Review Article

A REVIEW ON DAIRY CATTLE IMPROVEMENT PRACTICES BASED ON CONFORMATION TRAITS IN DEVELOPED COUNTRIES

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Abstract: This paper was aimed to review and indicate the Ethiopian dairy cattle improvement activities including the practices made by developed countries. Hence the production and reproductive performances, the traditional replacement selection practices of farmers and the gaps already exists between Ethiopia and other developed countries in using conformation traits as an improvement tool are indicated in detail. There is no as such satisfactory indigenous dairy cattle production and reproductive performances. This is implication for which the previous indigenous dairy cattle improvement activities were not successful. Unlike developed countries, Ethiopia has no any sort of recording habits and systems for dairy production. That is the reason why dairy improvement is not effective as other countries. Even though, conformation traits have known to be essential for dairy herd improvement, there are no any established correlations and patterns between conformation traits and production potentials for indigenous dairy cattle. In developed countries conformation traits are objectively evaluated its genetic and phenotypic correlation with milk production and being act as improvement engines. Therefore, in Ethiopia, there is a need to measure conformation traits which is being used as a selection criterion by farmers and would be evaluated and used for indigenous dairy cattle improvement.

Key words: Dairy, improvement, conformation traits, Ethiopia

Introduction

The most commonly accepted theory about the location of domestication of cattle is Middle East and South-east Asia. After cattle were domesticated, specialized breeds were

developed with improved dairy and/or beef production. Domestic animal production has proven to be good sources of food all over the world, and a rapid growth in milk and dairy consumption has been seen in many developing countries over the last years (FAO, 2002). Dairy herd improvement programs (DHIP) have recorded costs for nearly 100 years, but until recently only income traits are evaluated genetically (Vanraden, 2002). On the other hand the use of conformation traits in evaluating dairy cattle performance was not taken into

consideration. Therefore, it may be advisable the use of conformation traits for dairy cattle improvement program in the developing countries like Ethiopia until full recording potential have been achieved.

Conformation traits are known to be important to dairy producers so that dairy cows produce milk efficiently, and look appealing in doing so, over a long, productive lifetime. As a result conformation traits are recorded in many of the modern dairy cattle breeds. These traits have been known to have medium to high heritability (Kistemaker and Huapaya, 2006) and often can be recorded in a single assessment, which makes them reliable and relatively cheap traits that can be included in selection indices for several purposes. Pure size traits, such as stature and heart girth, are closely related to body weight (Heinrichs *et al*., 1992; Mantysaari, 1996), which is an important functional trait regulating feed conversion efficiency and energy balance in dairy cattle (Sondergaard *et al*., 2002). Feed conversion efficiency and energy balance traits, in turn, are key traits for the biological and economic efficiency of dairy production (Koenen, 2001). Other conformation traits such as dairy character, muscularity and body condition score (BCS) could be expected to be more specifically related to metabolic reserves, and therefore indicative of problems associated with a negative energy balance (Waltner *et al*., 1993). As suggested by different studies the relationship of conformation traits with milk production traits might be different between breeds, which could have implications for the use of conformation traits in different dairy cattle breeding programmes.

Different studies showed that both the phenotypic and genetic correlation between conformation traits and milk yield are all positive and follow the same trend even though the magnitude differed (Haas *et al*., 2007). In addition, these traits are known to have medium to high heritability. This also implies that all these conformation traits have some genetic background which contributed to the trends observed. Many studies (Meyer *et al*., 1987; Norman *et al*., 1988; Harris *et al*., 1992; Miztal

et al., 1992; Haas *et al*., 2007) have examined the relationship between conformation and yield traits in term of genetic correlation. Traits, for example, describing the shape of the udder are high to moderately correlate with milk yield. If several conformation phenotypes are identified as important predictors of estimated breeding values for milk production, if they are measured early in life before milk estimated breeding values are computed, and if these predictors have no known negative side-effects on cows' profitability, then those conformation traits could be used for mating decision-making. Indeed, dairy producers are usually able to evaluate their cows' conformation. This information could then be used before milk estimated breeding values are available, or when they are not available, as is the case for developing countries where record keeping of cows is not well known.

Recent studies showed that the traditional breeding practices of Ethiopian farmers are based on their conformational traits. This is a practical approach in a country where there is no any sort of recording habit and data base. However, the types of conformation traits to be considered are dependent on the breeding objective of the farmers (Zewdu *et al.*, 2006). For instance in most cattle of Northern Amhara conformational traits like teat size, navel flap width and length, dewlap width, neck length (which can be categorized as dairy character based on morphological appearance and their contribution to milk yield) are used as selection criteria by the farmers in their traditional breeding systems. The farmers believed that such traits are somehow correlated with milk yield and associated traits. Thus cattle keepers in their traditional breeding practices use these traits as major selection criteria (Zewdu, 2004).

In the absence of formal performance records, farmers relay on informal individual cow performance observations for purchase of cows and selection of replacements. This indicates that there is a need for a community based action to develop alternative reliable performance assessment and documentation options (Kelay, 2002).

Important implication of studying correlation of conformation traits with yield traits is, therefore, their usefulness in selection. In a situation where there is no reliable data on performance of the animals in question, the use of such traits has a paramount importance. Thus, it is suggested that those conformation characteristics be used as indicators of milk potential for first parity cows when accurate information on milk breeding values is lacking.

In Ethiopia, most conformation traits are subjectively appraised by herd owners, based on where better dairy cows are selected and used for the next generation, but none of these traits are objectively measured. Thus study of the relationships between milk off-take and conformation traits is of crucial importance under our circumstances. Therefore, the overall objective of this study is to establish the correlations that may exist between selected conformational traits and milk off-take of indigenous dairy cows.

The specific objectives of this study are:

✓ To review and indicate the indigenous dairy cattle productive and reproductive performances
✓ To assess the Ethiopian farmers traditional phenotypic selection practices for replacement stocks
✓ To review and indicate the gap about the use of conformation traits on dairy cattle improvement between Ethiopia and developed countries

Dairy cattle improvement in Ethiopia: Breed improvement programs for dairy production in Ethiopia were started by importing pure temperate breed of cows during the Italian occupation and since then crossbreeding using temperate breeds and indigenous breeds has been practiced by a number of governmental and non-governmental institutions. However, these efforts have been met with little success because of the various technical, organizational and socioeconomic constraints (Kelay, 2002).

With respect to distribution of selected breeding animals AI has been playing a significant role in Ethiopia. However, its activities have been unsatisfactory and limited to specific areas due to a number of technical, financial, infrastructural and managerial constraints that prevail in the developing countries (Azage *et al*., 1995). On the other hand, bull service for dairy breed improvement is being practiced as an option to a limited extent by some governmental and non-governmental institutions like the SDDP in the rural Ethiopia; however, the sustainability of this option is in question due to the uncertainty of the economic status of farmers to replace bulls (Bittner *et al*., 2000).

Four major systems of dairy production can be distinguished in Ethiopia. These are: lowland pastoral dairy production systems, rural highland small-holder dairy production system, urban and peri-urban small scale dairy production system and large scale dairy production system (Kelay, 2002).

Reproductive performance of dairy cattle: An important prerequisite for the sustainability of a dairy production system is that cows must have efficient reproductive performance. The reproductive performance of the breeding female is probably the single most important factor influencing herd or flock productivity (Azage and Alemu, 1998). High reproductive efficiency is necessary for efficient milk production and it, therefore, has an important influence on herd profitability (Pryce *et al*., 2004). Low reproductive performance decreases herd profitability by increasing calving interval, which reduces number of offspring born per year and hence less milk produced per cow in her lifetime. Low reproductive performance also results in increased number of cows being culled due to infertility and, therefore, increases replacement, management, breeding and veterinary costs (Roche, 2006) and decreases the rate of genetic progress in both selection and crossbreeding programs (Mukassa-Mugerewa and Azage, 1991). In Ethiopian highland Zebu cattle raised under traditional management, the lactation period is eight months and average calving intervals is 26 months (Mukassa-Mugerewa, 1989). Zewdu (2004) reported that, the average calving interval and lactation length of Fogera, Dembia and Wogera cattle were 17,

21.5 and 17.5; and 9, 9.4 and 7.7 month, respectively .

The cause of low reproductive performance in dairy cows is multi-factorial. These include inadequate nutrition, unimproved genetic makeup, diseases and the huge variety of management practices either alone or in conjunction with the others. Establishing relationship between these factors and reproductive performance is a must when identifying constraints in particular systems (ILCA, 1990; Lucy, 2001; Roche, 2006).

Milk production performance of dairy cattle: Milk yield is one of the most important traits used for selection of breeds or selection within a breed in both dairy and beef enterprises. Much has not been done in characterizing local breeds of Ethiopia based on their milk yield. Some scanty information on milk yields of local breeds indicates that Ethiopian zebu cattle types yielded between 500 and 700 kg of milk in less than 100 days of lactation under condition of average to good management (IAR, 1976). Yohaness *et al.* (2001) reported that Borana cows produce 5 kg milk per day in partial suckling and 3 kg per day in non-suckling experiment. Goshu and Mekonnen (1997) reported that Fogera cattle produced 2.9 kg of milk per a day under suckling condition and 3 kg under non-suckling condition. Similarly Kiwuwa *et al.* (1983) reported daily milk yield of 2.7 kg and 2.8 kg for Arsi and Zebu cattle in Arsi region. Alberro and Haile-Mariam (1982) reported that Horro cows produced 3.2 kg milk per day at Holleta research station. Gebrekidan (2010) also reported that, the average daily milk yield of the indigenous local dairy cattle in central zone of Tigray was 2.56 kg. In Northern Amhara the report indicates that the daily milk yield of indigenous local cattle breeds differ with lactation length, management, nutrition, genetics of the sample population and parity. The daily milk yield of Fogera, Dembia and Wogera cattle in the first lactation were; 2.23, 1.83 and 1.46 kg, respectively (Zewdu, 2004).

Contributions of conformation traits for dairy cattle improvement: In Ethiopia the role of conformation traits in indigenous dairy cattle improvement program is not well described. Genetic improvement can be made through selection and mating those selected animals. Due to the lack of appropriate selection and judgment criteria either using conformation traits or performance record to our indigenous dairy cattle. This kind of genetic evaluation needs information that combines the direct information on herd life from a survival analysis with the indirect information derived from breeding values for conformation traits (Vukasinovic *et al.*, 2002). The reliability of evaluation for herd life for young bulls is enhanced by considering information on correlated traits that can be measured early in the life of a bull's daughters. In practice, conformation traits have been used for many decades as indirect selection criteria for herd life. Numerous studies have been conducted over the past years to identify and quantify the influence of conformation traits on herd life in dairy cows improvements (Boldman *et al.*, 1992; Dekkers *et al.*, 1994; Vollema *et al.*, 2000). Conclusions drawn from these studies indicate that cows with desirable body proportions, healthy udders and teats, and correct feet and legs usually have a longer herd life, because they are more likely to withstand the stress of milk production, and they remain fertile and healthy. Conformation traits are recorded in the first lactation of the cow, have higher heritability than herd life, and have moderate correlations with herd life (Vukasinovic *et al.*, 2002). The current methods for genetic evaluation for herd life based on survival analysis cannot combine information on conformation traits with information on herd life and, therefore, cannot be used to estimate genetic covariance between the conformation traits and the herd life. To overcome the problem of unknown genetic covariance between herd life and conformation traits, an approximation must be used. Besides this, conformation traits are also basically involved in the judgment criteria of dairy cows. Each body conformation is evaluated on the individual replacement heifers and, identifies which should be the parent of the next generation and which could be culled.

Judging dairy cattle in developed country:
Judging dairy cattle is a comparative evaluation of cattle in which animals are ranked based on their closeness to "ideal" dairy conformation. Desirable dairy conformation involves functional traits associated with high milk production over a long, trouble free productive life. In addition to learning how to judge cattle, many life skills are gained through the dairy judging experience. In order to judge dairy cattle, knowing the parts of a cow, ideal dairy conformation, and how to describe differences between animals will provide us with the necessary tools to place classes. In addition, good judges of dairy cattle need a definite mental image of the ideal animal for the breed being judged. This image can be developed by observing cattle at shows, visiting outstanding herds, studying breed journals, and observing personally-owned dairy cattle closely (Seykora and Hansen, 2000).

The Purebred Dairy Cattle Association (PDCA) in united state of America for Holstein cows developed a score card that describes ideal dairy conformation that focuses on and evaluates five major categories: frame, dairy character, body capacity, feet and legs, and udder (Seykora and Hansen, 2000).

Frame - 15%: The skeletal parts of the cow, with the exception of feet and legs, are evaluated. Rump should be long and wide throughout with pin bones slightly lower than hip bones. Thurls need to be wide apart and centrally placed between hip bones and pin bones. The tail head is set slightly above and neatly between pin bones, and the tail is free from coarseness. The vulva is nearly vertical. A long bone pattern throughout the body structure is desirable. Height at the withers and hips should be relatively proportionate and wide apart and squarely placed. Shoulder blades and elbows need to be firmly set against the chest wall. The crops should have adequate fullness. Back straight and strong, the loin broad, strong, and nearly level. Head should be feminine, clean cut, slightly dished with broad muzzle, large open nostrils, and a strong jaw is desirable. Rump, Stature, and Front End receive primary consideration when evaluating Frame.

Dairy Character - 20%: The physical evidence of milking ability is evaluated. Major consideration is given to general openness and angularity while maintaining strength, flatness of bone and freedom from coarseness. Ribs wide apart, rib bones are wide, flat, deep, and slanted toward the rear. Thighs - lean, in curving to flat, and wide apart from the rear. Withers sharp with the chine prominent. Neck must be long, lean, and blending smoothly into shoulders. A clean-cut throat, dewlap, and brisket are desirable. Skin also should be thin, loose, and pliable.

Body Capacity - 10%: The volumetric measurement of the capacity of the cow is evaluated with age taken into consideration. Barrel should be long, deep, and wide. Depth and spring of rib increase toward the rear with a deep flank. Chest deep and wide floor with well-sprung fore ribs blending into the shoulders. The barrel receives primary consideration when evaluating Body capacity.

Feet and Legs -15%: Feet and rear legs are evaluated. Feet steep angle and deep heal with short, well-rounded closed toes. Rear Legs: Rear view - straight, wide apart with feet squarely placed. Side View - a moderate set (angle) to the hock. Hocks cleanly molded, free from coarseness and puffiness with adequate flexibility. Pasterns also should be short and strong with some flexibility.

Udder - 40%: The udder traits are the most heavily weighted. Major consideration is given to the traits that contribute to high milk yield, lactation number and a long productive life. Teats are squarely placed under each quarter, cylindrical shape and uniform size with medium length and diameter, plumb and properly spaced from side and rear views. Rear udder, wide and high, firmly attached with uniform width from top to bottom and slightly rounded to udder floor. Udder balance and texture should exhibit an udder floor that is level as viewed from the side. Quarters should be evenly balanced; soft, pliable and well collapsed after milking (Seykora and Hansen, 2000). Therefore, these conformation traits are assessed its significant in relation to the production and reproduction

potential of the indigenous dairy cattle and, judgment is done to the weights of selected conformation traits for each breed.

Judging of dairy cattle in Ethiopia: There is no clear indigenous dairy cattle judgment criteria based on the morphological appearance of the cows. Most of the Ethiopian farmers consider the history of high daily milk yield, high fat content and shorter age at first calving and calving interval. However in some part of the country like Mulu-Sululta, Degem and Addis Ababa morphological characteristics that are considered to be related to dairy cows productivity are being used. Such as small head size in relation to the overall body size and , almost all the farmers considered a cow as best for milk production if it has a straight back, triangular shape of the frame of a cow and straightness of the back of the cow and large udder of the cow (Kelay, 2002) . Hence, it is possible to set the best selection criteria for our indigenous dairy cattle by evaluating conformation traits that used by the local farmers in selecting their best milking cows.

Breeding and selection of dairy cows : In dairy cattle breeding, most of the dairy farmers in the highland, midland and the lowland areas of Ethiopia used natural mating by using indigenous breeding bull. But crossbred bull in the highland and midland agro-ecologies were used for service. Some farmers used AI along with natural mating in highland and midland areas. Some of the farmers also preferred seasons for mating for their dairy cattle. They mate their cows in such a way that the calving falls during the wet season to take the advantage of abundant feed supply which promotes better milk production and hence a better chance of survival of calf (Tesfa, 2009).

Breeding goals: It is the first step to be made in designing genetic improvement strategies. The breeding goal identifies those traits that farmers would like to improve. To be able to identify the traits, the existing and future development objective of the agricultural production in the country is to be defined and the livestock production system to be characterized. The current livestock population structure should be described and opportunities, to utilize it and hence, maximize the realization of genetic gain, should be sought for and some appropriate changes should be made (Hammond and Galal, 2000).

Selection criteria in developed countries: It is an accepted principle that the more characteristics for which one selects, the less progress can be made. Therefore, it would be advisable to restrict selection criteria for dairy cattle on milk production, fat and protein yield, feet and legs, udders, capacity and dairyness. Each are analysed separately. For example in South Africa, collectively, selection for these six characteristics would go a long way to ensuring more productive dairy cows are selected (John, 2005). The effect of selection for milk yield which might imply that selection of dairy cattle has been exclusively for milk yield. Although selection for yield traits has received primary emphasis in the selection goals of dairy breeds in the United States, substantial emphasis has been placed on other traits, too.

Selection criteria of farmers in Ethiopia: Takele (2005) indicated that farmers in Benchi-maji zone use selection criteria for indigenous breeding females that are related to production traits. However, as indicated in Table 2.1 selection criteria relevant to milk production potential include bigger size of the udder and teat, pedigree history of the animal indicating inheritance from a known high producer as recalled by owner, well attached udder and squarely placed teats. Related conformation traits include wide hindquarter, long and thin tail, longer navel flap, thin and long neck, concave face, reduced hump, attractive appearance, drooping vulva (for easiness of calving), bushy tail end, thick skin (to withstand the infliction of biting flies) and big body size. Other relevant traits include temperament, non-black hair coat, better growth rate, good mothering ability and being in good health condition.

Table 1. Reported farmers' selection practices and mating systems in indigenous cattle for milk production in Amhara Region

Cattle type	Location	Mating system	Phenotypic Selection criteria		Reference
			Male	female	
Semein cattle	Beyeda and Janamora districts	Selective mating	pedigree and physical appearance	wide pelvic width ,long and thin neck , long height and udder size	Zewdu, 2004
Wogera cattle	Debark, Dabat, and Wogera	use crossbreeding (either bull or AI)	light head size ,long sheath length and short tail length	mothering ability and fertility	
Dembia cattle	Dembia, Gondar Zuria, Chilga and Alfatakusa	pure breeding and AI	Short tail length, light head size long to medium sheath length,	long navel flap, wide pelvic, long neck, medium to large udder and balanced teats, and medium tail length	
Fogera cattle	Dera and Fogera districts of South Gondar zone,	pure breeding and crossbreeding , and uncontrolled random breeding	Large body size, Large hump, Small horns and Large and folding preputial sheath	Large udder, medium or long body, pelvic width and Large navel flap	
Mahbere-Slassie composite	Orthodox Christian Monastery	normally random	body size and family performance mainly on milk yield	good milk yield and mothering ability, and large body size	
Gojjam Highland Zebu	Gozamen, Ankasha and Enemay	Uncontrolled and controlled	physical parameters and parent history	Coat colour, parent history, temperament and udder size	Fasil, 2006

Conformation traits and milk yields: In India the different conformation traits were assessed in relation to milk yield of the different local cattle breeds. The result showed that some cows that have non prominent navel flaps but proportionate and medium sized teats are average milk yielders. On the other hand cows that have voluminous dewlap and large navel flap; well developed udder and teats with prominent milk vein are docile and good milk yielders. Cows that have short and tacked up navel flap, long and well round barrel, small compact udders and small hard teats are also poor milkers (Manoj *et al*., 2008).

In our indigenous cattle breeds the different conformation traits were physically assessed and the milk yield statuses of the different indigenous cattle breed were estimated. As indicated in Table 2.2 from the collection of general figures of milk yield estimates for each breed and general morphological descriptions of different conformation traits by different studies for each breed; cows that have small udder and teat sizes, short navel flap, narrow pelvic width, compacted body and short and thick necks are poor milkers than cows that have average appearance on those conformation traits (Zewdu, 2004; Dereje, 2005; Getinet, 2005; Takele, 2005; Fasil, 2006).

Table 2.2: Conformation trait descriptions and milk yield of indigenous cattle breed in Ethiopia.

Cattle type	Location	Conformation trait description in local cattle						Average milk yield /lactation	Reference
		Udder size	Teat size	Navel flap	Pelvic width (cm)	Body length (cm)	Neck size		
Semein cattle	Beyeda and Janamora districts	small	Small	Small or absent	35.81	111.49	NA	153.75 liters	Zewdu, 2004
Wogera cattle	Debark, Dabat, and Wogera	medium	medium	Small	37.60	115.6	NA	450 liters	
Dembia cattle	Dembia, Gondar Zuria, Chilga and Alfatakusa	small - medium	small - medium	Medium - large	37.28	117.35	NA	645 liters	
Fogera cattle	Dera and Fogera districts of South Gondar zone,	small - medium	small - medium	Large	37.77	119.77	NA	997.5 liters	
Qocherie cattle	Metema, Quara and Tacharmachiho	medium size	medium size	medium size	38.37	114.72	NA	397.5 liters	
Mahbere-Slassie composite	Orthodox Christian Monastery	medium - large	medium - large	Large	41.07	127.33	NA	NA	
Gojjam Highland Zebu	Gozamen Ankasha and Enemay	NA	NA	Small - medium	35.6	104.86 ± 0.39	NA	509 liters	Fasil, 2006
Ogaden/Boran	Haramaya University	Small - medium size	cylindrical and funnel shaped teat	Mostly no navel flap	NA	121.09	NA	682 liters	Getinet, 2005
Sheko	Benchimaji zone	Small - large	average(3.4 cm)	medium (2.7 cm)	33.5	110.2,	29.9 cm	698.3 litres	Takele, 2005
Wollo Highland Zebu	South and North Wollo	NA	NA	absent or very small	33.81	116.8	short and thick	645 liters	Dereje, 2005
Raya Sanga	Kobo Woreda	NA	NA	Small – medium	35.2	119	NA	594 liters	
Afar Sanga	Afar Region	'NA	NA	Large – medium	38.7	126	NA		
Intermediate cattle	eastern Wollo	NA	NA	small - medium	33.6	114	NA	448.8 liters	

NA=data not available

Relationships between body conformation measurements and production performance of dairy cows: The relationships among body measurements of dairy cow represent a special interest to the diary industry because most of the dairy farmers usually judge the merit of dairy cows, to a certain extent, on the basis of body conformation. Brum and Ludwick (1969) found that measurements of body capacity such as body length, heart girth and withers height are related to milk production. Lin *et al*. (1987) found that: 1) rump length is the most important trait among all body measurements studied for prediction of first lactation performances; 2) body measurements are interrelated because of the physiology and genetics of the cow. Some traits refer to some part of the body, like basic form and strength of the body, which have a high genetic correlation of 0.91 (Foster (1985); 3) the udder of the cow is one of the most important criteria that can be used to predict production performance. Lin *et al*. (1987) found that high producing heifers have lower udder height than low producing heifers. Udder height was more closely related genetically and phenotypically to first lactation yield; 4) the udder conformation and teat attachments are related to udder health and the efficiency of machine milking; 5) cows with high score of body measurements live longer in the herd and not being culled for a health problem. Rogers *et al*. (1981) found that udder depth and teat rear view are the traits most related to survival; 6) selection based on body measurements and milk production could result in a greater genetic gain in milk yield than single selection for milk yield.

Genetic correlation between udder morphology and productive life: Many conformation traits are combined after genetic evaluation into composites based on relative weights from correlations with productive life. Holstein udder composite includes udder depth, fore udder height; rear udder height and width, udder cleft and teat placement; feet and leg size composites each of which include four traits. Selection for higher udders and against larger body size can prevent undesired responses in those two correlated traits. Because selection for increased milk production has also increased the body size and weight despite evidence that smaller cows have advantages for longevity, and welfare. Since, more emphasis on angularity may have also contributed to increased metabolic stress, and large size and weight affect the mechanics of movements of the cow ((Seykora and Hansen, 2000).This reflects to the proposed study, possible correlation among conformation traits should be evaluated and therefore, it could be easy to identify which body conformations are depressed or progressed when; selection is applied to bring genetic gain on the basis of some conformation trait. According to Vollema and Groen (1997), udder depth shows a weak genetic correlation with milk uncorrelated longevity but a strong association with milk correlated longevity (0.39). In contrary to this results, they reported a negative correlation (–0.06) between the central ligament and herd life and a positive one (0.08) between the central ligament and functional herd life. Similarly, Vukasinovic *et al.* (2002) found positive genetic correlations of milk-corrected longevity not only with suspensory ligament (0.16) and udder depth (0.35) but also with fore udder (0.32) and with rear udder attachment (0.35).

Udder traits associated with teats were front teat placement, teat length and teat width. These showed similar correlations with both longevity traits. For front teat placement they were positive (0.22; 0.20), and for teat length (–0.16; –0.14) and teat width (–0.24; –0.29) they were negative. The correlation between longevity traits and teat associated traits seems to be independent of milk production. According to the estimated correlations, cows with shorter and narrower teats have an advantage concerning longevity (Perez-Cabal and Alenda, 2002).

Genetic parameters of conformational traits and yield traits: The genetic parameters for conformation traits and their genetic and phenotypic correlations with milk production traits and somatic cell score (SCS) in three Swiss dairy cattle breeds (Holstein, Brown Swiss, Swiss Simmental and Red & White Cattle) were estimated in Switzerland (Haas *et*

al., 2007). Conformation traits have a better heritability and show strong phenotypic correlations with milk yield in Holstein cows than the remaining cattle breeds.

Phenotypic correlations between milk production and conformation traits:
Phenotypic correlations between conformation traits and milk production of Holstein cows ranged from 0.35 to 0.75. For Brown Swiss, these phenotypic correlations were less strong (0.08 to 0.19), and also for Red & White heifers (0.15 to 0.19). However, phenotypic correlations between conformation traits and fat and protein production were very low and near zero in Holstein, but reached values near 0.20 for Brown Swiss and Red & White (Haas *et al*., 2007). Therefore the variability of phenotypic correlation value between conformation traits and milk yield within the breed indicates that we must measure the conformation traits and record milk yields for each breed and run correlation independently to each breed.

Genetic correlations between milk production Heritability: The heritability for some conformation traits vary within breed. For all breeds, the most heritable body measurement was stature (0.64 – 0.74). Regarding linear type traits, for Holstein estimated heritability were around 0.4, for Brown Swiss between 0.3 and 0.5, and for Red & White values ranged from 0.41 to 0.59. BCS had a low heritability of 0.13. For Brown Swiss, the heritability estimates were between 0.3 and 0.5. The heritability's of the conformation traits for Red & White ranged from 0.41 to 0.59 (Haas *et al*., 2007). So conformation traits are genetically heritable and hence genetic progress can be made through selective breeding based on confirmation traits known to have strong and significant correlations with milk production in indigenous cattle.

Genetic correlations among conformation traits: in general, BCS was negatively correlated with the conformation traits, except with heart girth. For Brown Swiss, the strongest correlations were estimated between (i) body depth and heart girth, and (ii) between rump width and muscularity. The genetic correlations

and conformation traits: Genetic correlations of milk production with conformation traits in Holstein cows were all positive, except for BCS. In Brown Swiss, however, muscularity and rump width showed negative correlations with milk production. For Red & White, only muscularity was negatively correlated with the milk production. The directions and trends estimated for the genetic correlations between conformation traits and both fat and protein production were similar for all breeds, and SCS (somatic cell score) was generally negatively, or just slightly positively, correlated with the conformation traits, although it showed moderate values for some traits in the Red & White breed (Haas *et al*., 2007). For all breeds it holds that most genetic correlations had a similar direction of relationship to the phenotypic correlations, although the magnitudes differed. This implies that also for all breeds there is some genetic background to the trends we observe in the field.

between conformation traits were mainly positive, ranging from 0.21 to 0.72, with the negative values for correlations of muscularity with stature and body depth. For Red & White stature and heart girth were strongly positively correlated, while body depth and muscularity were strongly negatively correlated (Haas *et al*., 2007). This implies that success in selection for one key conformation trait can also be expected to result in a significant correlated genetic response in the other related conformation trait.
Generally, many studies (Harris *et al*., 1992; Miztal *et al*., 1992; Haas *et al*., 2007) have been conducted in developed countries to estimate the relationships of milk yield with conformation traits. And thus, many conformation traits are now used by the modern dairy farmers for dairy cattle improvement through selection. But, up till now the information is scanty in many developing countries about the phenotypic and genetic correlation of conformation traits with milk yield. In Ethiopia some conformation traits are traditionally in used by smallholder farmers to select best dairy cows (Zewdu et al., 2006). Thus, detail information on the phenotypic

correlation of conformation traits with milk off-take should be available and this task is the base of the present study.

Conclusion: The reproductive and milk production performances of the Ethiopian local dairy cattle breeds are still very poor. The average lactation length and calving intervals of Ethiopian highland zebu cattle is 8 and 26 months, respectively. Therefore, this low reproductive performances decrease herd profitability. The milk production performance is also varied between 5 kg/day to 1.5 kg/day for Boran and Wogera cattle, respectively. In developed countries, conformation traits are serving as the main actors for dairy cattle genetic improvements. Unlike developing countries, in most of their modern dairy farms, dairy cows and replacement heifers judged based on conformational traits which are evaluated in relation to longevity and milk production performances. However, Traditionally in Ethiopia, farmers select their cattle by conformational traits but there is no any established pattern and the selection is dependent on farmers' individual conception. Mostly pelvic width, naval flap size, udder and teat size are the mainly considered traits.

Generally, in developing countries, conformation traits are subjectively related with milk yield potential. There is no more studies which confirms the possible established genetic/phenotypic correlations, because, it needs a long time recorded data which is not yet available in developing countries. But, in developed countries, most of conformation traits are appraised by herd owners to a certain extent. They have clear findings about the heritability of conformational traits, and genetic and phenotypic correlation with production performance and longevities.

Recommendation: Milk off-take under large category shows strong phenotypic correlation with navel flap width and length, dewlap width and withers height for all sampled cows. Body length and pelvic width for Fogera cattle and body length for Wogera cattle also had a strong correlation with milk off-take. But, under small category, all conformation traits except wither

height in Wogera cattle show relatively weak correlation to all cattle types. Therefore, this study recommends selection criteria for replacement heifers and cows should be based on large sizes of these conformation traits except dewlap width (small size), due to negative correlation. Further studies in controlled situations, should be carried out to estimate the heritability's of conformation traits, genetic correlations between heritable conformation traits and milk yield, to formulate authentic judgment criteria for indigenous dairy cow and selection criteria for breeding bull.

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