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Impact of introducing new technologies on bedouin sheep production in the Negev in Israel

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Abstract. Bedouin farmers in the southern region of Israel raise the local Awassi, a hardy but low prolific breed, under semi-extensive conditions. Economic analysis shows that traditional Bedouin sheep production is nearly unprofitable. In order to turn Bedouins' sheep production into a sustainable source of income, introduction of new prolific genotypes like the Afec Awassi and applying modern reproductive management practices is investigated. The consequences of those activities on flock productivity and the socioeconomic situation of households are the main objectives of our study.

Keywords. Sheep – Awassi – Afec – Bedouin – *FecB*.

Impact de l'introduction de nouvelles technologies sur la production ovine des Bédouins dans le Néguev en Israël

Résumé. Des Bédouins dans le sud d'Israël élèvent des ovins Awassi, une race locale très rustique mais peu prolifique, dans des conditions semi-extensives. L'analyse économique montre que l'élevage traditionnel est pratiquement non rentable. Afin de transformer cet élevage en une source durable de revenu, l'introduction d'ovins plus prolifiques, comme les Afec Awassi, dans des troupeaux bédouins, en combinaison avec une conduite reproductive plus moderne, est analysée. Les conséquences de ces activités sur la productivité des troupeaux et la situation socio-économique des exploitations sont les objectifs principaux de notre étude.

Mots-clés. Ovins – Awassi – Afec – Bédouins – *FecB*.

I – Introduction

About half of the national flock in Israel (some 500,000 head) belongs to the hardy but low prolific Awassi breed. Most of the Awassi sheep are kept by Bedouin farmers in the Negev –the southern arid part of the country, under traditional semi-extensive management, where animals rely for about half the year on pasture. Decreases in recent years in the availability of grazing land in the Negev area have forced Bedouin growers to spend more on feeding their animals by purchasing costly grains and fodder, making sheep production nearly unprofitable. To overcome the new economic constraints, some of the Bedouin farmers have been trying to improve their flocks' productivity by introducing new genotypes, such as the Assaf cross, Dorper crosses and the Afec Awassi that carry the *FecB* (Booroola) mutation (Gootwine *et al.*, 1995; Spharim and Gootwine, 1997). Under intensive conditions, where ewes are fully supported with their nutritional and veterinary needs, *B+* Afec Awassi ewes produce about 0.5 more live-born lambs than Awassi ewes (Gootwine, 2006).

To exploit the economic potential of the improved genotypes, the environmental conditions under which the animals are raised have to be modified and intensified (Moav *et al.*, 1976). Ewes of higher prolific genotypes need proper feeding year-round, and intensive care must be given to both the pregnant ewes and the lambs born in large litters. To what extent are the

traditional Bedouin farmers, who currently utilize the low prolific local Awassi, willing and able to change their management, and which of the new genotypes are most suitable for the Bedouin conditions? The aim of the present study, started in January 2007, was to follow the incorporation of the Afec Awassi strain in Bedouin flocks, by monitoring changes in both flock productivity and the socioeconomic parameters associated with sheep production. Similar projects, in which improved genotypes are being tested together with the local Awassi, are being conducted in other locations in the Middle East (Herold *et al.*, 2007).

II – Material and methods

The Bedouin flocks under study are located in a semi-desert area in a 35 km radius around Beer Sheva (31.2°N, 34.8°E). The selected flocks were assigned to two groups: Group A ($n = 8$, average flock size of 348 ewes), in which BB Afec Awassi ram-lambs were introduced in late 2005 into the flocks, and Group B ($n = 7$, average flock size of 202 ewes), in which Afec Awassi ram-lambs were not introduced. It is expected that by the end of 2007, the first Afec Awassi B+ ewes will have had their first lambing in the group A flocks.

At the beginning of the project, all ewes were tagged and information on prolificacy at their last lambing was taken for all non-pregnant ewes. Subsequently, continuously data on inventory changes and reproductive management interventions were collected. Body weight (BW) and body condition score (BCS) on a 1.0 to 5.0 scale with 0.5 points intervals (1 –very thin; 5 –very fat) were recorded at the beginning of the project in five group A flocks. Arithmetic means, standard error and ranges were calculated for: BW and BCS of ewes, lambs born (LB) and lambs born alive (Lba) per ewe lambing (EL), and lamb mortality rate at birth. Farms' average performances were compared by mono-factorial analysis of variance, using least-squares analysis.

Data on socioeconomic aspects were collected using semi-structured questionnaires, key person interviews, rapid rural appraisal tools and secondary data. Interviews and observation were carried out in the winter and spring of 2007.

III – Results and discussion

1. Performance results

Based on 2007 lambing records (Table 1) obtained by interviews (for the year 2006) and by data recording (for the year 2007), the average prolificacy of multiparous local Awassi ewes in the flocks under investigation was relatively low, being (mean \pm SE) 1.15 ± 0.03 LB/EL and 1.08 ± 0.03 Lba/EL. The low prolificacy observed in the local Awassi in the present study is in agreement with published results on Awassi prolificacy (Epstein, 1985; Degen *et al.*, 2000).

There were no significant differences ($P > 0.05$) in prolificacy between groups A and B. However, significant differences ($P < 0.001$) were found between flocks within a group, where average prolificacy ranged from 1.00 to 1.39 LB/EL. Lamb mortality rate around lambing also varied significantly among flocks in a group ($P < 0.05$), ranging from 0 to 15%. There was no significant ($P > 0.05$) association between average flock prolificacy and average lamb mortality rate around lambing. The vast differences among flocks in prolificacy and lamb survival rate may reflect between-flock differences in management conditions. How the socioeconomic situation of flock owners is associated with their success in raising sheep is under investigation.

Ewe BW and BCS (Table 2) were assessed throughout February and March 2007 in five flocks belonging to group A, after the ewes had been out of pasture for several months.

2. Reproductive management

Breeding activity in the flocks was based mainly on natural matings. Interestingly, oestrus

synchronization using progesterone sponges and eCG and ultrasonic pregnancy diagnosis were found to be quite common practices.

Table 1. Litter size born per lambing, litter size born alive per lambing and lamb mortality (mean \pm SE and range) for local Awassi ewes belonging to group A flocks (introduced Afec ram-lambs) and group B flocks (control)

Group	Data collection	No. of lambings	Lambs born	Lambs born alive	Mortality (%)
A	Interview	1309	1.15 \pm 0.03 (1-3)	1.10 \pm 0.03 (0-3)	4.5 \pm 0.2 (0-7.8)
B	Interview	922	1.09 \pm 0.04 (1-3)	1.07 \pm 0.04 (0-3)	1.7 \pm 0.1 (0-3.6)
A	Recording	776	1.19 \pm 0.04 (1-4)	1.09 \pm 0.05 (0-3)	8.3 \pm 0.3 (3-15)

Records of lambings were obtained by interviews for the year 2006 and through direct measurement in group A flocks during spring 2007.

Table 2. LSM \pm sd for body weight and distribution of body condition score (BCS) of multiparous Awassi ewes in five local Awassi flocks

Group	n	(kg \pm sd)	Body condition score (proportion)			
			1.5 - 2.0	2.5 - 3.0	3.5 - 4.0	4.5 - 5.0
Empty ewes	348	56.5 \pm 11.1	0.31	0.51	0.17	0.01
Pregnant ewes	583	62.0 \pm 11.5	0.16	0.58	0.25	0.01
Lactating ewes	195	60.3 \pm 10.0	0.31	0.50	0.19	

The average BW of the local Awassi ewes was about 60 kg and the ewes were found to have good body condition (carrying a fat tail reduced BCS by about 0.5 point as compared to non-fat-tailed sheep).

3. Socioeconomic results

The mean household size in the 15 flocks under investigation was 14.6 persons, including 1.7 wives and 11.9 children. Sixty percent of the farmers were exclusively involved with sheep production and sale of sheep represented their main income. Twenty-seven percent of the farmers worked part-time in off-farm jobs, but still depended on the income from sheep. Thirteen percent of the farmers worked full-time in off-farm jobs and keeping sheep appeared to be a security factor with social and cultural functions. Natural grazing started by the end of February and continued till the end of May, followed by an additional 3.5 months grazing on stubble fields. Shepherding was done by hired labour. From September on, the sheep were kept in stables and feedstuffs were purchased from traders, involving high expenses.

Women do not work outside the homestead. About 40% of them were involved with sheep-keeping. Only 20% of the women processed milk in the spring, preparing yoghurt, cheese and some butter, mainly for home consumption. To take care of the sheep at home (fattening) generally required three people: the head of the household, his wife and one of the children. Daily feeding at home required 3 to 4 hours of work.

4. Economic analysis

Preliminary economic analysis shows that on average, 0.95 lambs were sold per ewe annually from the Bedouin flocks. As lambs were sold at an average 42 kg BW and an average price of

21 NIS/kg (4.25 NIS = \$1 US), annual income per ewe was estimated to be 838 NIS. Annual cost of feeding the ewes while being maintained out of pasture was estimated at 438 NIS, and cost of fattening a lamb on grains till 4 months of age was estimated at 199 NIS. Other expenses, including costs for veterinary care, hormonal synchronization, pregnancy diagnosis, grazing fees and cost of temporary labour were estimated at 196 NIS/ewe per year.

Altogether, our preliminary economic analysis confirms that on average, sheep production in the Bedouin flocks kept under traditional semi-extensive management is close to being non-profitable. Income may cover the expenses of keeping the sheep, but does not provide a sustainable source of income for the producers. Adaptation of modern high-input management tools like fatting lambs on grains and the use of modern reproductive technologies may increase profitability of sheep production only in case of concomitant changes in genetic structure of the flocks towards a higher prolific sheep. The Afec Awassi is actually been tested for its suitability for that purpose as its genetic background is very similar to the local Awassi, combining traits of adaptation with genetic potential for high prolificacy. However, to what degree the Bedouin farmers are willing and able to change their management to support high prolific ewes remains to be determined.

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