

# Assessment of Energy Requirements of Shepherds on Pastures

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**Abstract** The aim of the study was to assess the energy needs of shepherds on pastures. Research methods. Average daily energy requirements were determined based on 24-hour timekeeping, taking into account the actual time allocated for all types of activity, using the generally accepted Harris -Benedict tables. As a result of the research, it was revealed that the chronometers of shepherds' activities, along with the characteristic general structure for livestock breeders and their families, have differences associated with the specific stay on pastures.

**Keywords** Shepherds, Livestock breeders, Energy requirements

## 1. Introduction

Globally, more than 200 million people are engaged in pastoralism, a livelihood system that involves extensive herding of livestock across pastures [1]. In Central Asia, pastoral farming remains a critical economic activity, particularly in mountainous and arid zones where sedentary agriculture is limited. In Uzbekistan alone, over 8% of the rural workforce is directly involved in animal husbandry, including nomadic and semi-nomadic shepherds [2]. These individuals typically work in remote, rugged terrains under extreme environmental conditions, which significantly elevates their physiological demands.

Shepherds spend prolonged hours walking long distances, guarding herds, and managing livestock, often in fluctuating temperatures and high altitudes. Such occupational conditions result in increased energy expenditure, requiring nutritional strategies tailored to their unique needs. According to the World Health Organization (WHO), physically demanding jobs in rural settings may increase daily energy requirements by 20–50% compared to standard recommendations for sedentary workers [3]. Nevertheless, limited research has focused on the specific energy needs of pastoral workers, despite their critical role in food production systems and rural sustainability [4].

A study by Kazuhiro et al. (2018) found that herders in Mongolia expended over 3,500 kcal/day during peak grazing seasons, emphasizing the need for precise dietary planning to

prevent energy deficits and associated fatigue [5]. Similarly, field assessments in Kyrgyzstan and Kazakhstan have highlighted seasonal fluctuations in energy intake and physical exertion among shepherds, which could contribute to metabolic stress, weight loss, and decreased immune function if unaddressed [6,7].

Understanding the energy requirements of shepherds is essential not only for optimizing their health and productivity but also for informing public health interventions, food supply logistics, and workforce support programs in rural economies. This study aims to evaluate the energy needs of shepherds working in natural pasture environments, considering factors such as work intensity, environmental conditions, and seasonal workload variations.

Livestock farming in Uzbekistan has historically developed specific features in the form of the use of labor of shepherds - persons engaged in round-the-clock stay on pastures and leading a nomadic lifestyle. The Decree of the President of the Republic of Uzbekistan No. 60 dated 01/28/2022 "On the Development Strategy of New Uzbekistan for 2022-2026" provides for Development of 464 thousand hectares of new and withdrawn from circulation land areas by allocating lands to agricultural clusters, including as pastures. At the same time, special attention is paid to ensuring the health of agricultural workers [2,3].

In general, the health of livestock workers, especially shepherds, directly depends on nutritional and living conditions [4]. The main criterion in developing the body's needs for energy and essential nutrients is the actual energy expenditure of a person during the day.

To calculate the amount of daily energy expenditure of a person, data on the energy value (energy equivalents) of

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all stages and types of activity during the day are needed. Meanwhile, estimates of energy expenditure of livestock breeders are contradictory and there are no studies devoted to studying the energy needs of shepherds in pasture conditions.

**The aim of the study** was to assess the energy needs of shepherds in pasture conditions, which should serve as a basis for developing measures to ensure healthy nutrition for livestock breeders. The objects of the study were livestock workers involved as shepherds in pasture conditions.

## 2. Research Methods

Average daily energy expenditure was determined on the basis of 24-hour timekeeping, taking into account the actual time allocated for all types of activity, BMR (basal metabolic rate) - determined by height -weight data using the generally accepted Harris -Benedict tables [2].

## 3. Results of the Research and Discussion

The main determining value of daily energy expenditure of workers and employees is the time and quality characteristics of individual types of activity. In this connection, special

attention is paid to a full analysis of timekeeping during the day and the accepted values of energy equivalents for various types of activity. Analysis of daily timekeeping by observation, questionnaires and determination of physical activity coefficients (PAC) made it possible to determine the daily energy needs of shepherds staying on pastures from March to November in a nomadic manner (Table 1).

As studies show, the chronometers of shepherds' activities on pastures along with the characteristic general structure for stationary livestock breeders have differences associated with specific professional activities (Table 1). In addition, it was found that shepherds more often involve their wives and children in nomadic field raids. It was established that despite the differences in the activities of male shepherds, in general, the average daily energy costs are almost identical and amount to  $4820.6 \pm 6.5$  kcal and for women  $4756.3 \pm 8.0$  kcal. And of these, the values of the basal metabolism are  $1677.2 \pm 3.0$  kcal for men and  $1595.5 \pm 6.0$  kcal per day for women.

Thus, the calculations show that the daily energy requirement for male shepherds is  $4820.6 \pm 6.5$  Kcal and for women  $4756.3 \pm 8.0$  Kcal.

Of these, the basal metabolic rate is  $1677.2 \pm 3.0$  kcal for men and  $1595.5 \pm 6.0$  kcal per day for women.

**Table 1.** Energy expenditure coefficients for individual types of shepherd activities on pastures,  $M \pm m$

Activities	Duration in hours		Energy consumption by CFA (Kcal.h)		Energy expenditure for activity (Kcal)	
	A	B	A	B	A	B
Morning toilet	$0.6 \pm 0.1$	$0.7 \pm 0.2$	$82.0 \pm 3.3$	$82.0 \pm 3.0$	$49.20 \pm 1.4$	$57.4 \pm 2.0$
Morning round of the farm	$0.4 \pm 0.2$	$0.25 \pm 0.1$	$97.5 \pm 4.0$	$97.5 \pm 3.5$	$39.0 \pm 1.0$	$24.3 \pm 3.0$
Making the bed		$0.33 \pm 0.1$		$117.2 \pm 4.0$		$38.6 \pm 2.0$
Breakfast	$0.66 \pm 0.2$	$0.83 \pm 0.2$	$30.0 \pm 2.0$	$30.0 \pm 2.4$	$19.80 \pm 1.0$	$24.90 \pm 1.6$
Washing dishes		$0.25 \pm 0.1$		$132.5 \pm 3.0$		$33.1 \pm 1.0$
Dressing	$0.25 \pm 0.1$	$0.33 \pm 0.1$	$88.8 \pm 3.0$	$88.8 \pm 3.6$	$22.2 \pm 2.0$	$29.3 \pm 3.0$
Preparing for horseback riding	$0.25 \pm 0.2$	$0.66 \pm 0.2$	$88.8 \pm 3.0$	$88.8 \pm 3.0$	$22.2 \pm 2.0$	$29.3.0 \pm 2.0$
Preparing animals for grazing	$0.25 \pm 0.1$	$0.25 \pm 0.1$	$110.0 \pm 5.0$	$110.0 \pm 6.0$	$27.5 \pm 2.0$	$27.5.0 \pm 3.0$
Prof. activity: walking in the pasture	$8.0 \pm 0.3$		$152.7 \pm 6.0$		$1221.6 \pm 18.0$	
Animal care	$1.0 \pm 0.3$	$1.0 \pm 0.4$	$99.9 \pm 4.0$	$99.9 \pm 4.0$	$99.9 \pm 4.0$	$99.9 \pm 4.0$
overnight places		$2.0 \pm 0.2$	$135.7 \pm 6.5$			$271.4 \pm 8.0$
Working with children		$3.33 \pm 0.2$		$99.5 \pm 3.6$		$331.3 \pm 4.0$
Eating	$0.5 \pm 0.1$	$0.5 \pm 0.1$	$30.0 \pm 2.0$	$30.0 \pm 2.4$	$15.0 \pm 4.0$	$15.0 \pm 4.6$
Washing dishes		$0.25 \pm 0.1$		$132.5 \pm 3.0$		$33.1 \pm 1.0$
Rest (conversations)	$0.5 \pm 0.1$	$0.5 \pm 0.1$	$42.0 \pm 3.0$	$42.0 \pm 3.3$	$21.0 \pm 3.0$	$21.0 \pm 3.2$
Taking a shower	$0.66 \pm 0.2$	$1.0 \pm 0.2$	$125.0 \pm 6.0$	$125.0 \pm 6.6$	$82.5 \pm 4.4$	$125.0 \pm 6.8$
Walking to the nomad	$0.66 \pm 0.2$	$0.66 \pm 0.2$	$84.6 \pm 3.0$	$84.6 \pm 3.0$	$55.8 \pm 3.0$	$55.8 \pm 3.0$
Active recreation	$1.0 \pm 0.2$	$1.0 \pm 0.2$	$120.0 \pm 3.2$	$120.0 \pm 3.6$	$120.0 \pm 3.2$	$120.0 \pm 3.6$
Watch TV shows	$1.77 \pm 0.3$	$0.5 \pm 0.1$	$30.0 \pm 2.0$	$30.0 \pm 2.0$	$53.1 \pm 2.0$	$15.0 \pm 1.2$
Evening dress	$0.5 \pm 0.1$	$0.66 \pm 0.2$	$82.0 \pm 3.0$	$82.0 \pm 3.0$	$41.0 \pm 2.0$	$54.1 \pm 2.6$
Night sleep	$7.0 \pm 0.5$	$7.0 \pm 0.6$	$25.0 \pm 3.0$	25.0	$175.0 \pm 6$	$175.0 \pm 8$
Total activity	24	24			$4820.6 \pm 6.5$	$4756.3 \pm 8.0$

## 4. Conclusions

1. The chronometers of the activities of shepherds staying on pastures have specific differences from the activities of rural households, which must be taken into account when consulting with medical workers related to the organization of healthy nutrition.
2. Despite the differences in the timing of the activities of men and women, among shepherds they are practically identical and amount to  $4820.6 \pm 6.5$  kcal per day for men and  $4756.3 \pm 8.0$  kcal for women.

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