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Performance of Crossbred Dairy Cows Suitable for Smallholder Production Systems at Holetta Agricultural Research Centre

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አህፅርኦት

ይህ ጥናት የተካሄደበት ዓላማ 50 በመቶ የውጭ ደም ያላቸው አንደኛ ትውልድ ዲቃላ የወተት ላሞች የዕድገት የምርትና የሥነ ተወልዶ ብቃታቸዉ በምርምር ማዕከል ደረጃ ዳብሮ በአርሶ አደሮች ማሳ ላይ ያለውን የዝርያ ማሻሻያ ሥራዎች ለመደገፍ እንዲያስችል ለማድረግ ታቅዶ በሆለታ የምርምር ማዕከል የተሠራ ጥናት ነዉ። በሥራው የተካተቱት ንፁህ የቦረና እናቶች ከ 111 የቃሊቲ (NAIC) ንፁህ ኮርማና 32 የዓለም አቀፍ ኮርማ ጋር ተዳቅለዉ የተወለዱ 153 ዲቃላ ጊደሮች ናቸዉ። ለዚህ ሥራ 153 የዕድገት መረጃ ከ 711 WWS እና ከ 91 ከቃሊቲ ኮርማዎች ከተወለዱ የወተት ላሞች የተወሰዱ በድምሩ የ 802 የወተት ሪኮርዶች ጥቅም ላይ ዉለዋል። የዲቃላ ጊደሮቹ አማካይ የወልደት ክብደት 24.83 ± 2.33 ኪ.ግ ሲሆን አማካይ በየቀኑ የሚያሳዩት የክብደት ለዉጥ ከ 0.437 ± 0.01 እስከ 0.546 ± 0.02 ኪ.ግ መሆኑ ታይቶአል ። ጊደሮቹ ለጥቂ የደረሱበት፤ ተጠቅተዉ የወለዱበት፤ በዉልጃ መካከል ያለዉ የቀን ርዝማኔ እና የጥቂ ድግግሞሽ በቅደም ተከተል 26.4±0.8 ወር, 35.7±o.81 ወር, 395.64 ± 4.9 እስከ 500.32±2.92 ቀናት እና 1.2 ± 0.2 እስከ 2.37 ± 0.05 ሆኖአል። ከአንድ የዓለባ ወቅት የተገኘዉ የወተት ምርት ከመጀመርያ 1ኛ እስከ 5ኛ ዉልጃ ድረስ ከ1874.65 ± 67.7 እስከ 2582.69 ± 111.2 ሊትር በማደግ የዕለ ለውጥ አሳይቷል። ከአምስተኛ ውልጃ በኋላ የወተት ላሞች መቀነስ ተፈጥሮአዊ አካሄድ ሲሆን ከዚህ ጊዜ ጀምሮ ምርታቸዉ የሚቀንሱ ከብቶቹን ከርባታዉ ማሰወገድ ተገቢ ነዉ። ከመረጣና ከአያያዛቸዉ መሻሻል የተነሳበ ሆለታ ግብርና ምርምር ማዕከል ዲቃላ ጊደሮች በአጭር ጊዜ ተጠቅተዉና ወልደዉ ለወተት ምርት የመድረስ ብቃታቸዉ በፊት ከነበረዉ አያያዝ ይልቅ እስከ 15.5% መሻሻሉን የዚህ ጥናት ዉጤት ያሳያል። በወተት ምርት መጠንም እስከ 21% ተጨማሪ ወተት ማስገኘት መቻሉን ጥናቱ አረጋግጧል። በሆለታ ግብርና ምርምር ማዕከል ባለዉ የማዳቀልና የአያያዝ አሰራር የወተት ላሞች ዕድገት፤ የወተት ምርትና የሥነ ተዋልዶ ባሕሪያት መሻሻል እየጎላ የመጣ መሆኑ በዚህ ዉጤት ስለተረጋገጠ፤ 50% (F_1) የዉጭ ደም ያላቸዉን ጊደሮች አዳቅሎ ለማሻሻል የተገኘዉ ልምድ በአነስተኛ አርሶ አደሮች ዘንድም እንዲለመድ ለማድረግ ከዚህ በታች በተቀመጡ ነጥቦች ላይ ትኩረት መስጠት ተገቢ ይሆናል። 1.ትኩረት በተሰጣቸዉ የርባታ ዓላማ ላይ ተመርኩዞ በከፍተኛ ጥንቃቄ የመረጣ ሥራ ማካሄድና መተግበር። 2. ዝቅተኛ ምርት የሚሰጡ ላሞችን በየደረጃዉ በሚደረጉ የመረጣ ዉጤቶች መሠረት ርባታዉ ማስወገድ 3. የምርምር ማዕከላት በአያያዝ ያልተደገፈ የዝርያ ማሻሻል ሥራ አካሄድ እምብዛም የጎላ ዉጤት ሊያመጣ እንደማይችል ተገንዝበዉ የተመረጡ የወተት ላሞች አያያዝ በከፍተኛ ባለሙያዎች እንዲካሄድ ለማድረግ ትኩረት ሰጥተዉ መንቀሳቀስ እንዳለባቸዉ ይታመናል።

Abstarct

The present study was undertaken to investigate productive and reproductive performances of F_1 crossbred cows to produce and develop improved dairy cattle breed at on station and back up the on farm crossbreeding program at Holetta Research Center (HRC). One hundred fifty three F_1 crossbred heifers were used to study growth performances and 111 worldwide sire (WWS) and 42 Kality (NAIC) sire records were used to analyze the data. A total of 802 milk records out of which 711 from worldwide sire (WWS) milk records and 91 from Kality (NAIC) bulls' milk records were used to analyze the milk production performances. Least squares means of growth traits in this study birth weight (BWT), average daily gain (ADG) of crossbred heifers was 24.83 ± 2.33 kg and ADG ranges from 0.437 ± 0.01 to 0.546 ± 0.02 kg respectively. Least squares mean for age at first service (AFS), age at first calving (AFC), calving interval (CI), and number of service per conception (SPC) were 26.4±0.8 months, 35.7±o.81 months, 500.32±2.92 to 395.64 ± 4.9 days, and 1.2 ± 0.2 to 2.37 ± 0.05 services, respectively. Lactation milk yield (LMY) obtained from this result reflected progressive trend from 1st to 5th parity (1874.65 ± 67.7 to

2582.69 ± 111.2 kg) and started declining thereafter. The declining trend observed after the 5th parity is the normal biological phenomenon from dairy cows under normal conditions. The improvement gained from this result is the outcome of the of management procedures and practices followed which have accounted for 15.5 % of early calving of young heifers and 21 % in milk yield increments made from Frisian Boran (FB) crossbred cows at HARC. The overall observed growth, reproductive and milk yield performance of FB crossbred dairy cows at HARC has shown progressively significant improvement. Thus in order to continue with the crossbreeding for development of F_1 50% crossbred dairy cows to maintain the on station and backup the on farm breeding activity there is a need to do intensive and proper performance evaluation based on defined breeding objectives. Culling procedures to avoid milking cows beyond the 5th parity is important. Research centers have to put maximum efforts to improve routine management activities to maintain performance evaluated animals at the centers at all levels.

Keywords: Crossbred, heifers, dairy cows, performance

Introduction

Significant improvements were made from the crossbreeding program which was initially started to upgrade the exotic blood level of indigenous cattle. Performance of the F_1 crossbred cows were improved compared to the performance of indigenous cattle (Kahi, 2002; Mc Dowell et al., 1996). More milk yields (MY), prolonged lactation lengths (LL), lower calving intervals (CI) and shorter age at first caving than local breeds (Mc Dowell, 1985; Galukande, 2010) were recorded. Crossbreeding between indigenous and exotic dairy cattle has been implemented in Ethiopia since early 1974 by the Institute of Agricultural Research (EIAR) to improve the performances of local cows. The program was initiated as part of the overall cattle improvement program in the country in terms of growth, milk yield and other important production and reproduction traits. The crossbreds were evaluated for the intended traits under different environmental conditions of highland, mid altitude and lowland AEZ using Friesian Jersey and Simmental sires on Boran Barca Horro as dam indigenous breeds.

Results from the study in Ethiopia at on station conditions indicated better performances of crossbreds to local Boran in milk production and reproductive performance (Demeke et al., 2000). Daily milk yield 6.2 kg, Lactation milk yield 2278 kg, and Lactation length LL of 374 days was recorded. In conclusion the result of the study showed that Friesian, Simmental and Jersey crosses with exotic inheritance of 50 to 62.5% were appropriate and suitable for smallholder dairy production in Ethiopia (Beyene, 1992).

On-farm evaluation of the recommended crossbred cattle to smallholder farmers around Holetta and Debre Zeit (Gryseels, G. and de Boodt, K., 1986.), Arsi area (Kiwuwa et al., 1983), showed lower performance level even under the provision of better organized inputs (feed housing etc). Similarly, study carried out in IAR (now EIAR) on smallholder farms around Bako and Holetta centers showed lower level of milk production of F_1 crossbred cows than that of on-station yield (Tesfaye, 1993). . During those periods farmers were not even willing to use the crossbred cows, because of high feed consumption and difficulties to handle the animals. Above all lack of training,

understanding and awareness on crossbred dairy management might have limited the acceptance of the technology during earlier disseminations.
After passing all those steps in the early 2000 the crossbreeding and selection was designed to be implemented at on-station and on-farm. The on-station crossbreeding and selection was properly implemented for 10 years by using 50% Friesian Boran (FB) crossbred cows. Adequate information was generated through selection to maintain superior genotype for further production of high-grade dairy cows. The number of high yielding (BF 50%) crossbred cows have increased and the LMY rose up to 13% ranged between 2328.2 to 2596 kg / lactation. The on farm milk production was also improved as a result of selection of better yielding crossbred dairy cows. The crossbred dairy technology was verified and demonstrated in the central highlands and was found to be viable to be used my smallholder farmers in the country.

Since 2010 cross breeding of Boran cows with exotic Frisian bulls using worldwide sire (WWS) bull semen was initiated to further improve the selection and milk production as a new activity at Holetta Agricultural Research Centre (HARC). Purchased Boran heifers from the center of origin and reared on station heifers were assigned to different WWS Frisian sires bulls at HARC. The objectives of this study was to evaluate the growth, production and reproduction performances of F_1 crossbred dairy cows using semen from Kaliti National Artificial Insemination Center (NAIC) and imported WWS bulls to produce improved dairy cattle breed at on station and to back up the on farm crossbreeding for synthetic breed generation and development.

Materials and Methods

Study area

The study was carried out at Holetta Agricultural Research Center (HARC) altitude: 2400masl; annual rainfall: 1100mm; average temperature minimum: 6°C, maximum: 24°C) located at 35 km west of Addis Ababa, Ethiopia (3°24'N to 14°53'N and 33°00'E to 48°00'E). The study area experiences two major seasons the wet (June to September) and the dry (October to May).

Animals and management

A total of 157 pure Boran heifers as a dam were mated to 32 kaliti (NAIC) and 10 WWS sires to produce F_1 crossbred heifers. A total of 217 F_1 crossbred cows produced from Holetta Agricultural Research Center were included in this study. One hundred fifty three growth record from F_1 crossbred heifers and 803 milk records were used for data analysis. Cows were inseminated using pure Holstein from NAIC (Kaliti) and WWS semen to produce F_1 crossbred calves. Animals are left to grazing from early morning 8.00 AM to 4.00 PM in the afternoon and are fed with natural pasture hay as required at night. Concentrate mixture composed of wheat middling (32%), wheat bran (32%), noug (Guizocia abyssinica) cake (34%), and salt (2%) was supplemented to different categories of dairy cattle at their different physiological states. Milking cows are supplemented with concentrate mixture at a rate of 0.250 kg for every kg of milk produced daily during milking periods. The concentrate mixture had 81.0% DM, 29.5% crude protein, 46.9% neutral detergent fiber and 71.8% digestible organic matter. A kilogram of concentrate in

excess of the allowance was given to all milking cows for anticipated increase in milk yield. The cows had free access to clean water all the time.

Reproductive management and live weight measurement

Accurate heat detection of the estrus periods and correct time in relation to the onset of estrus to ensure the insemination is most the important practices in reproduction of dairy cows. These could avoid later return to estrus so that they can be re-inseminated without delay. In this study a teaser bull runs with the cows for heat detection every day. Cows detected in heat are served using artificial insemination by qualified technicians. Cows with repeated heat may be served up to four times. Cows not seen in heat after service or longer are diagnosed for pregnancy after 45 days of service. Live weight of all categories of animals (calves heifers and cows) is taken every 28 days and is entered to the main data base at the center. In dairy cows optimum conception rates will only be achieved if the quality of semen used is good and the AI technicians have adequate training and skills in the procedures for handling semen and performing inseminations correctly.

Performance evaluation

Performance evaluation of dairy cows for various merits requires the use of a model for genetic merits that involves the cross products of genetic values for milk and milk products. The relative importance of type and production has often been discussed in general terms. The performance evaluation of crossbred heifers / cows in this study are made based on pre and post weaning daily growth rate of young heifer and calves. Crossbred heifers are subjected to bucket feeding before the year 2006 and those born after 2006 were treated on free suckling up to weaning. Major focuses was given to performances made based on post weaning growth rate of crossbred calve from birth up to yearling. Evaluations on milk production performances were considered from 1st parity and extend to 5th parity. Extending the parity of crossbred cows beyond the 5th parity is not recommended.

Statistical analysis

Data used for this study was obtained from the breeding program panned at HARC. Data on growth, milk yield and reproductive performance were subjected to statistical analysis using the General Linear Model (GLM) procedure of the Statistical Analysis System (SAS 2003). Age at different growth intervals; parity and sire were considered as independent variables were body weight (WT), Average daily gain (ADG) lactation milk yield (LMY), lactation length (LL) and calving interval (CI) were taken as dependent variables in the model. Means were separated using Duncan multiple range. Experimental cows calved between 2002 and 2014 and the consecutive parity from 1st to 6th was considered as an independent variable for the estimation body weight changes and lactation milk yields.

Results and Discussions

Body weight and daily growth rate to yearling & sire effect

Least squares means and standard errors (± se) of growth traits in this study as affected by random and fixed effects are presented in Table1.The estimated least square birth

weight of crossbred heifers 24.83 ± 2.33 was better than previous reports (22.5kg) for female calves (Demeke, S.et - al 1987) . The average daily gain of crossbred calves from birth to yearling (0.437 ± 0.01 and 0.546 ± 0.02) is by far higher than past reports. The result obtained from this study is encouraging to continue to implement the improved management practices in addition to suckling the crossbred heifers for production of F_1. Suckling crossbred heifers could definitely accelerate growth and attain early puberty for reproduction and milk production. The mean birth weight obtained from similar study from Fogera crosses with Holstein Frisian (HF) at different age was comparatively lower 23.1 kg (Addesu Bitaw et-al 2010) than the current result. The present study indicated that improvement in birth weight of FB crossbred heifer. This could be due to the adequate steaming up ration supplied staring from 7th month of pregnancy and improved management practices employed at the center (HARC). The improved body weight at 3 months, six months, nine and yearling in FB crossbred heifer could be due to the improved management in combination to free suckling implemented at on station system of management. Daily growth performance, Post weaning daily of non-suckle BF crossbred heifers and Bucket Fed calves at different growth intervals (Melaku Menale, et –al 2011, Habtamu Abera et- al 2012 , Zelalem Yilma et –al 2006, Yohannes Gojjam et –al. 2001) are lower than the present result.The improvement made at all level when compared to previous non suckled calves reports (Demeke et-al 2003) was much better than the previous management practiced at the center. The overall mean daily body weight gain up to 90 days, 180 days and yearling age for the same breed at Holetta, was 336, 327, and 253 gm / day respectively (Gizachew Bekele et-al 2003). Growth performance of crossbred dairy cattle at Assella livestock farm (Abdinasir Ibrahim et-al 2001) at 6th an12th months of age shows less than 100 kg and 150 kg, while the result from the present study showed 135.47 ± 2.33 and 192.16 ± 2.33 respectively. The improvement made in growth rate of crossbred heifer calves at Holetta could be due to the overall management and suckling practices implied on local Boran cows for production of accelerated growth of F_1 dairy cows to be used for 75% synthetic breed production at on farm and on station.

Table 1 Least square means ± se of body weight and daily growth rate to yearling F_1 FB crossbred heifers

Age	N	Ls mean ± se body weight
Birth weight (00)	153	24.83 ± 2.33
3 months (97 days)	151	79.20 ± 2.30
6 months (190 days)	151	135.47 ± 2.33
9 months (280days)	150	168.12 ± 2.3
Yearling weight (361days)	147	192.16 ± 2.33
SIRE	**Record**	**ADG**
WWS bulls	111	0.437 ± 0.01^a
Other (kaliti) bulls	42	0.546 ± 0.02^b

Age at 1st calving (AFC), calving interval (CI) service per conception (SPC) at different age

Focused breeding objective and the level of management are an important factor which contributes to the determination of age at first calving in growing animals. In the present study Least square means for age at 1st service (AFS) and age at 1st calving (AFC) for 197 heifers was 26.4 ± 0.8 months and 35.7 ± 0.81 months respectively (table 2). This result shows improvement in reproductive performances compared to reports obtained from data earlier generated from 1974 to 2005 in which age at 1st calving for Frisian crosses was

43.4 ± 0.6 months (Kefena Effa 2011). Similarly from the data collected from Assella, D/Zeit and Holletta age at fist calving in Holstein Frisian crosses was reported to be 42.59 months (Million Tadesse et-al 2006). Addisu et-al 2003 reported that age at first calving in Fogera crosses to be 40.46 ± 0.93 months. Age at 1st calving in F_1 Frisian Boran cows at Holetta has progressively improved as a result of improved management and feeding practices applied at the center. From the current study it could be noted that improvement made on age at fires calving alone accounted for 15.5 % to accelerate early calving of young heifers. Further interventions to be made in improvement of reproductive performances of crossbred heifers may include the provision of feed supplementation (M.H. Hammoud1, S. Z. El-Zarkouny1, E. Z. M. Oudah2, 20100) at the level of 90% DM, 14% CP, 9.1 M Joule of ME/kg) given at 1% body weight.

Calving interval

Least square mean for calving interval showed decreasing trend from the first parity until the fifth parity and slightly increased at the 6th parity. Calving interval is usually influenced by dam parity and year of lactation period. However the changes in late parity period could be attributed to periodical changes in feeds management and health situations. Similar effects were reported in studies conducted at Holettt D/zeit and Asella (Million Tadesse et –al 2006). Prolonged overall calving interval of crossbred dairy cows in north Shoa was reported (Mulugeta Ayalew1 and Belayeneh Asefa 2013) to be 22 ± 4.4 months (> 672 days) for crossbred cows. In a study by Hare et al. (2006), using more than one million lactation records of Holstein cattle, the CI was estimated to be 13.3 mo, with an annual increase across lactations of 0.90 to 1.07 day/year for all breeds except Jersey which was 0.49 day/year. In developed countries dairy farmers often try to get the cow back in calf within 2 months of her giving birth, so that she produces one calf per year. However many farmers do not achieve this. In Ethiopia and some developing countries cows often give birth approximately every 450 days or more.

Service per Conception (SPC)

Number of services per conception is another widely used index of fertility. The overall mean of NSP obtained in the present study was between 1.2 to 2.3 services (Table 2).Similar estimate of NSP (2.0 services) was reported by Kassab and Salem (1993). High NSP results from either failure to conceive at a given service and/or failure to maintain pregnancy thus requiring repeated service. Numerous factors affects this efficiency like heat detection efficiencies, heat stress, semen quality, AI technique, nutrition, body condition and clinical and sub clinical mastitis are among the factors that could affect the SPC. Successful mating is very dependent on good body condition for the cow/heifer at mating. Being underweight or overweight can cause unsuccessful mating and an increased risk of calving difficulties. Above all the skill of the technician, the health status of the animal and the proper time of heat detection are among the important factors number of service per conception.

Table 2. Least square means ± se of age at 1st calving, calving interval service per conception at different age of F_1 FB crossbred cows at different parities

Age at different sages	N	Service age (months)	Calving age (months)	CI (days)	SPC
1st	197	26.4±0.8	35.7±o.81	00.00	1.2±0.2
2nd	157	43.1±0.90	52.38±0.91	490.32±2.92	1.62±0.04
3rd	131	59.34±0.98	68.70±0.99	489.00±2.52	2.14±0.05
4th	95	75.17±1.16	84.5±1.16	475.4±5.20	2.70±0.08
5th	73	88.39±1.32	97.71±1.32	395.64±4.9	2.31±0.04
6th	58	102.11±1.49	111.44±1.49	413.00±4.90	2.37±±0.05

Milk production and lactation Length

Lactation milk yield (LMY) obtained from this study reflects progressive trend of milk production from 1st to 5th parity (1874.65 ± 67.7 to 2582.69 ± 111.2 kg) as shown in table 3. The lactation milk yield (LMY) at the 6th parity shows declining (2401.93 ± 124.7 kg) trend. Estimated least square means at 4th and 5th parity significantly ($p < 0.001$) increased than at other stage of parities. The first and second lactation milk yields are significantly ($p > 0.001$) lower. Unlike the previous reports, the lactation milk yield gained from this study showed better improvement. Lactation milk yield from F_1 FB genetic group from Holetta was reported to be 2149.67 ± 85.86 litters (kefena et –al 2006). The same report showed increasing trend from 1st to 4th parity (1833.26 ±72.61 to 2035.54 ± 89.62) and peak LMY was attained at 4th parity. Similar study at Holetta (kefena et –al 2011) showed a lactation milk yield of 2088 ± 29.4 litters for Frisian crosses which also reflects increasing trend with the parity from 1st to 4th (1749.2 ± 37.9 to 2052.4 ± 56.4). Other studies indicate similar results at Holetta and D/Zeit (Million et al 2006) reported total milk yield of 1970 ± 85 kg for the same breed from 1st to 6th parity.

Since production and reproduction performances of dairy cattle are closely associated with total milk yield per lactation, average daily milk yields, and lactation length, these traits are among major factors to determine the performance of dairy cattle. Even though lactation length of 305 days is commonly accepted in most dairy farms as a standard, in most cases these standards are not maintained because of extended utilization of the farmers for more milk production (Masama et al., 2003) which has practical significance for the smallholder dairy farmer as it provides compensation for the usually extended calving interval (Omore, 1998).

The trend reflected from this study is in line with the previous reports from (kefena et –al 2006 Million et al 2006)), and (kefena et –al 2011) respectively. Unlike past results progressively higher improvements are shown at the 4th and 5th parities. This could be attributed to the periodical performance evaluations of breeding animals at the centre at different physiological states in keeping more productive animals at the centre's herd. Accordingly from this study improvement made from the last thirteen years have accounted for the increment of over 21 % in milk yield due to keeping productive animals and improved management practices applied at the research center (HARC)

Effect of worldwide sire

Use of worldwide sire (WWS) bulls for production of 50 % crossbred cows in this study with indigenous (Boran) cow did not seem improve milk production as reflected in this result. The milk production of WWS sired cows decreased by 4.46% when compared with kaliti bull sired cows (p = 0.2433). Preliminary observations we have made at the center shows that the vigouresity of WWS bulls seem to be expressed when they are mated to high grade cows. Therefore, evaluations of WWS bulls for the production of F_1 could be one of the study areas as the way forward to continue with production of F_1 crossbred heifers.

Worldwide Sires (WWS) bulls are generally characterized as outstanding fertility, creating high producing daughters with balanced udders which deliver an elite genetics with diverse management system. WWS bulls are used by different breeders based on their breeding objectives. Bulls are selected for transmutation of higher levels of milk production, most suited to those farming systems where the cows are managed under intensive management systems year round. In Ethiopian conditions imported WWS semen are assigned to indigenous and some crossbred cows and the performance of their crosses are not yet evaluated. In most cases the efficiency of WWS bulls might be superior when mated to high grade heifers or cows.

Table 3 Least square means ± se of milk production from F1 FB crossbred animals from WWS and other (kaliti) Bulls at different parities

Parity No	N	LMY ± se (kg)	LL (days)	P < 0.001
1st	197	1874.65 ± 67.7 ^{c}	346.6±12.05^{b}	
2nd	157	2227.95 ±7 5.8 ^{b}	349.69±13.50^{b}	
3rd	131	2442.88 ± 83.2 ^{ab}	378.00±14.78^{ab}	
4th	95	2569.35 ± 97.4 ^{a}	393.95±17.35^{ab}	
5th	73	2582.69 ± 111.2 ^{a}	424.12±19.80a^{b}	
6th	58	2401.93 ± 124.7 ^{ab}	399.08±22.21^{a}	
Sires	**Records**	**LMY**		**P> 0.2433**
WWS bulls	711	2442.32±78.14		
Other (kaliti) bulls	91	2556.41±34.13		

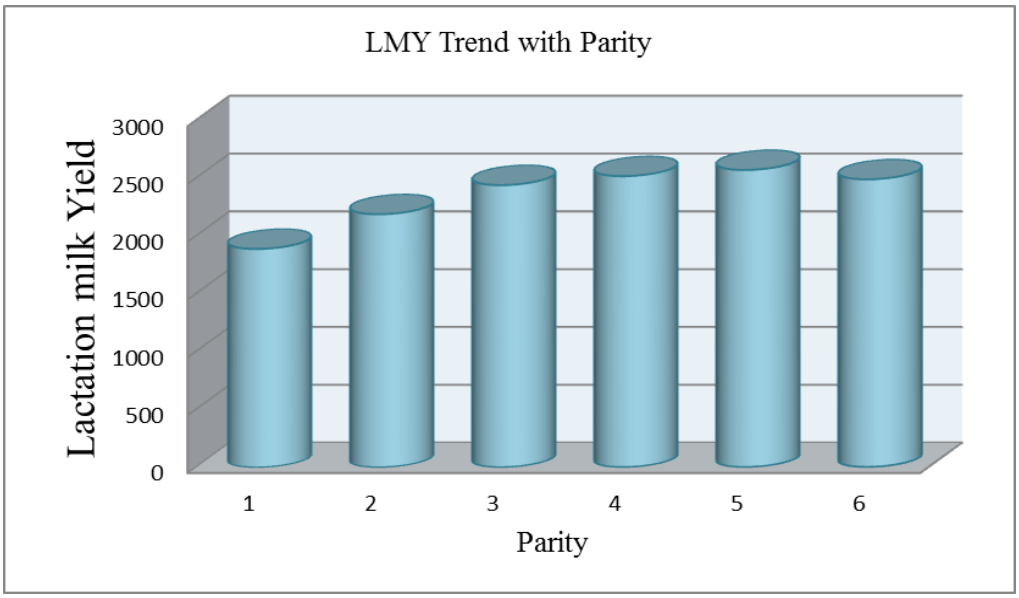

Figure 1. Inclination of Milk production F_1 FB crossbred cows after 5th parity

Conclusions and Recommendations

Based on the results of this study, the highly significant effect of growth performance, average daily gain (ADG) (0.437 ± 0.01 to 0.546 ± 0.02 kg) from birth to yearling indicates that growth rate may be used as a an important management practices in line with proper sire selection and to maximize production and productivity. The improvement gained from this study is encouraging to implement free suckling methods together with better management practices on indigenous cows for production of F_1 crossbred heifers. Age at first mating (26.4±0.8 months), age at first calving (35.7±o.81 months) were improved when compared with the different previous research reports. The LMY (2569.35 ± 97.4 & 2582.69 ± 111.2) at 4th and 5th parity was higher ($p< o.oo1$) due the dissection made to allow the high yielder cows /heifers to stay in milk for about 400 days and the prolonged calving interval effect. Variations in growth rate, reproduction and milk production performances of the crossbred cows could be the combination of management and genetic effects. Consequently proper dairy management practices housing, feeding and health conditions have significant effects on productive and reproductive performance of F_1 crossbred heifers.

Recommendations

The increased level of milk production of F_1 crossbred cows from this study is the result of proper management and use of sires from exotic blood level combined with maternal effects Intensive performance evaluation procedures should be followed in order to come up with more milk production than the current level of production. Milk estimated

breeding values are estimates of the genetic differences between animals in milk production potential, expressed through variation in calf growth performance. To continue with the crossbreeding for production of F_1 50 % crossbred cows to improve milk production at on satiation and backup the on farm breeding activity intensive performance evaluation procedures is required from post weaning to yearling and at stages of 1st and 2nd parity for all productive and reproductive traits.
Evaluation of used sires from Kaliti (NAIC) and worldwide sire (WWS) is important based on closely defined breeding objectives to provide meaningful improvement of F_1 crossbred cows and make possible recommendations for on station and on farm breed improvement activities.

Cow falling below the production level including non-pregnant, late-lactation beyond 5th parity should be culled from the herd. Such cows might not have additional benefits; rather they may lead to extra expenses, feed costs and put extra burden on the growing animals from which additional information (income) could be collected
Dairy research farms have to make maximum efforts to work on their breeding objectives and breed improvement strategies to improve routine management practices in their farm and maintain best animals to further exploit optimum level of reproductive and productive performances in dairy cows.

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References

Abdinasir Ibrahim and Eskill Brannang. Growth performance of crossbred dairy cattle as Assella Livestock Farm, Arsi Ethiopia.Sinet: Ethiopian Journal Science 24 (1):35 – 49, 2001

Addisu Bitaw, Mengiste Taye, Adebabaye Kebede, Getenet Mekuria, Asamenew Tasew Tezea Mulugeta and Gebeyehu Goshu 2003. Milk yield and calf growth performance of cattle underpartial suckling system at Andassa Livestock Research Centre, North West Ethiopa

Beyene Kebede 1992 Estimation of additive and non-additive genetic effects for growth, milk yield and reproduction traits of crossbred (Bos taurus x Bos indicus) cattle in the wet and dry environment in Ethiopia. PhD. Thesis, Cornell University. Ithaca, New York. pp 235.

Demeke, S.,, Kebede, B., Bekure, T., Kebede, M. and Gebre-Mariam, H.,1987. Preliminary results of cattle crossbreeding studies II Growth performance of European x Zebu

crossbred cattle In: *Proceedings of the First National Livestock Improvement Conference,* 11-13 February 1987, Addis Ababa. JAR, Addis Ababa. pp. 73-75.

Demeke, S., Neser, F.W.C., Schoeman, S.J., Erasmus, G.J., Van Wyk, J.B., Gebrewolde, A. (2000): Crossbreeding Holstein-Friesian with Ethiopian Boran cattle in a tropical highland environment: preliminary estimates of additive and heterotic effects on milk production traits. South African Journal of Animal Science, Vol. 30 (1)

Demeke, S, Neser F W C and Schoe man S J 2003 Early growth performance of Bos Taurus X Bos Indicus cattle crosses in Ethiopia Evaluation of different crossbreeding models. Journal of Animal Breeding and Genetics 120: 39-50.

Gizachew Bekele Zelalem Yilma, Tadesse Bekele, Alemu G/Wold, Sendros Demeke, Yohannes Gojjam and Roman H/Silase Performance of two and three way crossbred Dairy cattle in the central highlands of Ethiopia. I.Proccedings of the 10th annual conference of Ethiopian Society of Anmal Production (ESAP) held in Addis Ababa, Ethiopia August 21-23 pp 127 – 132. 2003.

Gryseels, G. and de Boodt, K., 1986. Integration of crossbred cows (Boran and Friesian) on smallholder farms in the Debre Zeit area of the Ethiopian highlands. ILCA Highlands Programme Report. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia.

Kefena Effa Zewde wondatir Tadele Dessie and Aynalem Haile Genetic and Environmentaltrends in long-term dairy cattle genetic irovement programs in the central tropical highlands of Ethiopia Journal of Cell and Animal Biology Vol. 5 (6). Pp. 96 – 10

Kahi, A. K., Thorp,e W. Nitter, G., Gall, C.F. (1999): Crossbreeding for dairy production in Kenya: Parameter estimates for defining optimal crossbreeding systems. Humboldt University, Berlin. International Conference on Tropical and Subtropical Agriculture and Forestry Session: Sustainable Technology Development in Animal Agriculture.

McDowell R.E. (1985): Crossbreeding in tropical areas with emphasis on milk, health, and fitness. Journal of Dairy Science Vol. 68 (9), pp 2418-2435

Million Tadesse , Tadele Dassie, Gifawesen Tesema , Tamirat Degefa and yohannes Gojjam. Ethiopian Journal of Animal production Vol. 6 (2) pp 1 – 16, 2006

Masama, E., Kusina, N.T, Sibanda, S. & Majoni, C., 2003 Reproductive and lactational performance of cattle in a smallholder dairy system in Zimbabwe Tropical Animal Health and Production 35, 117–129

Tesfaye Kumsa. 1993. Smallholder dairy in Ethiopia. Proceedings of the Workshop held at Kadoma Ranch Hotel, Zimbabwe 20-23 July 1992.

Yohannes Gojjam, Zelalem Yilma, Gizachew Bekele, Alemu Gebre-Wold and Sendros Demeke, 2001b. Milk yield and reproductive performance of Borana cows and growth rate of their calves under partial suckling method. In: Proceeding of the 9th National Conference of Ethiopian Society of Animal Production (ESAP). Aug 30-31, 2001. Addis Ababa, Ethiopia. pp 367 – 370

Zelalem Yilma and yohannes Gojjm 2006; Milk yield and reproductive performance of Borana cows and growth rate of their calves under partial suckling method Livestock Research for rural Development Volume 18 (5) 2006