

# Roles of small ruminants in rural livelihood improvement – Comparative analysis in Egypt

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## Keywords

Sheep, goat, rural poverty, agropastoral system, coast, irrigated land, oasis, Egypt

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## Summary

The study focuses on the assessment of the contribution of sheep and goats to reduce poverty and vulnerability in rural farming systems of three agroecological areas in Egypt: the pastoral area of the Northwestern coast (Matruh governorate), the irrigated areas of the Nile Valley (Sohag governorate) and the oasis area of the West Desert (New Valley governorate). An empirical study on 90 farms in the three agroecological areas on different social and economic indicators related to poverty gave indicators on the roles of sheep and goats in different farm types according to resource endowment (e.g. land, livestock, capital) and human resources. The results showed that sheep and goats provided the main source of income to landless and very small land owners to escape the poverty trap. Moreover, the livestock asset generated other sources of wealth that were not taken into account in the monetary poverty approach.

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## ■ INTRODUCTION

Recent studies highlight the different roles of livestock outputs in terms of food production, food security, income generation, employment all along the livestock chain, capital asset, but also in terms of services and input supply to the agricultural sector such as manure, transport and draft animal, and biological diversity (Ashley et al., 1999; Faye and Alary, 2001; Thornton, 2010). Livestock and specifically small ruminants contribute to the development of areas where other activities are not possible; they constitute a way to face risk events such as drought or family urgent needs (health) or social events (e.g. birth, marriage) (Faye and Alary, 2001). Many researchers gave evidence of the multiple roles of small ruminants in harsh Mediterranean environment (Haenlein, 2001;

Haenlein and Abdellatif, 2004; McDowell and Woodward, 1982) and also as a pathway out of poverty (Peacock, 2005; De Vries, 2008; De Haan, 2001).

Despite its potential importance to sustainable economic growth and poverty reduction, the livestock sector development has received limited attention from the international community and national governments in recent decades. In Egypt, agropastoral and pastoral areas raised less social and policy interests because of their marginal contribution to economic growth and food security. The irrigated system in the Nile delta and valley has allowed the husbandry development of large ruminants based on forage production, i.e. *Trifolium alexandrinum* (berseem) and *Medicago sativa* (alfalfa). In addition the small ruminant (SR) population represents around 50% of the total ruminant population against more than 80% for the majority of the countries in the Near East and North Africa regions (FAOSTAT, 2009; Alary, 2010). However, the sheep population in Egypt greatly increased from 3.1 to 5.3 million over the decade 1995–2005, whereas the goat population increased from 3 to 4 million and the cattle population from 3 to more than 4.5 million in the same period. One third of the sheep and goat population is in Upper Egypt, followed by the West delta with 22.8% of the population, and Middle Egypt for goats with 23.5% of the population. How to explain this increase in SR

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population in intensive agriculture conditions? This was one objective of the present study.

A rapid review of research studies in Egypt revealed the importance given to the analysis of the economic and biological efficiency of sheep or goat production systems. For instance, Soliman (1990) cited by Haenlein and Abdellatif (2004) estimated that the contribution of sheep and goats to the livestock income of Egyptian farmers was 9% for farms less than five feddans (1 feddan = 0.42 ha) but 2% in the case of larger farms. Similar work in Sohag recorded gross margins of about 12 to 22 US\$ per ewe and 4 to 12 US\$ per doe (Alsheikh et al., 2011). Siddik (Livestock and Poverty in Egypt, 2009, PowerPoint presentation) reported that poverty indices recorded a significant decrease from 22.9 to 19.6% from 1995-96 to 2004-05, whereas rural poverty increased from 23.3 to 26.8% during the same period. The poverty percentage was the highest in Upper Egypt rural areas (29.3%) and Lower Egypt rural areas (21.5%). There was a strong relationship between the number of small ruminants per feddan and the poverty level. This meant that small landowners or landless farmers invested more in small ruminants to cover family needs. The livestock per capita income varied from 70 to 88 US\$ in the delta, Middle and Upper Egypt, and up to 155 US\$ in the border governorates.

This causal relation between SR and poverty may explain policy makers' negative perception of small ruminants. SR is seen as a sign of poverty because of being unable to invest in large ruminants such as buffaloes or cattle. Yet it is difficult to find research studies that approach the SR roles in the system. Gihad and El-Bedawry (2000) cited by Haenlein and Abdellatif (2004) determined that for the price of one buffalo a farmer could buy 10 goats, which would produce 25% more cash income than the buffalo because of lower feed requirements. Goats are more profitable than sheep because they are more prolific and more tolerant to a harsh environment. But this statement did not include the financial and economic costs related to family labor, as cut-and-carry and indoor feeding systems are more labor intensive per animal unit.

Generally in this system, animals constitute a flexible source of cash, enabling farmers to purchase farm inputs and meet other urgent needs, and also a buffer against non-remunerative crop prices or poor harvest (Tabana et al., 2000). It is in addition a source of animal proteins and a way to satisfy social events and ceremonies. However few studies describe the roles of small ruminant activities in the household economy in relation to their contribution to reducing poverty and enhance livelihood improvement. The comparison between small ruminant and land gross margin cannot reflect the multipurpose functions of animals.

Based on the livelihood research approach (Carney et al., 1999; Ellis et Mdoe, 2003), the present paper proposed to analyze the contributions of small ruminant activities in terms of income generation, food security and capital endowment in three contrasted governorates of Egypt.

## ■ MATERIALS AND METHODS

In 2010 three surveys were organized among a stratified sample of 90 farms in three agroecological areas: the rain-fed arid area of Matrouh governorate, the intensive agriculture area of Sohag governorate in Upper Egypt and the Oasis area in New Valley governorate (Figure 1). The three areas represented different integrative crop-livestock systems with different levels of intensification according to irrigation access and land fragmentation.

The rain-fed production system was a complex system based on livestock, annual crops (mainly barley), trees (mainly fig and

olive) and off-farm jobs. This system was well developed by traditional farmers (Bedouins) in North coastal areas. The feeding system was based on barley grain, crop-residue grazing and seasonal rangeland in a normal rainfall year. Transhumance was practiced during late spring for grazing residual crops and during winter in the common pastures (desert) when rainfall had been good. Meat production was the main output; goat milk was used for domestic consumption. The main local milk product was a hard cheese called *gamid* that could be refreshed with water and used as raw milk. According to Ashley et al. (1999), the main constraints of these systems are the highly fluctuating feed supply due to erratic rainfalls which affect production and reproductive performances: the number of offspring per female and per year, the body weight and milk yield.

The irrigated production system was a typical mixed crop-livestock system that represented the majority of farms in the delta and Nile valley, around 76% of farming systems according to Tabana et al. (2000). The livestock activity integrated large ruminants (cattle and buffaloes), small ruminants and rural poultry. The feeding system of ruminants was based on berseem, green corn, crop residues, external feedstuff and concentrates.

In densely populated areas along the Nile valley, the mixed system was close to the farmyard household system in which small ruminants were associated with other animals: poultry, cattle and buffaloes. Farm size was usually small (less than five feddans) with high cropping intensity. The flock size was small with around 2–5 head.

The common feature between the three areas was their high poverty status and social vulnerability. One hypothesis was that sheep and goat activities might be one way to face socioeconomic constraints such as poverty, land fragmentation and climatic changes.

A stratified sample was used based on two hierarchical criteria: 1) the location of the villages (their distance and access to the main city), and 2) the flock size at farm level. In New Valley, with the agriculture land scarcity, landless farmers were also surveyed. Thirty farmers were surveyed in each governorate in the different locations (Table 1). The survey was based on a questionnaire with three components: 1) farm and family history; 2) farm description, i.e. cropping and pasture lands, livestock system, off-farm



Figure 1: The three studied locations in Egypt.

**Table I**  
Description of the farm survey in Egypt  
from April to June 2010

Governorate	Location
Matruh	Matruh Neguila Sidi Barani
Sohag	Sohag city, 2 villages Al Muncha, 2 villages Saqlta, 2 villages
New Valley	El Karga Darlha Paris

activities, and farm facilities; and 3) risk and poverty perception, and the role of SR to manage family risks. The farm description on the livestock system comprised different aspects such as herd structure, fattening practice, marketing strategy and domestic consumption, feeding system and other expenditure (labor, feedstuff and concentrates, veterinary costs). The data collected were only data declared over the last year.

To understand the socioeconomic status of farmers and more precisely the roles of livestock in the reduction of vulnerability, we used the conceptual and methodological approaches developed in the livelihood approach. Within the general framework proposed by Carney et al. (1999), we focused our approach on the evaluation of the livelihood assets that constituted a way to estimate the degree of vulnerability of the studied populations. The study

focused on the description of the farm and family livelihood assets in order to determine the relative contribution of livestock to poverty reduction. The analysis used also qualitative data on the social capital at family and community levels and the risks and poverty perception.

■ RESULTS

Each studied area had specific agroclimatic conditions that determined the dominant crop and livestock activities. Table II gives some characteristics of the prevailing farming system in each area.

The three systems were oriented to animal production with 60–75% of the land allocated to fodder crops; the largest small-ruminant herds were found in the pastoral area of Matruh and were based on a barley-pastoral system. During dry years, farmers had to purchase all feed requirements to maintain their stock. Following a number of dry years, 2010 was also a dry year, and the average annual feed cost of small ruminants was around 80 US\$ per head.

In Sohag and New Valley the livestock systems were mainly based on fodder crops such as berseem in winter and green corn in summer, and feed supplementation for all animals with approximately a double ration for growing lambs and kids, or lactating ewes and goats. According to the feed prices on the market in Sohag, some farmers preferred to sell their forage, especially green corn, and purchase straw or berseem hay for their animals. The variability of the herd size was more important in New Valley according to the land tenure and water source depending mainly on the date of installation. Feed costs estimated at 66 US\$/head were the lowest in New Valley because of their remoteness from the main markets of the Nile valley, compared to 105 US\$/head in Sohag.

To understand the links between small ruminant activity and the reduction of vulnerability, we used the capital asset approach. The two main hypotheses were: 1) the poverty level constituted a first approach of the degree of vulnerability faced to external risks;

**Table II**  
Characterization of farming system in three governorates in Egypt

Governorate	Farming system	Cropping system (% utilized land)	Share of fodder crop on cultivated area (%)	Average num. small ruminants	Average num. large ruminants
Sohag	Mixed crop-livestock	Green maize, 36.8 Wheat, 20.9 Berseem, 18.2 Fruit trees, 6 Sorghum, 5.8	66.5 [15]*	7 [15.7]*	4 [4.8]*
New Valley	Oasian	Wheat, 22.7 Alfalfa, 23.5 Berseem, 17.6 Green maize, 16 Other crops, 7 Barley, 5.4	58.9 [16]*	54 [87.1]*	28 [45.6]*
Matruh	Agro-sylvo-pastoral	Barley, 83.4 Fruit trees, 15.6	75.26 [20]*	122 [155.9]*	1 [3.9]*

\* [standard deviation]

2) the capital asset radian allowed analyzing the different roles of small ruminants according to the household capital asset composition. Four groups were defined: 1) very poor with less than 1.25 US\$/capita/day; 2) poor with between 1.25 and 2 US\$/capita/day; 3) medium with 2 to 6 US\$/capita/day; and 4) rich with more than 6 US\$/capita/day. Table III shows the distribution of the sample for each governorate. The daily net income was estimated from all agricultural and non-agricultural activities. For agricultural activities the outputs included all the production (including family consumption).

We noted the high percentage of very poor (with less than 1.25 US\$/capita/day) in Matruh compared to the other two governorates. This high percentage resulted mainly from the effects of the drought conditions that had been affecting the area since the last decade. Most of the breeders limited the sale of animals to cover urgent needs such as the purchase of animal feeds or family basic expenditures. Moreover the second main source of income was the fruit tree. In 2010 the yields have been very low or nil for all the farmers. This explained why very large farmers were often classified below the poverty line.

In Sohag and New Valley, two profiles of distribution of poverty could be distinguished. In Sohag, there was an equal distribution between the three classes, very poor, poor and medium. Due to land fragmentation, few farmers reached the rich level. In New Valley, the majority of very poor farmers were landless. The medium and rich groups cumulated different activities including government jobs that had been developed within socio-political programs of the 1970s and the New Land Reclaimed Program. The poor group reflected the situation of typical farmers that needed to manage their small land.

The capital asset radars (Figure 2) give some indicators to understand the different roles of activities to escape poverty. Two very large farms in the sample have been omitted. The radars show very specific profiles of capital assets according to each area and agroclimatic conditions. Matruh presented a very specific profile because of last years' agroclimatic conditions. The SR flock size did not allow escaping the poverty level fixed to no more than 2 US\$/capita/day. However the poor group was proportionally better endowed in human, physical and financial capital than the very poor group. The main gaps between poor and very poor groups were the access to the lowland area called *wadi*, the animal stock and the off-farm income. Among the poor group, 40% of the farmers had more than 100 head of small ruminants compared to only 26% in the very poor. The farms with less than 30 head in the poor group comprised around 8.5 family members compared to 13.3 in the very poor. So the family size, which may be a driving force

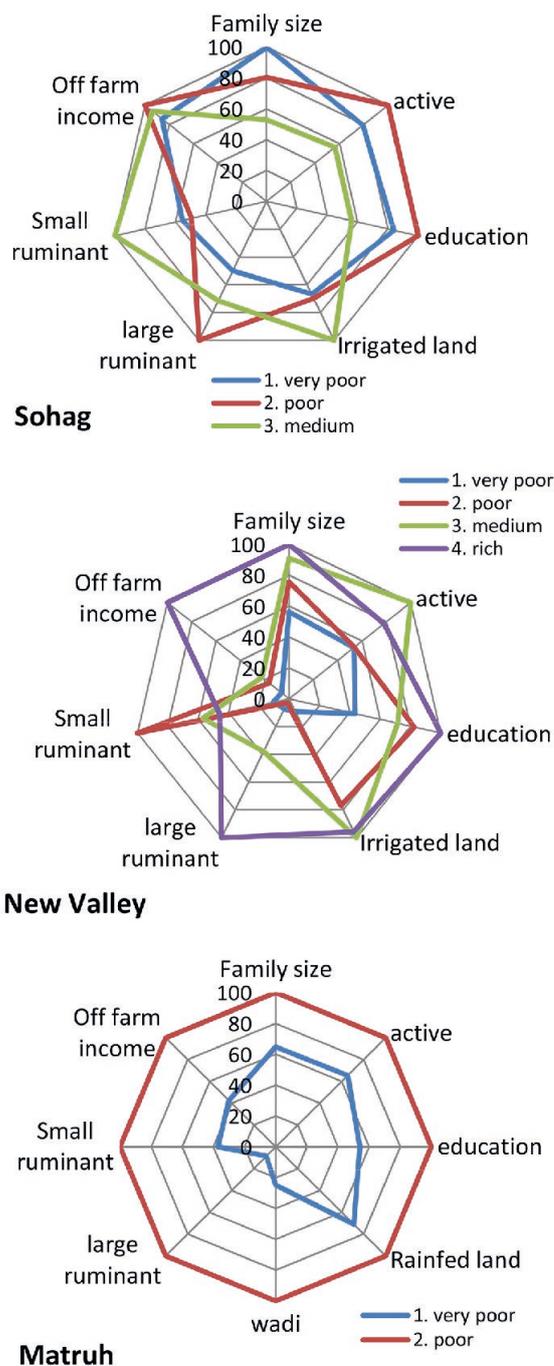


Figure 2: The eighty-eight surveyed farmers' capital asset radars in three governorates in Egypt.

Table III

Distribution of the levels of poverty between the three studied governorates of Egypt

Governorate	Very poor Less than 1.25 US\$/day (%)	Poor Between 1.25 and 2 US\$/day (%)	Medium Between 2 and 6 US\$/day (%)	Rich More than 6 US\$/day (%)
Matruh	76.7	23.3	0	0
New Valley	37.9	13.8	27.6	20.7
Sohag	34.5	34.5	31.0	0
Total	50.0	23.9	19.3	6.8

during good climatic years, becomes a factor of poverty aggravation during dry years.

Sohag and New Valley presented contrasted profiles with regard to the role of small ruminants. In New Valley, the main asset for the poor group which could pass the poverty threshold of 1.25 US\$/capita/day was the sheep and goat stock. When the households could invest in cattle, they could escape the poverty trap. The main assets of the rich group in our sample were the large ruminant stock with a remunerative off-farm activity thanks to a high education degree. Therefore we can say that sheep and goat capitalization constitutes a first step to escape extreme poverty. Its part decreases again when the household can invest in large ruminants (cattle or buffaloes). Off-farm activities constitute an important way to invest in large ruminants by providing a sort of collateral to bank credits. The education level is also a way to invest in land capital reserved to graduates on the New Reclaimed Lands.

Contrary to New Valley, the main difference between very poor and poor groups in Sohag was the large ruminant asset. Only medium-revenue farmers invested consequently in small ruminants. SR was often a new activity for the farmers who were in an early phase of investment. The figure also shows that the medium group had a low level of education compared to the other two poor groups. One hypothesis was that SR activity might be one way to diversify economic activities without jeopardizing the farm economy in case of low opportunity.

We then confronted the monetary poverty status with the perception of poverty in each area, mainly the main reasons and risks to become poor and the main factors to escape poverty (Tables IV and V). The main reasons to be poor corresponded well to our analysis of poverty. The main reasons in the rain-fed area were the climatic conditions in Matruh. In the irrigated areas, the main factors were land fragmentation linked to demographic and social pressure. The main risks mentioned in irrigated areas were animal diseases or the difficulties in developing animal activities. The

main social costs declared by the farmers were wedding costs, the risks of health problems or the loss of parents at an early age.

The main factors to escape poverty would be off-farm income diversification through migration and new job opportunities in rural areas. Despite different answers and experiences between the areas all of the farms expected a lot from public support either as part of development projects or subsidy policies.

■ DISCUSSION

The field research work showed different contributions of animal species to the household livelihood according to asset endowments, as well as social and agroecological environments. For the landless and very small land owners, sheep and goats provided the main source of income to escape the poverty trap as shown by Siddik (2009) and Soliman (1990) cited by Haenlein and Abdelatif (2004). As soon as the farmers were able to invest in cattle or buffaloes, sheep and goats became the basic cash flow whereas large ruminants provided a sort of family insurance. Poor farmers mainly used common lands along canals or took their flocks to graze on crop residues. In some arrangements with large landowners, agricultural workers had access to small parts of land to graze.

In New Valley and Matruh, one of the main constraints that affected sheep and goat keepers were feed costs. In New Valley, the majority of herders maintained small flocks in enclosures. The feeding system was mainly based on green fodder (berseem) and wheat residues in winter and green corn in summer. The problem of availability of water or the problem of water pump functioning led the farmers to buy feed outside New Valley and reduced the profitability of their livestock activity. This problem impeded also the development of milk productivity and milk marketing.

In Matruh, the feed cost was entirely linked to climatic conditions and the degree of remoteness. During the last years, herders were obliged to sell part of the flocks to buy feed from the delta; the

**Table IV**

Main reasons to fall in poverty according to the surveyed farmers in three governorates of Egypt

Governorate	Drought (%)	Land fragmentation (%)	Social events (%)	Employment (%)	Livestock risk (%)	Others (%)
Matruh	91.7	0	0	6.3	0	2.1
Sohag	0	54.9	21.6	9.8	13.7	0
New Valley		56.7	10.0	16.7	16.7	0

N = 90 farms; CIRAD/APRI, 2010

**Table V**

Main factors to escape poverty according to the surveyed farmers in three governorates of Egypt

Governorate	Employment/Off farm (%)	Development project (%)	Livestock development (%)	Social nets (%)	Others / no answer (%)
Matruh	38.0	32.4	18.3	2.8	8.5
Sohag	64.4	17.8	8.2	6.8	2.7
New Valley	26.6	20		16.7	36.7*

N = 90 farms; CIRAD/APRI, 2010

\* The majority of the farmers mentioned reduction in living costs

feed ration was on average 0.3–1 kg/day/head of grain. The straw was negotiated at around 0.17–0.2 US\$/kg compared to 0.21–0.24 US\$/kg for cereal grain. This dependence on feed from outside the area might be reinforced in the coming years because of different factors, e.g. climate change that can disturb the quantity and quality of ranges in rain-fed areas, water access in irrigated systems, and feed prices in the market. Some herders covered their feed costs by selling young animals, mainly males between four and six months old. Furthermore this fitted with the development in market demand in nearby cities but could have major social and economic impacts at territorial level. In Sohag, sheep and goats constituted one way of income diversification for the medium households who did not have the resources to invest in other sectors. In poor households, the farmers preferred to invest in large animals that constituted a more consequent social and economic capital. These three case studies reflected the different roles of livestock as shown in Faye and Alary (2001).

When poverty factor perception was crossed with monetary poverty indications, some obvious factors such as the climatic factor in rain-fed areas and land fragmentation in irrigated areas were highlighted by the majority of farmers. In irrigated areas, other factors mentioned were social events in Sohag, or the loss of employment in New Valley. This corresponded to two particular realities. In Sohag, the farmers' main problem was land fragmentation because the married daughters left the family taking their land ownerships with them. In New Valley, off-farm jobs, mainly in the public services, were developed during the 1970s, which enabled each family to have a secure source of income. The loss of this job because of the retirement or the death of the head of the family caused uncertainty at family level, especially in families without livestock. In this area, animal and off-farm jobs were considered as a major source of income diversification.

The factors to escape poverty were more diversified and well embedded in the history of each area. For example in Matruh, besides off-farm diversification mainly through the social networks at the Libyan-Egyptian border, one way to escape poverty would stem from governmental development projects such as the Natural Resource Matruh Project (NRMP) that prevailed during ten years in the area. The development projects supported the development of many activities with subsidies to the breeders. In Sohag and New Valley, they mainly provided credits. The social support mainly reflected the development of social networks to get a job, facilitate migration, receive social support (religious associations), access loans, exchange animals. Livestock development was mainly cited as one way to escape poverty in Matruh, where livestock represented the main asset to face climatic conditions. The perception of livestock to escape poverty was entirely linked to the flock size.

## ■ CONCLUSION

These results showed that the national data do not allow approaching the multiple roles of sheep and goats at farm and regional levels in terms of poverty reduction, reduction of vulnerability, and local food security on the short and long terms, notably in harsh environments. A more in-depth survey on risk perception and the role of livestock will help better understand the role of livestock as a way of adaptation in the face of global changes such as climate change in rain-fed areas or demographic change in irrigated areas. Nevertheless, these first results showed different contributions of animal species to household livelihood according to asset endowments, societal and agroecological environments. For the landless and very small land owners, sheep and goats provided the main source of income to escape the poverty trap. The results also

showed some gaps between capital asset and poverty, especially for large herders in the pastoral and agropastoral areas of Matruh. The livestock asset produced other sources of wealth that were not taken into account in the monetary poverty approach.

The poverty profile analysis in rain-fed areas raises thus several questions. In such areas, we need to distinguish the structural poverty from the annual poverty linked to climatic conditions. Moreover the annual monetary poverty is not always a good indicator of the family poverty because of the strong social network in the society. In Matruh, major economic activity emerges from the social network in the society. This activity is based on animal exchange, keeper activities, smuggling activities or a combination of these activities at the Libyan-Egyptian border. This leads to the need to diversify the indicators of poverty in relation with the capital asset composition that reflects different roles of livestock at family level.

However, the key roles of small ruminant stocks in the different farming/household systems explain the increasing SR population at regional and national levels. Any development or research activity on small ruminants to sustain this endogenous development needs to understand well the multiple reasons of this development in link with the nature of the animals and family needs. Moreover, these interviews showed that the main constraints of livestock development in Egypt are the lack of know-how in the use of crop residues – notably with the recent price increase of concentrates –, the unavailability of credit lines for landless and small-scale landowners, but also the absence of associations to support sheep and goat breeders.

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## Résumé

**Alary V., Aboul-Naga A., El Shafie M., Abdelkrim N., Hamdon H., Metawi H.** Rôles des petits ruminants dans l'amélioration des conditions de vie en milieu rural – Analyse comparative en Egypte

L'étude est centrée sur l'évaluation de la contribution de l'élevage de petits ruminants dans la réduction de la pauvreté et de la vulnérabilité des systèmes agricoles de trois zones agro-écologiques en Egypte : la zone pastorale du littoral Nord-Ouest (région de Matrouh), les zones irriguées de la vallée du Nil (région de Sohag) et les oasis du désert Ouest (région de la Nouvelle Vallée). Une étude empirique sur 90 exploitations dans les trois zones agro-écologiques portant sur différents indicateurs économiques et sociaux liés à la pauvreté a donné des indications sur le rôle des ovins et des caprins dans différents types d'exploitation, selon les dotations en ressources (en particulier terre, bétail, capital) et les ressources humaines. Les résultats ont montré que les petits ruminants constituaient la principale source de revenus des ménages pour échapper à la pauvreté, notamment pour les sans terre et les très petits propriétaires terriens. En outre, l'élevage était un capital qui générait d'autres richesses qui n'ont pas été prises en compte dans l'approche de la pauvreté monétaire.

**Mots-clés :** ovin, caprin, paupérisme rural, système agropastoral, côte, terre irriguée, oasis, Egypte

## Resumen

**Alary V., Aboul-Naga A., El Shafie M., Abdelkrim N., Hamdon H., Metawi H.** Papel de los pequeños rumiantes en la mejoría del sostén rural – Análisis comparativo en Egipto

El estudio se enfoca en la evaluación de la contribución de ovejas y cabras para reducir la pobreza y la vulnerabilidad en sistemas agrícolas rurales en tres áreas agroecológicas en Egipto: el área pastoril de la zona costera noroeste (gobernación Matruh), las áreas irrigadas en el Valle del Nilo (gobernación Sohag) y la zona del oasis en el Desierto del Oeste (gobernación Nuevo Valle). Un estudio empírico en 90 fincas en las tres áreas agroecológicas sobre diferentes indicadores sociales y económicos en relación a la pobreza dio indicadores de los roles de las ovejas y las cabras en diferentes tipos agrícolas, de acuerdo a la dotación (tierra, ganado, capital, etc.) y a los recursos humanos. Estos resultados muestran que las ovejas y las cabras proveen la principal fuente de ingreso para escapar de la trampa de la pobreza para los propietarios sin tierra o con terrenos muy pequeños. Aún más, la posesión de ganado produjo otras fuentes de riqueza que no fueron consideradas en el enfoque de la pobreza monetaria.

**Palabras clave:** ovino, caprino, pobreza rural, sistema agropascícola, costa, regadio, oasis, Egipto

