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**COEXISTENCE OF VITICULTURE AND LIVESTOCK KEEPING IN KAKHETI
REGION (GEORGIA) – HISTORIC EXPERIENCE AND PERSPECTIVES**

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Milk is the main agricultural product of contemporary Georgia (Fig. 1) while wine and spirits have a leading position in agro-export of the country (Table 1), the share of which in total export is close to one third; export of live grazing animals in this table is in the fourth position the dynamic of growth is impressive.

Kakheti region located on eastern part of Georgia and bordered by the Russian Federation to the *Northeast*, Azerbaijan to the Southeast with a population of 317,5 thousand inhabitants in 2017 (8.5 % of Georgia's total) and with a territory making 16.4% of the country's total is the main agricultural region of Georgia. Along with viticulture (the region produced 150.3 thousand tons of grapes, or 70.0% of Georgia's crop in 2015), the region has a long tradition of livestock breeding, especially in sheep breeding (482.0 thousand heads or 55% of the total Georgian sheep) [1] and the role of the two branches of agricultural sector in the development of the Kakheti region makes it necessary to analyze them in the overall context of the social-economic transformation. Both viticulture and sheep breeding are deeply connected with the lifestyle of people living in Kakheti. In Tusheti (Akhmeta municipality), located on the northern slopes of the Caucasus, near the borders of Georgia with the autonomous republics of Russian Federation Dagestan and Chechnya transhumant sheep breeding, which was widely spread in Europe in the past centuries and is still maintained in the Alps [8], is traditional lifestyle and livelihood is strictly dependent on quality and quantity of pasture resources [2].

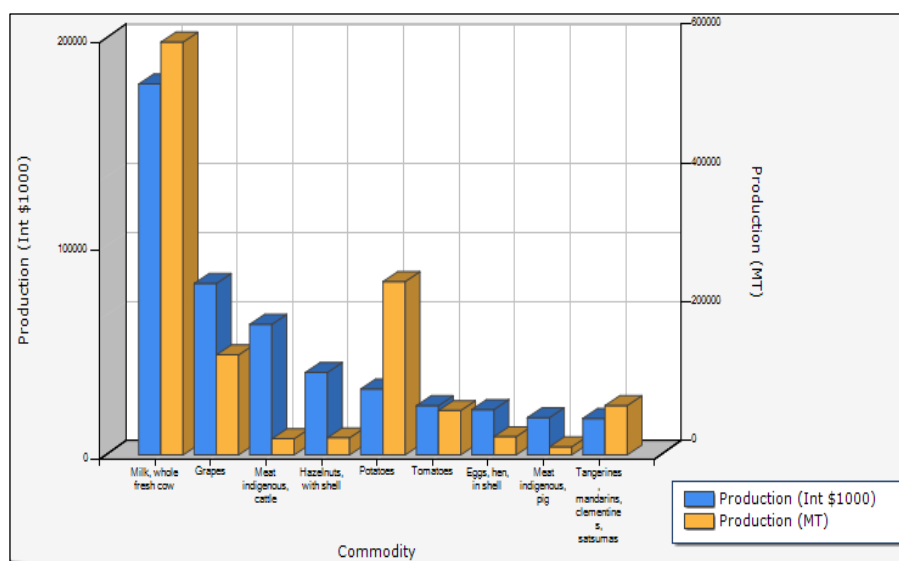


Fig. 1. Top ten commodities production in Georgia, FAO, 2013

There are about 0.16 million ha of meadows and 1.8 million ha of pastures in Georgia, in addition to that unproductive arable land is also often used as low productive pastures. It is a striking disparity between winter and summer pastures: Most pastures (1.3 million ha) are for summer grazing, and the total productivity of the Georgian summer pastures amounts to about 800 thousand tons, while the figure for the winter pastures is only 200 thousand tons. If we add to this the fact that according to capacity, that is, the number of livestock grazing per 1 ha of summer pastures more than twice exceeds the corresponding area of winter pastures, then the discrepancy between winter and summer pastures in relation to the total number of livestock of all types of cattle grazing on them will become even more obvious. The situation is slightly softened by the condition that in summer, in the third quarter of a year, due to increase in export of live grazing animal (Table 1) and forced slaughter the sheep head count is 25-45% higher compared to head count in winter (first quarter) [3]. Historically, this disproportion was partially equalized by the use of winter pastures outside Georgia (Dagestan, Azerbaijan), but currently it is impossible to use these pastures (war in Chechen Republic, transportation problems) and the former transhumant systems collapsed [2].

Main Agrarian Export of Georgia, mln US dollars. Source: Geostat

Table 1.

HS	Name of position	2000	2005	2010	2015		2016
2204-2205-2208	Wine Alcohol, spirits	30,1 4,0	81,8 29,2	43,7 56,2	96,7 65,1		115,2 92,0
0802	Hazelnuts & other nuts	19,3	70,3	75,1	176,6		179,5
2201-2202	Waters (natur., miner.)	13,4	52,9	51,6	101,1		91,6
0102,0104-0204	Live grazing animals	0 0	0 0	32,7 0	39,8 0,4		47,4 3,9
4101-4106	Meat of sheep Skins and	2,2 0	1,5 0	3,4 0,2	4,3 0,1		3,8 0,5
5101	leather Wool						

	Agrarian Export	92,6	303,9	349,3	573,3		642,6
	Total Export	323,9	865,5	1677,3	2204,7		2113,7
	Share of Agrarian Export in Total, %	28.6	35,1	20,8	26.0		30.4

In his "Description of Kingdom of Georgia, its habits and canons" (1745) Georgian scientist Vakhushti Bagrationi informs, that King of Kakheti Levan II (1520-1574) with a view to strengthening northern borders of Kakheti and to keeping in obedience inhabitants of Tusheti gave credentials allowing them to graze their sheep on Kakheti lowlands, but in the same time, these places were included in the zone of vineyards and orchards. On Kakheti lowland almost on all territories in between of Alazani and Iori valleys numerous flocks of sheep and other kinds of livestock were grazed during winter times and most of the territory were used in a combined way i.e., for viticulture and as winter pastures mostly for sheep. It should be noted that combined use of areas under vineyards, should be the most rational for that time, contributing to raising the yield of agricultural plants: if the ovens ate on these areas of grass (weeds), then in return they enriched the land with organic fertilizers. Thus, parallel use of land for agricultural crops and livestock grazing was necessary for plant growing and livestock keeping. For centuries the population in Kakheti themselves invited shepherds to have the sheep graze in their vineyards, and further to that a one-day stopover of a flock of sheep in vineyards was paid by the owner of these vineyards by one "chapi" (18 liters) of wine [4] during the transhumance movement of sheep and cattle from summer pastures in northern part of Kakheti to winter pastures in southern part takes place during the months of May (direction N-S) and October (S-N) respectively. The number of livestock moving to from winter-summer pastures varies and may reach from few thousand to hundreds of thousands of livestock. The distance transhumance livestock travel is also different and varies between 70 to 250 km (Fig. 2).

Kakhetian villages in the vineyards zone have various levels of transhumance traffic intensity. Some parts may be characterized by almost no mobile livestock movement whilst other villages may have high levels of transhumance going through villages during migration periods. In the region as an example Gombori temi (community) in Sagarejo municipality has almost no transhumance movement and Arashenda temi in Gurjaani municipality and Shakhvetila temi in Akhmeta municipality have high levels of transhumance movements. Covering such a long distance requires proper infrastructure, well established and identified transhumance routes, resting places, etc. which is in fact not available at most places and wherever available is in poor condition. However, in recent years, through the help and engagement of central authorities the situation on transhumance and resting places has improved. At some places resting places have been cleaned and arranged bathing places.

There are three resting places on the section of transhumance route that passes through the Georgian viticulture leading Gurjaani municipality; There are also three resting places in Sagarejo municipality. Public registry registers transhumance routes under the state property, in Akhmeta municipality some sections of transhumance route are already registered but the process is not finished yet, there are difficulties on those sections where routes pass through or cross the private property, among them are mostly vineyards. In some village pasture conflicts between livestock keepers and vineyard owners were observed, primarily because of the trespassing transhumance herds [7] beyond the transhumance routes which is mainly due to fact that after independence, the privatization of agriculture land happened in a rapid way and part of those routes were transferred to private possession. In addition, there is a new tendency of transforming pasture lands into vineyards which is the reason for new conflicts; To solve the latter conflicts in those villages where viticulture and livestock-keeping should be possible by establishing multifunctional cooperatives which has been facilitating by the state through adopting appropriate legislation [6] and activities of the Agricultural Cooperatives Agency.

Transhumance livestock while passing through villages in low land areas cause problems to not only for the locals who practice livestock keeping but also for those who have vineyards. Main problem stems from lack of pasture resources and resting places. Shepherds are interest to have well fed livestock

because if they fail to well feed livestock in such a case livestock will not be able to travel long distances up until the summer pastures and because of that they have to use pastures and vineyards belonging to locals. Locals also complain that there are many cases when their vineyards are damaged by transhumance livestock especially in such municipalities as Gurjaani where vine growing and wine production takes the lead in local economic activities and engagement. It should also be noted that there is no proper law or regulation in place as where, when and how to graze livestock.

As of today, organic farming is weakly developed, this method of agro-production is used only by around 200 farmers on 1452 ha (2014), that is on 0.1% (for comparison: Austria - 19.4%, Sweden - 16.4%, Estonia, Switzerland, Latvia, Czech Republic, Italy – more than 10%) of agricultural land (without pastures) and with this indicator, which practically does not increase in recent years, the country in Europe is only ahead of Albania and Andorra. Grapes organic area comprises 130 ha, that is 0.2% [9]. At the same time, the organic viticulture and so-called "organic wines" are developed in the world and in 2012 the EU adopted Regulation (EU) No 203/2012, which determined the rules for organic wine production; In the production of such wines the use of additives is avoid as much as possible and preference is given to natural process. Considering this, restoration of ancient tradition of synergic coexistence of viticulture and sheep breeding becomes acceptable and necessary. That is exactly the case in the US, Australia and New Zealand [5]. For example, Australian vineyards are generally highly mechanized, relying on heavy machinery for pruning, slashing, trimming, spraying and harvesting, but using sheep to control midrow and undermine growth is one of option to reduce the need for slashing and spraying and therefore reduce vineyard management costs and greenhouse gas emissions. Sheep are typically grazed in vineyards between harvest and budburst. Sheep are generally not used during the growing season because they eat the grapevine leaves that are required for photosynthesis and to protect the fruit from sunburn.

It is possible to accommodate the sheep without disrupting vineyard practices by splitting vineyard into different parcels for the sheep to graze. Then the sheep is kept together and rotated through the parcels using a technique called “cell” or “crash” grazing. The aim of this method is to have the midrow and undervine growth heavily grazed so everything is eaten and no weeds are left before moving the sheep onto the next parcel. If sheep are introduced into a larger area, they could graze preferentially - only eating the vegetation they like and leaving the weeds behind.

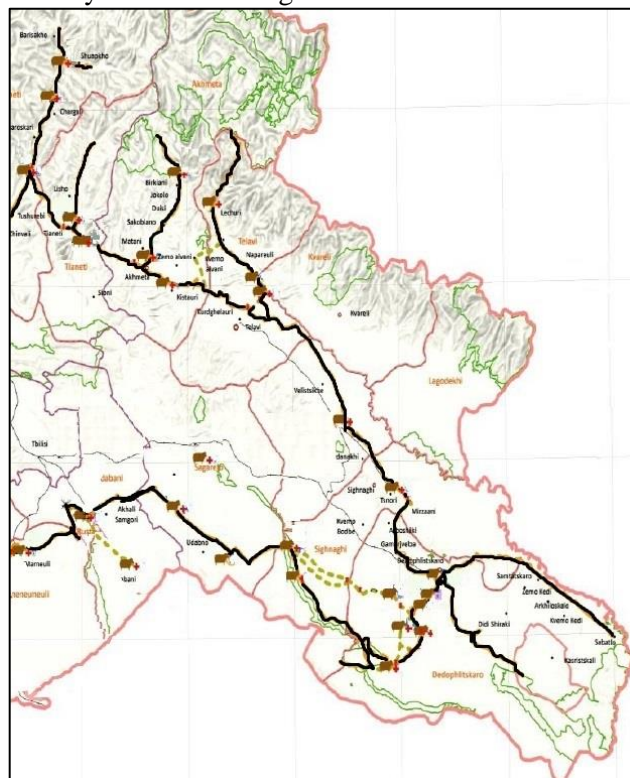


Fig 2. Pasturing areas and transhumance roads in Kakheti [From: Report on Georgian Animal Migration Route, SDC project of the Mercy Corps Georgia Alliances Lesser Caucasus Programme, 2014].

Using sheep in vineyards is an efficient and cost-effective way for vineyard managers to remove unwanted vegetation. But if the sheep eat the vines too, that could be a problem. Thus, solution comes from training the sheep and creating a strong aversion to the grapes or leaves through giving the sheep an oral dose of lithium chloride (LiCl) immediately after eating the grape. The aversion happens because LiCl causes a temporary stomach illness that animals then associate with whatever food they had just eaten.

As research shows there are few more tricks to improve the results and by incorporating non-vineyard areas as part of the vineyard grazing blocks, the sheep seemed more comfortable, maybe because they could keep to their normal daily grazing habits. Giving trained sheep another place to graze is important because it reduces the possibility that the sheep will taste a leaf or vine simply out of boredom. Even worse, research shows that if other animals see their herd mates eating a food, even if they were trained not to eat it, they will again begin trying it, and the entire herd will lose their aversion.

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