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ADAPTABILITY AND PRODUCTIVITY OF WASHERA RAMS AND ITS CROSSES WITH FARTA SHEEP IN SOUTH GONDER ZONE OF AMHARA REGION, ETHIOPIA

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ABSTRACT: *A rapid survey was conducted in south Gonder zone districts to collect information on the adaptability and productivity of distributed Washera rams and its crosses under smallholder farmer's management systems in the study areas. Pre-survey information was collected from zone agricultural office professionals and checklist was used to collect information from zone and district professionals, development agents and smallholder farmers. In addition, physical observation and body measurements were taken on rams and their progenies. Since the distribution has started in 2005, 1965 Washera rams were distributed in to nine districts by different organizations like Food for Hunger International, World Vision, Research and District Agricultural and Rural development office (WoARD) safety net program. According to the professionals and farmers judgments, Washera sheep has many economically important traits of which better growth rate, attractive coat color and big fat tail are the most important ones. Farmers recalled some adaptation problems as susceptibility to food shortage and disease, especially at their early age of arrival. The observed physical measurements depicted that these sheep are performing well. The body weight and other linear measurements obtained for rams were better than the values for the same breed of sheep at Adet and Quarit. Among the interviewed farmers (70%) preferred to rear Washera and its crosses while 8.7% of them preferred their locals (Farta). In general, most of the farmers (73.9%) have positive comment and suggestion on the distribution of Washera rams through which the performance of the locals could be improved. For future distribution, districts should consider when and where to buy and distribute the rams. In addition, for efficient use of the rams, the distribution should consider communal use of the rams in a common grazing land and it is better to distribute on recommended areas. Finally, in the context of animal genetic resource utilization and conservation, a strategy that would help to improve and conserve the Washera sheep at its belt should be designed.*

Keywords: *Adaptation, fat tailed sheep, growth performance, performance assessment*

ORIGINAL ARTICLE

INTRODUCTION

Sheep production is an important agricultural activity in the mixed crop livestock farming systems of the highlands of Ethiopia. They provide cash income from sale of live sheep, meat and skin, manure and social and cultural functions for the farm household. There are about 21 million heads (CSA, 2006) of sheep in Ethiopia of which 70% are found in the highlands of the country (Alemayehu, 2003). However, irrespective of high population numbers, the production and productivity of sheep and the contribution of this sub-sector to the farm economy is unsatisfactory. This is because, sheep are managed under traditional husbandry practices to which there are wide spread of animal diseases (including internal and external parasite), shortage and seasonal variation in feed availability and low productivity of local breeds.

In order to improve the productivity of indigenous breeds of sheep, improving the management (health, nutrition, housing, etc) aspects and the genotype (selection, crossing with better performing exotic/indigenous breeds) is of paramount importance. In Ethiopia, crossbreeding of sheep, with the aim of improving growth and

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wool of indigenous sheep, has been started in 1944 when the Merino breed was imported from Italy. Since then different exotic breeds (more than five) were introduced in to the highlands of the country (Tibbo, 2006; Beyene, 1989). Farmers in the highlands of Ethiopia, however, declined to accept the crossbreds due to their phenotypic unlikeness to the indigenous sheep. Consequently, due to assumed phenotypic similarity to the local sheep the Awassi breed was imported from Israel and still is in use in the cool highlands of central Ethiopia (Tibbo, 2006). However, due to different reasons, like the high cost and un-availability of Awassi x local crossbred rams to reach in to the farm households and bring an impact to the sector, the breeding program still has a limitation.

With regard to this, the Amhara national regional state bureau of agriculture and rural development has designed a strategy to distribute Washera sheep rams to different zones of the region where the local sheep are believed to be low performing (BoARD, 2004). The Washera sheep, found distributed in the western highlands of Amhara National regional state (E. Gojjam, W.Gojjam, Awi), is believed to be one of the promising sheep breeds of the country (Chipman, 2003; Mengistie, 2008). This breed of sheep is known by its fast growth, better reproductive performances and wide range of environmental adaptations as compared to other highland breeds of the region (Sisay, 2002). Accordingly, about 2000 Washera rams were purchased from the Washera area markets and distributed in to the traditional production systems of the south Gonder zone districts by different actors. And, therefore, this rapid survey was designed to assess the adaptability and performance of Washera rams and its crosses with Farta sheep in the south Gonder zone districts.

MATERIALS AND METHODS

Study area

The study was conducted in the eight districts of south Gonder zone during February 2009 in areas where Washera rams were distributed by different governmental and non-governmental organizations. The study area has an altitude range of 1300-4135 m a.s.l, mean range temperature of 9-19 C^{o} and mean range annual RF of 600-1100 mm (BoARD, 2004).

Data collection and analysis

Pre-survey information about districts where Washera rams have been distributed was obtained from the south Gonder Zone Bureau of Agriculture and Rural Development office. Within each district, sample peasant associations (PAs) were selected in consultation with district level extension staff (where the distribution is?) and based on road accessibility. However, due to lack of information about the exact time of distribution and for whom the rams were distributed, only flocks with Washera rams either intact or castrate and the neighbors who had Washera rams (as hear-say) were visited. Flocks/farms were identified and visited together with development agents from each PA. Information on adaptability and productivity of the rams was collected from 38 farm flocks of 13 PAs. Name of districts and PAs, and number of farms/flocks included in the study are shown in Table 1.

Table 1 - List of districts and PAs, and number of farms/flocks included in the survey

District	PAs	No. farms/flocks	No. Washera rams
Dera	Emashenkoro	2	-
Fogera	Alember	2	1
Libokemkem	Shamu	5	5
	kebele12	1	-
Ebinat	Debreabajale	4	4
Farta	Ata	2	1
	Awzet	6	6
L/Gaint	Damot	3	3
T/Gaint	Kebele 12	2	1
	Kebele 2	2	2
	Kotmender	2	2
Simada	Kebele15	6	6
	Kebele 12	1	1
Total	13	38	32

A Checklist focusing on the history of Washera ram distribution (number distributed, date of distribution, current inventory of the distributed rams and responsible bodies for the distribution) and performances of the distributed rams was used to collect information from zone/district/PA expertise and from farmers. Individual ram examination and progeny performance assessment was undertaken. Age was estimated by dentition for rams and by asking the owners on recall bases for the progenies. Weight - the live weight of an animal; was taken using the

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Salter scale (50 kg capacity with 200 gram precision). Other body measurements (heart girth, wither height, body length and scrotal circumference) were taken using flexible metal tape (3 meter length) to the nearest 0.5 cm after restraining and holding the animals in an unforced position. Body condition was scored 1-5 (1 for the worst and 5 for the best). The reference points for linear measurements taken were according to Sisay (2002). Heart girth - the circumference of the chest posterior to the forelegs at right angles to the body axis; Wither height - the highest point measured as the vertical distance from the top of the shoulder to the ground (bottom of forelegs); Body length - horizontal length from the point of shoulder to the pin bone. The data collected from the field was managed and analyzed using statistical package for social sciences (SPSS, 2006).

RESULTS AND DISCUSSION

The influence of the dietary protein level on feed intake, weight gain and feed efficiency is shown in Table 2. Feed intake increased with increasing protein levels of 16% and 18 % crude protein respectively. These results are in agreement with Kingori et al. (2003) who reported increased feed intake as protein was increased. In this study there was a general increase in body weight throughout the growing stage. Adeyemo et al. (2006) reported increased live body weight of guinea fowls fed different levels of crude protein. There was significant difference ($P<0.05$) in feed intake between the three treatments. This might be due to the differences in percentage crude protein content. This could also have been influenced by some ingredients in the diets to compel the birds to eat more to meet their body protein requirements. The weight gain increased significantly ($P<0.05$) between the treatments. Adeyemo et al. (2006) also reported significant difference of weight gain between birds fed 14 and 16% CP. Growth in animals is influence by genotype of birds, nutrition, hormones, tissue specific regulatory factors and other aspects of the bird's environment (Carlson, 1969). When birds consume below their protein requirement they do not improve protein utilization. The study showed that feed efficiency improved as protein was increased between 14, 16 and 18% crude protein (Table 2). Although slower growing than broiler chickens they are reported to out-perform replacement layer pullets in feed conversion efficiency (Olomu, 1983).

Ram distribution

Distribution of Washera rams in the districts of south Gonder zones were started since 2005. Since then, 1965 rams were distributed in to nine districts of the zone. From the visited 38 flocks, 18, 12, 4, 4 were provided for the farmers during the year 2008, 2007, 2006 and 2005 respectively. It was not possible to get data on the current inventory of the distributed rams due to lack of information (district/PA expertise lack follow up). Therefore, the indicated figures could not indicate the representative status of the distributed rams as died, sold, and in service. Different organizations like Food for Hunger International (FHI), World Vision (WV), Andassa livestock research center (ALRC) and district office of agriculture and rural development safety net program were participated in the distribution.

Performance assessment

Performance assessment by zone/district/PA expertise: According to the expertise from zone/district/PAs, Washera rams have better growth performance; they grow fast, they gain better when fed well. However, its reproductive performance is similar as compared to the local one. Washera rams are preferred by the producers and local markets due its attractive coat color and big fat tail character. Due to this all the districts where the survey was undertaken had planned to scale-up the distribution of Washera rams in the following budget years.

Performance assessment by farmers: Adaptation and productivity of Washera rams and its crosses with the local breed was assessed in a set out check list. As the result indicates (Table 2), from the total interviewed farmers (n=23), 78.3% and 74% responded that Washera rams and their crosses with Farta ewes have a characteristic of fast growth and better body conformation than the locals, respectively. Similarly, respondent farmers (34.8%) reveal interest on the colors of Washera rams and its cross with the local breed. Its color was plain red (15.9%), plain white (14.77%), red and white with white or red on the head and/or tail/leg (63.63%) and black and white (3.4%).

However, 56.6% of respondent farmers pointed out that Washera rams were susceptible to dry season feed shortage prevailing in the area, which might be because, the area where they came from is a better cropping area and then have better crop aftermath and crop residue. In addition, their body size is larger than the local and need more feed. About 52.2% of interviewees mentioned health problems like coughing and diarrhea and even death during early arrival period. The rams were very young and transported long distances (more than 300 km - in asphalt and gravel road) with in two-three days which could be a stress and may cause health complexity.

About 22% of interviewed farmers responded that big fat tail was one of the merits of the Washera sheep considered and was transferred to the crosses as a positively changed trait (30.4%). Washera sheep is characterized by large body size and wide fat tail usually curved up ward tip (Mengistie et al., 2009).

From the total interviewed farmers, 26.1% mentioned that Washera rams and its crosses attributed an increased market value due to its better body conformation (size, color, tail). Sheep price is affected by animal characteristics such as weight, sex, age, condition, and color (Beneberu et al., 2006). According to Chipman (2003), Washera breed of sheep has been found to be a relatively fast growing breed under harsh circumstances with good

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potential to aid producers and the economy of Ethiopia. In spite of this, 13% of interviewed farmers mentioned that Washera rams could not tolerate the dry season temperature, feed shortage and disease as a demerit of the breed. So it is important to improve animal management and infrastructure related to health services. This adaptation problem was lowered (4.3%) on the crosses. The Lion share (34.8%) of demerits of Washera rams and its crosses with Farta sheep as compared to Farta sheep lied on the absence of horn on the rams. According to the respondents, absence of horn has impact on local market preference and during mating time since it cannot resist competent local rams with horn.

Table 2 - Washera ram adaptation problems

Parameter for adaptation	N	Yes (%)	No (%)
Adaptation for disease problems	23	63.2	36.8
Adaptation for feed shortage	23	60.0	40.0
Walking ups and downs problems	23	22.2	77.8
Adaptation for cold	23	12.5	87.5

Even though farmers have their own Washera breeding rams, only 65% of them use controlled breeding with their Washera ram only while 30.4% of the farmers use random mating on the field. 52.2% of the rams of the respondent farmers serve the neighbors flocks from which 13% were controlled by bringing the ewes to the ram owner's house.

Due to their fast growth and high market values, 70% of the respondent farmers preferred to rear/keep Washera sheep and its crosses while 8.7% of them preferred locals. In general, most of the farmers (73.9%) have positive comment and suggestion on the distribution of Washera rams and local sheep breed improvement program.

Table 3 - Merits and demerits of Washera rams and its crosses with the local as compared to the local sheep breed

Parameters	Sheep breed		
	N	Washera	Washera × local
Merits	23		
Fast growth & better body conformation		78.3%	74.0%
Attractive color (Red and white)		34.8%	34.8%
Big fat tail		21.7%	30.4%
High market value (better price, demand)		26.1%	26.1%
Demerit	23		
Absence of horn		34.8%	34.8%
Susceptible to drought, feed shortage & disease		13.0%	4.3%

N: number of observations

Flock size and composition

The average flock size obtained from the study was 9.17 (4.19) with a range of 4-18 sheep. A similar flock size was reported for Washera sheep (Chipman, 2003; Mengistie, 2008). However, it is lower than the 16.02 sheep/household in Gumuz sheep (Solomon, 2007), and 24 sheep/household in Lallo Mama Midir in the central highland of Ethiopia (Abebe, 1999).

Flock composition in terms of sex and age classes has been taken as an indicator of the management system that reflects to some degree the management objective, flock productivity and constraints on the system (Ibrahim, 1998). From the total flock, the higher proportion (47.87%) were mature ewes followed by lambs less than 6 month age (27.50%). This indicates that more ewes were kept for breeding. The result is inconsistent with other studies in the highlands of the region (Mengistie, 2008; CSA, 2006). The mean number of rams (1.29), both Washera and locals, was more than what is needed and violates the 1:20-25 ram to breeding ewes ratio in year round mating. The higher proportion of rams in the flocks could be due to farmers offered the Washera rams in addition to their local ram before selling or castrating them.

The higher proportion of rams decreases the efficiency of the rams since it makes them idle; and the farmers knowingly or unknowingly castrates the rams after some crosses get born. This is because the farmers think that the rams replaced their progeny.

Table 4 - Average flock size and composition of the surveyed flock

Classification variable	N	Mean	Range	Composition
Flock sizes	23	9.17(4.19)	4-18	100.00

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Number of mature ewes	4.39(1.92)	2-10	47.87
Number of mature rams	1.29(0.47)	1-2	10.40
Number of ewe lambs (6-12 Months)	2.22(1.09)	1-4	9.47
Number of ram lambs (6-12 Months)	1.71(1.49)	1-5	5.68
Number of lambs (<6 Months)	2.90(1.65)	1-5	27.50

Growth performances

The age of sheep was estimated based on dentition classes. From the total observed Washera rams (31), only two of them were with 3 permanent incisors (PPI) and most of the distributed rams (12, 9 and 8) were with 0 PPL,1 PPL and 2 PPL respectively. They were distributed to the farmers when they were very young (with milk teeth).

The overall mean body weight (kg) of Washera rams obtained in the current study was 39.63±1.66 (Table 5). There was a significant difference (P<0.01) between dentition classes, that rams with 3PPI were heaviest and those with 0PPI were lowest in weight than other dentition classes. The overall mean wither height obtained was 71.38±1.20 cm and was significantly affected by age category. Rams with 1 and 2PPI were higher. Heart girth (80.49±1.40 cm) also was significantly affected by age; older rams had larger heart girth than those with 0PPI.

Scrotal circumference, measured for intact rams as the circumference of the scrotum at the wider area, was 25.17±0.34 cm. This figure is within the range of values reported for Menz and Horro rams at one to two years of age (Tibbo et al., 2004). It was significantly affected by age of the ram; rams with 0PPI had smaller scrotal circumference than older ones. Scrotal size could differ between breeds and even within breeds; there was significant difference between age groups and circumference increased with age (Girma, 2008).

The performance figures obtained in the current study were by far better than the performance observed for the same breed of rams at Adet and Quarit districts which is the home land of the breed (Mengistie et al., 2009). This difference might be because; the rams in the current study were managed in a better way than those in Quarit and Adet. Thinking of the rams need extra care, because farmers think these rams are improved, farmers gave better attention for the distributed rams. The other thing is, the rams were idle; the rams did not give the intended service since the number of ewes were so small. In addition some farmers castrated and fed fattening diet to their rams to fatten them.

Table 5 - Weight and body measurements (Mean±SE) of Washera rams under the farmer's management in the surveyed areas

Classification variable	N	Weight (kg)	Wither Height (cm)	Heart Girth (cm)	Body Length (cm)	Scrotal Circ. (cm)	Body Condition[1]
Overall	31	39.63±1.66	71.38±1.20	80.49±1.40	62.84±1.34	25.17±0.34	4.02±0.24
Agro-ecology		NS	NS	NS	NS	NS	NS
Dega	14	39.06±1.79	71.68±1.27	80.49±1.48	63.56±1.49	24.80±0.50	4.18±0.26
W/dega	17	40.19±1.71	71.09±1.48	80.49±1.73	62.11±1.73	25.53±0.46	3.86±0.31
Age category		**	**	*	NS	*	*
0 PPI	9	29.10±3.14^{d}	71±50±2.00^{bc}	73.42±2.34^{b}	60.45±2.35	23.00±0.52^{b}	3.13±0.46^{b}
1 PPI	12	33.89±3.06^{c}	75.45±1.95^{a}	77.81±2.28^{a}	62.63±2.28	25.30±0.60^{a}	3.61±0.44^{ab}
2 PPI	8	40.76±2.78^{b}	74.79±1.77^{ab}	82.36±2.07^{a}	63.13±2.07	27.20±0.64^{a}	4.17±0.40^{a}
3 PPI	2	54.76±4.49^{a}	63.79±3.64^{c}	88.36±4.25^{a}	65.13±4.26		5.00±0.65^{a}
Breeding status		NS	NS	NS	NS		NS
Castrate	3	40.43	73.30±2.64	82.13±3.08	63.99±3.09	-	3.69±0.59
Intact	28	38.82	69.45±1.32	78.84±1.54	61.68±1.55	-	4.35±0.27

[1]BC = Body condition score (1 to 5: 1= poor, 2= medium, 3= fair, 4= good & 5= very good); N: number of observations; NS=non-significant (p>0.05); *p<0.05; **p<0.01; ***p<0.001

Among the 31 physically assessed rams 28 (87.5%) were intact and were giving service while only 3 (9.4%) were castrated. According to the farmer's judgment, 71.43%, 14.28% and 7.14% of the breeding rams had good, fair and poor libido performance, respectively. The difference in libido performance between the rams might be because, the rams were purchased with no any selection criteria (eg. libido test), even some were with poor testicle condition (small and of un-equal size). Libido could be different between rams of different age, health status; body condition and even up to 15% of the rams are homo-sexual and will not mate with ewes (Girma, 2008).

Even though, distribution of Washera rams has been started since 2005, the numbers of crossbred sheep observed in the field were very small. This might be because, since the crosses could fetch better price, they are sold out without considering for replacement stock and the farmers castrated the rams before they give the intended service. In addition, the flock size in the surveyed areas is small.

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The mean weight and body measurements of Washera × Farta crossbred progenies are presented below (Table 8; Figure 1). The mean values obtained for different age groups in the present study were in comparison with the mean values of Washera sheep with comparable age groups (Mengistie et al., 2009) and were higher for Menz and Horro sheep (Tibbo et al., 2004).

Table 8 - Mean (SD) of weight and body measurements of Washera x local progenies under the traditional management in the surveyed areas

Classification variable	N	Weight	Height	Heart Girth	Body Length	Body Condition[1]
Age						
2-3 months	2	12.20 (3.11)	50.50(6.36)	49.50(10.61)	45.00(4.24)	2.50(0.71)
4-5 months	19	15.14(2.17)	57.68(2.63	58.00(3.32)	48.78(2.99)	3.00(0.47)
6-7 months	11	20.63(3.45)	60.91(5.43)	64.54(4.67)	53.63(2.36)	3.27(0.47)
8-9 months	4	22.37(5.34)	63.75(6.95)	67.00(2.94)	55.25(5.12)	3.33(0.57)
12-16 months	23	20.81(7.32)	61.60(6.79)	63.71(7.77)	53.35(6.82)	3.04(0.64)
Sex						
Female	22	19.42(6.37)	59.00(6.04)	61.91(6.99)	52.14(5.83)	3.04(0.50)
Male	37	18.31(5.54)	60.59(5.86)	61.73(6.93)	51.61(5.39)	3.08(0.59)

[1]BC = Body condition score (1 to 5); N: number of observations

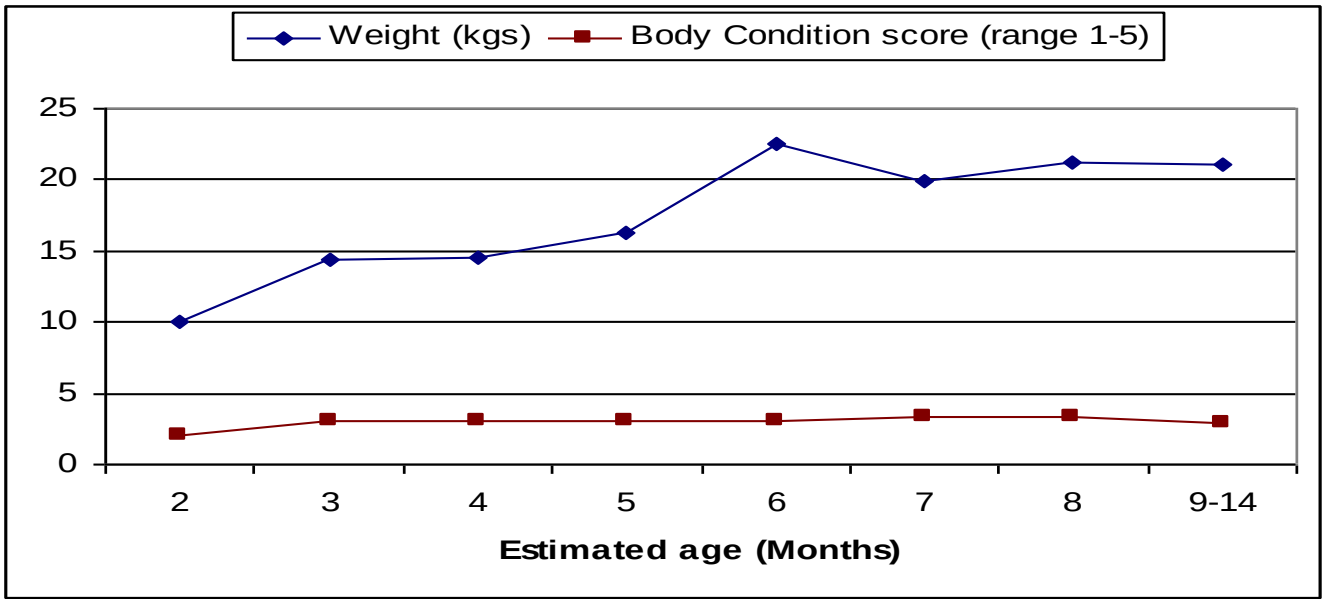

Figure 1. Growth of Washera × Farta crossbred sheep

CONCLUSIONS

The results obtained indicated that Washera breed of sheep is adaptive and productive in areas of south Gonder zones. To increase the reproductive performance of the rams, Washera rams should be bought with careful assessment including where and when to buy. Purchase should consider some criteria like age, conformation and condition. In order to make the distribution successful, a strategy that could make use the rams in a communal way should be designed. Rams could be offered for farmers with in a common grazing land by adjusting the number of breeding ewes and rams. Farmers in the targeted distribution area should be organized into village level community sheep improvement program involving integrated genetic and management improvement to increase sheep productivity. Training of farmers about breeding and management of sheep is needed. In addition, the distribution should be takes place on the recommended area that is suitable for adoption and diffusion of the technology. From the point of conserving and utilizing the animal genetic resources, a strategy to improve and conserve the Washera sheep from its belt needs to be designed.

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