

Full Length Research Paper

On-farm description and status of Nuer (Abigar) cattle breed in Gambella Regional State, Ethiopia

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Received 27 November, 2017; Accepted 19 February, 2018

This study was conducted in Gambella Regional State (GRS) in order to characterize the Abigar cattle breed phenotypically at its breeding tract. It was done purposively in four selected districts of the region using extensive field surveys, morphological measurements and focused group discussions on the origin, distribution, current status and future threats, production and reproduction characteristics of Abigar cattle at its production environment. By using semi-structured questionnaire, 160 cattle owners were interviewed and qualitative and quantitative data were recorded for mature 200 female and 100 male cattle. Milk yield monitoring of 95 lactating Abigar cows was assessed in and around Gambella district for three months long. The data were entered into Excel sheet and analyzed using SPSS (2007) software package. The study has shown that Abigar cattle are the most dominant both in the Nuer and Anywaa zones of the region. The breed possesses unique features that can be used in identifying the breed from other indigenous breeds. The breed has got large body size, long-curved horns, gray and white dominant coat colors as well as ease of management by all gender groups due to its recognized docile character. The average age at puberty, age at first calving and calving interval were found to be 36.2, 42.5 and 14.1 months, respectively under extensive management. In addition, the breed has better production and reproduction capabilities despite the high heat load, recurrent drought and repeated disease prevalence in the region. However, a decreasing trend of the breed had been noticed in the studied areas in recent years mainly due to disease outbreaks and lack of medication, ethnic conflicts, cattle raiding and high expansion of commercial crop production. Thus, a well-coordinated and community driven participatory *in situ* conservation strategy has great significance to ensure the maintenance, future use and improvement of the breed for enhancement of food security of the pastoral and agro-pastoral communities in the region.

Key words: Abigar, cattle, breed, Nuer, Anywaa, pastoral, agro-pastoral.

INTRODUCTION

Ethiopia is considered as home of huge diversity of animal genetic resources, possessing high population of livestock comprising mostly of the indigenous genotype; adapting variable agro-ecologies and farming systems.

Animal genetic resources provide alternative forms of high quality food, major source of income and livelihood, and very crucial in strengthening social and cultural linkages of indigenous people living in marginal areas

(Cardellino, 2006). In these areas, where crop production is unavailable due to physical and climatic barriers, there exists only a considerable livestock production (Maass et al., 2012) and a relatively feasible livelihood strategy in order to buffer and maintain food security, which has been practiced as a main-stay of life and coping strategy at resilient ecosystems (FAO, 2006). This production system has accounted for over 40% of the world agricultural output at the global level. Under such circumstances, the multiple functions of livestock at marginal areas (Bayer et al., 2003), such as food, source of income, employment opportunity and socio-cultural values, is considered as a major priority which coincides with the fitness of the indigenous genotype with the prevailing traditional husbandry practices (Leshan and Standslause, 2013). This is further enhanced by the hardy nature of the animals and also relatively productive which may be due to the adaptation accumulated through long periods of exposure to the low level of management as well as the stressful environmental factors (Bayer et al., 2003).

Indigenous cattle are an integral constituent of most of the production systems in Ethiopia and serve multiple functions and roles in majority of the rural community. Of the indigenous genotypes known in Ethiopia, the Abigar cattle are classified as 'Sanga' and they are found principally in the border area between Ethiopia and Sudan with larger extension in Ethiopia covering the Akobo area of Gambella (Alberro and Haile-Mariam, 1982a). The breed is found around the White Nile of Sudan and Ethiopia, highly distributed and populated in the adjacent lowlands of Southwest Ethiopia; it has been reared and maintained by the Nuer tribes of Gambella Regional State (DAGRIS, 2007). Abigar cattle breed is the sole dominant cattle type found throughout the region and providing valuable support to the socio-cultural and economic activities of pastoral and agro-pastoral communities (GRS, 2003). It provides majority of the milk and milk product requirements of people in the region. The breed is considered as productive taking into account, the prevailing high environmental stressors and extensive management provided to the animals. Among the indigenous cattle breeds, Abigar is known for its tolerance to tse-tse fly challenge, high heat load, periodic flooding and possessing of good milking and beef production qualities at its breeding tract (GRS, 2003). Despite the high significance of the breed in supporting and improving livelihood of people in the pastoral and agro-pastoral areas in Gambella, there is little information available for this cattle breed to figure out its current status and for further intervention in designing to

implement appropriate breeding programs and conservation strategies.

Thus, this study was designed to gather basic information on its origin and distribution, current status and threats, adaptability attributes, morphological features as well as its production and reproduction characteristics at its breeding tract.

MATERIALS AND METHODS

Study area description

This study was conducted in Gambella Regional State (Figure 1) which is about 800 km away from the capital city of Ethiopia, Addis Ababa. Geographically, the region is situated within latitudes 6°22' and 8°30' N and longitudes of 33°10' and 35°50' E.

Broadly speaking, the region is divided into three major administrative zones, that is, Nuer, Anywaa and Mejengir, which are further divided into eleven districts. Traditional livestock production system prevails in the entire region and the major livelihoods comprised of cattle rearing, fishing and bee keeping in the Nuer, Anywaa and Mejengir zones, respectively.

Most of the rangeland in the region is characterized as open grass land with an extensive plain topographic feature (PADS, 2004) which has got an altitude ranging between 300 and 2300 m.a.s.l. The region is characterized by arid and semi-arid ecologies coupled with pronounced humid characteristics. It experiences a relatively harsh environmental condition of having unreliable, low and erratic rainfall which varies between 900 and 1500 mm in the lower altitudes of the region. The mean annual temperature ranges between 17.3 and 28.3°C with the highest absolute maximum temperature occurring in the middle of March and is about 45°C (GRS, 2003). The major cultivated crops in the region include maize, sorghum, groundnut, sesame and cotton. The natural vegetation in Gambella Regional State (GRS) is characterized as savannah grassland with scattered wood and shrub lands. Poorly drained vertisol is the characteristic soil type of the grass land, particularly in Itang and Lare districts.

Sampling and data collection

Preliminary survey was done before commencing the actual study to explore the overall features of cattle production in the region and further to modify the questionnaire for simplicity of interviewing the cattle owners. Based on information obtained from the preliminary survey and experts of the regional agricultural offices, four districts in the region (Abobo, Gambella, Itang and Jikawo) were purposively selected taking into account the major breeding sites of Abigar cattle breed, population size and production potential of each district. A total of twelve (12) villages were selected from the four districts to gather information on the breed's characteristics, management by the owners and its diversity in the region. Accordingly, 160 cattle owners (40 households per district) were selected randomly and interviewed using semi-structured questionnaire. In the meantime, Abigar cattle owned by the respondents were also used to take qualitative and quantitative

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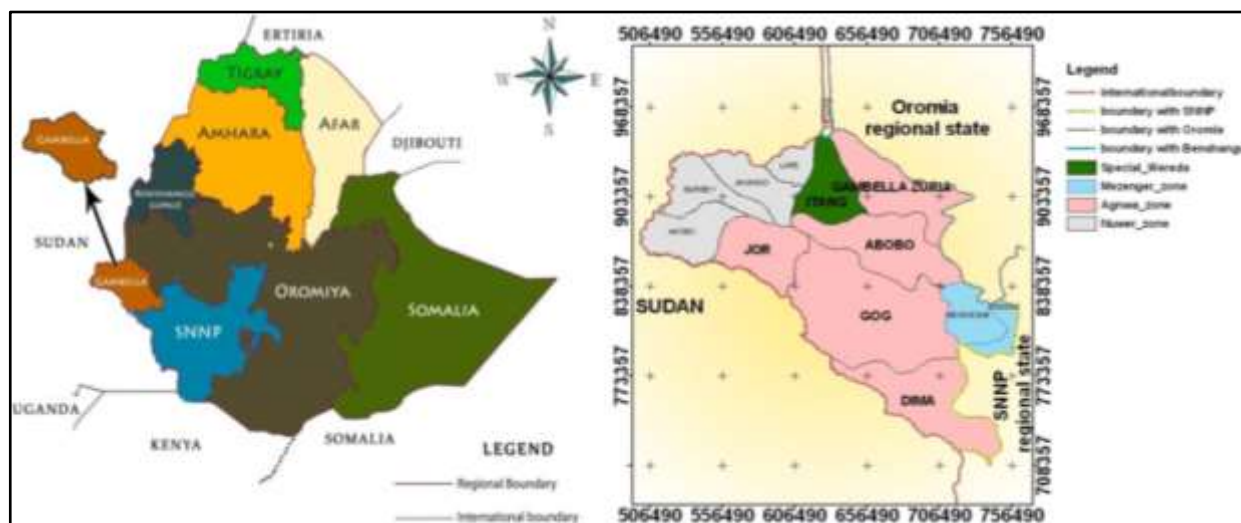


Figure 1. Map of Gambella Regional State (Riek, 2016).

measurements. A total of 300 mature Abigar cattle (200 females and 100 males) were randomly selected for the entire study. Extensive focus group discussions with elder Abigar cattle owners were made at each village (on average 3-15 persons per village participated) and the local languages were interpreted by respective development agents. In addition, pictures were taken from individual animals, grazing fields and management practices of the breed. Data were entered into Excel sheet (2007) and the required statistical parameters were analyzed using SPSS (2007) software package.

RESULTS AND DISCUSSION

Origin and distribution of the breed

The Abigar cattle are classified under the 'Niloitic Sanga' and are the sub-type of Nuer cattle found principally in the border areas between Ethiopia and Sudan with larger extension into Ethiopia covering the Akobo area of Gambella (Alberro and Haile-Mariam, 1982a). The term 'Sanga' is originally an Ethiopian word which refers to 'bull'. This would be an evidence that Ethiopia could possibly be considered as the origin and center of dispersal of Sanga type breeds which were evolved through interbreeding between the Longhorn, Shorthorn and Zebu type cattle commencing before 3000 to 4000 years ago (Payne and Wilson, 1999) and still, the process is continuing. The Abigar cattle are found along the white Nile in Southern Sudan (mainly bred by Nuer, Dinka and Shilluk tribes) and in the adjacent lowlands of Southwest Ethiopia including Itang, Jekawo and Akobo districts of Gambella Regional State, mainly bred by the Nuer and Anywaa tribes (Alberro and Haile-Mariam, 1982a).

The word 'Abigar' derived its name from Abigar people

(Nuer ethnic group) who actually possess deep-rooted indigenous knowledge and putting pronounced effort for the better management and maintenance of the breed. They always show high priority against the other breeds and are known for their traditional management for the continued use and improvement of the breed. In fact, the word Abigar is derogatory to people across the region and livestock producers preferably like to name the breed as "Nuer breed" or "Anywaa breed" by referring the ethnic group names who dominantly rear the breed. However, several literatures use and cite the name 'Abigar' but it is recommended to use the already acceptable names (Nuer breed or Anywaa breed) by the local people as naming has its own factor as a source of conflict among tribes.

The study further showed that the origin of the Abigar cattle has been strongly associated with that of the ethnic group (Nuer) maintaining the breed for several decades in the region. During the focused group discussions, majority of the elder people usually explain that 'Nuer cattle' means 'Nuer people' and vice versa which ensures and provides evidence on the systematic and continuous roles being played by those people in developing and maintaining the breed against drought, disease outbreaks, parasite attacks, genetic admixture and cattle raiders. In line with this reality, the entire life and livelihood of the Nuer community heavily depends on rearing Abigar cattle for their socio-economic and cultural needs on the vast area of the Gambella rangeland (Ketema, 2007). The current study and other related literatures strongly support the claim that the border area between Ethiopia and Sudan, specifically the districts occupied by the Nuer people, is believed to be the original breeding sites of Abigar cattle (Alberro and Haile-

Table 1. Ranking of tolerance/resistance of Abigar cattle for some stress factors.

Stress factors	Level of adaptation	Mixed	Pastoral	Agro-pastoral	Overall
		N=40	N=40	N=80	N=160
Heat tolerance	Good	55	62.5	68.8	63.8
	Moderate	27.5	25	25	25.6
	Less	17.5	12.5	6.2	10.6
Drought tolerance	Good	57.5	75	68.8	67.5
	Moderate	27.5	15	18.8	20
	Less	15	10	12.5	12.5
Disease resistance	Good	50	60	73.8	64.4
	Moderate	30	17.5	23.8	23.8
	Less	20	22.5	2.5	11.9
Resistance to parasites	Good	55	82.5	66.2	67.5
	Moderate	35	17.5	26.2	26.2
	Less	10	0	7.5	6.2
Withstand feed shortage	Good	65	65	77.5	71.2
	Moderate	20	27.5	21.2	22.5
	Less	15	7.5	1.2	6.2
Withstand water shortage	Good	62.5	75	65	66.9
	Moderate	35	15	28.8	26.9
	Less	2.5	10	6.2	6.2

Mariam, 1982a) which indeed extends in all territories occupied by the Nuer people in the region. These days, Abigar cattle are commonly being reared by other tribes in the region as well as nearby districts of Oromiya region for milk production, source of income, payment of dowry and blood feud, strengthening social and cultural linkages. Next to the Nuer zone, large population of the breed is also found within the Anywaa zone which has paramount significance for supporting their crop production practices. According to the focus group discussion, the Anywaa people had actually started livestock rearing since few decades ago due to the efforts from serious extension work as well as due to the awareness they got from Nuer people during the dry mobility season while crossing over and reaching the Anywaa districts. The elderly Anywaa people also described their great interest and preference of rearing the Abigar breed for its hardy nature and productivity potential.

Moreover, it is common to find Abigar cattle in the adjacent districts of Oromiya region such as Denbidollo, Shebel, Gimbi and Bure (Tasew and Duguma, 2012) in considerable number and distribution in which the breed has been used for milk production, fattening practices and draft power production.

Adaptability features of Abigar cattle

Abigar cattle possess unique adaptive traits that enable them to survive, produce and reproduce under high temperature and heat loads, frequent disease outbreaks and challenges. More than half of the respondents reported that Abigar cattle relatively have better level of tolerance or resistance to most of the existing stressors as compared to the other cattle breeds in the region which ranges from 63.8% for heat tolerance to 71% for withstanding feed shortage (Table 1) as compared to all other indigenous cattle breeds existing in the region.

Such adaptation is very critical under low input production systems which may be developed gradually within locally adapted livestock breeds as they had been evolved parallel with all the confounding pressures in arid and semi-arid ecosystems (Leshan and Standslause, 2013). This will have a direct significance in ensuring food security, conservation and sustainable utilization of the resource by the local people.

Typical features of Abigar cattle

Abigar cattle have long body length, big body size and

Table 2. Overall least square means of quantitative traits in the male and female sample population.

Dependent variables*	Female (N=200)		Male (N=100)	
	Overall average	CV (%)	Overall average	CV (%)
Mouth circumference	39.2	4.0	39.8	3.3
Face length	43.9	3.5	44.3	4.2
Ear length	17.5	7.9	17.8	6.6
Horn length	44.6	20.4	39.0	19.0
Neck length	43.5	4.0	43.3	5.5
Dewlap width	13.3	25.9	15.1	17.7
Canon bone length	21.8	5.6	22.5	4.2
Canon bone circumference	14.9	6.6	15.7	6.9
Heart girth	142.5	3.3	148.9	4.0
Height at withers	114.0	2.4	118.3	2.7
Body length	122.2	4.7	122.7	4.4
Pelvic width	34.7	3.9	33.8	4.7
Navel flap width	4.8	21.1	-	-
Teat length	4.1	16.3	-	-

**Figure 2.** Typical Abigar cow.

medium height with an excellent body conformation accompanied by straight back and good heart girth (Table 2). The horns are either medium or very long in most cases which project forward and upward with curved and lyre shapes. They do have straight facial profile, small hump and sloppy rump in both sexes. White and gray coat colors are very dominant in the population in all the study areas which might have an association with the natural adaptation against the prevailing high temperature and heat load in the region (Kebede, 2016) (Figures 2, 3, 4, 5 and 6). Both sexes of Abigar cattle are

docile and can easily be managed by children and women. This breed is also popular for its good walkability and high endurance characteristics during long distance mobility in the dry periods while driven in search of good pasture and drinking water (Ketema, 2007) (Figure 7).

Reproductive performance

The age at puberty for female Abigar cattle was found to be in the range of 34 to 40 months on average and could



Figure 3. Typical Abigar calves.



Figure 4. Typical Abigar bull.

reach sexual maturity within 38 and 41.5 months which showed slight variations in the prevailing production systems and management. As a result, the mean age at first calving was found to be 45.4, 44 and 40.3 months, respectively in the mixed, pastoral and agro-pastoral areas which might be due to the differences in indigenous knowledge in cattle management such as free herd

mobility and feed resource availability. However, the mean reproductive life span of Abigar breeding bulls was found to be 6 years old after attaining maturity and the local people usually practice castration of young bulls when they reach 47.4 months of age in order to control unintentional or unwanted breeding before reaching full sexual maturity at 4 years.



Figure 5. Typical Abigar heifer.



Figure 6. Typical Abigar ox.

Production attributes of Abigar cattle

The field survey and milk yield monitoring assessments indicated the milk yield production potential of the breed, which varied from 0.47 to 5 L across the available production systems and the districts studied. The result

has shown that the mean milk yield recorded from Abigar cows' ranged within 1.3 and 3 L (Table 3) without considering the amount of milk suckled by calves. The values of milk yield showed slight variations in the studied areas which may be due to the variations associated with cattle management and resource availability. For



Figure 7. Dry season mobility of Abigar cattle herd (long distance trekking).

instance, in addition to huge indigenous knowledge of the Nuer people regarding cattle management, they do exercise herd mobility freely over the rangeland (generally natives exercise better) and would access better water and grazing sites. In addition, both the Nuer and Anywaa people are known for their ethno veterinary knowledge and practices which might have significant influence on controlling some diseases and parasites and ultimately improve the production and productivity potential of their herds. Moreover, the actual milk recording was done in a single season from a few 'dairy cows' and there was also a serious outbreak of disease and drought during the study period in which many deaths of cattle were noticed.

The age at first calving interval ranges from 34 to 45 months with an average calving interval of 14 months. As compared to other indigenous cattle breeds, which have shown high mortality rates and are facing tough pressures to survive, the Abigar cattle breed was able to give better daily milk yield of 2.9 L (this study and GRS (2003)), mean lactation length of 8 to 9 months which is larger than the national average (6 months for indigenous cattle with 1.85 L of milk per day) (CSA, 2009) (Table 3).

It is also in agreement with Mureja (2002) in which Abigar cow could give 1-4 L of milk yield per day under traditional management. Moreover, Abigar cattle have larger calf crop production (7.4 to 10 calves) potential during their reproductive life span. However, the current milk yield is slightly lower than that of a previous study (3 to 5 L/day) reported by Alberro and Haile-Mariam (1982a), which might have been associated with the high disease outbreaks and drought incidences, which had occurred in the region when this particular study was

carried out.

Major threats and current status of Abigar cattle

Disease outbreaks and recurrent drought

Despite possessing highly valued traits which could potentially play significant food and nutrition contributions at the national and international levels, the current study has shown the gradually decreasing trend of Abigar cattle population in the region due to some practically observed threats. As noted from the various focus group discussions with elder cattle owners and experienced experts, it is common to find several disease outbreaks which usually kill large number of cattle of all age groups and consequently disturbing the livelihood pillars of many households. This problem usually exacerbates the situation badly as it is mostly coupled with lack of veterinary services and drug supply in the region; bringing more serious tension in the livestock sector in general and Abigar cattle in particular. The loss of cattle due to trypanosomiasis, CBPP, brucellosis and foot and mouth disease, is very common in the region, sometimes causing the loss of more than half of, or even, the whole herd of cattle; particularly in times of drought due to lack of feed shortage and associated problems. Through time, recurrent drought has caused multifaceted challenges and is considered as one of the top threats of livestock production in the Gambella Regional State. Thus, because of frequent drought, both disease prevalence and feed shortage has become very critical and bring socio-economic instabilities on cattle owners due to the loss of large number of cattle in the study areas.

Table 3. Measured milk yield (lit/day) performance of Abigar cattle in Gambella district.

Village	Stages of Lactation	N	Mean	SD	Min	Max	CV (%)
Addis Sefer	Early (0-3 months)	9	2.1	0.514	0.6	2.8	24.4
	Mid (4-6 months)	11	1.7	0.399	0.5	2.7	23.6
	Late (≥ 7 months)	11	1.5	0.523	0.4	2.3	34.2
Baro Mado	Early (0-3 months)	12	2.1	0.535	1.5	2.9	25.7
	Mid (4-6 months)	12	1.6	0.394	0.9	2.9	24.0
	Late (≥ 7 months)	9	1.3	0.628	0.5	2.7	47.2
Jejebe	Early (0-3 months)	17	1.6	0.475	1.2	2.5	29.3
	Mid (4-6 months)	9	1.5	0.564	0.3	3.0	36.9
	Late (≥ 7 months)	6	1.3	0.769	0.3	2.2	59.2
Overall	Early (0-3 months)	38	1.9	0.542	0.6	2.9	28.8
	Mid (4-6 months)	31	1.6	0.441	0.3	3.0	27.1
	Late (≥ 7 months)	26	1.4	0.605	0.3	2.7	43.2

*N = Number of milking cows per lactation stage, SD = standard deviation, Min = minimum, Max = maximum, CV = coefficient of variation.

Cattle raiding and conflicts

Next to disease and drought constraints, cattle owners had been highly discouraged by cattle raiders who usually come either from Sudan or nearby surroundings, which would be more difficult when frequent mobility is required during the dry season (late December to early May) because of severe feed shortages. In these periods, livestock owners must drive their herds more than 30-100 km per day within the rangeland. However, they may eventually reach the danger zone of being life threatening and/or losing their cattle by well-armed thieves (Jal, 2014). In addition to the grazing sites, cattle raiding could possibly be done at night by attacking and fighting seriously and intentionally with livestock owners (Phillip, 2017). In those days for instance, it has become very apparent that thousands of Abigar cattle were driven and taken to Sudan by the Murle ethnic group (cross boarder cattle raiders) after killing and wounding the owners from the Nuer zone. Some villages had been still free of any settlement during the study period due to the displacement and destruction of their belongings. For instance, the same event had occurred in April 2016, which caused the loss of 208 Nuer lives and 108 children were abducted in the Nuer Zone by those armed Murle who came from South Sudan (Addis Admas Newspaper, 23 April, 2016).

In certain cases, rampant cattle raiding has been taking place at the intra-ethnic level (the Lou-Nuer and Jikany-Nuer) as those people had started to use the stolen livestock to pay dowry (Phillip, 2017; Jal, 2014) within their own community. Among these raiders, it is common

to find inter- (between Anyuwaa and Nuer) and intra-ethnic (among the Nuer clans) conflicts (Riek, 2016; Jal, 2014) while people are crossing from one territory to another in search of better grazing or feed resources (Borchgrevink and Lie, 2009; Medhane, 2007) in the dry season and this will cause the loss of human life and livestock, destruction of property and bringing further decline in the rangeland resources and enhancing potential land degradation (Jal, 2014; Dereje, 2009).

Population pressure and expansion of commercial crop farming

In addition to the above production threats, there is high population pressure by the native people because of their cultural affinity towards increasing the size of their family by polygamy. Population pressure has also been a real concern as there is ever increasing flow of immigrants from Sudan and this would show an increasing human-livestock population and hence, bringing shrinkage of grazing lands and potential source of conflicts. Finally, the alarming and huge expansion of investment for commercial crop agriculture in the region is considered as the a big and serious concern for the fate of animal genetic resources in the region including Abigar cattle, resulting in the over dwindling of grazing lands, deforestation as well as deterioration of the rangeland. In the study period alone, the land investment and administration agency of the region approved and handed over thousands of hectares of land to local and foreign investors (Nakachew, 2009) for commercial rice,

cotton and sesame productions (Keeley et al., 2014). Despite these heavy threats imposed on the breed, it has received little attention and there are no established/planned conservation measures and strategies for maintaining the breed in a sustainable basis for future use and further improvement.

CONCLUSION AND RECOMMENDATIONS

Abigar cattle breed has been bred and maintained under pastoral and agro-pastoral production systems mainly by the Nuer people in which the origin and major breeding tract is found to be Gambella Regional State. Though the largest population and distribution of the breed is evident in the Nuer zone, it has been significantly reared in the Anywaaa zones as well as in the adjacent districts of Oromiya region due to its preferred traits for milk production, beef production and draft production potential. The breed is also characterized as having docile character, long body length, big body size, medium height, mostly long-curved horns and dominantly white and gray coat colors in the population. Despite the prevailing high heat load, disease challenges and recurrent drought, the breed is known as possessing better productive and reproductive potential and showing less mortality rate as compared to other indigenous breeds found in the region which actually requires survival rather than being productive due to the high intensity of environmental stressors in the region. However, the current study has indicated a decreasing trend of the breed because of repeated disease and drought prevalence, cattle raiders, conflicts and expansion of commercial crop production. The regional government should also give due attention to cooperation, to resolve the available threats and maintain the rangeland ecosystem against the currently expanding crop farming. Thus, community based *in situ* conservation strategy is highly recommended to curb the available threats and improve its maintenance for sustainable utilization of Abigar cattle breed.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors are highly indebted to EIAR and ILRI for their financial assistance. Furthermore, they appreciate the support of Abigar cattle owners for collaborating to provide the required information as well as allowing them to take phenotypic data measurements and observations. Finally, all the experts in the respective zones and

districts deserve special thanks for their generous help in selecting the appropriate and potential cattle production sites and also for creating smooth communication with the cattle owners for ease of data collection from the pastoral and agro-pastoral communities.

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