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SHEEP GRAZING IN THE BESKID SĄDECKI AS AN EXAMPLE OF SUSTAINABLE AGRICULTURE

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Abstract

The sheep-farming economy has been an inseparable part of the mountain landscape. Sheepherding forms the cultural heritage of the region and helps to maintain biodiversity. The purpose of the study was to analyse the state of the sheep-farming economy in the Beskid Sądecki region by collecting surveys from 14 homesteads (farms) in the area. The research questions were divided into five groups: identification data (4 questions), pastures and their owners (9 questions), management of sheep grazing (17 questions), economic and production-related problems with grazing and milk processing (14 questions), social and cultural aspects of mountain-pasture grazing (14 questions). There were 58 questions altogether. The results of the study suggest that, despite the changes in the management of sheep grazing and the profitability of sheepherding, the sheep

farming economy has maintained an important role in shaping the regional traditions.

Key words: sheep, grazing, sustainable development

Introduction

Wallachian pastoral nomadism and the waves of settlement have spread large-scale grazing, resulting in the establishment of new meadows and pastures on mountain slopes. By the 13th century, pastoral farming as well as trade and settlement have been well developed in the Carpathian Mountains. The forms of pastoral farming in the Radziejowa and Jaworzyna Krynicka mountain ranges are not found in the other regions of the Carpathian Mountains (Kowalska-Lewicka, 1980). The Carpathian Beskid Sądecki with the highest peak Radziejowa (1266 m above sea-level), is characterized by high forest coverage and a small number of glades. Meadows are located mainly in the lower parts of the mountains, close to buildings (Kondracki, 1994, 1998). Mid-forest glades and ridge pastures have emerged due to human activities in this area. Centuries-old settlement resulted from the lie of the land, which featured narrow and steep valleys and broad ridges (Kowalska-Lewicka, 1980; Reinfuss, 1998). Severe climate conditions required the inhabitants to grow plants able to withstand harsh conditions. The dominant cereals were oats, followed by barley, spelt, linseed, possibly wild perennial rye (a hardy variety of rye). Root crops were represented in this area by swede and turnip, and potatoes began to be cultivated as late as the 19th century (Brylak-Załuska, 2001). Grazing pastures and meadows

were located in the higher part of the mountains, which enabled the animals to be kept outside the farms during the summer season. The natural topography influenced the pastoral farming system and also the layout of the buildings. As a consequence, the Beskid Sądecki area is characterized by three types of spatial distribution patterns differing in the way animals are grazed: open fields (Kokuszka), forest fields (Łomnica) and scattered settlements (Piwniczna) (Kowalska-Lewicka, 1980). Animals in these areas were grazed on common (collectively grazed) pastures (e.g. Kokuszka); seasonally in mid-forest glades (e.g. Łomnica); on own land and on idle land (Kowalska-Lewicka, 1980). In the Beskid Sądecki, sheep were grazed under two systems: mountain shepherding and agricultural shepherding. In the first system, sheep were given into the care of a senior shepherd, who grazed them during the summer and processed the obtained milk in his hut (e.g. in the Jaworzyna Krynicka range, Radziejowa, Rytro, Sucha Struga, Homrzyska and Roztoka Ryterska). In the second system, sheep were folded in nearby lands to fertilize them. Milk was processed in landholder farms in the villages (Łomnica) (Reinfuss, 1998). Sheep grazing in this region drew on subsidiary farming; for example, in Łomnica and Piwniczna fields were cultivated partly as arable land and partly as hay fields. Therefore, this area still has buildings showing that mountain pastures were permanently or temporarily inhabited. Still after World War I, all the huts in the upper parts of the mountains were inhabited. The animals were tended by landholders' children, less often by hired shepherds. After World War II, grazing was conducted on mountain pastures and on agricultural land (fields owned by particular homesteads). The land owners agreed on joint farming and grazing economy. However, the landholders more often gave their sheep to be grazed rather than grazed them themselves. In the area of Łomnica, sheep were also grazed in forests. The turn of the 19th and 20th centuries brought changes in the traditional pastoral farming, especially in communal grazing. Farmers lost the right to graze sheep in forests and the pastoral conditions slowly deteriorated. In the Beskid Sądecki region, animals

were traditionally grazed on idle land and on community pastures. This practice was still extremely common in the 1920s and 1930s, as evidenced by a decree of the Kraków Voivode from 18 January 1933, which had an additional purpose of developing pastoral farming in the communal areas (Włodek and Nowak, 1937).

Today, sheep farming in the Beskid Sądecki region returns to traditional pastoral farming. Therefore, the aim of the study was to analyse the state of sheep farming and pastoral economy in the Beskid Sądecki region.

Material and methods

Inventory studies on pastoral farming were conducted in the area of the Beskid Sądecki Mountains. A total of 14 sheep farms and 13 shepherd's huts (grazed flocks) were investigated. A questionnaire survey was performed from May to July 2019 in shepherd's huts, and continued until December 2020 in landholder farms. The questionnaire comprised 58 questions divided into 5 groups: identification data – 4 questions; pasture and its owners – 9 questions, grazing system – 17 questions, production and economic problems of grazing and milk processing – 14 questions, social and cultural aspects of mountain sheep grazing – 14 questions. After verification, the descriptive data obtained were summarized in tables, and the numerical data from the surveyed farms and huts were reported as mean values (min, max) (Musiał et al., 2006).

Results

The results for the surveyed pastures in the Beskid Sądecki region are presented in Table 1. In this area, sheep are grazed in the municipalities of Piwniczna-Zdrój, Rytro and Krościenko nad Dunajcem, located in the Nowosądecki and Nowotarski counties. The pastures range from 0.7 to around 120 ha in area.

Tabela 1. Wykaz hal, na których prowadzony jest wypas
Table 1. List of grazed pastures

Nazwa hali Name of pasture	Powierzchnia (ha) Area (ha)	Lokalizacja hali Location of pasture
Kosarzyska	0,7	Piwniczna-Zdrój
Brzanówki	5	Piwniczna-Zdrój
Księży potok	30	Piwniczna-Zdrój
Stacja narciarska w Kokuszce Kokuszka ski station	20	Kokuszka – gm. Piwniczna-Zdrój
Pod Łysinkami Kozia Dolina	2 1	Łomnica Zdrój gm. Piwniczna-Zdrój
Piwniczańskie hale	20	Piwniczna-Zdrój
Wierchomlańskie hale	7	Wierchomla Mała, Wielka
Majerz, Karpały	50	Piwniczna-Zdrój, Łomnica Zdrój
Łomnickie	15	Piwniczna-Zdrój
Obidza	4	Piwniczna-Zdrój
Wierchomla, Granica, Wapienne, Groń	ok.120 (powierzchnia łączna czterech hal) Approx. 120 (total area of four pastures)	Piwniczna-Zdrój, Łomnica Zdrój Wierchomla Mała, Wielka
Rytro Połom	70	Rytro

Tabela 2. Charakterystyka hal, na których prowadzony jest wypas
Table 2. Characteristics of grazed pastures

Opis hal Description of pastures	Uzyskane dane Data obtained
Forma własności hal: Form of pasture ownership	
prywatne (ha) private (ha)	min. 0,7 – max. 120 ha średnia: 25,7
dzierżawa (liczba właścicieli) lease (no. of owners)	min.1 – max 15 średnia: 7
państwowe (ha) state-owned (ha)	10 ha – tylko jedna osoba pasie na terenach należących do gminy 10 ha – only one person grazes sheep on muncipality--owned land
Dojazd do hali Access to pasture	Większość baców nie ma utrudnień z dojazdem do hali, czasami ze względu na ukształtowanie terenu utrudniony dojazd po deszczu. Most flock masters have easy access to pasture; sometimes, due to the lie of the land, access is more difficult after rainfall.
Ukształtowanie powierzchni hali/lie of the land	
przeważające nachylenie terenu predominant slope of the land	35–40 stopni 35–40 degrees
Możliwość pojenia owiec Availability of sheep watering	– woda z potoków i strumieni (7 stad) – dostarczana w poidłach (3 stada) – woda donoszona w wiadrach (30m) (2 stada) – źródła (naturalne lub specjalnie wykopane studzienki) (1 stado) – water from streams and brooks (7 flocks) – delivered in water troughs (3 flocks) – carried in buckets (30 m) (2 flocks) – spring (natural or specially dug wells) (1 flock)
Degradacja hal przez dzikie zwierzęta (dziki) Degradation of pastures by wildlife (wild boars)	– każdej nocy – 50% (hal) 3x do roku – nawet w każdy dzień – kilka razy do roku kilka procent powierzchni – every night – 50% of pastures 3 times a year – every day – several times a year, several percent of area

Tabela 3. Organizacja wypasu
Table 3. Management of sheep grazing

Zasady organizacji i prowadzenia wypasu Principles of sheep grazing management	Udzielone odpowiedzi Answers givens
1	2
Doświadczenie bacy Experience of flock master	Większość ankietowanych styczność z owcami miała od dziecka, a hodowla zwierząt była zajęciem kultywowanym od wielu pokoleń. Na własnym gospodarstwie (czyli jako bacowie) pracują: min. 2 lata max 40 lat (średnio 21 lat). Most of those surveyed have had contact with sheep since childhood, and livestock farming has been cultivated for many generations. On their own farms (as flock masters) they have worked between 2 and 40 years (21 years on average).

Ilość zatrudnianych juhasów Number of shepherds	zatrudnieni: 0–4 osób wypas rodzinny: 1–5 osób no. employed: 0–4 people family grazing: 1–5 people
Wielkość wypasanego stada – matki (2019 rok) Size of grazed flock – number of ewes (2019)	min. 4 szt – max 400 szt., średnia: 92 szt. between 4 and 400 sheep, 92 on average
Rasa owiec Breed of sheep	polska owca górska, polska owca górska odm. barwnej cakiel podhalański, owca wschodnio-fryzyjska, wrzosówka, plenna owca olkuska, lacaune, texel, czarnogłówka suffolk Polish Mountain Sheep, Coloured Polish Mountain Sheep, Podhale Zackel, East Friesian, Wrzosówka, prolific Olkuska sheep, Lacaune, Texel, Black-headed, Suffolk
Rozpoczęcie wypasu owiec – zwykle co roku Start of grazing (generally once a year)	od połowy kwietnia From mid-April
Zakończenie wypasu owiec End of grazing	do października till October
Rotacja stad w czasie wypasu (przechodzenie z jednej hali na drugą) Rotation of grazed flocks between pastures	nie – pasienie cały czas na jednej polanie tak – rotacja – trzykrotna zmiana polany no – grazing one glade all the time yes – rotation – glade changed three times
Koszenie hal Cutting of pastures	Koszone są całe hale lub ich część by zabezpieczyć paszę na zimę (niedojady, 1 pokos, 2 pokos tzw. potrow) – 600 bal z 40 ha. Whole pastures or their parts are cut to provide feed for winter (remains of grazing, first cut, second cut) – 600 bales per 40 ha.
Infrastruktura Infrastructure	– stałe bacówki/permanent shepherd's huts – przenośne szałasy/portable log huts
Wypas strzeżony – kwaterowy Guarded rotational grazing	– do czerwca/lipca hala dzielona na połowę, później wypas na całości – odgradzane pastuchem (siatką) – pastuch (siatka) obszar wielkości 0,5 ha – kwatery o powierzchni 1 ha – pasture is halved till June/July, later on entire pasture is grazed – fenced off (net) – area of 0.5 ha fenced off (net) – paddocks 1 ha in area
Organizacja koszarów na noc i czas doju Folding of sheep at night and for milking	– koszarowanie na noc i do doju – na noc zganiane do owczarni – koszarowanie tylko na noc – owce koszarowane na noc na kwaterze – folding at night and for milking – driven into a fold at night – folded at night only – folded at night in paddock

cd. tab. 3 – Table 3 contd.

1	2
Nawożenie hal nawozami sztucznymi Fertilization of pastures with chemical fertilizers	nie, tylko naturalne: obornik no, only natural fertilizer (manure)
Od ilu gazdów zbierane są owce Number of farmers from whom sheep are collected	min. 1 – max 6, średnia: ~4 gospodarzy between 1 and 6, ~4 farmers on average
Liczba owiec pochodzących od jednego gazdy Number of sheep per farmer	min. 10 – max 250 szt., średnia: ~81 szt. between 10 and 250 sheep, ~81 on average
Sposób dotarcia zwierząt na pastwiska The way animals access the pasture	przepęd droving
Sposób powrotu zwierząt z pastwiska The way animals return from the pasture	przepęd lub z hal oddalonych samochodem (np. z Krościenka) droving, or from distant pastures by car (e.g. from Krościenko)

Table 4. Economic and production-related aspects of grazing and milk processing
Economic and production-related characteristics of grazing

Pozyskiwanie mleka od owiec Collection of milk from sheep	Miesiąc Month	Dojone sztuki No. of animals milked	Udój dzienny (l) Daily milk yield (l)
	maj czerwiec May June	min. 12 szt. max 300 szt. between 12 and 300 sheep	do. 0,5 l /udój/owcy ok. 1 l /dzień/owcy (od 300 owiec – 200 l mleka/ dzień 2 x udój) up to 0.5 l/milking /sheep approx. 1 l/day/sheep (from 300 sheep – 200 l milk/day 2x milking)

	lipiec sierpień wrzesień październik July August September October	(od 300 owiec – 50 l mleka na dzień 2 x udój) (from 300 sheep – 50 l milk/day 2 x milking)
Częstotliwość dojenia owiec Frequency of milking	– 2 razy dziennie – twice daily	
Ilość osób zatrudnionych przy dojeniu No. of milkers employed	– min 1 os. max. 2 osoby – between 1 and 2 people	
Produkty wytwarzane z mleka owczego Products made from sheep milk	– bundz – oscypek – klagan – klagany (sery podpuszczkowe) – sery twarde (gouda, cheddar, oraz „porna” bryndza – charakterystyczne dla tego regionu – hard cheeses (gouda, cheddar, “porna” bryndza – characteristic of the region	
Urządzenia do przerobu mleka na hali Devices used to process milk on pasture	Formy do oscypków, chusty, ferula (do mieszania mleka), puciera (beczka dębowa lub jesionowa) Moulds for oscypek cheese, cheese cloth, ferrule (for mixing milk), puciera (oak or ash barrel)	

Koszty związane z prowadzeniem wypasu Costs related to grazing	Media (prąd, woda, opał) Utilities (electricity, water, fuel)	30 zł/miesiąc 30 PLN/month
	Lekarstwa Drugs	ok. 20–30zł/ owcę approx. 20–30 PLN/sheep
	Dodatki paszowe i witaminy Feed additives and vitamins	ok.15 zł/owcę +lizawki approx. 15 PLN/sheep salt licks
	Materiały i środki pomocnicze do przerobu mleka Auxiliary materias for milk processing	Podpuszczka ok. 100 zł/miesiąc Rennet approx. 100 PLN/month
	Wynagrodzenie dla pasterzy Remuneration for shepherds	3000 zł/miesiąc netto 3000 PLN net/month
	Opłata za dzierżawę Payment for lease	min.1000 zł max. 2000 zł śr.1400 zł/sezon between 1000 and 2000 PLN, 1400 PLN on average per season
	Badanie wody Water tests	105 zł/rok 105 PLN/year
	Inne (narzędzia, paliwo) Other (tools, fuel)	min. 1000 max. 2500 zł / rok np. ok. 70–100zł/bal between 1000 and 2500 PLN/year, e.g. approx. 70–100 PLN/bale
Sprzedaż produktów Sale pf products	na własne potrzeby (brak sprzedaży) mleczarnia (mleko), sery dla turystów/ gości, na bacówce for own consumption (no sale) dairy plant (milk), cheeses for tourists/guests, in shepherd's huts	
Jakie ceny uzyskuje się średnio za wyprodukowane produkty Average prices obtained for the products made	Bundz 15– 28 zł/kg Oscypki 35 zł/szt Bryndza 22 zł/kg	

Major problems affecting the economics of grazing on pasture:
poor grass quality
low milk price
losses caused by wild boars, wolves and red deer
treatment costs
low live sheep procurement prices no wool and skins purchased problems with on-farm slaughter costs of shepherd employment low production profitability
harsh climate condition

The study showed that most farmers graze sheep on privately owned pastures (from 0.7 ha to a maximum of 120 ha in area, averaging 25.7 ha), and only one landholder grazes sheep in the municipality-owned area (10 ha) (Table 2). Due to the mosaic landscape and fragmented ownership, pastoral farming is difficult. It happens that one senior shepherd must agree grazing principles with 15 pasture owners. The pastures in this area are steep and hilly meadows with a slope of 35–40□. They are not always easily accessed. Some sites can be reached on foot and transport is dependent on weather conditions. On most pastures, natural water sources or wells specially dug for sheep are available. In few (often smaller) farms and in flocks grazed close to homesteads, water is brought.

The present study showed that most of the surveyed senior shepherds have raised sheep since childhood because of family tradition (Tab. 3). In their youthful years they helped their grandfathers or fathers with grazing, and pastoral knowledge was passed from generation to generation. Only few senior shepherds started to graze sheep in shepherd's huts, and most of the landholders have raised sheep for 21 years on average. Grazing in this area is family run, which means that every family member helps to run a farm and graze sheep. Hired helpers (shepherds) are seldom employed except for large dairy flocks (Podhale Cakiel, Polish Mountain Sheep). When analysing the grazing structure, most of the surveyed senior shepherds changed grazing sites in search of the land suitable for grazing, which is associated with pasture characteristics. The grazed flocks vary in size according to production type (breed of sheep). Meat flocks (Blackheaded, Suffolk, Texel) are smallest and dairy flocks largest (up to 600 sheep, taking into account the sheep taken from landholders for grazing – East Friesian, Lacaune, Polish Mountain Sheep). Native breed sheep are also raised in this area (Polish Mountain Sheep, Coloured Polish Mountain Sheep, Podhale Cakiel, Blackheaded). Sheep are grazed from the time snow recedes from high pastures until new snow falls in the autumn, or "from snow to snow". The pastures are also used for hay and as needed, the first and second cut is taken from meadows, and rejected herbage is mown from pasture areas. In the high pastures, just like in other regions of the Carpathian Mountains,

there are both permanent and temporary huts. On each farm, sheep are driven down for the night and for milking into a sheep fold or sheep house. Throughout the grazing season, to prevent the pastures from degradation and overgrazing, the sheep are driven to other pastures; strip grazing, where small areas are fenced off, is also used for efficient pasture use. Every senior shepherd grazes sheep according to his needs and there is no common timetable for the rotation of flocks. Today, droving is the main method used for sheep to reach the pastures. In exceptional cases sheep are transported to the farmer (provided that the droving route is so far that the way back would be too tiring for the sheep). The surveyed senior shepherds took sheep for grazing from 6 owners at the most (81 sheep on average, and only one landholder gave around 40 ewes to be grazed).

Due to the seasonality of sheep reproduction, milk is obtained from May to October (Tab. 4). The milk yields are highest in May and begin to gradually decline from mid-June. The sheep are milked twice daily, most often from 4:00 to 5:00 am and from 6:00 to 7:00 pm by one or two persons. The milk collected in the huts is sold to milk plants or directly processed into cheeses in the huts. Apart from “porna” bryndza characteristic of the region, regular bryndza, bundz and oscypek cheeses are also made. The milk is processed using traditional tools: moulds for oscypek cheeses, “ferrules” (for mixing milk), and “puciery” (oak or ash barrels). Cheeses are produced for personal consumption or sold with personal pick-up. The average prices of the products sold at the huts were 21 zloty/kg for bundz, 35 zloty/piece for oscypek, and 22 zloty/kg for bryndza. The main grazing costs include medications for sheep and the lease of the pastures. It is also expensive to hire the helpers who earn 3,000 zloty/month on average.

Discussion

The present study demonstrated that pastoral farming in the Beskid Sądecki region is still kept alive and sheep grazing in this area has always been varied. The grazing system was determined by the way the local places were founded and by the historical changes taking place in these areas. Shepherding was one of the ways to survive in harsh mountain areas (Kowalska-Lewicka, 1980). Today, pastoral farming is to a certain extent becoming uniform, and the predominant form of pasturing in these areas is individual grazing of flocks on own or leased fields. Typical of these areas is family grazing, which is a relic of the traditional grazing systems described by Kowalska-Lewicka (1980). Pasturing is an integral part of life of the mountain people. Over the years it has shaped their mentality and formed a characteristic culture (Zuskinová, 2018). According to those surveyed, shepherding formerly was more ritual. Interestingly, the traditions and beliefs in this region are different from those cultivated in the Podhale, which is due to ethnic determinants (Kowalska-Lewicka, 1980). The study showed that in the Beskid Sądecki region, just like in other regions of the Carpathian Mountains, especially Polish Mountan Sheep and Podhale Zackel are grazed on large areas. These two breeds of sheep are very well adapted to grazing in difficult mountain regions (Kawęcka and Sikora, 2009). In the Beskid Sądecki region, Czarni Górale are strongly involved in shepherding. Their folk costume differs from that of the other Polish highlanders and they show exceptional attachment to the mountains (Talar and Łomnicka-Dulak, 2010, 2018). For this reason, Coloured Polish Mountain Sheep have been raised in these regions for many generations (Kubiak and Molik, 2019). An important aspect of pastoral farming is landscape and biodiversity conservation. Sustainable sheep breeding and large-area grazing allows for effective use of feed resources and follows the organic farming principles (Paraponiak, 2007). Milk obtained from the sheep is directly processed in shepherd's huts using traditional cheese making technology. Products obtained from sheep milk in the mountain regions exhibit special taste and health-promoting benefits (Kawęcka and Pasternak, 2019). In the Beskid Sądecki region, sheep milk is made not only into oscypek and bundz, but also into specific local hard cheeses: gouda, cheddar and "porna" bryndza. Pastoral farming in this region also involves the grazing of meat breed sheep (Blackheaded, Suffolk, Texel) and production of market lambs. Shepherding is also an important way of preserving the traditions and culture of a given region (Drożdż, 2002; Molik et al., 2017a,b).

In summary, pastoral farming is of great economic and social importance. It is a form of social activization and investments in tourism and promotion of pasturing makes the region

attractive and creates new jobs. In our study the farmers stressed that an important aspect is professional activation related to state journeyman and master exams in the senior shepherd and shepherd professions. The granting of vocational qualifications contributes to economic activization, reduces the migration of young generation, but also helps to develop the market for traditional and regional products.

The importance of pastoral farming for the mountain and foothill region is crucial. The use of the existing cultural grazing as one of the bases for social development offers hope for the generation of sustainable development thematic clusters.

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