Profile of Transhumant Sheep and Goat Greek Farmer in Central Greece

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Abstract
Transhumance is traditional extensive farming system that involves the seasonal migration of animal husbandry between winter and summer rangelands. The purpose of this paper was to study the profile of the Greek transhumant herder and to construct a typology that could be used by the decision makers to improve the strategies used to determine and preserve the system. The required information was obtained from totally 140 Greek transhumant producers of the region of Central Greece. A Principal Component Analysis gave three components related to the "education of the producer", "the future of the system" and the "type of the herds". Using multivariate techniques, a farm typology was established with three categories. The first defined as the "younger and more educated", the second group "the elder traditional producer" and the third group the "more experienced" group. Interestingly the results highlighted the future of transhumant farms being doubtful for a number of farmers originated mainly by the first group, the negative connection of future of the system with the younger, higher education and more innovative producers, emerging the need for protection and preserving its extensive character.

Keywords: sheep and goat farming sector, transhumance, typology.

1. Introduction

Transhumance is a pastoral activity that includes grazing in mountainous and semi-mountainous rangelands for 4-5 months in year basis, following the geographical availability of feed [1,2]. The system through grazing effects positively biodiversity, plants regeneration, landscape configuration as well as preservation of cultural identity and economic dynamism in rural areas [3,4]. The latter decades however transhumance has been evolved in various ways ought to the need of the producers to be competitive (naming genetic improvement, increase of indoor periods etc.) [4,5]. Purpose of this paper was by using the background of the farmer such as age and educational level, to identify whether the personal characteristics of the producer affect their management approach in terms of planning (type of herds, funding etc) and or the future of the system.

2. Materials and methods

Necessary data were collected through a structured questionnaire to a random sample of 140 transhumant sheep and goat farmers in Central Greece. The questions were selected to obtain a general description of producer's characteristics and information about: a) flock size and structure and b) personal characteristics of the producer.
Data were obtained in 2014 through personal interviews that lasted 60 minutes on average due to complexity of the questionnaire. A combination of multivariate techniques, namely Principal

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Components Analysis and Cluster Analysis, were employed to identify explanatory variables and to group farms in homogenous types.

Initially Principal Components Analysis (PCA) was used to estimate the relations between variables and to reduce the original variance though the recognition of the new variables (factors). Eventually, this allows for reducing the number of variables and preserving the maximum variability of the sample. The variables used involved aspects of the farmers profile including personality and choices affording the farm.

The variables used in PCA were **nine** including:

1. Index of **'new practices'** was defined as an ordinal variable ranging from 0 to 5. The variable was measured through the use of milking machine (ranging from 0 to 1), the performance of oestrus synchronization (ranging from 0 to 1), the genetic improvement of the reared animals (from 0 belonging to mountainous breeds, 1 cross breeders with improved dairy breeds and 2 improved dairy breeders) and the facilitation of movement using trucks (form 0 to 1).
2. **Future of the farm**, defined as an ordinal variable ranging from 2 to 5. The variable was measured by the succession of the transhumant farm (ranging from 1 being positive, 2 being doubtful and 3 being negative) and whether the successor decided on his own to take over the farm (ranging from 1, being a personal choice and 2 being obligatory).
3. **Animal**, expressed as percentages of sheep to the total population of the herd
4. **Herd size** (total number of animals including females, males and replacement animals).
5. **Age of farmers** (years)
6. **Educational level**, designed as 0 graduates of primary school, 1 high school graduates, 2 graduates of Upper Secondary school, 3 graduates of technological institutions and 4 graduates of higher educational institutes
7. **Years of occupation with transhumant farming** (measured in years)
8. **Years of leadership**, naming the years that the producer is the leader of the farm and responsible for the decisions taken.
9. **Actions**, defined as an ordinal variable ranging from 0 to 4. The variable was measured by the participation to producers associations (ranging from 0 being negative, 2 being occasionally and 3 being continuous) and participation on funding programmes (ranging from 0 being negative and 1 being positive).

A Cluster analysis was performed using the log likelihood logarithm to classify the farms using the factors with eigenvalue greater than 1, emerged from PCA, while a post hoc test (Bonferroni) was performed to identify differences between the Groups for each factor.

3. Results and discussion

Three factors explaining the 58/40% of the original variance obtained by the PCA (Table 1).

Factor 1 named "education of the producer" reflected a negative relationship between the educational level of the producer and the years of occupation with transhumance as well as with the years the producers have been leaders, implying that occupation with the farming system (as a leader or not) is restrictive to education ought to limitation of hours available.

Factor 2 named "the future of the system" recognized a positive relationship between the adaption of innovations such as mechanization of movement or genetic improvement, the "action" variable, meaning funding or participation to associations and the future variable. This relationship implies that the most innovative producers had also participated on funding programs such as biological agriculture. However, the future for these transhumant farms tends to be negative (higher value of future parameter implies doubtful future), indicating that the transhumant farms that had adapted innovations and/or have been funded have also uncertain future, meaning no succession or absence of motives.

Factor 3, the "type of herds" factor, implied a negative relationship between the size of the herds and the kind of the reared animals, indicating that the herds that bred goats or to a higher percentages' goats tend to be larger. Also, a positive relationship was recognized between the kind of the reared animal and the age of the farmer implying that elder herders bred mainly sheep and to smaller herds.

Factors 1 to 3 with eigenvalues greater than 1 that explained 58.4 % of variance were retained in the Cluster analysis. Three groups of farms were identified. the general features of which are being quoted in the following table

Table 1. Contribution of the variables to the main factors in the PCA

	Components		
	1	2	3
Index of innovations	0,138	**0,634**	-0,123
Status of the farm	-0,117	**0,717**	-0,069
Years of occupation	**0,823**	0,146	0,188
Years of leadership	**0,777**	0,305	0,078
Actions	0,171	**0,463**	0,117
Animal	0,288	0,094	**0,698**
Educational level	**-0,647**	0,276	0,035
Age of the farmer	-0,153	0,385	**0,476**
Herd size	-0,010	0,195	**-0,834**

Table 2. Profile of the groups

	Group I (N=32)	**Group II (N=69)**	**Group III (N=29)**
Factor 1	**-0.10±0.70**	**0.46±1.24**	**-1.20±0.82**
Years of occupation	28.28	25.84	45.45
Years of leadership	21.28	14.93	36.48
Educational level	1.84	1.84	1.10
Factor 2	**-0.56±0.74**	**-0.38±0.87**	**0.52±0.66**
Index of innovations	**2.88**	2.09	2.76
Future	**3.59**	3.05	3.28
Actions	3.03	2.77	3.10
Age of farmer	42.44	**48.86**	47.31
Factor 3	**1.19±0.64**	**0.23±0.59**	**0.32±0.52**
Herd size	528.56	229.39	280.93
Kind of reared animal	41%	69%	85%

Subsequently, a Cluster analysis was performed using the log likelihood logarithm to classify the farms using the factors with eigenvalue greater than 1, emerged from PCA.

Group I, of the "*younger and more educated*" is characterized by younger producers ($p<0.05$), of higher ($p<0.01$ contrary to the 3rd group)) educational level (graduates of high school) that possess large and bred to higher percentage goats' ($p<0.01$) herds ($p<0.01$). Also, producers adopted some kind of innovations ($p<0.01$ contrary to the 3rd group). Interestingly the future of the system is the most uncertain contrary to the rest groups.

Group II, of the "*elder traditional producer*" is constituted by older herders of lower educational level that possess small ($p<0.01$ and $p<0.05$ contrary to the 1st and 3rd group respectively, average herd size of 200 animals) mixed type of herds (69% sheep, $p<0.05$). The producers were less innovative ($p<0.05$) that had undertaken to a lesser degree actions ($p<0.1$ contrary to the 3rd group) such as accompanying associations or funding programs. The future of the system in this group is promising as the analogous parameter is quite low.

Lastly, in group III of "*the more experienced*", producers possess small (average herd size of 280 animals) mainly sheep (about 85% sheep, $p<0.05$) herds, had the lowest educational level (graduates of preliminary education, $p<0.01$) while have been occupied with the system or have been leaders longer ($p<0.01$) contrary to the rest groups

4. Conclusions

The results revealed that the younger and more educated producers tend to adapt management practices (innovations) that could improve the

management and performance of the animas (genetic improvement, mechanization of movement) contrary to the elder and less educated producers. Interestingly the future of the system in this group is doubtful contrary to the rest groups implying the gradual abandon and "ageing" of the system as the future parameter implies that transhumance is currently and will in the future be represented by the "elderly" groups.

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