

AWASSI AND ITS POSSIBLE RURAL DEVELOPMENT ROLE IN AFRICA AND ASIA

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The Awassi sheep is the dominant breed of the Southeast Anatolia region of Turkey and is also the sole breed of the Arabian Peninsula. It is a milk breed and is the top milk producer among the existing breeds in Turkey. It is well known for its hardiness, resistance to diseases and parasites, tolerance to extremely high temperatures, high adaptation to desert and temperate climates. It has had great genetic relations with the Awassi found in Israel through vast imports of the Awassi from Turkey in mid fifties. Its litter size is around 1.1 lamb/lambing; lactation milk production is approximately 180 kg under extensive conditions and responds very well to intensification. Growth performance of the Awassi sheep is also remarkable and is the highest among all the breeds in Turkey. Under feedlot conditions daily gains of 300–340 are highly common. Greasy fleece weight is around 2.5–3.0 kg and is of mattress quality. Its fleece is high in medullated fibers and is extremely well known with its kemp fiber ratio. The Awassi population demonstrates high variation regarding milk production and growth performances and high genetic gains are achieved via progeny testing for improving milk production in unique Ceylanpinar State Farm population of 25.000 ewes. It seems to be a very suitable breed for poverty alleviation and prevention of hunger in Africa and Asia. In line with this objective great numbers of the Turkish Awassi sheep have been imported by Libya, Saudi Arabia, Jordan, Iraq, Syria, Cyprus within the last forty years.

Key words: Awassi; milk production; growth performance; breed utilization; rural development; poverty alleviation

АВАСИ И НЕЈЗИНАТА МОЖНА УЛОГА ВО РУРАЛНИОТ РАЗВОЈ НА АФРИКА И АЗИЈА

Овцата од расата аваси е доминантна раса во југоисточна Анадолија, а исто така единствена на Арабскиот Полуостров. Тоа е млечна раса и е прва по продукција на млеко меѓу постојните раси во Турција. Добро позната по нејзината цврстина, отпорност спрема болести и паразити, толеранција спрема екстремно високи температури, голема адаптација на пустинска и умерена клима. Има голема генетска поврзаност со овцата од расата аваси создадена во Израел преку огромниот увоз на аваси од страна на Турција во средината на педесеттите години. Големината на леглото е околу 1,1 јагне/јагнење, продукцијата на млеко е приближно 180 kg при екстензивни услови и се приспособува многу добро на интензификација. Гојните перформанси на овцата аваси исто така се извонредни и се највисоки меѓу сите раси во Турција. Во услови на гоеење дневниот прираст изнесува 300–340 g/ден.. Тежината на непрано руно е околу 2.5–3.0 kg и е со добар квалитет. Нејзиното руно е богато со медуларни влакна и е добро познато по грубото влакно. Популацијата на аваси покажува големо варирање во поглед на продукцијата на млеко и производните можности, а високи генетски прирасти се постигнати преку прогеното тестирање за подобрување на продукцијата на млеко во единствената државна фарма Сеуланпilar со популација од 25.000 овци. Расата аваси е многу погодна во однос на издржливоста на гладување во Африка и Азија. Поради тоа последните четириесет години голем број на турската овца аваси е увезен од страна на Либија, Саудиска Арабија, Јордан, Ирак, Сирија, Кипар и др.

Клучни зборови: аваси; продукција на млеко; производни можности; користење на раса; рурален развој

1. INTRODUCTION

The fat tailed Awassi sheep is the native sheep of upper Mesopotamia, the cradle of civilization and the holy lands lying between the Euphrates and Tigris rivers. Awassi, is known as

‘İvesi, Sarıbaş and Arap Koyunu’ in Turkey. It is the prominent breed in Mardin, Şanlıurfa and Gaziantep provinces of the semi-arid Southeast Anatolia region which lies along the Syrian and Iraqi border. It is the major breed in Syria, Jordan, Lebanon, Palestine, Iraq and Saudi Arabia. Its share in

the sheep population of Turkey has been increasing since early eighties due to its comparatively high productivity.

Before the fall of the Ottoman Empire in the beginning of the 20th century, Awassi herds of the northern Arabian Peninsula used to migrate annually from their respective origins all the way to the cool uplands of Southeast and East Anatolia in a transhumant system and graze until October–November. This fact determined a relationship among Awassi populations of the Arab countries and Turkey. After the establishment of national borders between Turkey and the Arab Countries the free movement of herds for the grazing purpose was abandoned resulting in the isolation of local Awassi populations (Gürsoy, 2005). Regarding the relations among the populations, Finci (1957) in his well documented report on the improvement of the Awassi sheep in Israel, clearly accounts that between 1925 and 1935 the number of sheep was increased by 400% partly through significant numbers of Hirik (the author refers to the Turkish Awassi by this name) imported from Urfa and Mardin provinces of Turkey. Batu (1951) also points out the importations of Awassi by Israel. Furthermore, in the period between 1953 and 1957 a total of almost 14 632 Awassi ewes were imported from Cizre county of Mardin province in 17 shipments forming the basis of the Israeli Awassi (Epstein and Herz, 1964) as reported by Epstein, 1985). In more recent years, Turkish Awassi were imported by Saudi Arabia, Jordan, Lebanon, Syria, Libya, Iraq, and Northern Cyprus from the Ceylanpınar State Farm for breeding purposes.

The Awassi sheep was taken to different parts of Turkey such as Trace, Western, Central and Eastern Anatolia where they performed better than the local breeds with respect to milk production and growth performance. As a result, its importance increased year by year both as pure breeding and crossbreeding with the other local breeds such as Akkaraman, Morkaraman and Dağlıç.

It is considered to be the highest milk producer among all the Asian sheep breeds and is recognised to be the second best milker after the famous East Friesian in the world. It proves to be a fast growing breed with daily gains reaching 350 g in various feedlot studies. Some of its desirable characteristics are ability to walk long distances, tolerance to extreme temperatures, strong flocking instinct, resistance to diseases and parasites, endurance to adverse nutritional and management conditions and finally high adaptation to different

ecological conditions (Eliçin, 1970; Gürsoy, 1980).

This paper's main objective is to underline the possible milk production and fast growing ability of Awassi and accelerate its incorporation as pure breed or crossbreeding programs in rural development areas of resource poor and food deficient regions of Africa and Asia.

CHARACTERISTICS OF THE TURKISH AWASSI SHEEP

Morphological

The Awassi sheep is unique in its appearance and can hardly be mixed up with other fat-tail breeds. It is a medium sized breed with a typical brown head and neck. The colour of the rest of the body is yellowish white. The fat tail constitutes 15–20 % of the carcass in the fat lambs but may reach 30–40 % in the 2–3 year old rams. In the ewe the fat tail serves as a good fat reserve and the size fluctuates depending on the nutritional status and the stage of lactation. Table 1 gives mean body measurements of the Awassi sheep.

Table 1

Body measurements of fat lambs¹ (Gürsoy et al., 1993)

Measurements	Producers' exceptional milkers ²	Ceylanpınar top milkers	Control ³
Height at withers, cm	63.8	64.9	63.6
Height at sacrum, cm	65.5	66.4	65.1
Width behind scapula, cm	18.3	18.8	18.4
Body length, cm	55.8	56.9	56.5
Depth of chest, cm	27.9	28.3	28.3
Heart girth, cm	86.9	86.6	88.0
Live weight, kg	46.5	47.1	47.3

¹Male lambs 5 months old.

²Producers' exceptional milker ewes sired by Ceylanpınar rams.

³Randomly selected Ceylanpınar ewes.

Reproduction

Like most of the other sheep breeds of Anatolia and West Asia, the Awasi sheep is a non-prolific sheep. This might have been the result of

poor ecological conditions and producers' preferences in selecting thrifty, large framed, fast growing male lambs (single born) as the replacement rams, causing a negative selection against twinning as the twin born lambs would be smaller in size (Epstein, 1985). However, under improved nutritional conditions and via hormonal administration, it has been shown that the number of multiple lambing (prolificacy) increase significantly (Gürsoy, 1980, Özcan et al., (1993c).

On a large sample size, Gürsoy (1992a) studied the reproductive performance of the Ceylanpınar Awassi population under the extensive management system to determine the effect of age on reproduction traits of Awassi (Table 3).

Table 2

Reproduction traits of the Awassi ewes
(Taken from Gürsoy, 2005)

Researchers	Lambs per	Lambs per	Fertility
	ewe mated, %	ewe lambded, %	%
Yarkın et al. (1963)	93.5	100.0	93.5
	86.7	100.0	86.7
Sönmez and Kızılay (1972)	96.4	108.0	89.3
	103.9	112.8	92.2
	105.4	113.5	92.9
	110.6	121.7	90.9
Pekel (1973)	106.8	112.3	94.1
	106.0	113.0	94.2
Gürsoy (1980)	89.1	106.0	84.0
	118.0	127.7	92.4
Özcan et al. (1981)	93.3	107.6	86.7
Özsoy et al. (1987)	94.0	112.0	85.0

Table 3

Reproductive performance of the Awassi from the Ceylanpınar State Farm (Gürsoy, 1992a)

Age yrs	No and %	Ewes mated	Ewes lambded/mated	Single	Twins	Lambs born	Lambs per ewe mated	Lambs per ewe lambded
2	n	2,312	2,163	2,114	49	2,212	0.96	1.02
	%	100.0	93.5	91.4	2.1	95.7	–	–
3	n	1,770	1,645	1,503	142	1,787	1.01	1.09
	%	100.0	92.9	84.9	8.0	101	–	–
4	n	3,361	3,087	2,574	513	3,600	1.07	1.17
	%	100.0	91.9	76.6	15.3	107.1	–	–
5	n	2,640	2,409	2,018	391	2,800	1.06	1.16
	%	100.0	91.2	76.4	14.8	106.1	–	–
6	n	2,771	2,547	2,203	344	2,891	1.04	1.14
	%	100.0	91.9	79.5	12.4	104.3	–	–
7	n	2,166	1,992	1,701	291	2,283	1.05	1.15
	%	100.0	91.9	78.5	13.4	105.4	–	–
Mean	n	15,020	13,843	12,213	1730	15,573	1.04	1.12
	%	100.0	92.1	80.6	12.5	103.7	–	–

Lactation

The Awassi is a dairy breed and has outstanding lactation characteristics. Its milking ability was first investigated by Sönmez (1955) and followed by many researchers (Table 4). It is obvious that the management system affects the milking performance very significantly. For instance Bulgurlu (1960), Bulgurlu and Sevçican (1964) and Gürsoy (1980) reported very high lactation yields under higher nutritional regimes and better man-

agement systems in comparison with the lactation yields reported under extensive management conditions.

Eralp (1963) investigated the effects of age on the suckled and milked yield as well as the fat content of the Awassi ewes (Table 5). Under extensive conditions milked yield of the Awassi and the quantity suckled by the lamb represented 1/3 and 2/3 of the lactation yield which was 154.2 kg for all ages, respectively. Milk production peaked around in the 4th–5th lactation.

Table 4

Lactation yield results by previous researchers in Turkey, kg.

Researchers – Prod. system	Lactation yield	Lactation sequence	Research Location
Sönmez, 1955. Extensive	123.2	All	Ceylanpınar State Farm – Şanlıurfa
Yarkın et al., 1963	94.7	1	Ankara University – Ankara
	128.2	2	
Bulgurlu and Sevgican, 1964. Intensive	178.3	–	Ege University – İzmir
	211.1	–	
Yaşın and Aktaş, 1969. Extensive	125.0	All	Ereğli Zoot Res.Inst . Konya
	134.0	All	
	116.0	1	
	144.7	2	
Eliçin, 1970. Extensive	165.1	3	Ceylanpınar State Farm – Şanlıurfa
	175.0	4	
	168.0	5	
	158.6	6	
	146.6	1	
Gürsoy, 1980. Extensive	160.4	2	Ceylanpınar State Farm – Şanlıurfa
	200.7	1	
Gürsoy, 1980. Semi-intensive	218.8	2	Ceylanpınar State Farm – Şanlıurfa
	159.5	All	
Güney et al., 1982. Semi-intensive	147.8	1	Çukurova Univ. – Adana
Gürsoy and Özcan, 1983. Extensive	170.1	2	Ceylanpınar State Farm – Şanlıurfa
	104.3	All	
Vanlı et al., 1984b. Extensive			Atatürk University – Erzurum

Reorganized from Gürsoy, (2005)

Table 5.

Lactation characteristics of the Awassi ewes (Eralp, 1963).

Age of dam	Milk suckled kg	Milked yield kg	Fat %	Daily milk yield kg	Lactation length kg
2	41	77	5.6	0.75	156
3	48	97	6.0	0.87	164
4	61	104	6.2	0.98	168
5	65	110	6.4	1.03	170
6	61	108	6.3	0.94	179
7	57	101	6.2	0.92	171
Mean	55	99	6.1	0.92	167

Since the first study reported on the Awassi by Sönmez (1955) milk production increased significantly (Gürsoy et al., 1998). A study supported by FAO initiated in 1987 on the Ceylanpınar State Farm compared the performance of producers' flocks with the Ceylanpınar flock that practically remained closed since its first establishment in the late forties. A screening program covering around 400 flocks in the South Eastern Anatolia region mainly in Şanlıurfa and Mardin provinces led to

the purchase of 55 exceptional ewes of producers that were compared with the top producing Ceylanpınar ewes as well as Ceylanpınar ordinary ewes selected at random. The results indicated that the Ceylanpınar top producing Awassi ewes were superior to both the top producers' ewes and ordinary Ceylanpınar ewes, selected at random. Considerable intra-group variation was also seen, i.e. the Ceylanpınar Awassi population's lactation yields ranged between 97.5 and 469.0 kg. Among the top producing Ceylanpınar ewes some recorded individual yields of 4.3 kg of milk during the recording days (Gürsoy et al., 1992b).

Growth and feedlot performance

Gürsoy (1980) in an effort to compare intensive and semi intensive management systems (supplementing during grazing and providing strategic nutritional status during critical periods such as flushing, steaming up and early lactation) recorded the growth performance of male and female lambs in two flocks. The results are summarized in Table 6, clearly showing significant differences in weights as a consequence of the system of management.

Table 6

*Growth data of the Awassi lambs
on the Ceylanpinar State Farm*

Age at weighing	Live weights, kg					
	Extensive			Semi-intensive		
	Mean	Min	Max	Mean	Min	Max
Birth – male	4.4	3.4	5.6	4.9	3.2	6.1
Birth – female	3.8	2.9	5.1	4.6	2.9	6.0
90th day – male	23.2	13.1	29.4	29.4	22.0	38.0
90th day – female	20.9	12.2	28.3	26.7	19.4	31.4
6 th month – male	32.2	22.3	39.6	37.6	29.6	45.3
6 th month – female	29.1	20.9	36.7	35.7	27.3	40.6
12 th month – male	40.0	30.1	52.4	51.9	41.6	60.8
12 th month – female	34.9	22.9	40.4	45.6	36.0	52.2

Gürsoy (1980).

Gürsoy et al. (1993) studied the growth performance of improved Awassi lamb genotypes under semi-intensive management conditions. The growth of lambs of the producers' exceptional ewes sired by Ceylanpinar rams were compared with the lambs of exceptional milkers (nucleus flock) and Ceylanpinar control ewes (Table 7). All male lambs performed very well and reached 43.2–49.2 kg within 6 months. This reflects the excellent and continuous relationship between the State Farm Awassi sheep and sheep producers in the region through the dissemination of rams from the State Farm in which the producers have a solid belief.

Table 7

Growth of the Awassi lambs under intensive management (Gürsoy et al., 1993)

Age, type of birth and sex	Live weights, kg		
	Producer's flocks	Ceylanpinar exceptional	Control Ceylanpinar
	At birth		
Single male	5.1	4.8	5.0
Single female	5.0	4.8	4.5
Twin male	4.0	4.0	3.9
Twin female	4.1	4.1	3.8
At day 90			
Single male	28.3	27.4	26.8
Single female	21.7	24.1	22.1
Twin male	22.2	22.1	22.0
Twin female	19.7	20.1	20.1
At day 180			
Single male	49.2	48.5	48.3
Single female	40.2	42.1	40.0
Twin male	45.4	46.0	43.2
Twin female	35.4	39.1	37.9

Görgülü (1994) and Görgülü and Öztürkcan (1994) in search of optimizing energy and protein levels achieved daily gains of 225–329 g in 8 weeks after lambing. The mean daily gains during the first 4 weeks were 218–364 g. Low energy and low protein levels adversely affected the growth performance. Feed conversions during the 8 weeks were as low as 4.42 and 4.62 in the high energy/low protein and high energy/high protein groups respectively. This clearly highlights the superiority of the Awassi as a feeder lamb over other indigenous breeds of Turkey. It is also important to note that protein is more important than energy level at the beginning of fattening.

Among the low energy groups, the high protein group demonstrated 362 g of daily gain as compared to the low protein group that only gained 218 g. Disregarding the energy level all the high protein groups performed over 340 g. Conversely energy became the limiting factor in the second half of the feedlot. High-energy groups performed significantly better (294–296 g) than the lower energy groups. The overall evaluation over the 8-week trial indicated that high energy induces more economical gains than the other alternatives (Tables 8). Researchers reported that as protein and energy levels of the diet increase the daily gains increase significantly.

Table 8

Effects of energy and protein levels on feedlot performance of the Awassi lambs

Energy levels	Low		Medium		High	
	Low	High	Low	High	Low	High
Period	Protein levels		Protein levels		Protein levels	
	Lambs, n	16 17	16 15	17 16		
0–28 d	Initial wt., kg	22.8 22.0	23.0 22.9	23.4 23.4		
	ADG (g)	218 362.0	267.0 342.0	299.0 364.0		
	FI (kg)	1.18 1.37	1.32 1.33	1.20 1.36		
	FCR	5.43 3.79	4.95 3.88	4.04 3.75		
	ADG (g)	232.0 272.0	251.0 291.0	296.0 294.0		
29–56 d	FI (kg)	1.48 1.62	1.59 1.86	1.42 1.68		
	FCR	6.37 5.96	6.33 6.40	4.81 5.71		
	ADG (g)	225.0 317.0	259.0 317.0	297.0 329.0		
0–56 d	FI (kg)	1.33 1.50	1.46 1.60	1.31 1.52		
	FCR	5.60 4.72	5.61 5.04	4.42 4.62		
	Cost, \$/kg DG	1.06 0.88	1.05 0.97	0.86 0.92		

Görgülü (1994). ADG: Average daily gain; FI: Feed intake; FCR: Feed conversion rate; DG: Daily gain.

Table 9 presents the feedlot performance of newly weaned Awassi lambs (age 55–84) at the University of Çukurova, the Ceylanpınar State Farm and the Atatürk University – Erzurum conditions (7 month old lambs). It is obvious that the Awassi breed is a fast growing feeder and has to be put on feedlot right after weaning. The best age for feedlot is 45–60 days when animals are weighing 18–22 kg.

Table 9
Different estimates of growth performance Awassi

Researchers	Age (days)	Days on feed	Initial wt. (kg)	Final wt. (kg)	ADG (g)	FCR
Güney and Özcan (1983)	60	55	19.1	38.3	348	3.4
Güney and Biçer (1986)	60	84	18.2	43.0	301	3.8
Baş et al. (1986b)	214	84	26.9	45.3	231	–
Özcan et al. (1991)	60	82	18.7	38.7	240	5.3
Özcan et al. (1992)	75	56	22.2	40.5	328	3.9
Özcan et al. (1993a)	89	77	24.6	45.4	270	4.5
Torun et al. (1992a)	75	56	22.2	40.5	328	3.9

ADG: Average daily gain; FCR: Feed conversion rate

The Awassi is a breed having good adaptability to different ecological conditions be it dessert, temperate or subtropical climates.

Carcass merit

The carcass traits of Awassi male lambs reported by various researchers are summarized in Table 10. Dressing percentages ranged 44.3–52.3. The values obtained at the University of Çukurova were fairly low as compared to the values obtained at the Ceylanpınar State Farm. The high proportion of the fat tail (of the carcass) is a major drawback of this breed.

The Awassi has very similar carcass characteristics to the Akkaraman and Morkaraman breeds, though it has a smaller fat tail. In comparison with the Western thin-tailed breeds Awassi has strong aromatic properties most probably originating from the type, content, nature and fatty acid composition of the fat. In recognition of this fact Australia crosses Merino with Awassi in order to add the desired aroma component to the fat lambs exported to the Arab countries.

Disregarding the intramuscular fat the Awassi has quantitatively more subcutaneous (including fat tail), intermuscular, internal (mesenteric, kidney and pelvic) fat than the lean Western meat breeds.

Table 10
Carcass merits of the Awassi reported by various researchers

Researchers	Slaughter weight	Cold carcass	Dressing	Fat tail weight	Fat tail	Muscle	Fat	Bone
	kg	kg	%	kg	%	%	%	%
Güney and Özcan (1982)	51.2	24.7	48.2	2.5	10.1	53.6	24.5	18.3
Güney and Özcan (1983)	40.9	18.1	44.3	2.1	11.6	53.5	23.4	20.0
Güney and Biçer (1986)	41.3	18.7	45.2	2.3	12.3	54.6	22.9	20.3
Özcan et al. (1991)	40.6	21.3	52.4	3.6	16.9	56.4	21.0	22.6
Özcan et al. (1992)	40.1	19.5	48.6	3.4	17.4	53.3	21.8	25.0
Özcan et al. (1993b)	45.9	23.1	50.4	3.8	16.5	51.0	26.6	22.3

Table 11 gives the detailed slaughtering data of Awassi male lambs. The data involves Ceylanpınar's and producers' lambs that showed similar slaughtering and carcass characteristics.

Table 11
Slaughtering data of the Awassi of 171 day-old male lambs (Gürsoy et al., 1993)

Traits	Mean (kg)	Percent
Slaughter weight	47.3	100.0
Hot carcass	22.96	48.4
Cold carcass	21.91	46.2
Tailless carcass	18.45	39.0
Shrinkage	1.08	4.6
Blood	1.77	3.8
Head	2.21	4.9
4 Feet	0.93	2.0
Pelt	5.52	11.7
Liver	0.83	1.8
Heart	0.16	0.3
Lungs	0.79	1.7
Spleen	0.13	0.3
Testis	0.25	0.5
Internal fat	0.28	0.6
Rumen (Tripe)	1.46	3.1
Large intestine	0.96	2.16
Small intestine	1.03	2.0
Length of small intestine (m)	26.66	–

Fleece characteristics

The Awassi has a low quality fleece, suitable for mattress making, however, due its high content of medullated and kemp fibres it is not suitable for carpet making. In fact fleece accounts for a very low portion of the total returns from the Awassi. Gürsoy (1980) studied the fleece characteristics of Awassi on Ceylanpınar State Farm (Table 12).

Table 12

Fleece characteristics of Awassi ewes and yearlings (Gürsoy, 1980)

Traits	Ewes		Yearlings ¹	
	2 year old	3 year old	2 year old	3 year old
Greasy fleece wt. (kg)	2.89	2.75	3.16	3.04
Fibre diameter (μ)	38.41	45.59	38.76	38.30
Wool grade (S')	46'S(E)	44'S(E)	46'S(E)	46'S(E)
Staple length (cm)	19.85	17.74	20.31	20.71

¹ Yearlings of the dams 2 and 3 years old

Torun et al. (1993) compared the fleece characteristics of the Awassi population of the Ceylanpınar State Farm with the high milk Awassi ewes of producers managed under the same conditions of the State Farm. The ewes were managed somewhat above semi-intensive conditions due to the main objective of comparing their milk producing abilities. Differences among groups were rather minimal in the fleece production, though high milk ewes from producers had slightly better fleece than the State Farm Awassi ewes (Table 13).

Table 13

Comparative fleece characteristics of the Ceylanpınar State Farm and producers' Awassi ewes (Torun et al., 1993)

Traits	Producer's high milk ewes	Ceylanpınar high milk ewes	Ceylanpınar control ewes	Mean
Greasy fleece wt.	2.87	2.70	2.92	2.80
Staple length	19.81	18.46	19.31	19.19
True length	20.61	19.37	20.24	20.08
Fibre diameter (μ)	36.24	37.88	37.15	37.09
Medullated fibres	7.64	10.24	12.50	10.03
Postshearing wt.	64.00	69.30	69.2	67.50

Quality grade D E E E

Breeding efforts

The Ceylanpınar State Farm in the Şanlıurfa province of Turkey was established in late forties and has the biggest Awassi population in the world. The total number of breeding ewes fluctuate between 25 000 and 30 000. The breeding effort until seventies was selection of rams according to the dams' outstanding milk production in the elite flock where milk recording was very carefully conducted. This unfortunately did not result in appreciable increase in lactation performance on the farm. The research on the farm indicated an increase of approximately one kg of milk/annum (Pekel et al., 1994).

In late seventies a total of 25 Israeli Awassi rams were introduced to the closed gene pool of the Farm for out-crossing purposes. Similarly in 1991 another four rams were imported from Israel. The out-crossing efforts were successful in increasing variation in the population (Pollott et al. 1998). In 1992 progeny testing scheme using AI was initiated. Gürsoy *et al.* (1998) reported the results of the progeny testing covering a period of 6 years. A total of 111 rams were progeny tested on 13215 yearlings between 1992 and 1998 and the tested rams were used for planned mating with top producing ewes of nucleus flock (Table 14).

Table 14

Summary of progeny testing between 1992 and 1998 on Ceylanpınar Farm

Years	Rams tested <i>n</i>	Ewes inseminated <i>n</i>	Ewes lambed %	Lambs born <i>n</i>
1992-93	21	3050	60.5	1939
1993-94	17	2206	74.7	1737
1994-95	18	2271	81.6	1996
1995-96	13	1058	87.1	1034
1996-97	20	2285	81.1	2024
1997-98	22	2345	82.3	1930
Total	111	13215	80.7	10664

As a result of two factors namely outcrossing with Israeli Awassi rams and progeny testing the milked (marketable) yield increased from 66.9 kg

to 152.3 kg/ewe. Meanwhile a very significant number of male and female breeding stock were disseminated to the producers (Table 15).

Table 15

Milked yield per ewe and dissemination of breeding stock

	1990	1991	1992	1993	1994	1995	1996	1997
Ewes milked (000)	23.3	17.9	15.5	12.1	14.4	13.0	12.5	13.0
Milked yield/ewe (kg)	66.9	81.3	90.1	133.6	118.3	136.0	141.5	152
Males disseminated	1026	524	391	384	239	2512	177	Na
Females disseminated	5285	1940	3134	3498	7502	2260	2499	Na

Gürsoy *et al.* (1998)

Unfortunately the only progeny testing scheme ever realized in Turkey (including cattle and goats) was stopped by the General Directory of State Agricultural Enterprises in 1999 when the milked yield for all the ewes on the farm reached 160 kg/milking ewe. There has been a tremendous increase in milk production and in 1998 the record ewe's lactation yield was 592 kg.

Table 16

Major sheep producing Asian and African countries

Africa				Asia			
Country	Sheep population Million	Milk prod. 000 t	Meat prod. 000 t	Country	Sheep population Million	Milk prod. 000 t	Meat prod. 000 t
Sudan	50.9	498.0	148.0	China	146.0	1.072.0	2.000.0
Nigeria	33.1	–	144.7	India	64.3	534.0	234.5
Ethiopia	26.1	44.0	79.0	Iran	53.8	35.0	390.0
S. Africa	25.1	–	118.0	Pakistan	26.8	466.0	151.0
Algeria	19.9	205.0	182.0	Turkey	25.5	782.6	272.0
Morocco	16.9	27.0	120.0	Syria	22.9	873.7	204.6
Somalia	13.1	468.0	48.0	Turkmenistan	15.5	–	90.2
Niger	9.8	35.2	37.4	Mongolia	14.8	32.9	68.4
Kenya	9.4	31.0	85.0	Kazakhstan	12.8	26.0	115.6
Mali	8.9	133.0	37.7	Uzbekistan	10.5	–	83.0
Mauritania	8.9	96.0	25.0	Yemen	8.4	28.6	33.0
Tunis	7.6	18.1	56.6	Afghanistan	8.1	121.5	65.8
B. Faso	7.3	–	17.1	Azerbaijan	7.3	21.9	45.0
Egypt	5.5	93.0	42.5	Saudi Arabia	7.0	82.5	76.0
Senegal	5.1	8.8	19.4	Iraq	6.2	150.0	20.0
Libya	4.5	56.0	28.0	Kyrgyzstan	3.2	36.3	37.7
Cameroon	3.8	17.2	16.4	Jordan	2.5	90.0	5.9
Tanzania	3.5	–	10.4	Tajikistan	2.0	–	29.4
Ghana	3.4	–	10.8	Bangladesh	1.6	31.2	3.3
Chad	3.0	11.1	15.4	Kuwait	0.9	0.1	30.0
Namibia	2.7	–	7.6	Nepal	0.8	13.5	2.8
Eritrea	2.1	4.0	5.6	Georgia	0.7	19.6	3.6
Togo	1.9	–	4.3	Palestine	0.7	55.0	12.7
Uganda	1.7	–	5.8	Armenia	0.6	33.8	7.3

Possible Use in Rural Development

Sheep and goat numbers have been increasing in less developed countries having serious food shortage and nutritional bottlenecks especially regarding livestock based protein. It may be regarded as efforts primarily meeting the household consumption and generating appreciable income from the sale of surplus. It has been well documented that many of these countries are deficient in livestock products; namely meat, milk and eggs. Table 16 gives the major sheep producing countries of Africa and Asia along with their sheep milk and sheep meat production. It is very well known that sheep production provides livelihood in the extensive management system in most resource poor areas of these countries. With the exception of almost totally Awassi dominant Iraq, Syria, Jordan, Saudi Arabia, Palestine, Kuwait, U.A.E., the remaining countries have their own indigenous breeds. In some countries such as South Africa, Burkino Faso, Nigeria, Tanzania, Ghana, Namibia, Togo, Uganda and Cote d'Ivoire in Africa and Turkmenistan, Tajikistan and Uzbekistan in Asia, producers do not milk their sheep. The reason underlying this behaviour may be the low milking ability of the local breeds.

C. d'Ivoire	1.2	–	6.7	U.A.E	0.6	–	14.0
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WWW.FAOSTAT, 2009

Some of these countries have imported the Awassi from Turkey, Syria, Jordan or Israel within the last fifty years (Table 17). It was reported by many researchers that as a result of these imports the Awassi sheep proved to be highly adaptive as pure breed and as crossbreeds with local breeds. Bahhady et al, (1994), clearly reported significant lactation and growth performance superiority of the Awassi imported to ICARDA Syria. Similarly in Iraq, Al Rawi et al, (1992) reported results indicating significant differences between the local Awassi and Turkish Awassi strains regarding the growth performance and milking ability. In 2006 Iraq imported another batch of 1500 Awassi from the Ceylanpınar State Farm via FAO funding.

Hassen et al, (2004) reported slightly over 5 kg of weaning weight differences between the lambs of pure Awassi and indigenous breed and 2 kg higher values for the crossbred lambs in Ethiopia. The Awassi is a milk sheep and 60–84 % of its gross returns is from milk sales (Kukovics et al., 2006). Therefore similar superiority is expected concerning lactation but the nutritional requirements need to be considered carefully. The Awassi is a high input high output livestock and should be treated similarly to dairy cattle or goats.

The introduction of the Awassi and the Asaf (East Friesien × Awassi) to Spain, Portugal is a good example where the pure and crosses reached almost one million heads. The producers are contented with their performance because the breed is highly productive and they make good use of the milk (Caja et al, 2006; De la Fuente et al, 2006). Introduction of the Awassi to Hungary, Macedonia, Romania and Bulgaria may be added as other good examples in Eastern Europe (Kukovics et al, 2006). Table 18, gives some lactation data reported from these countries. The performances are very high due to intensive management conditions provided.

In order to demonstrate the significance of milk production in productivity and income generation, Gürsoy, (2006) roughly compared the productivity of major indigenous sheep breeds. The main criteria used were the typical reproductive efficiency, marketable milk production and greasy fleece production average values and market prices for the weaned lamb, fresh whole milk and greasy fleece. It is clearly seen that two breeds (Awassi

and Sakız) excel in total returns/ewe. These two breeds are good milkers and the Sakız is also highly prolific.

Table 17

Awassi breeding stock imports in the World
(Reorganized from Galal et al., 2008)

Importing countries	Source of Awassi			
	Turkey	Syria	Jordan	Israel
African				
Algeria		•		
Egypt		•		
Ethiopia				•
Libya	•	•		
Morocco		•		
Tunisia		•		
Asian				
Bahrain		•		
India				•
Iran				•
Iraq	•		•	
Israel	•	•		
Jordan	•		•	•
Kyrgyzstan *				•
Kazakhstan				•
Kuwait			•	
Lebanon	•	•		
Myanmar				•
Pakistan		•		
Palestine	•			•
Qatar		•		
S. Arabia	•	•		
Turkey				•
U.A.E		•	•	
Yemen		•		
Europe				
Albania*				•
Bulgaria				•
Cyprus	•			•
Hungary				•
Italy*				•
Macedonia				•
Portugal				•
Romania				•
Spain				•
UK*				•
Yugoslavia				•
Oceania and America				
Australia*				•
New Zealand				•
Peru				•
Total	8	13	4	23

* Albania, Australia, Italy, Kyrgyzstan, UK received Awassi through a third country.

Table 18

Lactation milk of the Awassi, and Awassi crosses

Country	Awassi	Awassi crosses
Albania	300–330	270–280
Bulgaria	na	300
Hungary	350–400	180–230
Macedonia	330–360	120–180
Spain	314	335 (Assaf)

CONCLUSIONS AND RECOMMENDATIONS

The Awassi sheep is a productive animal and responds very well to high nutritional status providing good income to the producers via its milk and milk products as well as lambs highly preferred by the Arab consumers. Due to similar fat tail indigenous breeds, Asian and African consumers will accept it freely. A couple of the Awassi sheep can provide annual milk products for an average sized family and also provide meat that double or triple the present meat consumption of the very family. The Awassi is a hardy animal and can withstand very adverse climatic and nutritional conditions. It is a good improver breed with high milking and growth ability. Many countries that have already imported the Awassi are contented with their performance as a pure breed or contented with the performance of the crossbreds.

Therefore, it can be highly recommended in the rural development programs of the resource poor areas of Africa and Asia. Through this, the household livelihood will be improved both in relation to more balanced food and also will upgrade the socio-economical status of the people in the target areas.

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