m=1-4, 1=born in main rainy season(June-August), 2= born in the cold dry season (September-November), 3= Dry season (December-February), 4= Short rainy season (March – May).
p_n = the fixed effect of the m^{th} **parity** (m = 1, 2, 3,4 and >=5)
tr_o= the fixed effect of the o^{th} **dam treatment group** (o=1-2, 1= ewes supplemented 200-300g/h/d commercial concentrate in the late pregnancy and during suckling period till weaning, 2= ewes not supplemented and only dwelled on grazing pasture.)
$dppwt_p$= the fixed effect of p_{th} **dam post partum weight category** (p=1-3, 1=Light (post partum ewe weight <26kg, 2= Medium (post partum ewe weight >=26<=46kg, 3= Heavy (post partum weight >46 kg)
$e_{ijklmnop}$ = the random error attributed to the n^{th} lamb.

3. Results and discussion

3.1. Lamb weight at birth

Birth weight averaged 2.29±0.01 (n=4950) for all groups. Birth weight of lambs showed significant differences with genotype, sex of lambs, type of birth, ewe feeding conditions and birth season, (P<0.0001) Table 1.

Cross breed lambs (AM 25-50 and AM 75%) were heavier at birth than the indigenous M lambs (P<0.0001). Indigenous M lambs were 19 and 33% lighter than the 25-50 and 75% AM lambs. Results of birth weight in the present study for indigenous M lambs was inferior to what was obtained for the indigenous Arsi sheep and their 25, 50 and 75% exotic crossbred lambs (Eskil 1990). Birth weight of lambs also increased with an increase of exotic Awssi blood level (2.46 kg vs 2.97 kg) for AM 25-50% and AM 75%, respectively. The pattern of birth weight of lambs has shown high relative values for cross bred lambs, suggesting superiority of crossbred ewes probably due to maternal effect over pure M ewes. Our result was in line with the results obtained for Lohi and crossbred ewes by Nawaz M. and Khalid Ahmed (Small Ruminant Research, 1998).

Year had effect on birth weight of lambs (P<0.0001). Lowest and highest birth weights were recorded in 1997 (1.96kg) and (2.74 kg) in the year 2001, respectively. Variability in birth weight for lambs in different years signifies the variability of pasture productivity in different years indicating the pattern of rain fall in the highlands of Ethiopia determining the birth weight of lambs. Differences in birth weight from year to year is mostly due to variation in climatic, feeding and management conditions, which either affects the lambs directly or indirectly through their effects on dams.

Birth seasons of lambs had significant (P<0.0001) effect on the lambs' birth weight. Significantly heavier (p<0.0001) lambs were born in the main rainy season while lambs with a lighter birth weight was born in the dry season. Lambs born in the cold dry and short rainy season had similar (p=0.7907) birth weight. Inferior birth weight for lambs were observed in dry season compared to those born in other seasons; this is may be is attributed to the availability of grazing pasture to the sheep. About 7.6, 4.2 and 3.8% more birth weight advantages were obtained from lambs born to the main, short rainy season and cold dry seasons compared to those born in the dry season; this result may be is due to the moderate weather conditions and a viability of the green forage during pregnancy and suckling that favors the ewes' milk production.

Male lambs were 4% heavier at birth than their female counterparts. Single born lambs also had 23% more weight at birth than twin born lambs. Twins had lighter average birth weight and were more subject to physiological starvation. This difference arises because of the competition between the twins for their dam's milk and their smaller size at birth.

3.2. Adjusted Weaning Weight (AWWT)

Adjusted weaning weight at 90 days was 9.54±0.05 kg (n=2844) for all groups. Weaning weight was significantly (P<0.0001) affected by lamb genotype, birth year, birth season, lamb sex, lamb birth type, parity and dam feeding condition and post partum ewe body weight category, Table 1. Similar results were reported by Nawaz and Ahmed 1998 for the Lohi x Awassi lambs.

There was significant (P<0.0001) difference in adjusted weaning weight of lambs among the M, AM 25-50% and AM 75%. Lowest and Highest adjusted weaning weights were recorded for M and AM 75% cross bred lambs, respectively. Adjusted weaning weight improved with an increase in exotic blood level of Awassi, Accordingly, 30 and 43% more weaning weight were achieved from AM 25-50% and AM 75%. A 12% superiority of crossbred lambs of Lohi x Awassi was lower than current results we obtained. Our result from current study is in line with the observations of Boujenane et al., 1998 with a finding for the pre-weaning of lambs from three native Moroccan and improved breeds; crossbred lambs were 3.6 kg heavier than purebred lambs at 90 days. In the current study we noticed 2.28 more kg from AM 25-50% while an advantage of 3.83 kg from AM 75% at 90 days over M. In his work Teferawork (1990) has reported that a weight advantage of 1.82 and 3.82 kg at 90 days was obtained from Awassi x Arsi 25% and Awassi x Arsi 50% lambs over the indigenous Arsi lambs. The superiority of crossbred lambs can be explained by the high additive genetic effects of the exotic gene (Awassi breed) and by the possible hetrosis for pre-weaning growth.

Year and season of birth had also significant effect on the adjusted 90 days body weight of lambs. Lowest and highest (9.63 kg vs. 13.60 kg) adjusted 90 days body weight were recorded in 1997 and 2001 G.C., respectively. According to Teferawork (1990) a weaning weight of 18.41 kg was obtained from the 50 % Awassi x Arsi sheep in his first year observation while the same blood level demonstrated a 14.28 kg at the same age (90 days) and accordingly, concluded the differences in climatic factors and a drop in management operation between the different years.

Birth season of lambs had influence on the body weight of lambs at 90 days weaning (P<0.0001). Highest adjusted 90 days weaning weight for lambs were recorded from short rainy season, big rain and cold dry season births, respectively. This is may be attributed to the good pasture condition during lambs growth up to 90 days from births obtained from mating from late short rain and from the big rain seasons. In the short and big rain the pasture condition at Sheno is better favoring to good weight of lambs. In Sheno area, highlands of Ethiopia mating should be arranged in such a way that lambs could be born in the short rainy and main rainy season followed by cold dry seasons so that to get better weaning weight from the effect of good pasture at late pregnancy and suckling. Similar patterns of weaning weight for Awassi x Arisi sheep was observed in a study by Teferawork (1990) in the highlands of Arsi province.

Male lambs were slightly heavier at weaning than the female counter parts. An advantage of 1.91 kg was obtained from single born lambs at weaning age. This is may be attributed to insufficient amount of feed in the center to nourish the twin born lambs by their dams.

3.3. Pre-weaning daily weight gain (ADG)

Least squares for means for pre-weaning daily body weight gain were also given in (Table 1). The pre-weaning daily gain differed among the genotypes (P<0.0001). AM Cross bred lambs grew faster (P<0.0001) than the M lambs. Pre-weaning gain of 71.4, 94.03 and 101.18 g/h/d were noticed for the M, AM 25-50% and AM 75%, respectively. Crossbred lambs of AM 25-50% and AM 75% grew at an advantage of 32 and 42 g/h/d, respectively, over the M lambs. Our result from current study was better than what was reported by Nawaz and Ahmed (1998) an advantage of 10% from Lohi x Awassi over the pure Lohi lambs.

Year and season of birth of lambs had also effect on the pre-weaning daily gain of lambs. Better (104.12 g/h/d) and inferior (66.85 g/h/d) were obtained in 2001 and 1997 G.C., respectively. A 38% faster growth performance of lambs was observed between the 1997 and 2001 birth years. Lambs born in the dry season had the lowest (P<0.0001) gain in grams up to 90 days compared to the other seasons. The reason for this could be low pasture availability in terms of quantity and quality for both the ewe and lambs during the 90 days period suckling. On the other hand lambs born in the short rainy season had better gain at 90 days. About 16 g/h/d gain advantage was noticed for the lambs born in the short rainy season compared to those born in the dry season. This is because lambs born in the short rainy season are either weaned in late short rainy season or in early to mid rainy season where lambs and dams obtain better grazing on pasture. Though less, our result had similar pattern with the observation of Nawaz and Ahmed (1998) who reported a 33% better growth performance from spring-born lambs than autumn-born lambs. Males and single born lambs grew faster than females and twin born lambs up to weaning at 90 days. An advantage of 5% and 21% more gain up to weaning age was noticed for males and single born lambs, respectively. Nawaz and Ahmed (1998) in their study had observed an advantage of 14% faster growth for males than female lambs up to weaning at 90 days

Table 1: Least squares (LSM) and standard errors for the effects of genotype of lamb, sex of lamb, year and season of birth, parity lamb birth and ewe post partum weight category and ewe-feeding condition on pre-weaning growth rates of Menz (M) and Awassi X Menz (AM) lambs.

Variables	Birth weight (LSM±s.e.)	Weaning weight (LSM±s.e.)	Pre-weaning daily gain (gain g day^{-1})
Overall	**2.29±0.01(4950)**	**9.54±0.05(2844)**	**79.78±0.54(2844)**
Genotype	***	***	***
Menz	1.98±0.02(3482)^{c}	8.52±0.13(2263)^{c}	71.4±1.32(2263)^{c}
Awassi X Menz 25-50%	2.46±0.06(1388)^{b}	11.10±0.16(519)^{b}	94.03±1.62(519)^{b}
Awssi X Menz 75%	2.97±0.06(80)^{a}	12.35±0.35(62)^{a}	101.18±3.59(62)^{a}
Sex of lamb	***	***	***
Male	2.52±0.03(2488)^{a}	10.91±0.16(1398)^{a}	90.95±1.70(1398)^{a}
Female	2.42±0.03(2462)^{b}	10.40±0.16(1446)^{b}	86.69±1.70(1446)^{b}
Year of Birth (G.C)	***	***	***
1993	2.55±0.05(172)^{c}	11.61±0.21(137)^{c}	101.07±2.47(137)^{b}
1994	2.41±0.04(261)^{d}	11.21±.0.28(110)^{cd}	95.50±2.65(110)^{c}
1995	2.51±0.05(124)^{c}	10.92±0.46(30)^{f}	88.82±4.39(30)^{d}
1996	2.24±0.03(655)^{e}	10.84±0.21(381)^{de}	86.00±2.05(381)^{de}
1997	1.96±0.04(335)^{f}	9.63±0.25(164)^{fg}	66.85±2.47(164)^{g}
1998	2.52±0.03(763)^{c}	11.20±0.21(399)^{cd}	84.51±2.03(399)^{fg}
1999	2.31±0.04(472)^{cd}	10.45±0.21(355)^{f}	73.82±2.13(355)^{g}
2000	2.35±0.04(437)^{d}	12.53±0.21(324)^{b}	95.27±2.09(356)^{b}
2001	2.74±0.04(424)^{a}	13.69±0.20(356)^{a}	104.12±.2.09(210)^{a}
2002	2.73±0.04(418)^{a}	12.30±0.24(210)^{c}	96.08±2.36(250)^{c}
2003	2.62±0.03(519)^{b}	10.54±0.21(250)^{de}	77.86±2.01(252)^{ef}
2004	2.72±0.03(370)^{a}	10.85±0.25(128)^{b}	95.93±2.45(128)^{c}
Season of Birth	***	***	***
Big rain	2.56±0.03(1398)^{a}	10.59±0.17(799)^{b}	87.67±1.73(799)^{b}
Cold dry	2.47±0.03(887)^{b}	10.47±0.21(384)^{bc}	86.47±2.16(384)^{bc}
Dry	2.38±0.03(531)^{c}	10.14±0.20(318)^{c}	84.01±2.09(318)^{c}
Short rain	2.48±0.03(2134)^{b}	11.41±0.17(1343)^{a}	97.14±1.72(1343)^{a}
Type of birth	***	***	***
Single	2.73±0.02(4748)^{a}	11.61±0.12(2755)^{a}	97.30±1.20(2755)^{a}
Twin	2.22±0.04(202)^{b}	9.70±0.25(89)^{b}	80.34 ±2.63(89)^{b}
Parity	***	***	***
1	2.13±0.02(1575)^{c}	9.13±0.10(873)^{c}	76.96±0.97(873)^{c}
2	2.24+0.02(1312)^{c}	9.03±0.11(699)^{c}	74.63±1.08(699)^{c}
3	2.39±0.02(881)^{b}	9.86±0.13(477)^{b}	82.52±1.31(477)^{b}
4	2.45±0.30(445)^{ab}	10.12±0.16(330)^{b}	85.25±1.58(330)^{b}
>=5	2.52±0.03(545)^{a}	10.73±0.15(388)^{a}	90+10±1.45(388)^{a}
Dam treatment group	***	***	***
Supplemented	2.61±0.03 (944)^{a}	11.99±0.16 (769)^{a}	102.32±1.65 (2075)^{a}
Non-supplemented	2.33±0.03 (4006)^{b}	9.32±0.18(2075)^{b}	75.32±1.89 (769)^{b}
Post Partum ewe category	***	***	***
Light	1.99+0.01(1828)^{c}	7.38±0.11(486)^{c}	59.87±1.12(486)^{c}
Medium	2.28+0.01(1572)^{b}	8.95±0.06(1545)^{b}	74.21±0.63(1545)^{b}
Heavy	2.68+0.01(1540)^{a}	11.94±0.08(813)^{a}	102.27±0.87(813)^{a}

*values within sub class in rows with different letters differ significantly, p<0.05
** values within sub class in rows with different letters differ significantly, p<0.01
*** values within sub class in rows with different letters differ very significantly, p<0.001

3.4. *Pre-weaning lambs mortality ((0-90 days (90))*

The overall pre-weaning mortality for the whole group was 17.56% (Table 2). The survival rate for M, AM 25-50% and AM 75% were 83.1, 80.7 and 86.3%, respectively (p =0.0980). The cross breeds survived similarly as the indigenous M lambs in the highlands of Ethiopia. A 3% advantage in survival rate was observed from the AM 75% lambs. It is evidenced that the vigor or crossbred lambs was similar to that of purebred lambs. Reports of Boujenane et al., 1998 had similar pattern as in that of current works. Current results obtained for pre-weaning of lambs to 90 days is in the range what is obtained for estimates of lamb pre-weaning mortality worldwide range between 10 and 30% (Kelly, 1992; Binns et al., 2002; Fisher, 2003; Southey et al., 2004; Sawalha et al., 2007). Pre-weaning lamb mortality averaged 16.9% for M lambs over the period of these studies was similar with the results reported 15% for same breed by Mukassa and Lihlou (1995) which is in the range of 10-30% for tropical flocks (Gatenby, 1986).

Pre-weaning survival rate of 78, 84, 80 and 86% was observed for lambs born in big rain, Cold dry, dry and short rain seasons, respectively (Fig 1 and Table 2). Lambs born in the short rain season had better surviving ability while those born in the big rain season had the lowest surviving ability (86 vs 78 %) suggesting the plan to arrange lambing in the short rain season. Lamb loses varied among year of birth of lambs but there was no clear trend across the 12 years of the study; the highest number of deaths was recorded in 1997 (48.36%) while no lambs were died in 1993 and 1995 G.C. In their study, Maria et al., (1999) reported the trend of lamb mortality across lambing seasons to similar for RO and F1 ewes but not for SA which had the lowest lambs mortality in spring and the highest in autumn.

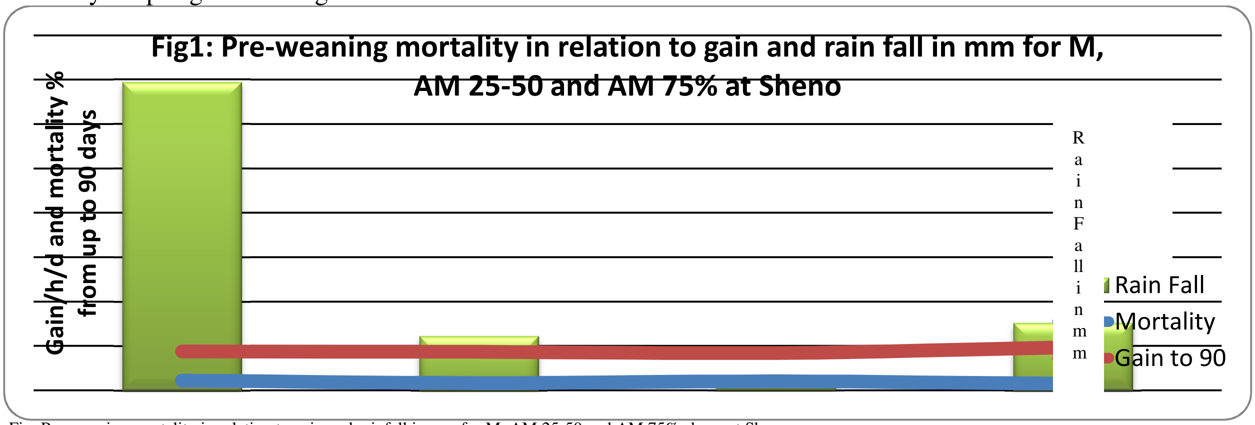

Fig: Pre-weaning mortality in relation to gain and rainfall in mm for M, AM 25-50 and AM 75% sheep at Sheno

The pre-weaning ability was affected by birth weight category. Accordingly, 67, 85 and 93% of lambs survived from light, medium and heavy weight category of lambs at birth. Improving the birth weight of lambs to medium and heavy could improve survival of lambs by 27 and 39%, respectively, compared to light weight lambs at birth.

Birth type of lambs had also influence on surviving ability of lambs until weaning to 90 days. Significantly ($p<0.0001$) higher proportion of lambs survived from single born lambs compared to their twin counterparts (83.13 vs. 66.34%). Maria et al., (1999) had reported the survival rates for single, twin and triplets lambs of Romanov, Rasa and Salz breed to be 95, 83 and 60%, respectively. This shows that lamb mortality increased in multiple births. On other hand, Yapi et al., (1992) found no significant effect of type of birth on lamb mortality.

Female lambs survived better ($p<0.0240$) than male lambs up to 90 days (84 vs 81%).Lambs born from relatively medium post partum weight of ewes survived better than lambs born from relatively light and heavy ewes at laming, respectively (99.5 vs 66 and 85%).

Pre-weaning mortality rate of lambs was influenced by many factors whose importance varied with lamb's age; highest mortality was recorded at lambs' age of 0-3 days (46.25%) while the lowest mortality of lambs' was observed at the age of 60-90 days (11.39%). Similar results were published by Sierra (1985) who found mortality values ranging from 19.4% to 21.1% within 2 days of parturition in a RO flock in Spain. Our results in the current study is in line with the observations of Sawalha et al., 2007 stating vast majority of mortalities occur within the first 3 days of postnatal life.

Table 2. Survival rate of Menz, Awassi X Menz 25-50% and Awassi X Menz 75% crossbred lambs to weaning age (90 days) in Sheno Agricultural Research Center, Ethiopia

Variable		Survival Rate of lambs up to 90dyas (%)				
		Survived	Dead	Total (count)	Chi-square value	p
Breed of the lambs	M	83.06% (2892)	16.94% (590)	3482	4.6457	0.0980
	AM 25-50%	80.69%(1120)	19.31%(268)	1388		
	AM 75%	86.25% (69)	13.75%(11)	80		
Lamb birth season	Big rain	78.04%(1091)	21.96%(307)	1398	35.6287	<0.0001
	Cold dry	83.65%(742)	16.35%(145)	887		
	Dry	79.85%(424)	20.15%(107)	531		
	Short rain	85.47%(1824)	14.53%(310)	2134		
Lamb birth year	1993	100%(172)	0%(0)	172	439.1386	<0.0001
	1994	99.62%(260)	0.38%(1)	261		
	1995	100%(124)	0%(0)	124		
	1996	78.93%(517)	21.07%(138)	655		
	1997	51.64%(173)	48.36%(162)	335		
	1998	76.15%(581)	23.85%(182)	763		
	1999	78.18%(369)	21.82%(103)	472		
	2000	85.13%(372)	14.87%(65)	437		
	2001	92.69%(393)	7.31%(31)	424		
	2002	90.91%(380)	9.09%(38)	418		
	2003	87.67%(455)	12.33%(64)	519		
	2004	77.03%(285)	22.97%(85)	370		
Lamb Sex	Male	81.23%(2021)	18.77%(467)	2488	5.0982	0.0240
	Female	83.67%(2060)	16.33%(402)	2462		
Lamb Birth type	Single	83.13%(3947)	16.87%(801)	4748	37.7523	<0.0001
	Twin	66.34%(134)	33.66%(68)	202		
Lamb age in days	0-3		46.26%(402)			
	4-30		24.86%(216)			
	30-60		17.49%(152)			
	60-90		11.39%(99)			
Lamb birth Parity	1st Parity	82.10%(1293)	17.90%(282)	1575	38.8177	<0.0001
	2nd Parity	77.90%(1022)	22.10%(290)	1312		
	3rd Parity	82.75%(729)	17.25%(152)	881		
	4th Parity	88.31%(393)	11.69%(52)	445		
	>= 5th parity	87.52%(447)	12.48%(68)	545		
Lamb Birth weight category[4]	Light	67.03%(854)	32.97%(420)	1274	320.8588	<0.0001
	Medium	85.01%(2087)	14.99%(368)	2455		
	Heavy	93.03%(1140)	6.63%(81)	1221		
Ewe Post Partum weight category[5]	Light	65.70%(1201)	34.30%(627)	1828	679.3772	<0.0001
	Medium	99.49%(1564)	0.51%(8)	1572		
	Heavy	85.43%(1311)	14.87%(229)	1540		
Grand Total		**82.51(4076)**	**17.49(864)**	**4940**		

Conclusion and Recommendation

From these results it could be concluded that Awassi crossbred lambs had higher birth weight, weaning weight and better pre-weaning growth in the highlands of Ethiopia signifying the potential contribution of cross breeding with Awassi genotype to increase meat production from indigenous sheep. Better birth weights were obtained from main rainy season, short rainy season followed by cold dry season. Lambs with the lowest birth weight were obtained from the dry season lambing indicating poor potential of pasture to give good fetal development. Better weaning weight and pre-weaning growth performance of lambs were obtained from short rainy season lambing. Lambs born to relatively medium and heavy ewes during birth had significantly heavier

[4] Lambs birth weight category (lighter= <2.5; lower 25% quartile, Medium= 2.5-3.5; the middle 50%, Heavy= >3.5kg; upper 25% quartile @ birth) or <=2.5, 2.51<3.5, >=3.5

[5] Ewe Post partum weight category (lighter= <25.5; lower 25% quartile, Medium= 25.5-46; the middle 50%, Heavy= >46 kg; upper 25% quartile while giving birth), Taye, 2008.

lambs compared to those born to lighter ewes. Survival rate was similar between the Menz and Awassi x Menz lambs. However, a relatively higher survivor to weaning age was obtained from AM 75%. The study also noticed that better survived lambs were born in the short rainy season compared to the other seasons. Lambs born as single had better survival ability. The highest mortality rate of lambs were between 0-3 days indicating care we need to deliver during early age of lambs management to reduce mortality by about 46%. Relatively medium to heavy weighted lambs at birth had better survival rate to weaning. Ewes with a relatively medium weight at post partum had weaned large number of lambs followed by heavy post partum weight ewes. Improving the genotype of Menz sheep by crossing with Awassi sheep, improving birth weight of lambs, Planning mating in short rainy season and considerable lamb management in the 1st 3 days had a positive contribution on lambs growth and survival to weaning in the highlands of Ethiopia.

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