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VALUE CHAIN ANALYSIS FOR DEVELOPMENT

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Cashmere value chain analysis in Mongolia

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April 2024

Funded by the European Union

Czech University of Life Sciences Prague

cirad LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

UNIVERSITY of GREENWICH
NRI | Natural Resources Institute

Value Chain Analysis for Development (VCA4D) is a tool funded by the European Commission / INTPA and is implemented in partnership with Agrinatura.

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For this VCA4D study, COLEAD (https://www.colead.link/) has provided information on market trends on national, regional and international markets and useful complementary elements or sources.

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The report was produced through the financial support of the European Union. Its content is the sole responsibility of its authors and does not necessarily reflect the views of the European Union.

The report has been realised within a project financed by the European Union (VCA4D CTR 2017/392-416).

Citation of this report: Morton, J., Kotyza, P., Vigne, M., Dashbaal, B. 2024. Cashmere value Chain Analysis in Mongolia. Report for the European Union, DG-INTPA Value Chain Analysis for Development Project (VCA4D CTR 2017/392-417), 122p + annexes.

VCA4D Project Management Unit Support

Frédéric Lançon, Heval Yildirim | Methodology and economic analysis software (AFA)

Giorgia Mei, Olimpia Orlandoni, Sara Baumgart | Project Management and Graphic Design

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ACKNOWLEDGMENTS

We are grateful to all the value chain actors and stakeholders who assisted us with their time, insights and information. We are particularly grateful to the herding families we met in different parts of Mongolia for their patience and good humour in answering our questions and for their hospitality. Special thanks to Bartłomiej Bajan, Erdenebayar Erdenebat and Gerelsaikhan Orgilsaikhan for assistance during preparation of the economic and functional analyses, and to Daniel Murphy and Elizabeth Fox for advice and provision of documents during preparation of the social analysis. We are grateful to the Mongolian National Federation of Pasture User Groups for provision of office space, and our drivers Batbold and Ankhaa. The European Union Delegation in Mongolia provided very helpful comments on interim presentations and drafts. We would like to thank the VCA4D Programme Management Unit for their support.

ACRONYMS AND MONGOLIAN TERMS (in alphabetical order)

Aimag	Province: Mongolia is comprised of 21 aimags and one province-level municipality
AoP	Area of Protection (in Life Cycle Analysis)
AVSF	Agronomes et Vétérinaires Sans Frontières
Bagh	Smallest local government unit, a soum comprises several baghs
Changer	Middleman
Dzud	An extreme weather event involving intense cold and/or heavy snowfall
EUD	European Union Delegation
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
Ger	The traditional Mongolian mobile dwelling, made of heavy felt on a wooden frame
GI	Geographical Indication
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ILO	International Labour Organization
IPOM	Mongolian Intellectual Property Office
LCA	Life Cycle Analysis
M	million
MACE	Mongolian Commodity Exchange
MASM	Mongolian Agency for Standardisation and Metrology
MITUF	Mongolian Industrial Trade Union Federation
MNFPUG	Mongolian National Federation of Pasture User Groups
MNT	Mongolian Tugrik
MOFALI	Ministry of Food, Agriculture and Light Industry
Negdel	Herding collective under the former communist system
NSO	National Statistical Office
PUG	Pasture User Group
RNS	Responsible Nomad Standard
RUA	Rangeland User Agreement
S3C	Sustainable Cashmere Certification Committee (as name of standard)
SDC	Swiss Agency for Development and Cooperation
SFA	Sustainable Fibre Alliance
Soum	Intermediate local government unit: most aimags comprise 15-25 soum
t	tonne
UNFPA	United Nations Population Fund
Unicef	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
VA	Value added
VC	Value chain
VCA4D	Value Chain Analysis for Development
WCA	Wool and Cashmere Association

DEFINITION OF ECONOMIC TERMS

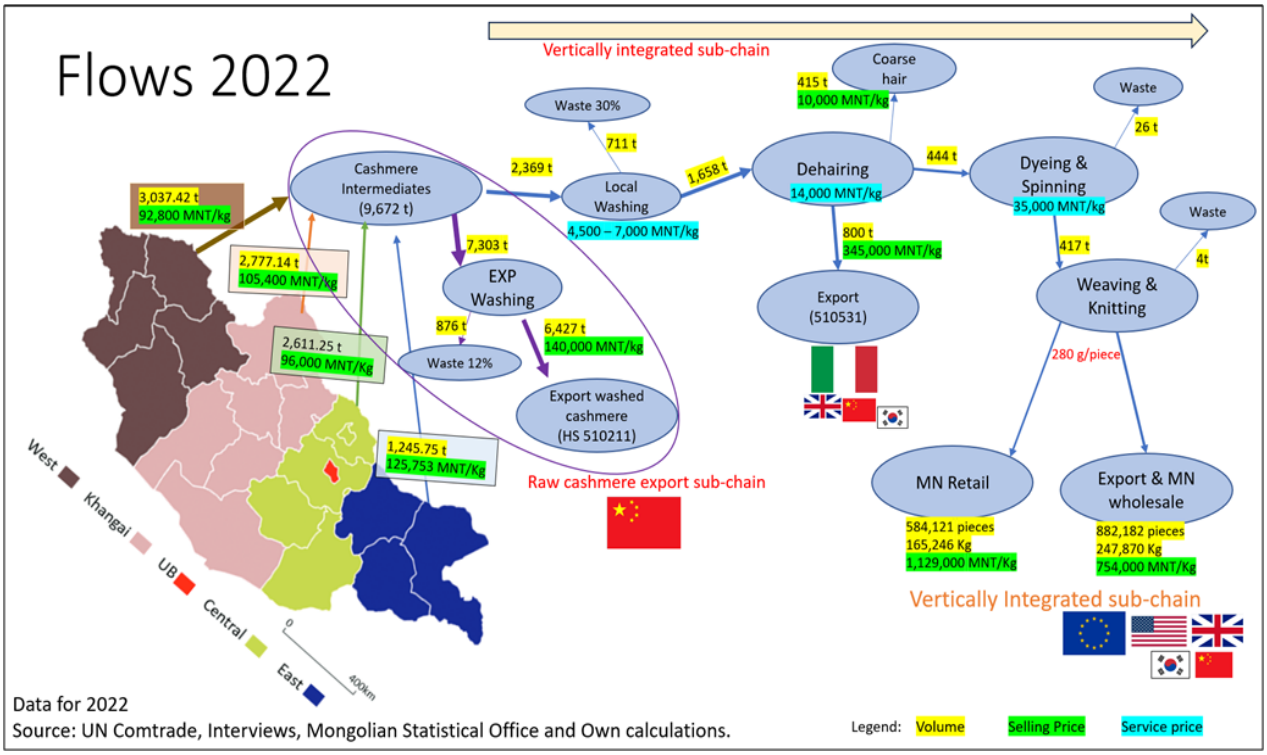
Economic terms	Definition
Net operating profit (NOP) (without valuing unpaid family labour)	(Revenues – Expenses) – Depreciation
Direct value added (VA)	The sum of the VA generated by all the actors operating within the VC limits (i.e. actors producing, processing or channelling the VC product)
Indirect VA	The sum of the VA generated by all the suppliers external to the VC (i.e. actors providing intermediate goods and services to the VC actors, therefore not handling nor processing the VC products)
Total VA	The sum of the direct and indirect VA
Rate of integration within the domestic economy	The portion of the value of the VC production which eventually remains within the national economy Rate of integration = Total VA / Production of the VC
Driving effect ratio	It informs on the involvement of domestic business in supporting the activities of the VC. Driving effect ratio = Indirect VA / Direct VA
Public funds balance	Impact on public funds= Benefits [*Total taxes* + *Total OP of public companies*] - Costs [*Subsidies* + *other public outlays*]
Balance of trade	Impact of the VC on balance of trade = VC exports – VC Total imports (inputs/ good and services/intermediate consumptions)
Nominal Protection Coefficient (NPC)	It compares the national and international prices of every VC product. NPC= Domestic price of the product / International parity price of the product
Domestic Resource Cost Ratio (DRC)	It compares (i) the actual internal cost for the economy given by the actual remuneration of the domestic non-tradeable factors (e.g. labour, capital, land, environmental goods) mobilised in the VC, and (ii) the net value created within the economy: estimated using international parity prices (of IC and production), i.e. from the opportunity standpoint of international markets. DRC= Non-tradeable domestic factors at market price (excluding transfers) / (Production at international price – Tradeable intermediate goods and services at international prices)

Exchange rate 2022
1 USD = 3,144 Mongolian Tugrik (MNT)
1 EUR = 3,302 Mongolian Tugrik (MNT)

EXECUTIVE SUMMARY

The raising of cashmere goats and harvesting of cashmere is practiced by the great majority (87%) of Mongolian herding families, amounting to 190,700 households, and is an important income source for them. The goat population has grown dramatically since the end of the soviet-dominated era. This dramatic increase in the number of goats raised for cashmere is universally acknowledged to be a primary cause of the rangeland degradation widely observed throughout Mongolia.

A Functional Analysis of the cashmere value chain (VC) presents data on increasing raw cashmere production in Mongolia, to 10,764 tonnes in 2020 with a slight decline since, compared to Chinese production, at 14,649 tonnes in 2022, down from a peak of 18,884 tonnes in 2016. An overview of the cashmere production process is presented, including goat breeds, goat population growth, combing practices, and contribution of cashmere to herder revenues, with disaggregation by aimag and by herder wealth where appropriate. Transactions along the VC, and technical operations during processing, are described, leading to characterisation of two sub-VCs: the raw cashmere export sub-chain involving export of minimally processed cashmere to China, and the vertically integrated sub-chain, involving export of dehaired cashmere to international markets, exports of garments, and retail of garments within Mongolia.



The Mongolian cashmere VC is characterized by a large number of standards and voluntary labelling schemes, promoted by different organizations. These are variously intended to promote environmentally sustainable production by herders, environmentally sustainable processing, and high quality of fibre, and are very important for the development of the VC. Increased promotion of the two nationally recognized standards as labels; and greater harmonization of different standards and schemes, are recommended.

The VC proves to be both economically profitable and sustainable, particularly at the level of herder families. Profitability is very similar across regions and between smaller and larger herders. Large herders sell a larger share of goats, produce less milk, and diversify their income into other animal species. Generally, large herders are less dependent on income from cashmere.

However, as we move down the processing chain, the economic results become more intricate. The most challenging situation is observed at the level of integrated large textile producers, who are exposed to large costs of interests. Profit margins are: 0.8% for middlemen, 4.6% for export washing, 15.4% for export dehairing, 5.6% for processing wool into apparel, 21.8% for small textile processors who outsource the washing to spinning process and 3.4% for retail.

The entire cashmere VC processing sector relies on loans for about 100% of its revenues, and from this amount, interest must be covered. Despite the presence of green loans, government loans, or soft loans supported by international donors, the interest paid still amounts to roughly 20% of total revenues in the whole VC. Loans are mostly used for purchasing cashmere during the short combing time.

Key findings on the contribution of the VC to national economic growth are given below.

INDICATORS	RESULTS
Value of final VC production	**2,108,676 million MNT**
Direct VA	**1,851,338 million MNT**
Total VA	**1,919,139 million MNT**
Total VA creation per stage	**Farmers: 73.9 %** **Transformation: 21.6 %** **Retail: 4.5%**
Total VA in percentage of the GDP	**3.6%**
Rate of integration into the Economy (total VA/VC production)	**91%**

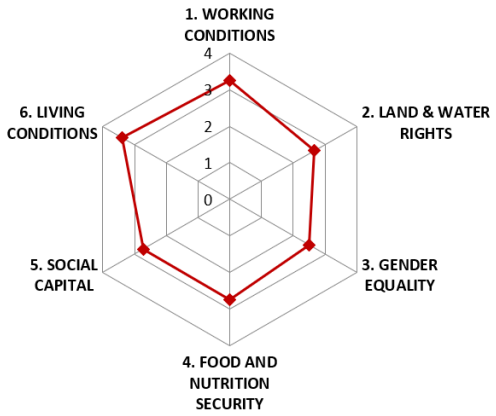
The VC contributes 27.4% to agricultural GDP. It contributes a net 62,056 million MNT to public finances and a net 1,210,020 million MNT to the balance of trade.

The economic growth driven by cashmere production is inclusive, a fact supported by several arguments. The VC provides employment opportunities for a significant number of women across various age groups. Salaries in the cashmere transformation sector are on par with the national average (1,503,800 MNT/month), making employment in cashmere processing highly sought after. As a benchmark, salaries in processing factories are approximately 50% higher than those in retail stores in the capital city, Ulaanbaatar. In total, it has been estimated that the VC provides employment of 7,584 workers in full time equivalent and provided net salary of 96,131 million MNT.

Furthermore, the high price of cashmere enables herders to increase their income, consequently reducing migration from the countryside to Ulaanbaatar. Also, during the combing season, herders

mentioned that they provide temporary employment opportunities (combing, shearing, etc.) to locals who might be unemployed. The downstream of the VC is mainly supported by female employees. Herders generally do not actively participate in the VC governance. Herders have limited potential to influence prices. Low negotiation power is further diminished by advance payments provided by middlemen.

Analysis of the social aspects of the cashmere VC is complicated by the very different social characteristics of the production stage and the processing stage, but overall the Social Analysis shows a VC where social indicators are favourable, especially in comparison with other low- and middle-income countries in which VCA4D analyses have been carried out.



In the processing sector, improvements in working conditions can undoubtedly be made, but there are signs of progress in activities being undertaken by MITUF and by employers, and the sector is attractive, especially for women, in comparison with other sectors of the Mongolian formal economy.

Major issues in the herding sector include gender inequality and the unattractiveness of the herding livelihood to younger generations especially girls. A lack of dietary diversity needs to be tackled by measures outside the VC. The development of community-level institutions for herders, PUGs and member-owned cooperatives, is progressing but still present in a minority of communities. The important issue of rangeland governance is being addressed through measures now progressing through parliament. Overall, the Social Analysis suggests that there are no major social factors militating against further investment by international donors in the VC and that such investment can enhance social wellbeing.

The Environmental Analysis provides a breakdown of the different stages of the cashmere VC to impacts on human health, ecosystems and resource depletion. Livestock production is the major contributing stage, being responsible for around 70% of overall impacts on these three pillars, virtually all of the impacts on ecosystems, and over 40% of impacts on human health. This impact is largely through overgrazing. The dyeing process contributes 36% of the impacts on resource depletion and 26% of the impacts on human health, especially through human non-carcinogenic toxicity, freshwater ecotoxicity and marine ecotoxicity. We also see impacts on climate change mainly (with certain caveats) through methane emission from livestock, and on biodiversity from grazing practices. Addressing rangeland degradation through improved institutions, increasing renewable energy use in processing, reducing GHG emissions from livestock, and facilitating sustainable chemical use and water treatment in processing are key areas of intervention.

Recommendations

Global interest in cashmere that is sustainable in terms of impact on the natural environment and the welfare of producing families is increasing, and Mongolian stakeholders are highly aware that this market can be tapped. There is wide agreement that with the right enabling actions and policies Mongolia can enter a virtuous cycle of verifiable high quality driving higher prices so that herders can get increased income from fewer goats, further raising quality.

The most important recommendation of this report is that international development donors should continue to support the cashmere VC in Mongolia as a source of rural livelihoods, high-grade urban employment and as an important contributor to national economic growth and diversification from mineral exports. Some of the most important specific recommendations arising from the analysis are as follows:

Livestock Services

- Support to herders through the improved design, management and communication of herder-level animal health services and livestock production advice.

Standards

- Collaboration by multiple VC actors on enforceable standards and well-promoted voluntary labelling schemes that: Incorporate animal health and welfare; guarantee herder incomes; incentivise higher quality production; and incentivise caps on goat numbers relative to rangeland resources. Promotion of such standards and labelling schemes to exporting companies, to drive increased demand for high quality Mongolian cashmere.

Livestock Production and Herder Livelihoods

- Promotion of livestock-based value chains beyond cashmere by government, civil society and international partners.
- Strengthening of the policy and legal framework for governing herder access to rangelands.
- Support to programmes of capacity-building for soum governments and PUGS.
- Mechanisms put in place for increased availability of cash flow to intermediate actors.

Marketing between Herder and Factory Level

- Promotion of member-owned cooperatives through a favourable policy environment and through capacity-strengthening.
- Piloting an auction model at herder level, to tighten the link between herder price and fibre quality.

Processing and Trade Policy

- Mitigation of the negative environmental impacts of processing enterprises through increased use of renewable energy.
- Enforcement of existing standards on sustainable use of chemicals and wastewater treatment in processing, and greater use of existing internationally recognised green certified chemicals.
- Increased attention to the quality of dehairing – some current processes are superficial.
- Incentives for the development of regional processing centres to offer more jobs outside Ulaanbaatar.
- Increased availability of targeted subsidised credit for both investment and operational purposes, including green loans designed to increase environmental resilience.
- Increased trade diplomacy by government to promote industries and offer feasible investment conditions to generate more FDI in (not only) animal product processing.
- Increased provision of training for the highest level of specialists within the VC.
- Capacity building for SMEs to manage risks associated with exchange rate fluctuations.

1. INTRODUCTION

Cashmere refers to a type of luxurious and fine wool that comes from the soft undercoat of certain breeds of goats, particularly the Kashmir goat. These goats are native to the Himalayan regions of India, Nepal, and Tibet, but they are also found in other parts of the world.

The name "Cashmere" is derived from the region of "Kashmir," situated in the western Himalayas. While the production of the fibre in this region is currently limited, cashmere is predominantly cultivated in northern China, Mongolia, Tibet, and Afghanistan. Additionally, smaller quantities of cashmere are generated in the Central Asian Republics, Iran, Australia, and New Zealand (Dalton & Franck, 2001).

The term "Pashmina" is commonly used in literature as another name for cashmere fibre. However, it is important to clarify that pashmina refers specifically to a special type of fine cashmere wool derived from Changthangi goats, also known as Changra, raised in the Ladakh region of India (Bhattacharya, Misra, Sheikh, Kumar, & Sharma, 2004). Pashmina, which has much lower annual production, is also called “Indian cashmere” and is generally finer (10-14 μm), softer and warmer than cashmere (Ammayappan et al., 2011).

Cashmere goats, scientifically identified as *Capra hircus laniger* and colloquially referred to as "shawl goats" or "Tibetan goats," exhibit a dual-layered coat consisting of two fibrous types, typically in a white hue. This includes a robust outer coat, known as coarse guard hair, and a delicate undercoat termed fine down hair. The coarse guard hair serves as a protective barrier against elements such as rain, shrubs, thorns, and other external factors (Hunter, 2020). The fine down fibres enables goats to sustain the extreme winter temperatures of Central Asian Highlands (Dalton & Franck, 2001). In general, the fine down fibres tend to grow during the summer, aiding the animal in adapting to winter conditions. As the seasons change and warmer spring weather approaches, these fibres are shed since the animal no longer requires the highly insulating layer for warmth (Hunter, 2020).

According to the US Wool Products Labelling Act, cashmere is defined as

- the fibre consists of the fine (dehaired) undercoat fibres produced by a Cashmere goat (*Capra hircus laniger*).
- the average diameter of the cashmere fibre does not exceed 19 microns.
- the cashmere fibres in the wool product contain no more than 3% (by weight) of cashmere fibres with average diameters that exceed 30 microns.

According to this definition, the coarse guard hair of the cashmere goat is not therefore considered to be cashmere (Hunter, 2020).

The cashmere value chain (VC) is of great importance to Mongolia, with cashmere and cashmere products forming the largest non-mineral export commodity. Mongolia is by some counts the world’s largest producer of raw cashmere, and the second largest producer of cashmere products after China – which currently processes a large proportion of Mongolian cashmere. Sub-VCs are complex, with herders, middlemen and co-operatives as actors at the primary level, Mongolian factories interacting with international buyers, and Chinese-owned factories exporting minimally processed cashmere to China. Mongolia has a strong and legitimate interest in capturing a higher amount of value added from its cashmere.

Pastoralism employs a third of Mongolians, providing more jobs than any other sector (2030 Roadmap report). The raising of cashmere goats and harvesting of cashmere is practiced by the

great majority (87%) of Mongolian herding families, amounting to 190,700 households,[1] and is an important income source for them. The goat population has grown dramatically since the end of the Soviet era[2], getting very close to the sheep population by 2010, sheep being the preferred meat source for Mongolians and the source for the coarse wool that was Mongolia's major livestock export during Soviet times. This dramatic increase in the number of goats raised for cashmere is universally acknowledged to be a primary cause of the rangeland degradation widely observed throughout Mongolia.

Global interest in cashmere that is sustainable in terms of impact on the natural environment and the welfare of producing families is increasing, and Mongolian stakeholders are highly aware that this market can be tapped by various forms of certification. There is wide agreement that with the right policies and certification practices Mongolia can enter a virtuous spiral of verifiable high quality driving higher prices so that herders can get increased income from fewer goats, further raising quality. There are at present several certification schemes at both herder and factory level and there is a slow process of harmonisation of these schemes and getting government backing for them. Attention also needs to be paid to the issue of cashflow and credit at all stages of the VC.

In order to support the policy dialogues with up-to-date analysis of the performance of the cashmere VC, the European Union Delegation (EUD) in Mongolia commissioned this expertise following the methodology developed with the Value Chain Analysis for Development (VCA4D) facility funded by the International Partnership (INTPA) Directorate of the European Commission.

After the functional analysis of the VC (mapping), the VCA4D method addresses four framing questions:

- What is the contribution of the VC to economic growth?
- Is this economic growth inclusive?
- Is the VC socially sustainable?
- Is the VC environmentally sustainable?

The study used the VCA4D methodology, and was carried out between May and December 2023, including two missions to Mongolia by the international team members (Morton, Kotyza and Vigne) in June-July and September-October 2023. National Consultant Burmaa Dashbal worked with the team throughout. Full itineraries and lists of people met by the VCA4D team is given in Annex 1. During the two missions the team held a series of meetings with government departments (including the National Statistical Office), trade associations, international organisations, NGOs, researchers, and secondary cooperatives in Ulaanbaatar, which allowed them to access a wealth of secondary data, reports etc., and carried out three visits to leading cashmere factories.

We carried out field interviews in selected soums (districts) of Tuv, Khentii, Bayankhongor, Arkhangai and Khuvsgul Aimags (provinces), in very different ecosystems. Generally, work in each soum consisted of a meeting with the soum Governor and senior technical staff, e.g in veterinary services and rangeland management, a meeting with one or more senior staff of a co-operative active in cashmere marketing, and an interview with a herding family producing and selling

[1] National statistical office data https://www2.1212.mn/tables.aspx?TBL_ID=DT_NSO_1001_027V1

[2] Mongolia and its development policies were strongly dominated by the USSR from 1924 to the early 1990s, while of course remaining in formal terms an independent and sovereign state. The term "Soviet era" is used here for convenience.

cashmere, in the family's *ger*.[3] In each meeting, all three international team members asked questions from mental checklists relating to their respective components, with interpretation by Ms Dashbal, but there were no firm boundaries for who asked what, and we were all able to follow new lines of enquiry depending on responses. This schedule allowed us to investigate the strong regional variations in production, the situation of producers, and marketing patterns across Mongolia[4], given the large distances to cover and the practical problems of convening multi-herder focus groups. There was however a limit on the extent to which all three analyses could be covered in one meeting, and a possible criticism that depending on co-operative officials to identify herders for interview may have skewed the inquiry towards more successful herders and away from those not engaging with co-operatives. However, we are confident that the field interviews generated insights that can be triangulated with development reports and published literature to give an accurate and useful analysis integrating the three components.

During the second mission, the team continued with interviews with a range of stakeholders, including three smaller factories with more limited processing functions and the trade union representing cashmere processing workers. We also held a group interview in Bayanakhangai soum, Tuv aimag with herders who were not selling cashmere through a co-op, to balance any possible co-op bias in the earlier interviews. Further important reports and secondary data were obtained. The team also consulted recent academic research on Mongolian society (e.g. Sneath 2018).

[3] The traditional portable felt and wood dwelling of most Mongolian herders, sometimes referred to in English by the Turkic term *yurt*, or as a "tent" – which does not convey the permanence or comfort of these homes.

[4] A visit to Western Mongolia, where producers are poorest and quality is lowest, was not possible given time and logistical constraints. For the purpose of the analytical work, we gained information about Western Mongolia from relevant literature, interviews and statistical data available.

2. FUNCTIONAL ANALYSIS

2.1 Global Production of Raw Cashmere

The majority of global cashmere production, accounting for over 90%, originates from China and Mongolia (Hunter, 2020). Iran, in conjunction with Afghanistan, holds the position as the third-largest cashmere producer globally, following China and Mongolia (Atav & Hunter, 2023). Smaller contributors to cashmere production include India, Nepal, Pakistan, Tibet, Kazakhstan, Tajikistan, and Kyrgyzstan. While these countries collectively produce a smaller quantity of cashmere.

In 1991 the average annual raw cashmere production worldwide was: China 10,000 tons, Mongolia 3,450 tons, Iran and Afghanistan 1,800 tons, Pakistan-600 tons, New Zealand-150 tons and Australia 65 tons. In 1999, China's production increased to 20,000 tons and Mongolia's production increased to 5,600 tons (Atav & Hunter, 2023).

In the 1990s, residents in Kazakhstan, Kyrgyzstan, and Tajikistan began selling raw cashmere primarily to Chinese traders. Afghan producers have been involved in cashmere sales for a longer duration. In contrast to China and Mongolia, cashmere from Central Asian and Afghan producers is sold without sorting and at relatively modest prices. Traders do not provide producers with varied prices based on quality, even though global market prices are highly influenced by quality. Consequently, producers miss out on potential value. The goats of Central Asia and Afghanistan could produce the finest qualities typical of Chinese and Mongolian cashmere (Kerven, McGregor, & Toigonbaev, 2009).

Apart from the above-mentioned countries, cashmere is also produced in Australia and New Zealand, and the UK. Attempts have also been made to breed goats with fine down fibres in the USA, South Africa, and some other European countries (Spain, Italy, Norway) (Dalton & Franck, 2001).

After the political changes of late 1980s and 1990s, China served not only as a substantial producer but also as a significant importer of raw cashmere. While nearly all cashmere was until the early 1990s sold to established processors in Europe and Japan, Chinese cashmere processors now processed most of the world's cashmere products (Waldron, Brown, & Komarek, 2014).

Due to high labour and other input costs that lacked competitiveness, European nations with a historical involvement in processing raw or partially processed cashmere—primarily Italy, Belgium, and the UK—have scaled down their cashmere processing facilities in Europe. Consequently, several European and some USA companies have formed collaborative ventures with Chinese and Mongolian cashmere processors (Ansari-Renani, 2014).

Most of the world's cashmere, irrespective of its country of origin, currently undergoes processing, either entirely or partially, in China. The notable exception to this trend is in Mongolia, where there exists a robust system for both cashmere production and processing (Waldron et al., 2014).

2.1.1 Chinese Production of Cashmere

The bulk of cashmere in China is produced in the north-western provinces. The cashmere is obtained by plucking or combing the goats in the first few weeks of June, which is then packaged and shipped to processing centres. Cashmere from China is considered the finest and of superior

quality[5]. The liberalization of the Chinese economy by the government in the mid-1980s resulted in a somewhat tumultuous period during which prices increased, the quality declined, and acquiring cashmere became challenging and intricate (Atav & Hunter, 2023). Table 2-1 compares the 2 basic indicators of cashmere quality comparing China and Mongolia.

	Average size of microns	Length (mm)
Chinese cashmere	**13.5 – 14.5**	**33 - 35**
Mongolian cashmere	15.5 – 16.0	38 – 43

TABLE 2-1: QUALITY OF CASHMERE
Source: Yondonsambuu & Altantsetseg (2003)

To bring order to the distribution of fibres and uphold quality standards, as well as enhance the quality of exported goods, the Chinese government implemented regulations in 1989. These regulations mandated testing and led to the establishment of a Cashmere Foreign Trade Centre in 1990 to oversee exports. The Centre organises four trade fairs each year for cashmere sales and imposes limits on export prices. Additionally, in 1991, the Chinese government enacted another regulation stipulating that all textile products from China must carry a label indicating their origin, cannot bypass quota restrictions, and may only be exported to countries that have entered into bilateral trade agreements with China. However, with the general opening up of the Chinese trade, the cashmere market was no longer controlled and cashmere trading open to everyone.

Years	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production (1,000t)	17,307	18,465	18,684	18,844	17,852	15,438	14,964	15,244	15,102	14,649

TABLE 2-2: PRODUCTION OF RAW CASHMERE IN CHINA, TONNES
Source: National Bureau of Statistics of China (2023)

Over the last 10 years, a declining trend in Chinese raw cashmere production has been observed (Table 2-2). In 2013, Chinese herders collected 17,307 tonnes of noble fibre; however, in 2022, the collection was only 14,649 tonnes.

2.1.2 Production of Cashmere in Mongolia

Although Mongolia holds the position as the world's primary supplier and exporter of cashmere, industrial processing of cashmere only commenced in the mid-1970s in the country. The USA was the largest buyer of cashmere (in an unprocessed form) between 1945 and the mid-1970s (Heritage Cashmere, 2003 cited in Atav & Hunter, 2023).

The foundation for the industrial processing of raw cashmere was established in 1976 with the inauguration of a small pilot factory, equipped with cutting-edge technology provided by Japan with the assistance of the United Nations Industrial Development Organization (UNIDO). Later, with a production capacity exceeding one hundred tons of combed cashmere, 200 tonnes of camel hair, and the manufacturing of 68 tonnes of tops (washed, unspun wool), along with 120 tons of yarn and over four hundred pieces of knitted wear, the Gobi factory was established with the support of a grant aid from the Japanese government. The successful launch of the first experimental factory (renamed Buyan), as well as the subsequent success of the Gobi factory, stimulated growth in other sectors of the cashmere industry. Initially, cashmere products were intended for export to third-world countries. The managerial staff, trained to operate in open markets, attracted a

[5] However, the length is also an important parameter. The longer the fibre, the better for spinning. In the length parameter, Mongolian cashmere is also appreciated (Yondonsambuu & Altantsetseg, 2003).

significant amount of foreign (US, Italian, UK, Japanese) and local investment during the first ten years of market transition. (Yondonsambuu & Altantsetseg, 2003).

In 1990, there were only 2 cashmere processing companies. By 2003, the total number of factories had reached 450. Approximately 10% of these were initiated with Chinese capital, focusing on the primary processing of raw cashmere. Simultaneously, several Chinese knitting factories were set up to knit final products using imported Chinese cashmere yarn and export garments labelled as 'Made in Mongolia' to the USA. During this period, the USA had imposed import quotas, and Chinese producers sought to utilize the Mongolian quota for their products (Yondonsambuu & Altantsetseg, 2003).

Cashmere produced in the central part of Mongolia is acquired through the annual combing of goats, following a similar practice as in China. Mongolian cashmere, while coarser than its Chinese counterpart, boasts longer fibres (de Weijer, 2007). Combing takes place towards the end of spring when the weather is warmer. The cashmere is then transported to global markets through Russian agents. The USA has been the predominant buyer of Mongolian cashmere products (Atav & Hunter, 2023).

Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production (1,000t)	5,472	6,326	7,010	7,727	8,053	8,591	9,330	9,967	9,972	10,764	10,092	9,672

TABLE 2-3: PRODUCTION OF RAW CASHMERE IN MONGOLIA, TONNES
Source: National Statistics Office (2023b)

Table 2-3 and Figure 2-1 display the total production of cashmere in Mongolia. As seen from the table, in 2011, production was 5.4 thousand tonnes. Since then, total production has almost doubled. The highest recorded production was in 2020, reaching 10.7 thousand tonnes. Subsequently, a slight decline in production is observed. In 2022, the Mongolian Statistical Office registered a production of 9,672 tonnes of raw cashmere. Comparing Mongolian and Chinese production, we can conclude that between 2016 and 2022, Chinese production decreased from 18,800 tonnes to about 14,600 tonnes Both trends — the decreasing trend in China and the increasing production trend in Mongolia — resulted in the fact that the global share of Mongolian cashmere production increased by 10 percentage points, from 26% to 36%.

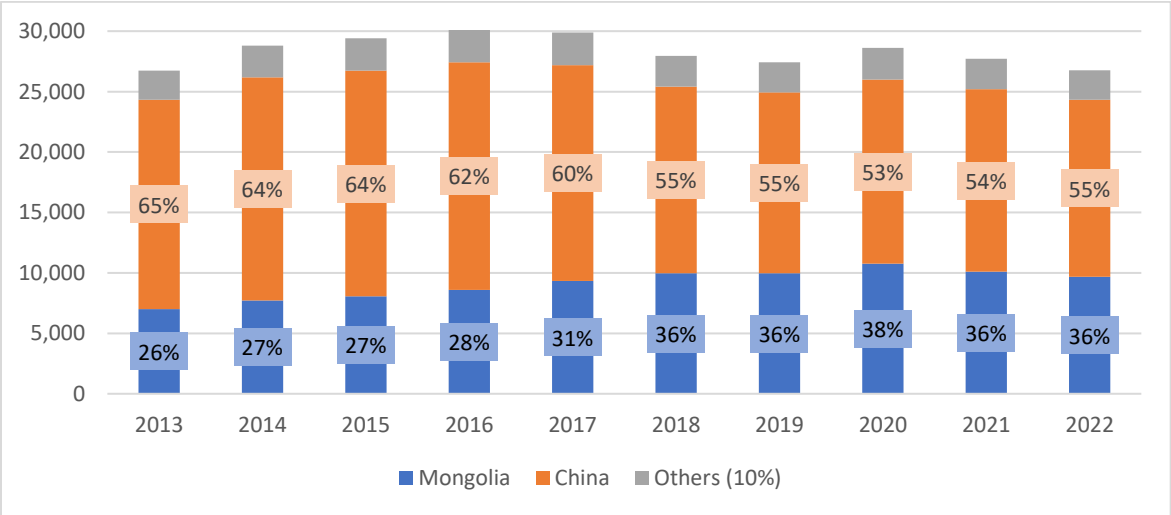


FIGURE 2-1: GLOBAL DEVELOPMENT OF RAW CASHMERE PRODUCTION
Source: Own figure based on Hunter, 2020; National Bureau of Statistics of China, 2023; National Statistical Office, 2023b.

In general, there are 4 basic cashmere colours produced (Figure 2-2):

Beige and Reddish (Brown)
The beige and reddish goats are well-adapted to the pastoral conditions of the Gobi Desert and steppe regions. Their cashmere is light in colour with slight orange tint and made distinct by its elasticity and silkiness.

White
The pure white goats, usually of medium size with sun-shaped horns and bright black eyes, are well adapted to graze in extremely hot and harsh climate of the Gobi Desert.

Blue Gray (Lighter)
The blue grey goats are incredibly rare. Their warm cashmere can only be found in sparsely populated western Mongolia, making up only 2% of the country's goat population.

Dark Grey (White creamy)
The dark-grey goats graze in high mountains and forest-steppe regions of Mongolia. They produce especially long fibre with a good viability.

FIGURE 2-2: COLOURS OF MONGOLIAN CASHMERE AS DISPLAYED IN THE GOBI SHOWROOM, ULAANBAATAR. (SOURCE: AUTHORS)

#	Quality grade	Average fineness (diameter), microns	Average length, mm (higher)	Share of coarse, intermediate fibre, %	Waste, dandruff content, % (not greater than)	Grease content, % (not greater than)
A. Dehaired cashmere						
1	MNF Premium	12.0-15.5	36	0.2	0.2	0.8
2	MNF	15.51-16.2	38	0.25	0.25	0.8
3	I	16.21-16.8	40	0.3	0.3	0.8
4	II	16.81-17.50	40	0.3	0.3	0.8
5	III	17.51-19.0	40	0.3	0.3	0.8

TABLE 2-4: QUALITY STANDARD FOR MONGOLIAN CASHMERE
Source: Mongolian Agency for Standard and Metrology (2015)

The Mongolian Agency for Standards and Metrology (2015) defines the quality of cashmere in the following way. The normal moisture content for dehaired cashmere shall be 16%. Five categories

are defined (Table 2-4). Mongolian Noble Fibre (MNF) defines superior fibre quality, with the lowest share of coarse and intermediate fibre.

2.2 Cashmere Goats

Cashmere goats typically inhabit elevated altitudes characterized by cold and rigorous winters, with an average lifespan of 7 years. Although they are generally smaller than Angora goats, the size of cashmere goats varies based on their origin and the regions where they reside. These goats typically stand between 60-80 cm in height, with males averaging around 60 kg and females around 40 kg in the more favourable areas. It is worth noting that Cashmere goats in the Gobi Desert tend to be smaller in size (Dalton & Franck, 2001). These goats are strong, active and can withstand even the lowest temperatures (Alvigni, 1979).

In Mongolia, generally those goats breeds are recognised by the Veterinary Hospital and Breeding Center (2017b). The table 2-5 identify the recognised goat breeds and their main characteristics (for fat female goat).

Breed (Female goat)	Weight (Kg)		Cashmere		
	May	October	gram	diameter, μm	length, cm
Zalaa Jinsat - Edren	28	40	300	≥16.0	≤5.0
Bayandelger Red goat	33	45	480	≥16.0	≤5.0
Altay Red Goat	38	48	420	≥15.0	≤5.0
Zavkhan Buural	33	45	330	≥15.0	≤5.0
Mongol Goat	30	40	250	≥15.0	≤5.0
Uuliin Bor Goat	29	42	600	≥18.0	8
Gobi Gurvan Saikhan Goat	28	39	450	≥18.0	8
Ulgii Red Breed	30	45	320	≥14.5	≤5.0
Erchim Black Goat	31	45	285	≥15.0	≤5.0

TABLE 2-5: BREEDS OF MONGOLIAN GOATS, AND THEIR MAIN CHARACTERISTICS (FOR FAT FEMALE GOAT[6])
Source: (Veterinary Hospital and Breeding Center, 2017b)

According to the information presented by Restall (2001), native animals exhibit cashmere of the desired fineness, displaying variations in combed-down yield, along with diverse colours. The appropriate breeding goal for these herds is to enhance cashmere weight while preserving the fine diameter of the cashmere within each breed or strain. This aims to maintain their adaptability and fitness for the specific environment they inhabit.

According to the Status of genetic resources of Mongolia's livestock (2017b), the Mongol Goat is the most dispersed over the territory of Mongolia (Figure 2-3).

[6] The source also identifies the diameters for bucks and yeanlings. Yeanlings' cashmere is softer with smaller diameter.

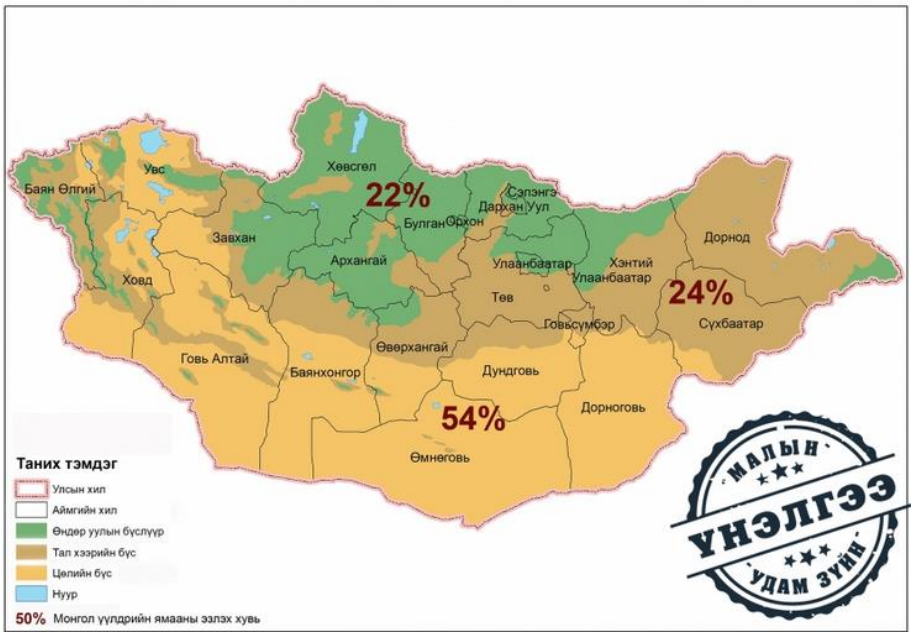


FIGURE 2-3: SHARE OF MONGOL BREED OVER THE MONGOLIAN TERRITORY
Source: Veterinary Hospital and Breeding Center, 2017a

It can provide a reasonable production combination of milk and cashmere. The main feature of the Mongol goat is that it is fully adapted to pasture grazing in the extreme natural and climatic conditions of Central Asia. Mongol goats grow intensively up to 1.5 years of age reaching 73.8% of the mother's weight, and further its growth continues until 4.5 years of age and reaches 97.4% of the adult goat's live weight. Mongol goats gain maximum fattening strength in summer and autumn and enter the year after losing 25-27% of their autumn weight in winter and spring.

Mongol breed goats have different colours in different regions of the country. Since 1958, due to the crossbreeding of local goats with foreign breeds, more than 60% of them became dark-skinned (Figure 2-4). Crossbred goats and their offspring are a result of Russian crossbreeding strategies. These animals are very variable and yield large quantities of coarse cashmere (17-22 microns) (Restall, 2001). But in recent years, due to the intensive use of red goats of the hybrid strain as the main improver, the skin of Mongolian goats has changed, and the production of light cashmere has increased.

FIGURE 2-4: DARK SKINNED MONGOL BREED. SOURCE: VETERINARY HOSPITAL AND BREEDING CENTER (2017A)

It is important to pay attention to the strengthening and development of the beneficial agricultural and biological characteristics of Mongol goats by selecting and breeding them "within themselves". For this purpose, it is necessary to continuously carry out measures to spread and strengthen the good characteristics of goats of good origin and breeding quality by using them to the maximum.

As indicated in Table 2-6, the diameter of Mongolian cashmere (thickness) increased by 2 microns between 1993 and 2002. The explanation was the following:

- The proportion of mixed breeds with higher production (Gobi Gurvan Saikhan, Uuliin Bor), but thicker fibre was increasing.
- Increase in the numbers of adult male goats.

	1993	1994	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Average microns	15.4	15.5	16.0	16.2	16.1	16.6	16.7	17.0	17.4	17.1

TABLE 2-6: THE DIAMETER OF FIBRE OF THE MONGOLIAN CASHMERE AS DELIVERED TO GOBI CASHMERE COMPANY
Source: Source: Yondonsambuu & Altantsetseg (2003)

2.2.1 Animal and Goat Numbers in Mongolia

The animal population did not undergo significant changes until the change in regime. Between 1970 and 1990, the total number of animals remained relatively stable (Table 2-7).

	1970	%	1990	%	2000	%	2010	%	2022	%
Horse	2,318	9%	2,262	8%	2,661	8%	1,920	6%	4,821	7%
Cattle	2,108	9%	2,849	10%	3,098	10%	2,176	6%	5,513	8%
Camel	633	3%	538	2%	323	1%	270	1%	470	1%
Sheep	13,312	54%	15,083	54%	13,876	43%	14,480	42%	32,747	45%
Goat	4,204	17%	5,128	18%	10,270	32%	13,882	40%	27,569	38%
Total	24,545	100%	27,849	100%	32,227	100%	34,740	100%	73,142	100%

TABLE 2-7:THE DEVELOPMENT OF ANIMAL NUMBERS (THOUSANDS), MONGOLIA (1970 – 2022)
Source: (National Statistical Office, 2023b)

In 1970, Mongolia had 24.5 million animals, with sheep accounting for 54% of the total. During the 1970s, only four million goats were registered in Mongolia. By 1990, the total animal count had increased to 27.8 million, with sheep still comprising 54%, and the goat population slightly exceeding 5 million. The animal population remained relatively constant, as the total numbers were regulated by the central government before 1990.

The Mongolian livestock sector, historically central to the economy and culture, remains a key, though diminishing, component of the Mongolian economy. During the Soviet period, efforts were made to develop a cropping sector, particularly grain, to support both extensively managed livestock production and mixed livestock-crop production (Goodland, Sheehy, & Shine, 2009).

After the end of the socialist period in 1990, both the cropping and livestock sectors underwent significant changes as Mongolia transitioned to a market economy. The collapse of rural collective and state farm systems, along with the return to more traditional animal management and livelihood strategies, has been well-documented during the early transformation period (Nixson & Walters, 2006). This shift from a command to a market economy led to a more traditional approach in livestock production as the established infrastructure of the rural collective and state farm systems collapsed.

During the transformation phase, a sharp increase in the total number of goats is evident. After 2002, the goat and sheep numbers became equal, and until 2015, both figures remained the same. Since 2015, the number of sheep has slightly exceeded the goat head count. It is important to hold to a proper ratio of goats and sheep. **Goats are more sensitive to winter cold; therefore, many herders keep sheep to provide protection and warmth to goats while they are in the herd during harsh winters.**

According to the World Bank report, the return to traditional livestock practices during the transition period has led to the misconception that current livestock production in Mongolia is a continuation of traditional "nomadic pastoralism." However, the current livestock production model is rather a response to: 1) the collapse of socialist support infrastructure, 2) livestock privatization, 3) limited alternatives to traditional grazing and husbandry practices, 4) reduced government production support, and 5) the gradual integration of livestock producers into the market economy (Goodland et al., 2009).

In 2022, Mongolia recorded a total of 73 million heads of animals. Sheep constituted 45% of this figure, while goats contributed 38%. The count also included 4.8 million horses, 5.5 million cattle, and 470,000 camels.

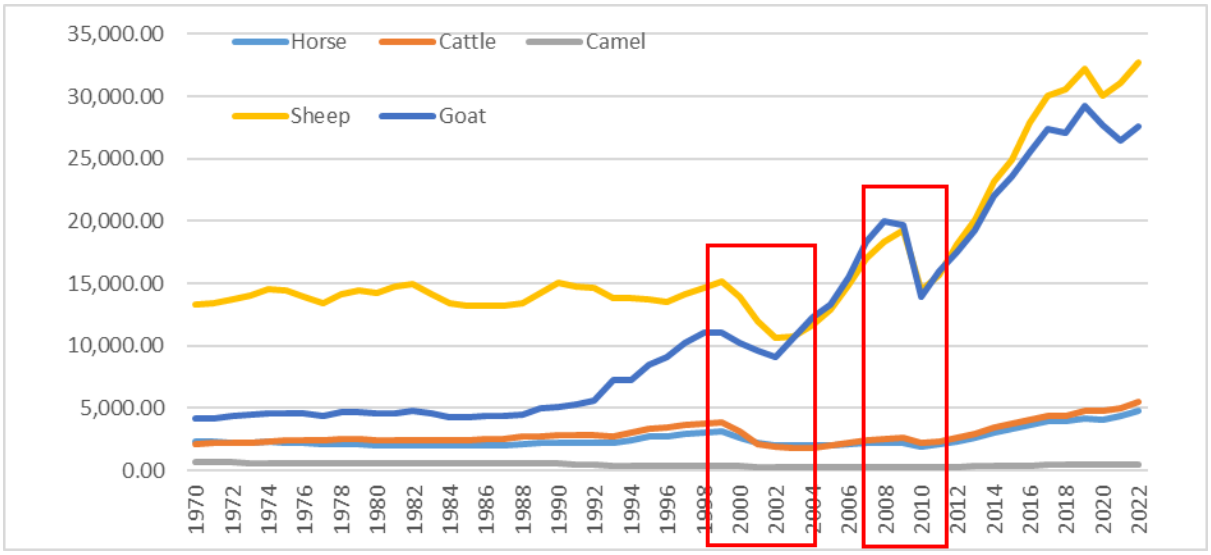


FIGURE 2-5: ANIMAL COUNT, DEVELOPMENT BETWEEN 1970 - 2022
Source: (National Statistical Office, 2023b)

Over the period depicted in Figure 2-5, two significant changes in animal head numbers are evident. These events are referred to as *dzud*. It is a term used in Mongolia to describe a severe winter weather phenomenon characterized by heavy snowfall, extremely low temperatures or both.[7] It typically leads to difficult grazing conditions for livestock, resulting in high mortality rates among animals. Mongolia encountered two major dzuds – the first occurred in winter 2002, and the second took place in winter 2009. Both incidents led to a substantial loss of animals, primarily affecting goats and sheep. The most recent dzud occurred in Mongolia in 2021; however, it did not result in as heavy losses of animals as the previous events.

For the analysis that follows, we identify 4 basic regions of Mongolia: Western region, Khangai region, Central Region (including Ulaanbaatar) and Eastern Regions. Division of regions is depicted in the Figure 2-6, indicating also aimags included.

[7] Whether specific cold weather events are experienced as dzud can depend also on the amount of standing grass left over from summer, and on livestock densities.

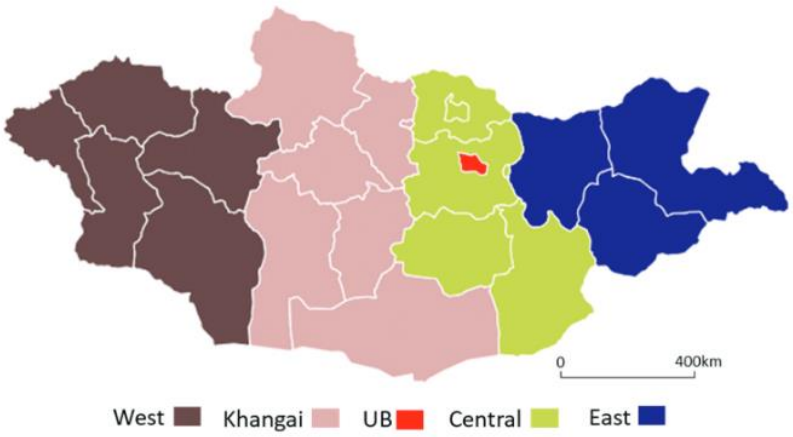


FIGURE 2-6: MAP OF REGIONS, MONGOLIA
Source: (Xu, Zhang, Kinnucan, & Chen, 2022)

TOTAL (thousand pieces)	1989	2022	Difference	% change
Central region + UB	5,588	17,414	11,826	212%
Eastern region	3,344	13,064	9,720	291%
Khangai region	7,584	24,513	16,929	223%
Western region	8,159	16,131	7,972	98%
Goats (Mongolia total)	4,959	27,569	22,610	456%
Total	**24,675**	**71,121**	**46,446**	**188%**

TABLE 2-8 EVOLUTION OF ANIMAL POPULATION IN MONGOLIAN REGIONS: A COMPARISON BETWEEN 1989 AND 2022
Source: (National Statistical Office, 2023b) Figures relate to all animal species: Horse, Cattle, Camel, Sheep, Goat

Table 2-8 provides data on the total number of head (in thousands) for various regions in 1989 and 2022, detailing the difference and percentage change. The data reveals that the total nearly tripled. The most significant increase occurred in the eastern region, where the numbers almost quadrupled.

Most alarming is the number of goats, which increased rapidly. In 1989, Mongolia accounted 6.9 million goats, while in 2022, it was already 29.5 million. Goats are ruminants, which has negative effects on the pasturelands. But the high value of produced cashmere has motivated herders to increase the number of goats, leading to land degradation problems (Munkhzul et al., 2021). The most significant increase was observed in Orkhon aimag, where the goat number increased 25 times (Figure 2-7) and where the goat density is also the largest. The largest growth in goat numbers occurred in Khuvsgul aimag, where the number of goats increased by almost 2 million.

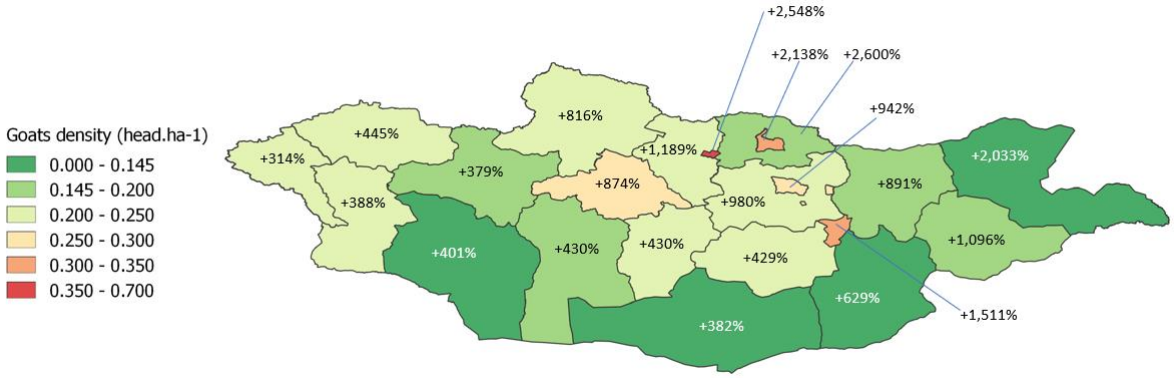


FIGURE 2-7: CHANGES IN GOAT POPULATION ACROSS MONGOLIAN AIMAGS: A COMPARISON BETWEEN 1989 AND 2022 SOURCE: (NATIONAL STATISTICAL OFFICE, 2023B)

2.3 Cashmere Production Process in Mongolia

Cashmere goats and other related breeds possess two distinct coats—namely, a coarse outer coat known as guard hair and a fine downy undercoat. Cashmere goats produce a notably higher amount of cashmere (down) fibre compared to other relevant goat breeds (Atav & Hunter, 2023; Dellal et al., 2010).

Once goats are 6 months old, their fibres can be harvested. When the first fibres start shedding, cashmere goats are combed. Cashmere shedding (moulting) starts at the neck and proceeds in a wave towards the rump, with up to a 5-6 weeks delay between the two sites (Ansari-Renani, Rischkowsky, Mueller, & Moradi, 2013). Due to that fact, combing each animal several times can make the best results. Antonini et al. (2016) say that combing all goats at the same time and collecting cashmere from different-aged goats in the same bag makes the cashmere less valuable. They suggest combing young goats first, then the older ones, and keeping fibres from the upper parts of the body separate from the rest to get batches with less contamination.

2.3.1 Mongolian Herders

These are the main and the most important actors in the chain. Cashmere goats are only a part of the large multispecies herds (from hundreds to thousands of heads) also composed of sheep, horses, cattle and camels or yaks, depending on the regional conditions.

The collapse of the communist system in the early 1990s led to the disappearance of the collective *negdel* system, and once again brought profound changes to pastoral households, livestock ownership and work organization. While grazing land remained the property of the state, all livestock was privatized and the government withdrew from pastoral activities, no longer regulating or providing services to herders. Regulatory institutions were abolished, and for the first time herders found themselves solely responsible for managing their herds and grazing lands. The collapse of many national industries as a result of the dismantling of the communist system, and the loss of employment of many former state employees, also led to a significant return of urban dwellers to pastoral activities in the 1990s.

Goats mainly graze natural vegetation on open rangelands with little or no supplementation with feed concentrates or cultivated fodders. Herd management is based traditionally on 4 seasonal moves along the year depending on the resource availability: spring, summer, autumn and winter

grazing. The camps are generally the same from one year to the next, within a defined territory. Activities in goat management follow the rhythm of the seasons. Spring is the time when new-born kids are born, as well as the time for combing cashmere and shearing wool. Summer is the time for pasture regrowth when animals need to fatten up to store enough energy and fat to survive the winter. Autumn is the time when farmers harvest hay and prepare for winter survival. Finally, winter, when the risk of animal mortality is highest, is mainly devoted to caring for and monitoring the animals.

In winter, goats can dig through the snow to reach grass covered by a white layer. However, when heavier snowfall occurs, goats face challenges in accessing enough grass. Considering this, herder families need to prepare fodder. It is recommended to provide at least 300 grams of hay and 150 grams of wheat bran per animal per day. However, discussions have clearly indicated that only a limited number of herders can afford to supply the necessary feed dose, with typically only the weakest animals and those giving birth receiving additional feed.

This situation heightens herders' vulnerability. Many herders often fail to maintain enough fodder, and when a harsh winter arrives, they either lack enough feed (resulting in increased mortality rates) or rely on government-provided feed from central and regional sources. The government maintains national hay reserves, which can be distributed at a discounted price if needed. In 2022, the price of wheat bran was around 19,000 MNT for a 25 KG package. Hay prices vary by region, with the majority produced in the eastern part of Mongolia, where prices are the lowest (approximately 5,000 MNT per hay package, weighing around 20 Kg). Transportation costs contribute to higher prices in the Central and Khangai regions, ranging between 8,000 and 9,000 MNT per hay package. The most expensive hay is found in the western part of Mongolia, where natural conditions do not permit hay harvesting.

Animal veterinary care poses challenges due to the rapid increase in the number of animals, and the veterinary services have struggled to keep pace with this situation. Certain veterinary activities, such as male castration, can be carried out by the herders themselves, while others require the expertise of qualified veterinarians. Basic vaccinations are provided for free by the local/central government, contingent on the region and specific diseases, while other veterinary services must be covered by the herders themselves. Additionally, each animal must undergo spring washing to guard against pests. Traditionally, animals pass through a special pool with a solution containing specific chemicals, but more recently, animals are sprayed using specialized showering machines. The presence of a spraying vehicle in a soum simplifies the washing process, eliminating the need for animals to travel to the soum centre as the vehicle can conveniently visit the herd. The cost per washing is 200 MNT per goat, irrespective of the technology used.

Cashmere fibres are harvested through combing, shearing, or collecting the moulted fibres. In Mongolia, cashmere is primarily collected through combing, with the most common practice being to comb the entire herd at once in a short period. Herders prefer single time combing, as they can hire local people for the service, given the labour-intensive nature of combing. After the herd is combed, the material is typically sold almost immediately.

Purely in terms of cashmere yield, it would be better to shear cashmere goats at the end of winter when they are in poor body condition because of the cold and limited food. However, for the goats' well-being, it's crucial to leave some hair on them while harvesting the wool as it acts as a protective layer in harsh weather (Ansari-Renani et al., 2013). **Mongolian herders have expressed that if they were to shear their goats, the animals would struggle to survive the challenging conditions in Mongolia.**

Region	Aimag	Combing time	Price (raw cashmere)	Raw Cashmere produced (t)	Herder household with goats
Eastern	Dornod	March, April	128,500	299.14	7.798
Eastern	Khentii	March, April	119,000	482.38	10.618
Eastern	Sukhbaatar	March, April	131,000	464.23	9.758
Central	Darkhan-Uul	April, May	140,000	39.66	1.861
Central	Dornogobi	April, May	105,000	471.07	5.015
Central	Dundgobi	April, May	96,250	594.33	7.608
Central	Gobisumber	April, May	105,000	63.3	0.993
Central	Umnugobi	April, May	92,908	771.74	6.964
Central	Selenge	April, May	100,000	171.45	9.030
Central	Tuv	April, May	94,000	459.34	14.753
Ulaanbaatar	Ulaanbaatar	April, May	102,083	40.36	4.461
Khangai	Arkhangai	April, May	107,500	436.22	16.918
Khangai	Bayankhongor	April, May	111,250	643.53	13.006
Khangai	Bulgan	April, May	95,000	328.96	9.647
Khangai	Khuvsgul	April, May	105,000	748.67	18.671
Khangai	Orkhon	April, May	87,500	14.2	1.150
Khangai	Uvurkhangai	April, May	104,500	605.56	16.807
Western	Bayan-Ulgii	May, June	87,500	375.36	13.448
Western	Gobi-Altai	May, June	93,000	783.49	9.169
Western	Khovd	May, June	93,000	699.53	10.565
Western	Uvs	May, June	95,000	672.38	11.488
Western	Zavkhan	May, June	93,750	506.66	11.819

TABLE 2-9: REGIONAL RAW CASHMERE PRODUCTION, PRICE DIFFERENCE, 2022. .SOURCE: NATIONAL STATISTICAL OFFICE, 2023B

In Mongolia, the combing process begins in March in the eastern part of the country and concludes in June in the western part. The time difference is related to the changing seasons; winter ends earlier in the east than in the western part. The timing of combing is also reflected in the price of raw cashmere. Early combs have higher quality, and since the market is not yet saturated, herders can reach a price premium. Cashmere combed in the west, usually in June, includes more coarse hair and dirt (sand), leading to consistently lower prices. In 2022, the highest regional price was observed in Darkhan-Uul (140,000 MNT), while the lowest price received herders in Bayan-Ulgii Aimag (87,500 MNT) (Table 2-9).

The weighted averages of regional prices are as follows for 2022:

- Eastern part (125,753 MNT)
- Khangai (105,458 MNT)
- Central part (96,080 MNT)
- Western part (92,888 MNT)

The eastern part of Mongolia boasts greater fodder and grass production, which is known to impact the quality of cashmere. According to literature, the nutrition provided to a cashmere goat plays a crucial role in determining the quantity and type of fibre it produces. The development of follicles in the skin, a key factor in cashmere production, mainly occurs during late pregnancy and the first ten months of a kid's life. Insufficient nutrition during these critical stages can negatively impact the overall cashmere production throughout the goat's lifetime (Ansari-Renani et al., 2013; Atav & Hunter, 2023).

Figure 2-8 clearly indicates that the motivation to increase herd size could be driven by revenues. In Mongolia, herders with a higher number of animals can receive greater revenues. Similarly, we can observe the relationship between the share of goats in the herd and the share of income from cashmere. Thus, the larger the portion of goats a herder has, the more the household depends on income from cashmere (Figure 2-9). At the same time, we cannot confirm the statement that the larger the herder, the more he/she depends on income from cashmere. Generally, this is rather opposite. The more animals herder has, the less important is cashmere in total household income as the household can sell other animal related products (meat, milk, wool, etc). The data of National Census (2021) shows that cashmere generates 56% revenues of small households, while only 43% revenue at the level of larger herders. Also, on the figure, there are 2 specific outliers (indicated by orange in the Figure 2-8) with a small number of animals and high income. In both cases, families sold a large number of animals last year (almost 1,000 and 570) which contributed to this large income. It is not possible to identify, whether family wanted to receive revenues from long term activity or whether the family acted as a middleman.

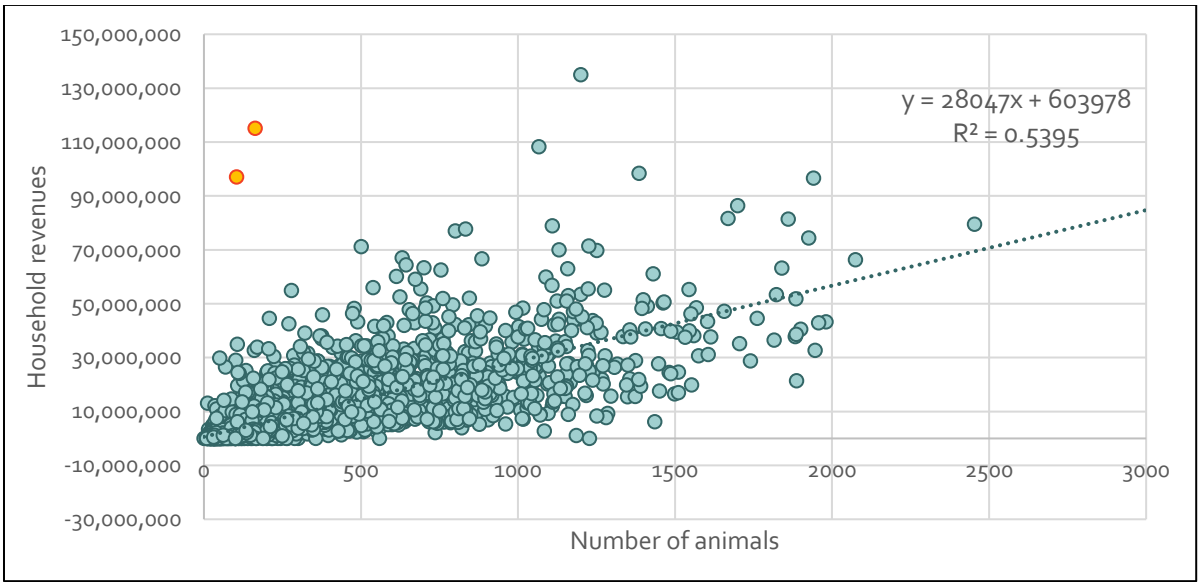


FIGURE 2-8: RELATIONSHIP BETWEEN NUMBER OF ANIMALS AND HOUSEHOLD REVENUES, MONGOLIA, 2021
Source: Authors based on Mongolian Census 2021 (National Statistical Office, 2023a)

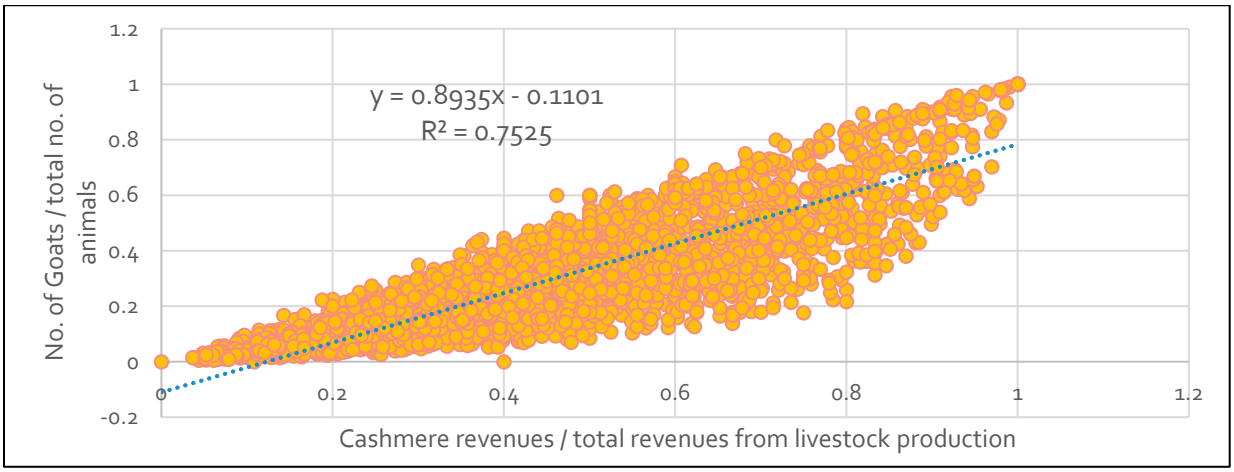


FIGURE 2-9: RELATIONSHIP BETWEEN PROPORTION OF GOATS IN HERD AND PROPORTION OF CASHMERE IN TOTAL REVENUE
Source: Authors based on Mongolian Census 2021 (National Statistical Office, 2023a)

The herders' way of life is very simple, as well as very harsh. As indicated above, many still live a nomadic lifestyle, which means they own a ger[8] and in some cases a second one used for storage. Their household equipment is basic, as all possessions must be transportable either on horses or small trucks. The Mongolian ger typically includes two beds, a simple stove, one or two wardrobes, and a small cabinet displaying family pictures, medals, and religious symbols. These gers are adjusted according to the winter season, with insulation layers added or removed in response to the ongoing weather. Energy is mainly supplied by solar panels and stored in local batteries. The available equipment allows families to use lights, charge electronic devices, watch TV, or listen to the radio.

Families with more animals not only have a simple passenger car but also own small trucks. These trucks are used for transporting animals to the market or for moving possessions to different locations. Everyday activities are typically managed by walking, horse riding, or the frequent use of small motorcycles (Chinese production, 125cc). Water sources are not always close; animals are guided to water sources once or twice a day during the summer period and less frequently during winter. Most of the water comes from wells that are maintained by public authorities.

FIGURE 2-10: TYPICAL MONGOLIAN DWELLING, THE GER.
Source: Mongolian National Federation of Pasture User Groups

At present, the majority of raw cashmere is sold by Mongolian herders shortly after harvesting, in an unsorted state. The local market, largely represented by middlemen, does not effectively reflect quality through price premiums. Consequently, herders are not strongly motivated to sort fibres based on animal age, colour, or quality. While some initiatives have been introduced, they tend to operate within specific regions and collect only a limited amount of material[9].

The management of goat herds is relatively straightforward, though herders often note that goats pose more challenges compared to sheep. They require increased attention and care during winter, especially after giving birth. Goats benefit from being in the company of sheep, as the latter

[8] It should be noted that the *ger* is a well-insulated, well-ventilated dwelling that is adapted to the herding livelihood and culturally favoured (Brown & Fox, 2023).
[9] Here we refer to initiatives by Mongolian or non-Mongolian NGOs that establish cooperatives within donor-based projects. The primary aims of these cooperatives, often also secondary co-ops, are to demonstrate sustainable practices that offer herders a higher income in exchange for improved pasture management.

help keep the goats warm. For every 50 female goats, one male goat or buck is required. The price varies, but the average is estimated to be between 300,000 and 400,000 MNT. A buck can remain active for up to 7 years. To address breeding issues, bucks are typically exchanged every 2 years, often through a barter system, where one buck is traded for another.

While the production process is very extensive in Mongolia, herders usually do not need to invest much in goat production. Most of the intermediate production costs are related to veterinary services, petrol, insurance, and costs related to water (operating a pump). Investment costs mostly include means of transportation (car, motorcycle, truck), a winter shed, and an investment in a buck (male goat). Larger herders need to hire assistant families, or they usually hire locals for combing. Among these expenditures, goats do not really receive a lot of attention from the expenditure point of view.

From the typology point of view, we did not identify significant differences in production characteristics over the country. However, we identified differences in prices of raw cashmere, we identified the differences in transportation distances (Table 2-10).

Region	0 - 600	600+	Total	0 - 600	600+	Total cashmere
	Amount of HH		248,296	Cashmere produced (thousand tonnes)		
Households with Goats	180,541	31,008	211,548	5,684	3,987	9,671
- Eastern	21,694	6,480	28,174	732	513	1,246
- Central	42,222	8,465	50,686	1,535	1,076	2,612
- Khangai	66,293	9,906	76,199	1,632	1,144	2,777
- Western	50,332	6,157	56,489	1,785	1,252	3,037

TABLE 2-10: SMALL AND LARGE HERDER FAMILIES (NUMBER AND CASHMERE PRODUCED)
SOURCE: AUTHOR CALCULATIONS BASED ON HOUSEHOLD SURVEY (NATIONAL STATISTICAL OFFICE, 2023A)

The most significant difference in typology was the division based on the size of the herds. Based on the discussion, we considered a **small herder** a farmer with herd size lower than 600 animals, while the **large herder** has more than 600 animals. As visible from the table above, there are over 175,000 households with less than 600 animals and almost 36,000 households with more than 600 animals. From the perspective of costs, the large herders need more labour and in an ideal situation, they would need an assistant herding family (see also Section 5.1). This assistant herding family would receive a ger for living and would assist in animal management. Based on the size of the herd, the assistant family would be present for the whole year or only during the most intensive season. This fact increases the costs of the cashmere production and therefore it was decided to include those 2 groups in the economic modelling.

However, herders mostly mentioned that if there is a possibility to factor in their additional activities, such as sorting, in the price, they would not have any problem doing so. Cashmere sorting is the first process which greasy cashmere undergoes after it is purchased by the manufacturer. In the factory cashmere is sorted by hand according to fineness, length, soundness, colour, enabling the manufacturer to produce the style and quality of yarn or fabric for which the cashmere is best suited (Dalton & Franck, 2001).

Because the total number of goats in stocks is constantly rising, and direct limits on herd size are not possible, the Mongolian government introduced an Animal Head Tax in 2021. Its intention was

to tax each animal[10] with a flat tax defined for each animal type (Table 2-12). The decision on the tax amount is in the hands of soum governors, who define the value of tax per head (can range from 0 to 2000 MMT). Based on our interviews, it was identified that the animal head tax was well received in 2021 by herders (in its 1st year), when many herders were willing to pay. However, since 2022, the herders were more reluctant to pay; in some soums, the estimated pay rate was as low as 50%. Some soums made an agreement with the local branches of commercial banks. Herders need to prove their payment of tax; only after that are they eligible to get a loan. And once herders are dependent on annual loans, this instrument seems to work well. The tax is collected by the soum government, and the local body can decide how will be funds used. This is very much criticised by herders, who think money[11] is not always efficiently used. Even though the local administration has specific guidelines on how to use the funds, there is a limited possibility of controlling this.

2.3.2 Intermediary Stage

Herders face a market power disadvantage due to the fragmented nature of animal and fibre production, the seasonal aspects of extensive livestock farming, and the dominance of a few processors in industrial slaughtering. Processors and traders hold market power, enabling them to offer herders a fixed price for animals and fibre, disregarding quality differences. Consequently, herders consistently receive a lower share in the final market values.

At this stage, cashmere is purchased by local traders, mainly operating in the sum centre. Traditionally, the middleman was referred to as a 'changer'[12] involved in trading various commodities. They traded not only in cashmere but also in meat, skins, wool, live animals, etc. For tax reasons, changers often formed cooperatives, and now they operate within the cooperative framework. As a result, we can observe three different types of intermediaries: changers, and two different sorts of cooperatives.

The middleman stage involves collecting cashmere from the vast expanse of Mongolia and transporting the commodity to Ulaanbaatar, where most of the processing takes place. The size of the country leads to extensive transportation routes served by motor vehicles (small vans, trucks, etc.).

The price of transportation is differentiated based on the distance between the aimag capital and Ulaanbaatar (Table 2-11). Based on available information, we estimated, that the transportation costs of one kilogramme of cashmere are around 1200 MNT/per trip from the aimag to the capital. The costs of transportation is not particularly significant considering the price of cashmere, as it constitutes only about 1% of the cashmere price. Additionally, herders generally do not concern themselves with transportation logistics; they typically sell their cashmere in local villages or regional centres, leaving transportation arrangements to middlemen or cooperatives, both of which work with small margins (1,000 – 3,000 MNT/kg, 1–2.5% of the selling price).

[10] Households' animal numbers are accessible to local authorities, as there is an annual census of animals. This provides very specific information on number of animals in the country.
[11] There are 13 specific categories of authorised expenditure. The idea was to use the money for investments that herder's benefit. Hence some villages purchase veterinary medicine, some construct water wells, others invest in infrastructure, etc.
[12] Derived from the English.

Aimag	Aimag capital	Region	Distance to UB (Km)	Aimag	Aimag capital	Region	Distance to UB
Dornod	Choibalsan	Eastern	655	Arkhangai	Tsetserleg	Khangai	453
Khentii	Öndörkhaan	Eastern	331	Bayankhongor	Bayankhongor	Khangai	630
Sukhbaatar	Baruun-Urt	Eastern	560	Bulgan	Bulgan	Khangai	318
Darkhan-Uul	Darkhan	Central	219	Khuvsgul	Murun	Khangai	671
Dornogobi	Sainshand	Central	463	Orkhon	Erdenet	Khangai	371
Dundgobi	Mandalgobi	Central	260	Uvurkhangai	Arvaikheer	Khangai	430
Gobisumber	Choir	Central	240	Bayan-Ulgii	Ölgii	Western	1,636
Umnugobi	Dalanzadgad	Central	553	Govi-Altai	Altai City	Western	1,001
Selenge	Sukhbaatar	Central	311	Khovd	Khovd	Western	1,425
Tuv	Zuunmod	Central	43	Uvs	Ulaangom	Western	1,336
Ulaanbaatar	Ulaanbaatar	Ulaanbaatar	40	Zavkhan	Uliastai	Western	984

TABLE 2-11: AVERAGE DISTANCES TO UB FROM AIMAG CAPITAL
SOURCE: AUTHORS, GOOGLE MAPS

Changers

A middleman or changer is typically a local individual who trades in various agricultural commodities, not only cashmere but also meat, wool, skins, etc. The role of the middleman is crucial in the herding economy. They provide advance payment for products to be collected in the future and, if necessary, can supply feed or other supplementary products that herders need during winter or early spring. However, herders are aware that middlemen do not always act fairly; they may provide misleading information to secure better prices, which herders must accept due to their financial obligations. While we were not able to directly speak to any middlemen, we gained insights into their operations through discussions with soum governors and herder families.

Two 2 types of changers can be identified. Some are working for Chinese customers and collect cashmere that is directly exported, while others are Mongolian changers who collect material for local processing companies (Holm-Olsen, 2021).

Products sold through intermediaries avoid tax registration and veterinary inspection, keeping the livestock product value chain (VC) outside the realm of value-added tax (VAT) and animal traceability systems (Kimura, Sedik, & Ayurzana, 2022)[13].

Cooperatives

The issue of unbalanced market power could be addressed through cooperative efforts. Paradoxically, it has been observed that poorer farmers are less likely to be cooperative members (Hilliova, Hejkrlik, Mazancova, & Tseren, 2017). Historically, the number of herders affiliated with cooperatives was relatively low, with a notable increase only between 2013 and 2016, primarily due to government regulations providing wool subsidies to cooperative members. However, a 2020 report from the Ministry of Food, Agriculture, and Light Industry revealed that most cooperatives did not adhere to cooperative laws and principles. Many were not collectively owned by members but rather controlled by a few individuals (Kimura, Sedik, & Ayurzana, 2022).

[13] The Center for Policy Research estimated the annual value of foregone tax revenues at around MNT40 billion in annual VAT payments due to untaxed and informal livestock product value chains. This is 10% of the total profits received by the uncontrolled and untaxed changers system, estimated at MNT400 billion (Kimura, Sedik, & Ayurzana, 2022).

Researchers have estimated that only one-third of goat herding households are members of any cooperative (Carcamo-Diaz & Van de Ven, 2021). Simultaneously, the study verified that there is no substantial evidence indicating statistically significant relationships between average annual sales prices and either producer scale (measured by herd size) or cooperative membership, for any of the four animal types under consideration.

In the field, we observed two different types of cooperatives. One functions as a classical business entity but takes on the legal form of a cooperative. It has shareholders who hold stocks and distribute dividends among themselves. We were informed that some middlemen establish such cooperatives, largely for tax reasons, which are managed and governed by one or a few shareholders. The second type of cooperative is a classical cooperative where there is an open opportunity to become a shareholder once a required financial amount is paid.

Some cooperatives are solely focused on collecting cashmere, while others can gather various commodities. Traditional cooperatives often encounter issues with working capital; for cashmere purchase, they need a substantial amount of cash to be distributed in a short time. While changers typically do not consider quality in the offered price, cooperatives sometimes have quality schemes. Some of them conduct sorting before selling to another stage.

Holm-Olsen estimate (2021), based on information from the Swiss Agency for Development and Cooperation (SDC), that cooperatives are involved in trading of about 10% of Mongolian cashmere.

2.3.3 Washing and dehairing

Washing and dehairing are industrial processes conducted in Mongolian factories. Jointly they represent the first stage of value creation. Most of the fibre is sorted in the washing factories based on the washing process. We identified two different washing processes. The first one is fine washing, which prepares fine fibre for dehairing. The second washing is done to clean the fibre from most dirt and to meet export regulations. According to the Mongolia-China agreement, **China requires imported fibre to be washed**[14]. However, during interviews, we found out that a large amount of cashmere is washed simply to be washed once again in China, based on technological needs.

After the sorting process, the different categories (groups) of hair are subjected to 'willowing.' This is accomplished by placing the fibres in a straightforward rotating machine to shake out most of the dust and grit. Following sorting and willowing, the fibres undergo washing before proceeding to the dehairing process (Atav & Hunter, 2023; Dalton & Franck, 2001).

The washing process is sometimes also called **scouring**. Scouring is a process in textile production that involves washing or cleansing fibres or fabrics to remove impurities, oils, dirt, and other unwanted substances (TextileGlossary, 2023). In scouring, the material is first soaked in a solution with cleaning agents like sodium hydroxide (for more details see Section 6). These agents help break down and remove impurities from the material.

During this process, cashmere is washed in hot water and later must be dried. Generally, this process is very energy intensive. First, machines need electric power to run engines, at the same time water need to be heated to required temperature and later the fibre needs to be dried. Various settings exist, some entities are connected to the grid and steam line. Some needs to

[14] Information received during the interview at the Customs Office.

generate own electric power and heat for water from coal/diesel. Washing is also water-intensive. Water comes from local wells; water disposal is an issue which shall be further investigated.

The number of times the fibre is washed depends on the quality requirements. Fine washing results in the loss of material, as unwanted substances are removed. The scouring yield is about 70%.

The export-oriented washing factories do not have a good reputation. They are said not to follow many legal requirements related to environmental protection or labour standards. Washing stations managed by vertically integrated producers need to follow all rules and standards as they are under more strict control.

During our field study trips, we were able to observe scouring machines either from China or from Japan.

Here are some more key points related to the washed cashmere:

- Total capacity in Mongolia fully reflects the need of raw material for washing.
- Estimated cost of washing service in this phase is 4,000 – 7,000 MNT/kg.
- Mongolia is by far the largest country to export unprocessed (washed) cashmere (Harmonised System Code HS 510211). Total Mongolian share of global export is 94% over a five-year period.
- In 2022, 6,427 tonnes of washed cashmere were exported (Figure 2-10).
- The norm for humidity of exported cashmere is between 16% and 17%.
- Price of washed cashmere is volatile and fluctuated between 29.2 USD/Kg (2020) and 49.8 USD/Kg (2019).
- 99.9% of exports of washed cashmere goes to China 2018 - 2022

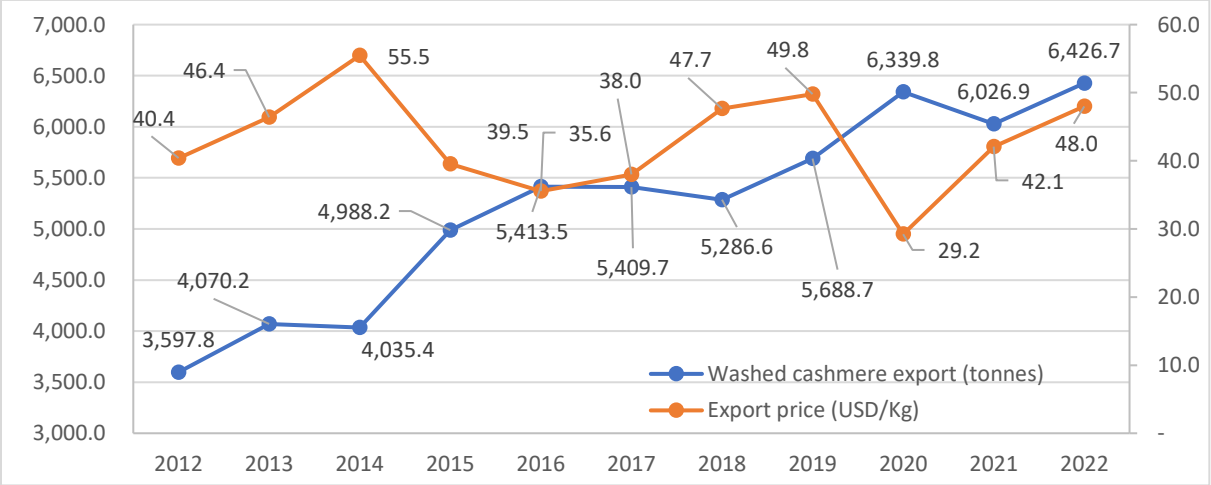


FIGURE 2-11: WASHED CASHMERE EXPORT AND EXPORT PRICE (HS 510211)
Source: Authors

The dehairing process is more technologically demanding. Originally, the coarse hair removing was done manually, but it was a very delicate and expensive process (Wang, Singh, & Wang, 2008). In the past, the manual process to yield 60g of cashmere fibre would take up to two hours (Hunter, 2020). To minimize unnecessary steps, the dehairing process should operate at a humidity level between 60% and 80%[15].

[15] Mongolian National Standard (MNS 3683:2015) defines fibre normal moisture content after dehairing process to be 16%.

Presently, only a small portion of Mongolian cashmere undergoes the dehairing process within the country. The implemented law starting in 2024 aims to mandate the dehairing of all export materials within Mongolia. However, due to uncertainties regarding the capacity to dehair the entire Mongolian production, discussions have been held about potentially extending the law's implementation.

FIGURE 2-12: LOSS OF MATTER DURING THE WASHING AND DEHAIRING PROCESSES

Dehairing is a slow and energy-demanding process. Machines extract about 25% of coarse hair. From this perspective, 1 kilogram of raw cashmere results in 525 grams of dehaired cashmere, with a yield of 52.5% (Figure 2-12). Residuals from the washing process include wastewater and mineral and organic substances, which can be obtained during the wastewater cleaning process and are usually provided for free. These residuals can be used as fertilisers or organic matter for plant/vegetable production. The dehairing process separates the middle and coarse hair (Figure 2-13). According to conducted interviews, dehairing facilities typically sell this material. The coarse hair is used for felt, and there is a high demand for goat coarse hairs by brush producers. The selling price of coarse hair could be up to 10,000 MNT per kilogram.

FIGURE 2-13: COARSE HAIR AFTER DEHAIRING PROCESS
Source: Authors

For the dehairing process, various dehairing machines are used. In some companies, we observed old Japanese machines or new machines of Chinese origin (Figure 2-14). According to information from Chinese manufacturers, Chinese machines have the following characteristics (Table 2-12).

Model	YQ-A186
Power	2.8 KW
Weight	4.1 tone
Output	4–8 kg/h

TABLE 2-12: CARDING/DEHAIRING MACHINE CHARACTERISTICS
SOURCE: YUANQUAN MACHINE (2023)

FIGURE 2-14: DEHAIRING MACHINES FOR CASHMERE IN MONGOLIA (2022)
Source: Authors

The total dehairing capacity reported for Mongolia in 2019 does not fully meet the demand for raw material (Table 2-13). Although a survey conducted by the Ministry of Agriculture and Light Industry (MOFOLI) in November 2023 may indicate an increase in capacity, the slow nature of the dehairing process—where a single machine with a width of 1000 mm can process about 4 - 8 kg of cashmere per hour—suggests that the expected capacity may not be fully realized in 2022 and 2023.

Processing stages	Indicator	2019 Output (tonnes)	Required capacity (t)[16]	Rate of utilization, %
Production	Raw cashmere	9,972		N/A
Dehairing	Installed capacity	5,827	~ 7,000	26%
	Utilization	1,520		
Yarn production, spinning	Installed capacity	2,278	~ 5,500	31%
	Utilization	717		
Weaving	Installed capacity	2,329		28%
	Utilization	644		
Knitting	Installed capacity	4,593		65%
	Utilization	2,976		

TABLE 2-13: MONGOLIAN CAPACITY OF CASHMERE PROCESSING INDUSTRY, 2019 DATA
SOURCE: STEPECOLAB PROJECT (2022)

Some important findings on dehaired cashmere include:

- 2,369 t (24.5%) of raw cashmere is being dehaired in MN. Output of dehairing process is about 1,215 tonnes.
- Service fee for dehairing is between 10,000 and 15,000 MNT/Kg.
- Most of the dehaired material is shipped to **Italy** (79.5%), **UK** (8.7%), **China** (5.1%), **Germany** (3%) and **South Korea** (2.5%) (Figure 2-15).

[16] The capacity that would need to be installed to process 100% of national raw cashmere production.

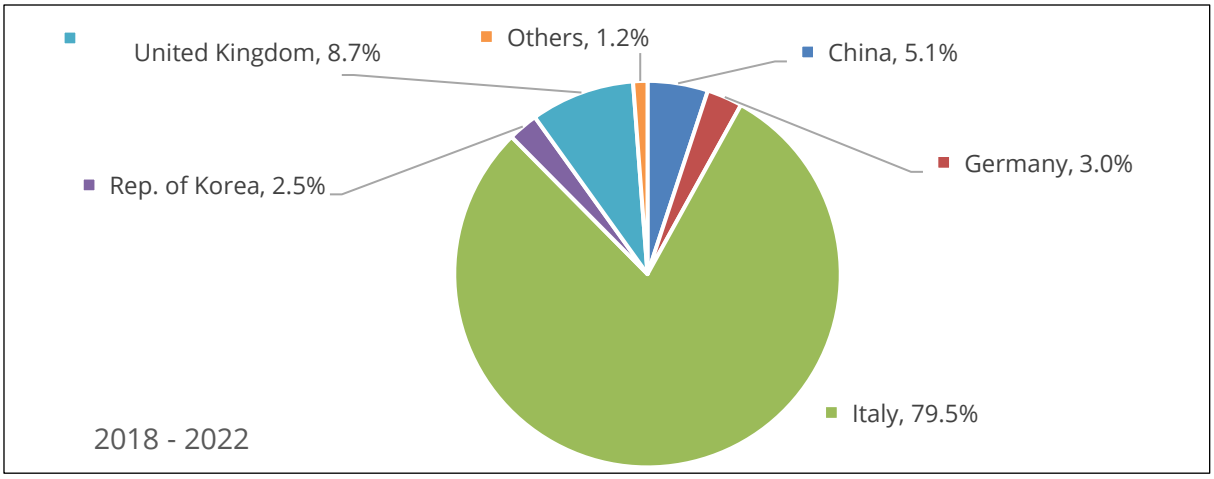


FIGURE 2-15: EXPORT MARKETS OF THE MONGOLIAN DEHAIRED CASHMERE (DATA FOR YEARS 2018 – 2022, HS 510531) .
SOURCE: AUTHORS BASED ON UN COMTRADE.

Between 2012 and 2019, the export of dehaired cashmere remained relatively stable, with the total exported volume fluctuating between 500 and 630 tonnes. However, due to a large decline in prices in 2020 caused by the COVID-19 pandemic, the volume of exported dehaired cashmere declined to 260 tonnes. The price of raw cashmere decreased by half, while the price of dehaired fibre decreased by 27%. In 2022, the price of dehaired cashmere reached more than 108 U.S. dollars per kilo, and the quantity exported significantly increased, with a year-to-year change of more than 100% (Figure 2-16).

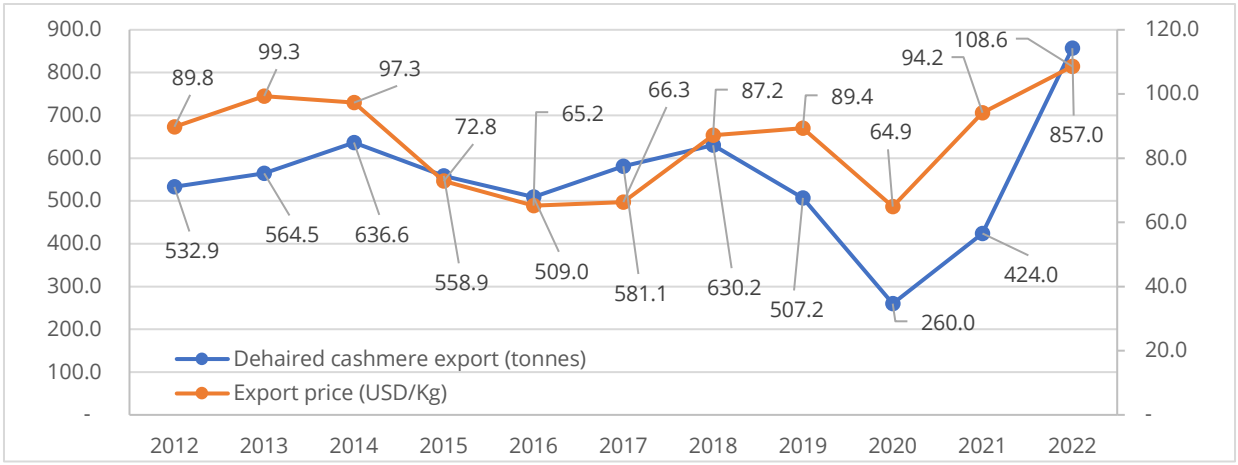


FIGURE 2-16: DEHAIRED CASHMERE EXPORT AND EXPORT PRICE (HS 510531).
Source: *AUTHORS BASED ON DATA FROM MWCA.*

Dehaired cashmere is packed usually into 75Kg packages, which are export ready (Figure 2-16). As cashmere is a very expensive commodity, packages are stored in well locked warehouses, electronic monitoring systems are also installed.

FIGURE 2-17: PACKED CASHMERE FOR EXPORT
Reference: Mongolian National Federation of Pasture User Groups.

The Schneider Group is a private company involved in the trade and processing of cashmere. They publish market reports and present a cashmere price index, as seen in the chart below. According to Schneider Group data (The Schneider Group, 2023), Chinese cashmere is the most valued on the international market. The index also indicates that Mongolian cashmere is priced 13% lower than Chinese, while Iranian cashmere is 39% cheaper than Chinese (Figure 2-18).

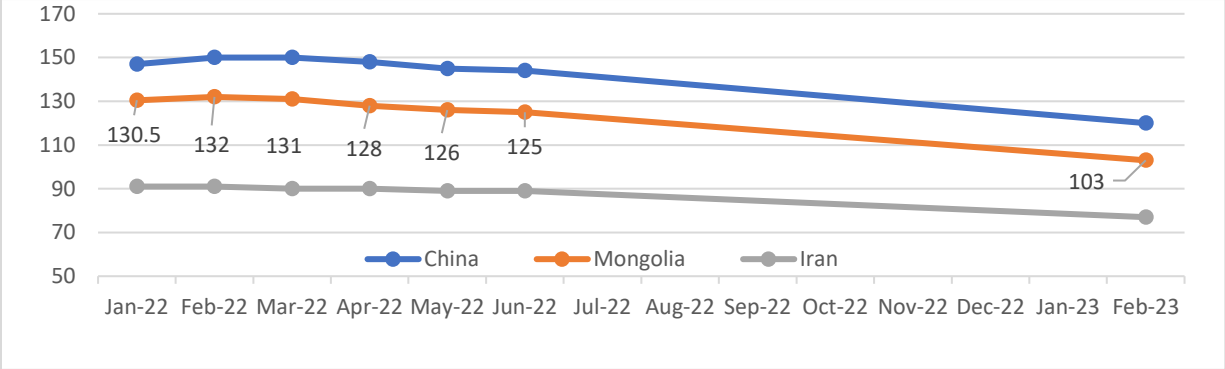


FIGURE 2-18: PRICE OF DEHAIRED CASHMERE (HS 510531).
Source: Authors based on The Schneider Group data (2023).

VAT will be imposed at **zero percent** on goods, works, and services (GWS) for export (Mongolian Tax Administration & Asian Development Bank, 2023).

2.3.4 Dyeing and Spinning

After the dehairing process, usually the dyeing and further fibre preparation takes place.

According to Atav and Hunter (2023), the yarn can be manufactured using either the woollen (90% of fine fibre) or worsted system (about 10%), determined by the fibre length and the intended end use (Dalton & Franck, 2001; Hunter, 2020). Spinning is processed on machines like those used for fine wool, but a specific setting tailored to cashmere is needed. The setting parameters are usually kept secret (Hunter, 2020).

Spinning is the most complicated and least developed process in Mongolia. About 444 tons of cashmere is left in the country that goes into the process of dyeing, spinning, and later for weaving or knitting. This is equivalent to about 845 tonnes of raw cashmere, 8.7% of Mongolian production. At the moment, there is only about 30% of the capacity available for spinning.

Spinning is technologically and capital-intensive activity. Spinning machines are not cheap and they require specific knowledge. Some companies use old Japanese machines, which still suit their needs. Others use European machines, e.g. Bigagli (IT). Due to the fact that Mongolian yarn still does not fulfil the highest quality standards, the most luxury brands are sourcing dehaired cashmere (to Italy) and yarn is produced under the highest quality standards in Europe.

During the spinning process, about 5% of fibre is wasted.

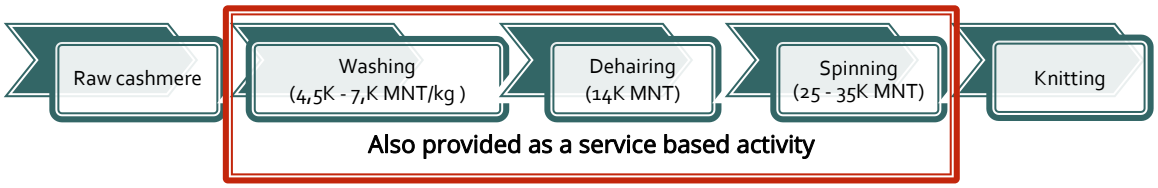
Based on the discussions, it was identified that Mongolian spinning companies are unable to produce the finest yarn, which is a blend of with cashmere and silk. The yarn used to produce silk-blended cashmere products must be imported from China.

The spinning process is either run by vertically integrated cashmere factories, which uses the yarn for production of apparel, or by spinning companies which offer the spinning as a service for smaller apparel producers, who do not have own processing capacities. Spinning price is about 35,000 MNT/Kg.

2.3.5 Knitting and Weaving

Knitting and weaving processes of Mongolian cashmere are highly decentralized. Most of the yarn is processed through knitting. In Mongolia, many small and medium-sized companies specialize in knitting cashmere fibre. Since knitting machines are not very expensive and can generate reasonable value-added, the knitting capacity has been consistently increasing in recent years. The current knitting capacity was utilized at 65% in 2019, but it is understood that these capacities are constantly being expanded.

Some knitting companies prefer to oversee the entire process. Therefore, they purchase cashmere, bring it to Ulaanbaatar, have it washed, dehaired, and spun into yarn. Others purchase already finished yarn for their own spinning purposes. However, because the first process is controlled by people from knitting factories and is cheaper, we believe that this type of process is used in most cases of small and medium companies without their own weaving capacity.



For knitting, mostly Japanese and German machines are in use. We mostly observed Shima Seiki knitting machines. The Mongolian University of Science and Technology, together with the Shima Seiki company, runs the Shima Seiki Training Center. The centre trains experts to use design, calculation, and programming skills up to international standards. This helps them understand and improve the techniques and technology of automated knitting machines. (Mongolian University of Science and Technology, 2023). For the weaving process, being less frequent, companies use for example machines from Stäubli (DE), with indicated market price of about 150,000 USD.

Shima Seiki offers 2 types of machines.

- Traditional knitting machines. They produce pieces of apparel (sleeves, front, back). Those pieces have to be linked. Traditional machines are able to produce about 5,500 pieces of apparel per annum. Some Chinese traders offer second-hand[17] knitting machines (Shima Seiki) for reasonable price and we believe that many small knitting factories use second-hand machines.
- Whole-garment machines. They produce the whole piece of apparel at once. They are not yet standard, but some machines are already in operation. They can save labour costs and energy costs. However, at the same time, the machine is much more expensive. In 2023, we did not observe any second-hand machines on internet marketplaces.

Based on information from Bolormaa (2023), there are about 34 washing factories, 46 dehairing factories, 16 spinning factories. At the same time, there exist about 80 small and medium sized enterprises that focuses on garment production.

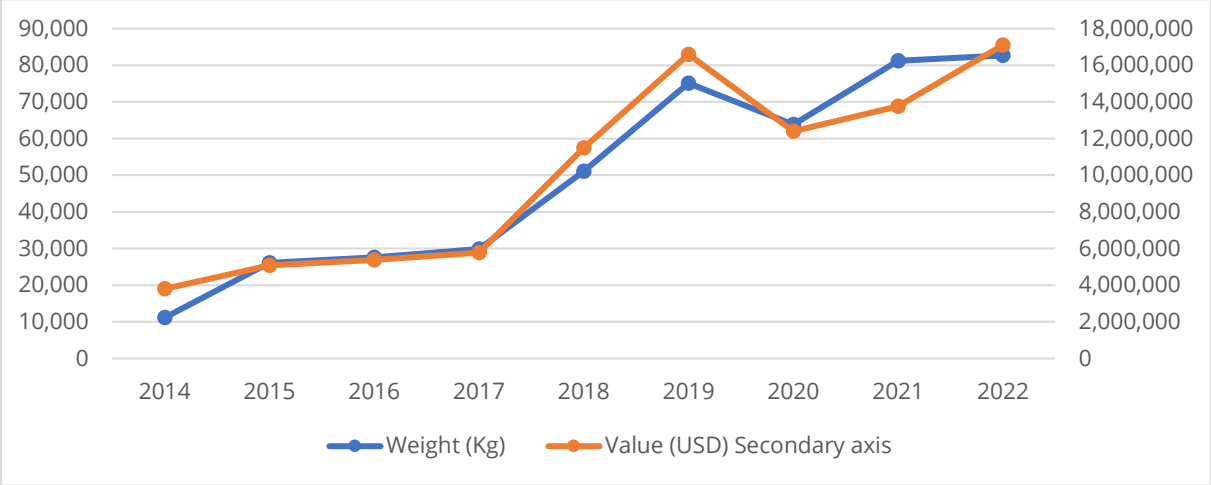


FIGURE 2-19: EXPORT OF MONGOLIAN CASHMERE APPAREL (HS 611012).
Source: Authors based on the UN Comtrade (2023).

Export of apparel is mainly in the hands of larger producers, while smaller producers are active rather on the domestic market. Between 2014 and 2022, total weight of exported apparel defined by HS code 611012 (sweaters, pullovers, sweatshirts, waistcoats (vests), and similar articles, knitted or crocheted, of cashmere) increased from 22 tonnes and 165 tonnes according to UN Comtrade (Figure 2-19).

Main importers of finalised products are countries from the EU (including mainly Germany, Italy, Netherlands and France), USA, United Kingdom, and Republic of Korea (see table 2-14).

[17] Very favourable offers are found on the Alibaba.com marketplace (11/2023).

Weight (Kg)			Value (USD)		
Total	**82,677**	**100.0%**	**Total**	**17,101,116**	**100.0%**
Germany	18,848	22.8%	Germany	3,294,924	19.3%
USA	18,706	22.6%	USA	3,914,104	22.9%
United Kingdom	12,820	15.5%	United Kingdom	2,953,141	17.3%
Italy	6,538	7.9%	Italy	1,469,153	8.6%
Rep. of Korea	5,258	6.4%	Rep. of Korea	869,189	5.1%
China	4,830	5.8%	China	764,004	4.5%
Netherlands	4,793	5.8%	Netherlands	1,116,873	6.5%
Japan	3,800	4.6%	Japan	958,656	5.6%
France	1,752	2.1%	France	395,389	2.3%
Others	5,333	6.50%	Others	1,365,683	8.00%

TABLE 2-14: EXPORT OF MONGOLIAN CASHMERE APPAREL (HS 611012).
SOURCE: UN COMTRADE (2022)

2.4 The Value Chain Flows

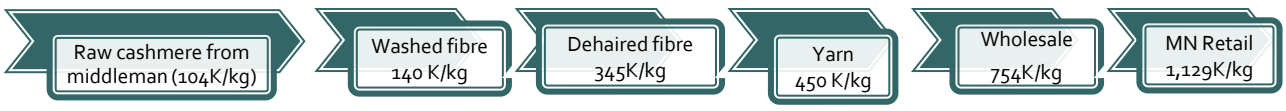
The Mongolian cashmere VC can be divided into 2 specific sub-chains. The one exports unprocessed cashmere to China, while the other one is focused on value creation.

2.4.1 Raw Cashmere Export Sub-Chain

The raw cashmere export sub-chain is based on the activities of middlemen, who collect the material from the herders, move it to washing centres owned by Chinese investors, and export to China. In total 8,828 tonnes of raw cashmere enter this sub-chain. This sub-chain is expected to be changed significantly with the new law on commodity export. From 2024, exported cashmere will need to be dehaired first.

2.4.2 Vertically Integrated Sub-chain

The second, vertically integrated, sub-chain includes all steps of the VC, starting from sourcing by intermediaries (here we identify primary and secondary cooperatives, middlemen), sorting, washing, dehairing, dyeing, spinning, weaving, sewing or knitting of final products. Those are either exported or sold on the local market. Flows and prices (in thousand MNT/kg) established for the vertically integrated sub-chain are reported respectively in Figure 2-20.



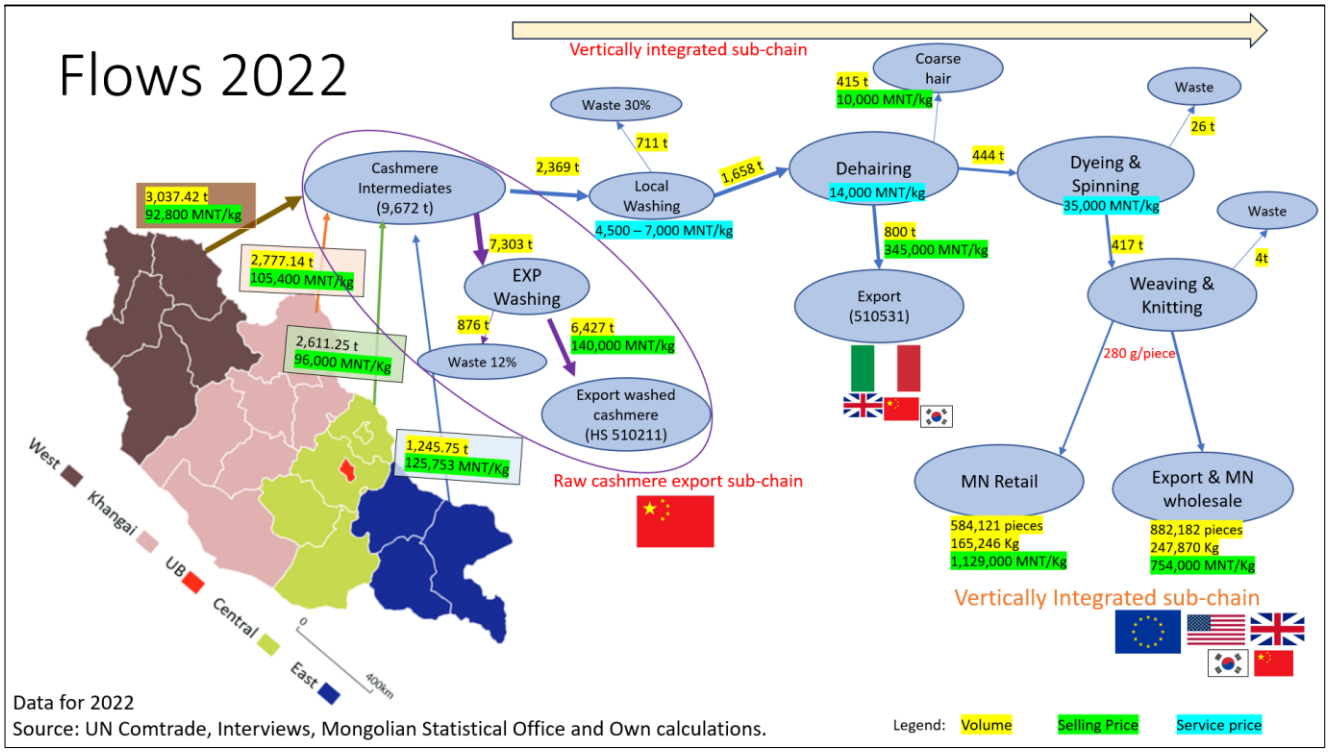


FIGURE 2-20: THE CASHMERE FLOW DIAGRAM, 2022, MONGOLIA
Source: authors based on UN COMTRADE, National Statistical Office, interviews, and own calculations.

2.5 Governance

Besides the private economic actors (herders, middlemen and different categories of processors), a variety of governmental, private, civil society and international actors contribute to the governance of the cashmere VC, which as a result is highly complex. These are outlined in Figure 2-21, and more detailed descriptions of their roles and mandates are given in Annex 2.

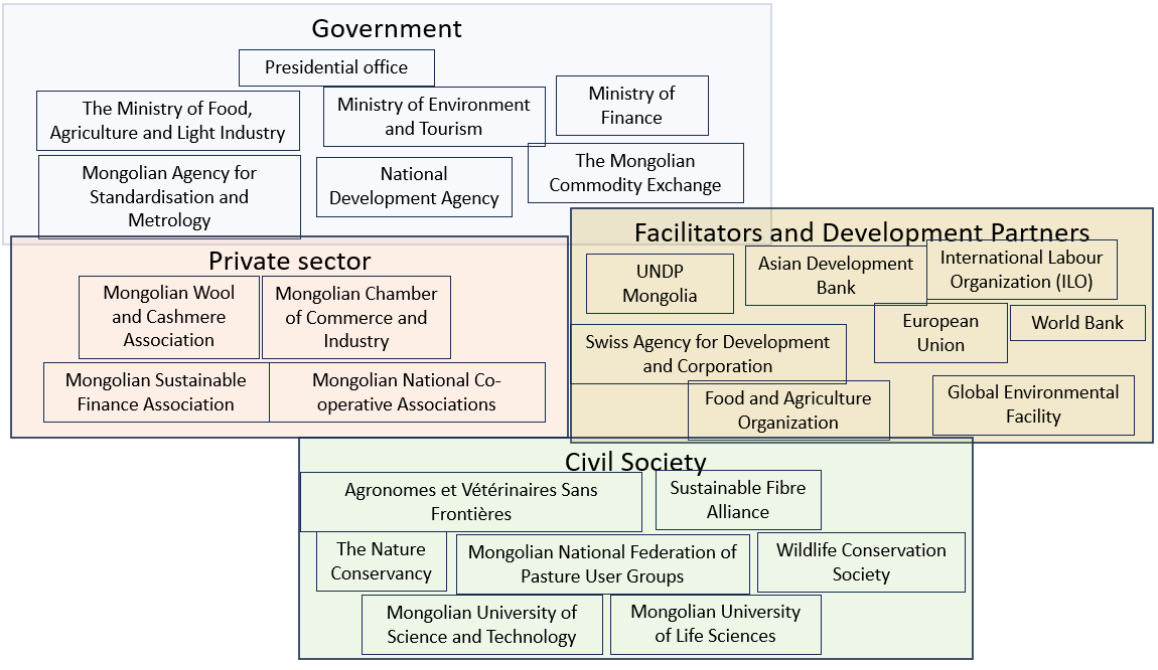


FIGURE 2-21: THE VC GOVERNANCE ACTORS, MONGOLIA
Source: authors based on UNDP Sustainable Cashmere Platform (UNDP, 2024).

A range of government ministries and agencies have produced, and are mandated to implement, key policies outlined in a number of strategic documents. Under the long-term national strategic documents such as **Vision-2050**, **Food and Agriculture Policy of Mongolia**, **Mongolia's Sustainable Livestock Action Plan**, **Government Action Plan for 2021-2024**, the Mongolian government aims to develop sustainable, diverse, and economically efficient livestock sector that is adapted to climate change and ensures reliable food supply. Table 2-15 summarises the key points of these as they relate to the cashmere VC.

Sustainable Use of Livestock Genetic Resources:	Optimize the utilization of livestock genetic resources.
	Create well-balanced herds that align with pasture capacity and consider cashmere quality indicators.
Climate Resilience and Disaster Risk Reduction:	Strengthen livestock resilience to climate change.
	Enhance disaster risk reduction skills.
Cashmere Industry Support and Export Boost:	Promote the cashmere industry.
	Increase exports of combed cashmere and finished products.
Comprehensive Processing and Export Expansion:	Fully process hides, leather, fur, cashmere, and wool.
	Boost exports of sewn and knitted products.
Effective Land Resource Management:	Utilize, protect, and rehabilitate land resources.
	Improve irrigation system efficiency using surface, rain, and snow water.
Pastureland Improvement and Disease Control:	Reduce pastureland degradation.
	Adopt international standards for animal disease surveillance and control.
	Develop a competitive livestock industry for the global market.
Intensive Animal Husbandry and Productivity Increase:	Develop intensive animal husbandry.
	Increase meat and milk production.
	Establish efficient supply, storage, and transportation systems.
Economic Goals:	Aim for livestock production to contribute 22% to Mongolia's GDP by 2030.
	Increase total investment in livestock production by 40%.
	Achieve an average annual growth of 5% in capital assets and a 20-25% return on investment.
Health and Safety Measures:	Implement preventive measures against animal infectious diseases.
	Eradicate zoonotic and other infectious diseases.
	Ensure the safety of animal products for both international and domestic markets.
Support for Pastoral Livestock Production:	Focus on pastoral livestock production based on the ecosystem of the eastern Mongolian steppe.

TABLE 2-15: SUMMARY OF NATIONAL STRATEGY DOCUMENTS.
Source: STeP EcoLab (2022)

The 2030 roadmap for the sustainable development of cashmere sector in Mongolia, developed withing the STeP EcoLab project, formulated the vision of sustainable cashmere industry being a leader in sustainable cashmere preparation, production, and manufacturing. The roadmap outlines three phases aimed at achieving several key objectives. These include reducing greenhouse gas emissions and water usage, increasing the number of breeding technology units, and boosting income for herders through cashmere production. At the processing level, the strategy focuses on: (i) Expanding the number of processing companies that adopt sustainable

production practices, (ii) Enhancing energy efficiency, (iii) Reducing chemical usage, (iv) Encouraging more green financing and (v) Elevating the value of exported cashmere final products.

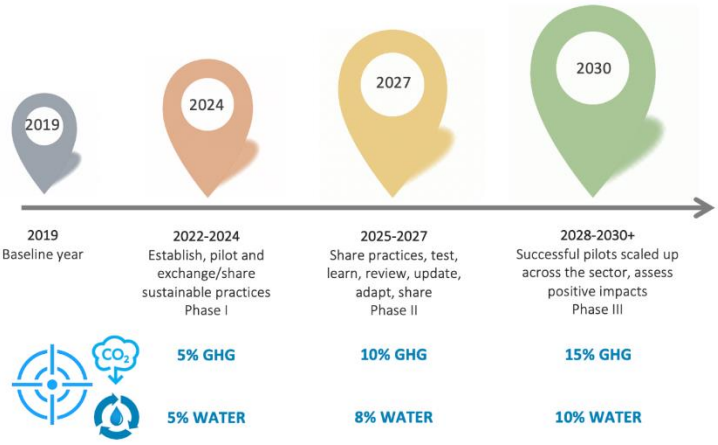


FIGURE 2-22: STRATEGY 2030 GOALS
Source: STeP EcoLab (2022)

2.5.1 Analysing the Governance of the Value Chain

FAO and UNIDO (2024) present the main components of an analysis of VC governance. Table 2-16 sets out the main features of the cashmere VC according to this schema.

Component	Relevant feature of the Mongolian cashmere VC
Vertical linkages	• Price is set by international markets (supply and demand for cashmere wool). • Herders co-operate in various cooperatives, PUGs and in non-formal networks. Price is discovered via internet or calls to several traders (for those close to the capital). In more remote areas, the price is not very transparent. Weak coordination among herders. • Herders are not rewarded for higher quality in most cases. Textile producers are willing to provide quality premium. Hence, a coordination problem exists. • Herders are dependent on middlemen as they provide cash advances. Cooperatives do not have such a financial capacity. Contractual production was not observed. • Not many vertical linkages exist at the processor level, but most processors are members of the Cashmere and Wool Association, others are members of the Chamber of Commerce.
Horizontal linkages	• Herders united in cooperatives. Cooperatives are united in a national umbrella association which lobbies for cooperative interests. Herders are linked informally at the horizontal through mutual help networks. • Processors cooperate in the Wool and Cashmere Association, which unites most of the Mongolian processors. The association represents producers in policy dialogue as well as in international fairs. Associations are open to new members; financial fees are required. • Efforts to develop Mongolian sustainable cashmere brand/logo (or GI equivalent). • Although small and large processors could be seen as competitors, there are processors who are willing to process (wash, dehair, spin) cashmere as a service for, for example for a small knitting workshops.

Market power	• At the herder level, an oligopsony exists. Herders are only able to sell to a few actors. Herders are exploited by middlemen in not receiving fair price. • Banks are very powerful. The State Bank and Khaan Bank, which are located across the whole country, have important positions, while herders are dependent on credits. • Middleman have a broad range of possible customers (processing companies) and export markets. • Large processors (like Gobi) have significant negotiating power and can negotiate better conditions for credits (even with international organisations), negotiate additional support from ministries, etc. • Washing and dehairing is expected to become very competitive (mainly due to the fact that export is required to be washed and since 2024 dehaired). Spinning is technologically complicated so the Mongolian companies are mainly affected by international competition. • As cashmere is very important for the Mongolian economy, major actors have political power.
Trust	• There is a reasonable level of trust between VC actors in the vertically integrated sub-VC, including trust held by herders in cooperatives and PUGs, and by cooperatives in Mongolian processors. • Herders give disparate answers on which organisations they trust most. • Many actors have negative perceptions of Chinese companies and their Mongolian middlemen.
Social capital	• There is a healthy level of participation in cooperatives, PUGs, and bagh assemblies. • Herders support each other in activities like well maintenance, planting and harvesting fodder crops, building and maintaining roads.
Formal and informal rules	• The ethnic homogeneity of Mongolia and the shared respect for pastoralism as an important traditional livelihood contribute to relations of trust within the VC

TABLE 2-16: GOVERNANCE OF THE CASHMERE VALUE CHAIN. CONTENT PROVIDED BY AUTHORS ON THE BASIS OF COMPONENTS SET OUT BY FAO AND UNIDO (2024)

2.5.2 Standards and Labelling

The Mongolian cashmere VC is characterized by a large number of standards and voluntary labelling schemes, promoted by different organizations. These are variously intended to promote environmentally sustainable production by herders, environmentally sustainable processing, and high quality of fiber. Table 2-17 shows some of the major standards and schemes operating mainly at herder or cooperative level, while Table 2-18 shows standards operating mainly at factory level.

Name	Licence-holder	Scope	Objective	Pillars and indicators	Reach as of 2023
Textiles. Dehaired cashmere. Technical requirement (MNS 3683:2015)		Dehaired cashmere quality standard	to determining the quality parameters and requirements of goat cashmere	Colour, processed level, qualification (grade), diamerer, length, coarse hair and other weaste partical share, humidity.	
Responsible Nomads CoP: RNS 6891:2020	MNFPUG	PUGs, baghs, soums, co-ops	To build green, traceable and competitive products for market	118 indicators under 5 pillars	• 15 co-ops • 600 tonnes meat • 15 tonnes cashmere
Rangeland management CoP	SFA	Co-ops	Rangeland management standard	30 indicators under 4 pillars	
Livestock CoP	SFA	Co-ops	Goat management and cashmere preparation standard	74 indicators under 10 pillars	750 tonnes cashmere
S3C	AVSF	Co-ops	Rangeland management	Not available	Merging with RN in 2023

TABLE 2-17: STANDARDS AND LABELLING SCHEMES OPERATING AT HERDER/COOPERATIVE LEVEL
SOURCE: AUTHORS' INTERVIEWS

Of the herder/cooperative level standards scheme, the Responsible Nomads code of practice for sustainable development standard (RNS) is the most important and is also in a process of increasing alignment with the S3C standard. The RNS was first developed under the SDC-funded Green Gold Animal Health Project which worked through the MNFPUG as a code of practice for sustainable livestock production, based on the project's experience, and a traceability system. The code of practice was piloted in various soums from 2017, while the traceability system is being tested on various commodities including milk, meat, cashmere, yak wool, and baby camel wool. "It is designed to validate and certify the quality and distinct properties of products originating from livestock raised on healthy, natural rangelands in the nomadic way of livestock herding". As of February 2021 the code of practice was granted the status of a national standard - MNS 6991:2020 - by the Mongolian Agency for Standardization and Metrology (MASM).

The RNS and AVSF's S3C standard each follow a process of successive levels of audit of different degrees of detail, running alongside mentoring of herders and their organisations. Some interviewees noted that the auditing process for the Sustainable Fibre Alliance was less rigorous and mainly questionnaire-based.

The RNS relies on five "pillars" or groups of indicators that can be objectively monitored either by MNFPUG or by third-party organizations:

- Rangeland management: herders affiliating to PUGs, establishing Rangeland Use Agreements and becoming members of cooperatives, subject to systematic and regular monitoring based on rangeland science
- Animal Health: monitored by the State Veterinary Authority
- Animal Welfare: monitored by MNFPUG
- Environmental Stewardship: conservation of wild fauna and rare plants, monitored by MNFPUG

- High Quality, Traceable Raw Materials.

In 2023, RNS underwent an audit conducted by Textile Exchange, marking the first instance of the standard being evaluated against industry standards by a third-party international auditor from Mongolia.

Name	Licence-holder	Scope	Objective	Pillars and indicators	Reach as of 2022
Sustainable Textile MNS 6926:2021	WCA	Processing companies	Textile monitoring and accreditation	61 indicators under 13 pillars	4 companies
Noble Fibre	WCA	Processing companies	Textile monitoring and accreditation	61 indicators under 13 pillars	4 companies
Cashmere CoP	SFA	Processing companies	Standard for processing company	88 indicators under 9 pillars	308 tonnes washed or dehaired cashmere, 4500 garments

TABLE 2-18: STANDARDS AND LABELLING SCHEMES OPERATING AT FACTORY LEVEL
SOURCE: AUTHORS' INTERVIEWS

Regarding processing and garment manufacture, the Wool and Cashmere Association (WCA) is accredited as an independent certification body that can monitor and audit companies using the Sustainable Textile Standard (MNS 6926:2021). It also holds the registered trademark Mongolian Noble Fibre. It is currently working with 18 garment companies, of which 12 are featured in the Mongolian Noble Fibre Factsheets as working towards sustainable production and adopting MNS 6926:2021. MNS 6926:2021 covers factory operation, including energy, wastewater treatment, chemical use, labour relations and health and safety. It is also tightly linked to the RNS: companies working towards MNS 6926:2021 need to source raw materials from herders and herder organisations that have adopted the RNS. The WCA is closely linked in this respect to both MNFPUG and AVSF: the Factsheets list 79 cooperatives from the MNFPUG database and seven from the AVSF database as aiming to implement sustainable herding practices.

The international websites of the major garment-manufacturing companies project a wide range of standards held (SFA Gold, MNS 6926:2021, Organic, Swiss OEKO-TEC, ISO 9001:2015, Woolmark) and desirable attributes: environmental sustainability, deforestation prevention, traceability, social responsibility. One major company features NFPUG, Step-Ecolab and SFA as partners. At present, no company yet advertises any herder- or cooperative-level standard.

The website https://sustainablecashmere.ngo states that the "Mongolia Intellectual Property Office (IPOM) issued to MNFPUG GI protection for its Sustainable Cashmere and other Noble Fibers in 2020-21".[18] One Italian garment company uses this on its website, in conjunction with the broader Responsible Nomads Standard.
MNFPUG is also working towards recognition of nine GIs dedicated to cashmere (see Table 2-19).[19] However, stakeholders have questioned whether the use made of the GI, as distinct from the standard as a whole or the Responsible Nomad branding, is appropriate. These are complex issues on which the team has not been able to reach a conclusion. In fact, the issue of GIs was not raised very much by stakeholders during the mission, and the team considers the development of standards and labelling schemes that can provide end-purchasers with assurance of both fibre quality and environmentally sustainable production practices, to be a higher priority.

[18] https://sustainablecashmere.ngo/#pgi-certication. This was also reported on 28.02.23 on the website of the Mongolian State News Agency https://montsame.mn/en/read/313756 .
[19] MNFPUG, pers.comm.

Name	Holding organization	Main aimags
Mongol red goat sustainable cashmere	MNFPUG	Tuv
Mongol black goat sustainable cashmere	MNFPUG	Tuv
Mongol white goat sustainable cashmere	MNFPUG	Govi
Altai red goat sustainable cashmere	MNFPUG	Govialtai
Bayandelger red goat sustainable cashmere	MNFPUG	Sukhbaatar
Zavkhan buural goat sustainable cashmere	MNFPUG	Zavkhan
Zalaa jinst goat sustainable cashmere	MNFPUG	Bayankhongor
Ulgii ulaan goat sustainable cashmere	MNFPUG	Bayan Ulgii
Erchim black goat sustainable cashmere	MNFPUG	Khuvsgul

TABLE 2-19: GEOGRAPHICAL INDICATIONS FOR MONGOLIAN CASHMERE

The linked issues of nationally-recognized standards and labelling schemes that can be advertised to prospective end-purchasers are very important for the development of the VC. However, the current plethora of standards and schemes risks producing confusion. The study team recommends: the increased promotion of the two nationally recognized standards to garment manufacturers as labels; and collaboration among organizations promoting different standards and schemes, and exporters, for greater harmonization.

2.6 SWOT analyses

Strengths	Weaknesses
- Large production base (territory and goat numbers) - Well-adapted goat breeds - Skilled and resilient herding population - Low costs of production - Cheap energy - Availability of relatively skilled workforce for processing - Attractiveness of processing work and relatively high salaries - Good standards of occupational health and safety - Sustainability standards provided by Mongolian Agency for Standardization and Metrology	- Uncertainties in legal framework for rangeland management - Lack of fodder for animals during winter (decreases quality of cashmere) - Unsystematic crossbreeding and dilution of local breeds - High dependence by herders on cashmere production - Low population densities and related logistical problems - Under-developed quality-based pricing system - Highly seasonal income for herders creating need for credit along the VC - High costs of capital (high interest rate on loans in comparison to costs of capital in China) - Underdevelopment of other livestock product value chains. Low valuation of older goat animals for meat purposes. Low price of hides - Concentration of processing sector in Ulaanbaatar. - Lack of effective environmental regulation for some stages of processing - Untransparent price system. Mongolian Agricultural Commodity Exchange not functioning well
Opportunities	**Threats**
- Development of Pasture User Groups - Amendments of laws on rangeland tenure and governance - Requirement to export only dehaired cashmere - Increased demand for natural fibres - Use of “nomadic narratives” in international marketing - FDI from European countries and Japan able to provide knowhow e.g. on high quality spinning/yarn production. - Better management of marketing via cooperatives - National Standard MNS 6926: 2021 for Sustainable Textile Production, based on a Voluntary Codes of Practice	- Climate challenges - Increase in goat numbers - On-going rangeland degradation due to overgrazing - Unstable economic environment - Dutch disease: due to large quantities of mineral exports, appreciation of the MNT making the national economy less competitive. - Lack of access to global transportation routes: Russia-Ukraine conflict making the Russian transportation route to the EU unfeasible. - Increasing economic influence of China

3. WHAT IS THE CONTRIBUTION OF THE VALUE CHAIN TO ECONOMIC GROWTH?

3.1 Methodological notes

The economic analyses rely on the VCA4D methodological brief, which clearly outlines the objectives of the economic analyses and defines the main framing questions. The outputs presented here were generated with the assistance of the AFA software.

For the economic part, the data used are coming from various resources.

- Mongolian statistical office and its information on national accounts, average prices, total cashmere production.
- Household socioeconomic survey of 2021 (National Statistical Office, 2023a)
- Discussion with stakeholders, producers, and processing companies.

The Household Socioeconomic Survey of 2021 provided detailed information on production costs and revenues of herder households. The survey data for 2021 were adjusted to account for the increasing price level, using the annual national inflation rate of 2022 (**13.2%).** The survey covered 3,504 out of 4,109 herder households involved in goat/cashmere production, offering insights into herd structure, animal numbers, revenues, and expenses. It specifically detailed income sources, including cashmere, sales of animals, and other livestock-based products like animal pieces and skins.

While some expenses (such as veterinary care, gasoline, depreciations) are common for all animals and cannot be easily attributed to goats, costs were recalculated. EU base Livestock Units (LSU[20]) were used to indicate costs related to goats.

The basic financial account was determined for a **group of 100 goats** at the herder level, with LSU calculations considering only animals aged 1 year and above. Therefore, a 100-head herd is equal to **11.55 LSU**. The cost values were recalculated to one LSU and multiplied by 11.5 subsequently. Herders do not need to pay VAT; they are eligible to pay income tax and social/health insurance. Detailed information is reported in the Table 3-1 as derived from the National census 2021 and adjusted with inflation to fit 2022 price level.

Item	Costs per 1 LSU – Small (n=2,922)	Costs per 1 LSU – Large (n=580)
Animal fodder	36,109 MNT	21,991 MNT
Animal veterinary	3,028 MNT	2,200 MNT
Petrol	14,651 MNT	9,752 MNT
Salary	3,876 MNT	5,172 MNT
Others (Water, etc.)	272 MNT	437 MNT
Motorcycle	20,536 MNT	8,646 MNT
Truck	55,326 MNT	41,770 MNT
Car	76,773 MNT	41,291 MNT
Ger	•	8,298 MNT
Herder's loan	54,133 MNT	42,371 MNT

TABLE 3-1: MONGOLIAN PER LSU COSTS BASED ON HOUSEHOLD SURVEY; PRICES DEFLATED BY INFLATION
SOURCE: OWN CALCULATIONS BASED ON (NATIONAL STATISTICAL OFFICE, 2023A)

[20] For more details see the Livestock unit glossary of the Eurostat (Eurostat, 2023).

Financial accounts for other actors are based on secondary data, interviews, financial reports made available by one of the largest companies, and I-O tables (Lenzen et al., 2016).

3.2 Profitability & Sustainability of actors

In the subsequent section, the study provides information on the financial accounts of the aforementioned entities. The first section concentrates on small herder households and large herder families. The latter section delves into the VC participants, encompassing middlemen, export washing facilities, export dehairing facilities, and actors involved in apparel production. Due to the intricate and technologically complex nature of the industrial production process, the financial accounts have been formulated as cost items per kilogram of production.

3.2.1 Financial account for 100 goats of small herder family, national average

Small herder families are characterized as households with fewer than 600 animals. In average, small herd has about 95 goats. As stipulated in the methodology, the costs are extrapolated from conducted interviews, with additional detailed information obtained from the Household Economics Survey. Out of a 100-goat herd, cashmere is combed from 87 animals, as the rest are yearlings that cannot be combed. The price per kilogram of cashmere varies across different regions due to differences in yield. In the Eastern part of Mongolia, a 100-head herd yields 30.9 kg of raw cashmere, whereas the western region, while having higher yield, is marked by lower quality due to late combing, resulting in elevated levels of dirt and coarse hairs.

Animal veterinary care poses challenges due to the rapid increase in the number of animals, and the veterinary services have struggled to keep pace with this situation. Certain veterinary activities, such as male castration, can be carried out by the herders themselves, while others require the expertise of qualified veterinarians. Basic vaccinations are provided for free by the local/central government, contingent on the region and specific diseases, while other veterinary services must be covered by the herders themselves. Additionally, each animal must undergo spring washing to guard against pests. Traditionally, animals pass through a special pool with a solution containing specific chemicals, but more recently, animals are sprayed using specialized showering machines. The presence of a spraying vehicle in a soum simplifies the washing process, eliminating the need for animals to travel to the soum centre as the vehicle can conveniently visit the herd. The cost per washing is 200 MNT per goat, irrespective of the technology used.

Both small and large farms alike need to hire specific labour, primarily for goat combing. The current practice involves combing goats in one or two days, and herders often hire individuals with expertise in goat combing as a service. Alternatively, herders frequently make informal arrangements with locals, such as the unemployed, promising to provide cash per animal combed. These working agreements have an unofficial character.

Concerning herders' contributions to the state budget, only approximately 10-15% of herders actively participate in social insurance. The majority neither contribute to the general budget nor pay taxes. In 2021, Mongolia implemented an animal head tax aimed at reducing the overall number of animals. As mentioned in the Functional analyses above, herders were initially willing to contribute to the first year, but by 2022, the payment rate had already decreased. For small herders, it is estimated that around 50% of herder families genuinely contribute to the animal head tax.

As highlighted in the Functional Analysis, herders face challenges with cash flow and find themselves in a cash flow trap. Despite generating enough cash to repay debts, they still require

external finances, often in the form of loans. Herder households predominantly earn income in two seasons: spring when they sell cashmere and autumn when they monetize fed animals, which are sold for 90,000 MNT per animal. However, the issue of animal trading is complex. Some herders opt for the services of a slaughterhouse, paying 5,000 MNT per animal and later selling the calves and skin separately. This approach allows them to obtain a higher price, but not all herders engage in such activities. Goat skins have very small value (1,000 MNT) in summer and autumn. However, once the goats start to produce cashmere, skins are getting more valued (up to 35,000 MNT).

Goats play a significant role in ensuring food security for small herder households. According to interviews, households can consume anywhere from 30 to 40 animals annually, with the census considering 8 goats for consumption.

Goat milking is a distinctive activity, primarily practiced in the Gobi region, where natural conditions limit opportunities for diversified income. Herders in this region also milk goats and process the milk into dried curd, a traditional Mongolian dairy product. In other regions, due to the labour-intensive nature, milk is obtained from cattle or sheep, which can yield larger quantities. However, the survey reveals that most of the goat milk is utilized for household purposes, with only a small portion being sold.

Small HH	East	Central	Khangai	West
Price (MNT)	125,753	96,080	105,458	92,888
Yield of cashmere (Kg/animal)	0.3090	0.3631	0.3118	0.4082
Production MNT	6,198,696	5,801,593	5,601,108	6,104,616
Gross operating profit (MNT)	5,336,887	4,944,237	4,745,757	5,244,230
Net operating profit (MNT)	4,679,341	4,286,691	4,088,211	4,586,684
Value added (MNT)	5,552,202	5,155,100	4,954,615	5,458,123
Profit margin (MNT)	75%	74%	73%	75%
Number of goats (Thousands of heads)	2,369	4,226	5,235	4,373
Contribution to agricultural GDP	1.9%	3.1%	3.7%	3.4%

TABLE 3-2: SMALL HERDER, FINANCIAL INDICATORS FOR 100 GOATS DIFFERENCES FOR DEFINED REGIONS, 2022, MNT

Considering all aspects of goat breeding across four different regions, it can be concluded that profitability is very similar (Table 3-2). Small herders in the east achieve a higher price but a lower quantity of cashmere from 100 goat animals, striking a balance in the profit margin per household. Nevertheless, the smallest profit margin is observed in the Khangai region, while the highest is in the Eastern region. Due to variations in goat numbers, small herders contribute differently to the national agricultural GDP. The Khangai region, with the largest number of goats, makes the highest contribution (3.7% of MN agricultural GDP). At the same time, it is important to mention, that small herders cashmere contribute by 12% to agricultural GDP.

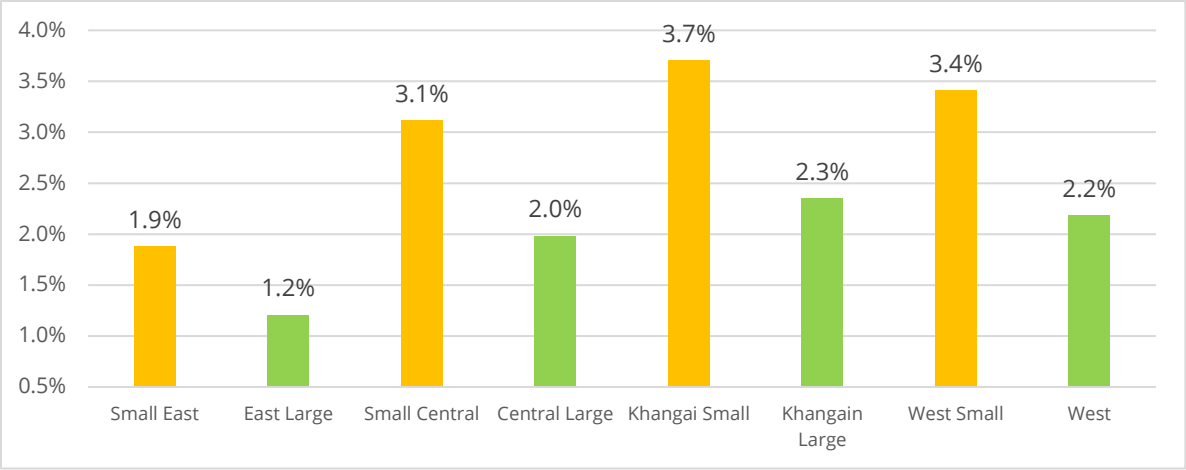


FIGURE 3-1: CASHMERE CONTRIBUTION TO AGRICULTURAL GDP – PRODUCTION FROM SMAL AND LARGE HERDERS, 2022, MONGOLIA

3.2.2 Financial account for 100 goats of large herder family

Large farms do not differ significantly from small farms, in average 338 goats per HH was considered. There is an observed increase in salaries, as larger herders often employ the services of what is known as an assistant family (but still just about 16% of the HH use the service of the assistant family according to the national Human Right Commission of Mongolia (Batuur, 2022). In this arrangement, the large herder shall provide a ger, food, in addition to a monthly salary that covers insurance and social payments (according to the herders). Despite these benefits, the work remains demanding, and there is a shortage of people willing to assist large herders. But according to the Battur (2022), the situation is very different. Assistant families only rarely receive real cash, rather are renumerated in kind (animals, food, etc.) with the total value of renumeration being below the minimal wage, while working constantly and without any possibility of day off. Larger herders also benefit from economies of scale, resulting in lower depreciation per hundred goat heads. Moreover, they incur reduced expenses on veterinary services, petrol, and fodder. Census data indicates that large herders use lower herder loans per hundred animal heads.

When comparing the financial results of small and large herders, larger herders exhibit a slightly increased profit margin due to economies of scale, but the difference is not very significant. Large herders sell a larger share of goats, produce less milk, and diversify their income into other animal species. Generally, large herders are less dependent on income from cashmere.

Large herders, contribute by 7.7% to agricultural GDP of Mongolia (Table 3-3).

Large HH	East	Central	Khangai	West
Price (per Kg)	125,753	96,080	105,458	92,888
Yield of cashmere (Kg/animal)	0.309	0.36	0.31	0.40
Production (MNT)	5,497,116	5,100,013	4,899,528	5,403,036
Gross operating profit (MNT)	4,728,411	4,337,503	4,140,146	4,635,799
Net operating profit (MNT)	4,149,942	3,759,034	3,561,678	4,057,331
Value added (MNT)	5,076,712	4,679,609	4,479,125	4,982,633
Profit margin (MNT)	75%	74%	73%	75%
Number of goats (thousands of heads)	1,662	2,965	3,672	3,068
Contribution to agricultural GDP	1.2%	2.0%	2.3%	2.2%

TABLE 3-3: LARGE HERDER, FINANCIAL INDICATORS FOR 100 GOATS DIFFERENCES FOR DEFINED REGIONS, 2022 (MNT)

3.2.3 Financial accounts for Middleman

Per 1 kg		Price / Kg	Units/ Ratio	Final costs/ Revenues
Revenues	Raw cashmere	104,000	1.00	104,000
Total production				**104,000**
Consumables	Cashmere (Kg)	102,000	1.00	102,000
Services	Transportation	681	1.00	681
	Others	100	1.00	100
Wages	Wages	150	1.00	150
Tax	TAX	956	10.0%	96
Depreciation	Depreciation	104,000	0.1%	104
Total Costs				**103,131**
Profitability Ratios				
Gross Operating Profit				973
Net Operating Profit				869
Value Added				1,219
Profit Margin				0.8%

TABLE 3-4: MIDDLEMAN FINANCIAL ACCOUNT, 2022 (MNT)

The activities of middlemen were more extensively detailed in the Functional Analysis. To briefly recap, there are two types of middle traders: traditional middlemen, known as 'changers', in Mongolia, and established cooperatives. Cooperatives operate more formally, acting on behalf of their members, while changers are profit-oriented individuals representing either Chinese traders or their own interests. Changers usually do not pay any tax, and cooperatives are not eligible for VAT. Their profit margins are typically small. They mainly purchase cashmere at the soum (village) level, transporting it to Ulaanbaatar, where they promptly sell it to processing companies. Changers, especially those representing Chinese traders, may not even need significant capital, as they are financially backed by their customers. On the other hand, cooperatives may not always have sufficient cash to purchase all available cashmere, leading them to rely on commercial credit. See table 3-4 for illustrative financial account for trader/middleman.

As indicated later in this section, the cashmere VC is highly dependent on financial institutions that provide credits for trading and processing companies. Additionally, the table below (Table 3-5) illustrates different transportation costs, with the cheapest transportation feasible around the capital city and the most expensive transportation originating from the western part of the country. Middlemen and cooperatives have few permanent employees, and their reliance on permanent staff often depends on whether they trade exclusively in cashmere or with other commodities as well. Transportation is typically contracted as a service, and it is common for the transportation to be accompanied by a person responsible for overseeing the cashmere delivery.

Region	Distance (km)	Transportation costs (MNT/Kg per trip)
East	331 - 655	633
Central	40 - 553	413
Khangai	318 - 671	595
West	984 - 1636	1084

TABLE 3-5 TRANSPORT COSTS BETWEEN REGION AND PROCESSING UNITS, 2022 (MNT)

3.2.4 Financial accounts for the export washing activity

Per 1 kg of raw cashmere		Price	Units	Final costs/ Revenues
Production	Cashmere	140,000	0.88	123,200
	Loan subsidy	1,000	1.00	1,000
Total production				**124,200**
Consumables	Cashmere	104,000	1	104,000
	Steam	200	1	200
	Energy, Drying	80	1	80
	Electricity	102	1	102
	Others	700	1	700
Services	Transportation to border	200	1	200
	Others	500	1	500
Wages	Sorting labour	200	1	200
	Washing labour	400	1	400
	Labour overheads	1,000	1	1,000
Interest on loans	Loan	124,200	7%	8,694
Taxes	Labour tax, insurance	1,600	0.31	496
	MCSE Licence	994	1	994
	Corpotation tax (10%)	6,335	10%	634
Depreciation	Washing, Dehairing	300	1	300
Total Costs				**118,499**
Profitability Ratios				
Gross Operating Profit				6,001
Net Operating Profit				5,701
Value Added				18,418
Profit Margin				4.6%

TABLE 3-6: WASHING ACTIVITY OF CASHMERE WOOL, FINANCIAL ACCOUNT FOR 2022 (MNT)

The cashmere purchasing season occurs between March and June. Once a company acquires sufficient cashmere, it undergoes a series of processing steps, including storage, sorting, cleaning, washing, and packing for export. The washing process is energy-intensive, requiring water to be heated to 50-plus degrees Celsius, followed by the drying of the cashmere. Large machines are employed in the washing process, demanding a significant input of electricity, and where possible, steam from central heating station. However, from a general cost perspective, the costs associated with steam, electrical energy, or heat play a relatively minor role in total costs. Labour, transportation, and depreciation also have minimal impacts on costs. The most critical cost items are unquestionably the cashmere itself, along with the costs of capital. The profit margin at the washing stage is relatively small (~ 5%), making this stage vulnerable from a long-term perspective. As more cashmere is purchased, companies require more capital, and higher loans result in increased interest payments.

This financial account (Table 3-6) mainly represents the costs related to exported cashmere in its washed form only.

3.2.5 Financial accounts for the export dehairing activity

Per 1 kg of raw cashmere		Price	Units	Final costs/ Revenues
Production	Cashmere	345,000	0.53	182,850
	Coarse hair	10,000	0.15	1,500
	Loan subsidy	1,000	1	1,000
Total production				**185,350**
Consumables	Cashmere	104,000	1	104,000
	Steam	300	1	300
	Energy, Drying	100	1	100
	Electricity	302	1	302
	Others	1,000	1	1,000
Services	Transportation to border	50	1	50
	Others	3,000	1	3,000
Wages	Sorting labour	200	1	200
	Washing labour	400	1	400
	Dehairing labour	800	1	800
	Labour overheads	2,000	1	2,000
Interest on loans	Loan	185,350	14%	25,949
Taxes	Labour tax, insurance	3,400	0.31	1,054
	MCSE Licence (0.8%)	1,483	1	1,483
	Corpotation tax (10%)	31,738	0.1	3,174
Depreciation	Washing, Dehairing	185,350	7%	12,975
Total Costs				**156,786**
Profitability Ratios				
Gross Operating Profit				41,539
Net Operating Profit				28,564
Value Added				76,598
Profit Margin				15.4%

TABLE 3-7: DEHAIRING ACTIVITY OF CASHMERE WOOL, FINANCIAL ACCOUNT FOR 2022 (MNT)

The dehairing process is inherently more complex and requires skilled labour. In this stage, cashmere remains the most significant cost item. Since dehairing is predominantly conducted for European customers, our team did not identify any traders from Italy, the UK, Germany, or France physically present in the market. Consequently, Mongolian companies purchase cashmere, process it, and export it to the destination. The conflict in Ukraine has led to the partial elimination of road transportation routes via the Russian Federation, with smaller quantities now being transported by plane.

From a labour perspective, cashmere undergoes sorting, washing, mixing/dyeing, and dehairing. On average, 1 kg of cashmere yields 500 grams of fine fibre, and companies with higher yields can achieve better economic results.

In terms of cost structure, cashmere, loan interest, remain the most crucial factors determining the economic success of this activity. Electricity, energy (steam), and labour have minimal impacts on costs.

The entire cashmere VC processing sector relies on loans for about 100% of its revenues, and from this amount, interest must be covered. Despite the presence of green loans, government loans, or loans supported by international donors with lower interest rates, the interest paid still amounts to roughly 20% of total revenues in the whole VC[21]. Loans are mostly used for purchasing cashmere.

3.2.6 Financial accounts for the local textile processing activity (wool to apparel)

Price per KG of produced product (knitted products, mostly)		Small producer	Large producer
Production	Textile selling price (per kg)	754,000	754000
	Loan Subsidy	1,000	1,500
	Coarse hair	0	1,500
Consumables		249,910	272,600
Services		55,000	135,990
Wages		83,050	113,325
Interest on loans		105,700	105,770
Taxes		44,020	39,791
Depreciation		52,850	46,086
Total costs		590,530	713,561
Ratios	Gross Operating Profit	217,320	88,024
	Net Operating Profit (after CIT)	164,470	41,939
	Value Added	505,090	482,900
	Profit Margin	22%	6%

TABLE 3-8: CASHMERE WOOL PROCESSING ACTIVITY, FINANCIAL ACCOUNT FOR SMALL AND LARGER PROCESSORS, 2022 (MNT)

Cashmere apparel production is well-developed in Mongolia, with a predominant focus on knitted products, likely influenced by the financial accessibility of second-hand knitting machines for local businesspersons. Small family manufacturers typically purchase raw cashmere directly from herders and offer services such as cleaning, washing, and spinning the cashmere. The resulting yarn is then used in the knitting process.

Currently, approximately 18 companies in Mongolia have the capacity to integrate the entire production process within one facility. These companies can buy raw cashmere and provide customers with finished apparel. The largest vertically integrated actor in this sector is traded on the Mongolian Stock Exchange and publishes annual sustainability reports and annual reports that include information on its assets, liabilities, cash flow, and revenues. Based on information from the report for the financial year 2022, a cost structure has been created. This company, like many other Mongolian cashmere processing companies, experienced losses in 2022, like the situations in 2021 and 2020. Although the company generated operating profit, the overall annual results were negative due to substantial financial expenses.

Textile companies in Mongolia can create significant value added (VA) by transforming raw materials into final products. However, financial constraints appear to be putting pressure on the industry, resulting in negative financial outcomes for several companies. Access to cheaper loans is believed to have the potential to spur further industry development.

[21] Information based on annual Gobi report (2022) combined with information from Ph.D. theses by SHARAVDEMBEREL Enkhtuul (SHARAVDEMBEREL, 2023).

3.2.7 Financial accounts for Ulaanbaatar retail companies

Per 1 kg of final cashmere apparel		Price / kg	Units	Final costs/ Revenues
Revenues	Textile selling price (per kg, incl. VAT)	1,129,000	1.00	1,129,000
Total production				**1,129,000**
Consumables	Cashmere (Kg)	754,000	1.00	754,000
	Others	1,129,000	0.5%	5,645
Services	Rent	1,129,000	4.7%	53,063
	Services	1,129,000	2.0%	22,580
Wages	Wages	1,129,000	3.0%	33,870
Interest on loans	Loan	1,129,000	8.0%	90,320
Taxes	Social, Health + PIT	1,129,000	1.1%	12,927
	VAT	1,026,364	10.0%	102,636
	CIT	42,669	10.0%	4,267
Depreciation	Depreciation	1,129,000	1.0%	11,290
Total Costs				**1,090,598**
Profitability Ratios				
Gross Operating Profit				49,692
Net Operating Profit				38,402
Value Added				293,712
Profit Margin				3.4%

TABLE 3-9: RETAIL ACTIVITY, FINANCIAL ACCOUNT FOR 2022 (MNT)

The retail costing was determined based on information from Ulaanbaatar, applying the same logic as before-costing per kilogram of sold products (Table 3-9). In our calculation, the average weight of one product is 288 grams, with a selling price ranging between 300,000 and 350,000 MNT. In the capital city, costs such as shop lease, VAT, and wages for shop assistants are significant items in the calculation.

Retailing cashmere products can generate a relatively high VA, but when it comes to profit margins, the results are generally low. The entire business is once again heavily dependent on loans, as a well-equipped cashmere shop needs to maintain a substantial stock of cashmere products, requiring credits. For the retail sector, estimated loan interest equals approximately 8% of shop revenues, which is lower than the VC average. However, it is anticipated that cashmere shops are likely to be opened by individuals who have some funds available.

Operating profits for average size actors

Actor	Net Operating Profit* (NOP) MNT	Size of the actor (operation)
Small herder Eastern small	5,070,042	95 goats
Small herder Central small	4,697,025	
Small herder Khangai	4,508,469	
Small herder Western	4,982,018	
Larger herder Eastern	14,026,805	338 goats
Large herder Central	12,705,536	

Large herder Khangai	12,038,470	
Large herder Western	13,713,777	
Middleman	10,927,148	11.2 tons of traded cashmere
Exporter-washing (NOP per kg of raw cashmere)	1,077,538,140	189 tons of raw cashmere
Exporter-dehairing (NOP per kg of raw cashmere)	942,620,580	33 tons of raw cashmere
Large apparel producer (per kg of apparel produced)	453,568,663	10.8 tons of final apparel
Small apparel producer (per kg of apparel produced)	345,387,000	2.1 tons of final apparel
Retailer (per kg of apparel sold)	92,164,047	2.4 tons of final cashmere product

TABLE 3-10: OPERATING PROFIT REACHED BY AVERAGE ACTOR PER ANNUM, 2022

3.3 Total effects within the national economy

From a cost perspective, farm consumables constitute a significant part of the total intermediate consumption breakdown. Although these costs may not appear substantial at the individual herder level, the cumulative impact of the total number of herders (over 210 thousand) in the system amplifies the overall consumption. In processing industries, services are not explicitly specified, but it is evident that external actors play a crucial role in the VC. These may include professional service fees, transportation, repair, insurance, as well as advertising and promotional services.

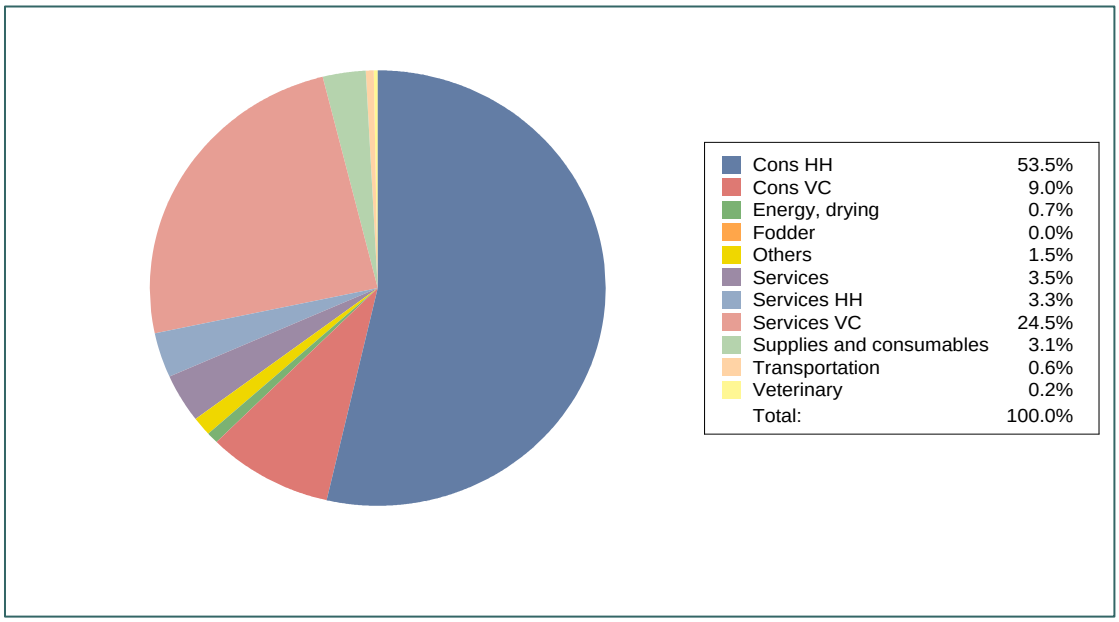


FIGURE 3-2: INTERMEDIATE CONSUMPTION BREAKDOWN, 2022, MONGOLIA

However, intermediate consumption is only part of the story. In general, the costs of material consumption (other than cashmere) represent only a small portion of the final apparel product. Looking at the figure below (Figure 3-3), the largest costs are related to VAT taxes, which must be covered for both exported and retail products. Other important costs, in addition to farm consumables, include financial charges at the level of processing industries (textile manufacturing) and depreciation at the level of herder households. Specifically, due to the number of households and their capital ownership, depreciation is rather significant. The most substantial depreciation

item is a winter shed, now a standard for goat and sheep. Priced at 7 million in 2022, it can accommodate about 200 animals, and its expected lifespan is 10–15 years.

In comparison to developed countries, labour is still not a significant cost item; however, the constant increase in average salary will also have important effects on profitability. Nevertheless, production in Mongolia could be more intensified, as some practices allow hiring a worker rather than investing in advanced labour-saving technology (i.e., whole garment knitting machines).

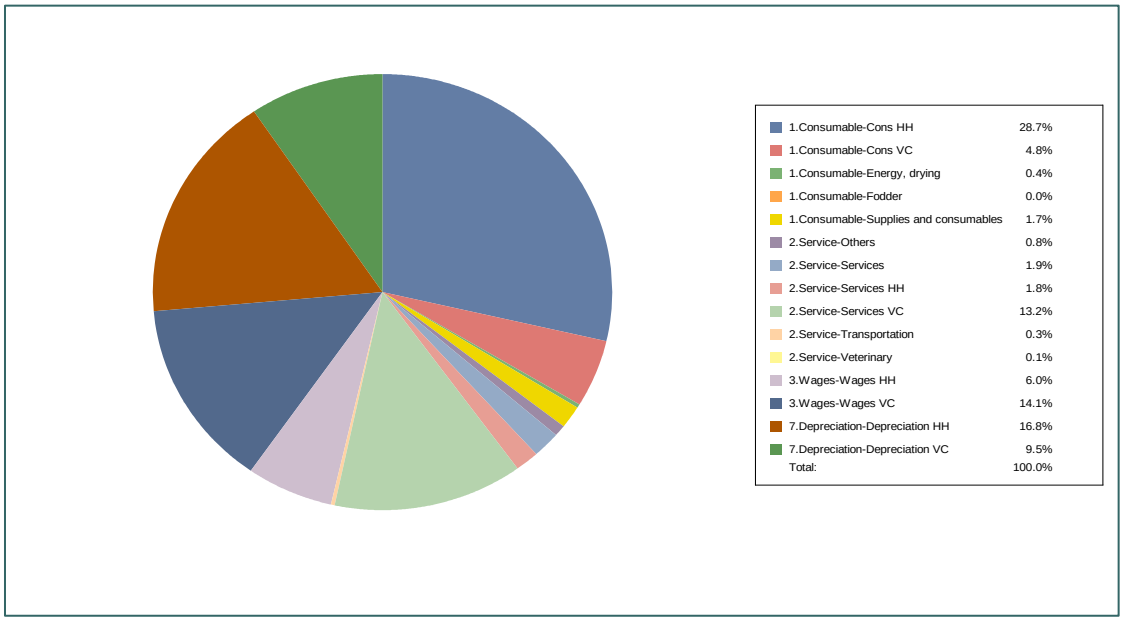


FIGURE 3-3: COST STRUCTURE, 2022, MONGOLIA

The total effects are based on the assumptions, how much of the VA is generated indirectly in the VC.

	Agriculture / Wheat[2]	Financial services	Transportation	Health	Energy	Wholesale	Maintenance
Imports (IMP1)	33%	0.5%	6.7%	18.6%	3.5%	7.5%	69%
Value added (VA1)	45%	64%	17%	35%	73%	42%	5%
Compensation of employees (Wag1)	18.3%	15.8%	39.4%	49.7%	21.7%	37.0%	37.0%
Taxes on production (Tax1)[1]	0%	0%	0%	0%	0%	0%	0%
Subsidies on production (-Tax1)	0%	0%	0%	0%	0%	0%	0%
Profit (Net1)	65%	70%	51%	43%	47%	56%	56%
Depreciation (Dep1)	16%	14%	10%	8%	31%	7%	7%

TABLE 3-11: COEFFICIENTS OF THE IMPORTS AND VA EMBEDDED IN INTERMEDIATE CONSUMPTION (USED FOR THE EFFECT CALCULATIONS) (MNT)

Source: authors based on I-O tables (Lenzen, Kanemoto, Moran, & Geschke, 2012).

[1]The I-O tables does not indicate any tax payments. But as the businesses makes profits, certain level of taxes paid are considered in calculations.

[2]FAOStat indicates that 77% of wheat is used from national resources and only about 1/3 is imported.

As visible in the table below (Table 3-12), the majority of VA is generated within the VC, only small portion is generated indirectly (only about 3% of the total VA). The reason is more than clear from the financial account tables. Once the cashmere is the most important intermediate consumption

in the upper stream of the VC, other most relevant costs are taxes and interests on loans (Se also Consolidate Account table in Annex 3).

	Direct effects	Indirect effects	Total effects
Imports		110,915	102,596
IC not disaggregated		78,455	76,403
Value added			
Wages	96,206	16,505	112,711
Taxes	93,319		96,112
Subsidy	34,056		34,056
Tax (+) Sub (-)	59,263	2,793	62,055
Interest on loan	185,215	1,769	186,982
Land Fee	0	242	242
Depreciation	125,960	9,113	135,073
Net Operating Profit	1,384,693	37,322	1,422,015
VA not disaggregated	0	60	60
VA Total	1,851,336	67,802	1,919,139

TABLE 3-12: VC DIRECT AND INDIRECT EFFECTS (MNT)

The VC contributes 27.4% to agricultural GDP. It contributes a net 62,056 million MNT to public finances and a net 1,210,020 million MNT to the balance of trade. The VC is well integrated into the national economy (rate of integration = 91%).

Not only taxes have to be paid, but also agriculture sector is subsidised a lot by government. The assumptions for taxation and calculations are included below.

Tax/ Subsidy	Justification
Personal income tax	1% for herders with income below 50 million MNT. For larger income, the tax is defined as 10%. Due to the fact that only small amount of herders has income higher than 10 million, for large HH the average efficient tax rate considered is 1.56%.
Social contribution by employee	11.7%, each employee in the VC is contributing. Only about 10% of herders are voluntarily paying the social contributions (their rate is based on the minimum salary)[1]
Social contribution by employer	13%
VAT – Export	10% for other commodities than agricultural products, textile. Hence efficient rate is 0%.
VAT – local retail	10%
Corporate income tax	10% used as a central range for the corporations (1%, 10% and 25% rates are applied)
Animal head tax	Based on MNPUG, the average animal head tax has been at the level of 617 MNT per goat, considering 50% payment rate in 2022.
Herder's support (subsidies)	FAOStat defines the total value of support to agriculture at the level of 121 billion MNT (about 1% of the governmental budget). From that value a contribution to one LCU was recalculated as of 900 MNT per head of goat.
Mongolian National Commodity Exchange (MNCE)	The MNCE requires any international transaction to be registered and according to the interviews, 0.8% is a service fee[22]

[1] This information reached during the interview at the labour research institute.

[22] Some mentioned that many transactions are done without MNCE involvement, the discount on the fee is negotiable.

Also, due to the fact that the raw cashmere is not very demanding on production and does not need a lot of intermediate consumption, the big portion of generated VA is a profit that is being distributed among farmers.

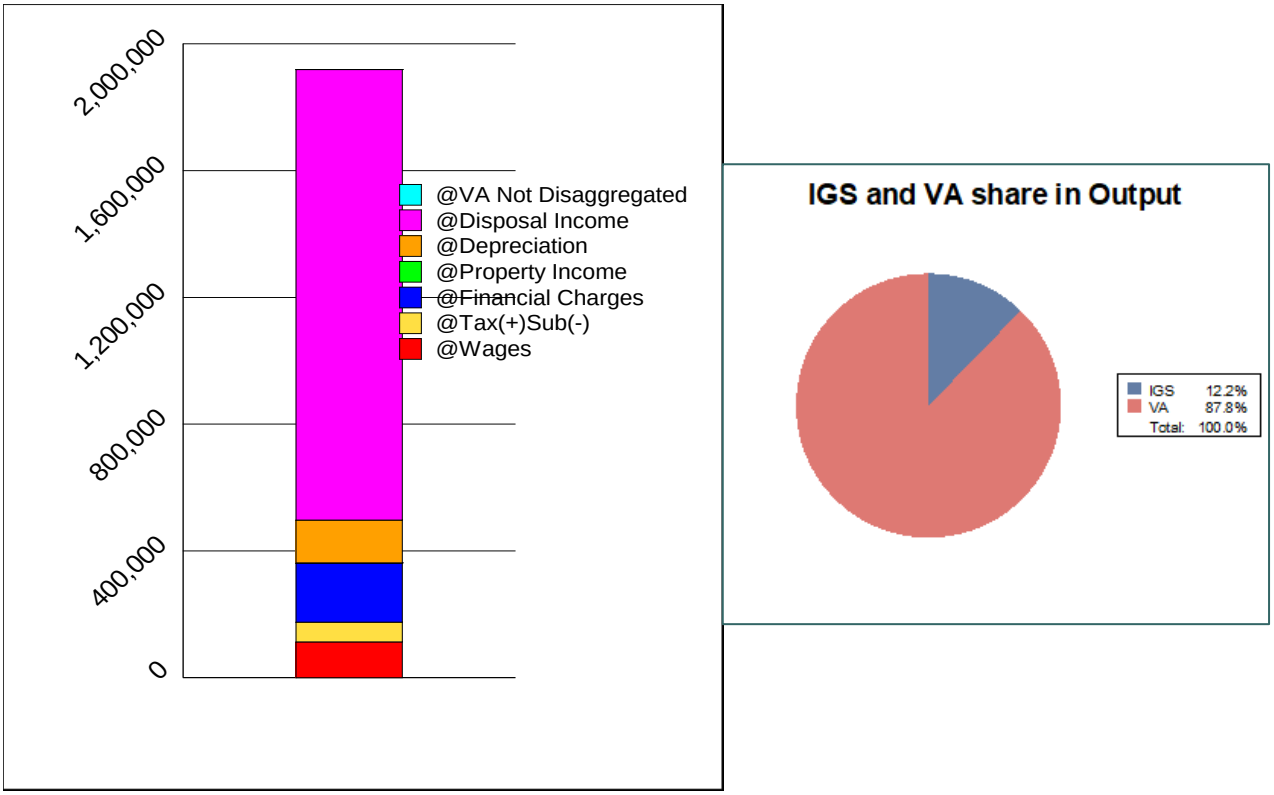


FIGURE 3-4: VALUE ADDED DISTRIBUTION, 2022, MONGOLIA

3.4 Competitiveness and viability within the international economy

The viability of the VC is estimated with the nominal protection coefficient (NPC). Parity price is the price of the possible alternative obtained by importing from, or exporting to, the same geographical point and in the same form. As the analysis encompasses the VC throughout the whole country, we use border prices as parity prices. The following calculation process eliminates transfers (taxes and financial flows) and values tradeable goods and services using international prices and using actual domestic market prices for other flows.

The parity price for the cashmere is based on the calculation with the average price of the biggest exporters, the China and Mongolia and Kyrgyzstan. Data for Iran for year 2022 were not available.

	Not carded or combed Cashmere (510211) =washed=	Carded or Combed Cashmere (510531) =dehaired=	Cashmere clothes (611012)
Mongolia	31.9	86.5	197.8
Türkiye	35.2		
Kyrgyzstan	42.4		83.4
Uzbekistan	72.0		
China	120.7	74.1	108.7
Italy		42.1	489.0
Iran		48.3	

TABLE 3-13: PRICES OF CASHMERE PRODUCTS, AVERAGE OF 2019 - 2022
SOURCE: UN COMTRADE (2023)

As evident, Mongolia holds a unique position among cashmere-exporting countries, as it exports all three of the most important cashmere commodities (Table 3-13). Notably, China almost entirely refrains from selling raw cashmere and dehaired cashmere. Mongolia has competitively priced washed cashmere (HS 510211), selling below the prices set by its major counterparts. In contrast, China prohibits the export of unprocessed cashmere, and the processed exports commands leads to a higher price than that of other countries.

The Net Price Coefficient (NPC) values are derived from the AFA software, with an estimated NPC of 1.0 indicating that the market is perfectly integrated into international markets without trade distortions. However, it is crucial to note that in Mongolia, the export of raw commodities contributes to the valuation of the national currency and may logically decrease competitiveness in sectors beyond mining. This phenomenon is called 'the Dutch disease' and leads to nominal currency value evaluation as the economy receives the foreign currency for its exported commodity. Mongolia is rather an open economy, with the GDP to export of about 70%, where majority of export is generated by export of raw materials and minerals. Dagys et al. (2020) specify that the Mongolian economy has symptoms of the Dutch disease.

The Domestic Resource Cost (DRC) ratio for cashmere is calculated to be 0.08. Once it is smaller than 1, result indicates that Mongolia uses domestic resources efficiently, in a sense, that opportunity costs are lower than value generated by the cashmere VC. Once the DRC ratio is very small, it refers to a great comparative advantage.

3.5 Sub-chains and their contribution to the VC economic performance

The VC was divided into two sub-chains (see 2.4). The first sub-chain deals with raw materials, which are washed and exported to China. The second sub-chain integrates a more sophisticated processing phase, including dehairing, spinning, and processing into the final product.

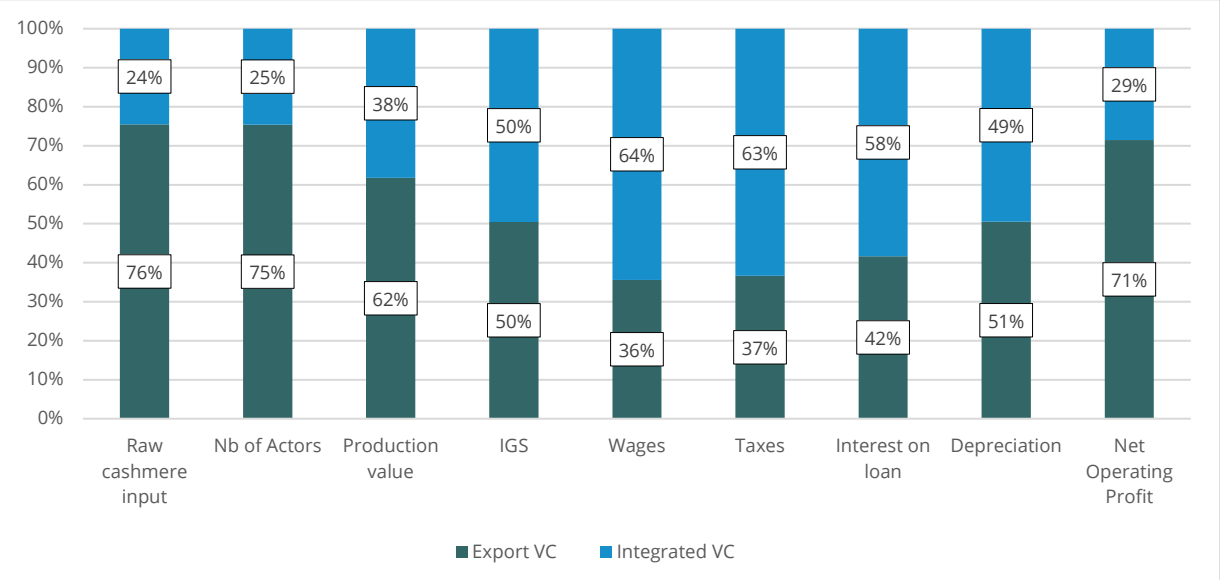


FIGURE 3-5: SUB-CHAIN CHARACTERISTICS, 2022, MONGOLIA

As observed in the Figure 3-5, the Export sub-chain uses majority of raw cashmere commodity as well as it effects the majority of actors. Once the herder households are the most numerous actors,

the share in actors is much anticipated. In the Export sub-chain, the production value equals 178 million MNT/tonne, whereas in the Integrated sub-chain, the more advanced processing leads to almost double the value generated by the VC from one tonne (340 million MNT/tonne). Higher production necessitates higher levels of IGS inputs and requires more labour. We mainly observe a significant number of labourers in the processing (textile) part of the VC. Herders paid labour needs are limited, washing of the raw cashmere is done just in few places (about 40). Most of the labour is required for dehairing, spinning, and textile production processes. Personal income tax, health, and social contributions serve as important sources for the state budget, as well as VAT from products sold in retail.

	Unit	Export VC	Integrated VC	Total VC
Raw cashmere input	tones	7,303	2,369	9,672
Production	Million MNT	1,302,371	806,305	2,108,676
• Production to input	Mil MNT/tone	178	340	218
IGS	Million MNT	129,867	127,471	257,338
Wages	Million MNT	34,262	61,944	96,206
Taxes	Million MNT	34,168	59,151	93,319
Interest on loan	Million MNT	77,199	108,016	185,215
• Interest to production	%	5.9%	13.4%	8.8%
Depreciation	Million MNT	63,615	62,345	125,960
• Depreciation to production	%	4.9%	7.7%	6.0%
Net Operating Profit	Million MNT	989,298	395,395	1,384,693
• NOP to production	%	76%	49%	66%
Direct VA	Million MNT	1,172,504	678,834	1,851,338
VA/Product	%	90%	84%	88%
Nb of Actors	Units	161,140	52,493	213,634
Nb of employees	Individuals	2,073	5,511	7,584

TABLE 3-14: SUB-CHAIN CHARACTERISTICS OF CONSOLIDATED ACCOUNT

The higher the level of processing, the greater the technological and mechanization needs, leading to increased demands for capital and technology. Depreciation and interest payments account for 4.9% and 5.9% of the total production in the Export sub-chain. In the Integrated sub-chain, loan interests amount to 13.4%, and depreciation to 7.7% of the total production. With a more straightforward approach involving Chinese middlemen, washed cashmere export is perceived as more profitable. Net operating profit over production equals 76% in the Export sub-chain, whereas for the Integrated sub-chain, the figure is only 49%[23]. Hence, considering the risks associated with the processing phase, capital intensity, and long capital (inventory) turnover, which in the case of Gobi could be even more than 2 years[24]. the Mongolian cashmere industry sector behaves very rationally – by purchasing raw cashmere from herders, conducting some basic material washing, and exporting to China. This approach reduces capital needs, mitigates risks, and results in higher profits.

3.6 Answer to the Framing Question 1

The table below summarises the primary outcomes derived from the economic and financial analysis undertaken for the Mongolian cashmere VC. The VC proves to be both economically profitable and sustainable, particularly at the level of herder families. However, as we move up the

[23] It must be noted that the high profitability of the VC is increased by the profit generated at the level of herder families, who with minimal inputs (not counting the family unpaid labour) are able to generate high profit margins.

[24] In 2021 total inventory turnover was 708 days, but already in 2022 just 504 days. Covid lead to inventory turnover of more than 950 days in 2020. The long inventory turnover is mostly given by the capacity of the production process. While the raw material must be purchased in the period of 1 – 3 months, some phases of processing are time demanding and the process from cashmere wool to knitted is therefore prolonged.

processing chain, the economic results become more intricate. The most challenging situation is observed at the level of integrated textile producers, who incurred losses in 2022, primarily due to high finance costs.

Nevertheless, given the significance of cashmere in terms of price and its impact on the Mongolian GDP and Agricultural GDP, the sector appears to be receiving a lot of attention.

Summary table of indicators for framing question 1 (See definitions of economic terms before the Executive Summary)

Framing Question 1: What is the contribution of the VC to economic growth?		**INDICATORS**	**RESULTS**
CQ1.1	How profitable and sustainable are the VC activities for the entities involved?	**Operating Accounts of every type of actor**	**See tables in the text**
		Net operating profit by type of actor	**Small herder: 4,152,000 (95 goats)** **Large herder: 12,980,000 (338 goats)** **Middleman: 869 per kg** **Washing export: 5,700 per kg** **Dehairing export: 28,500 per kg** **Textile production (Large): 42,000 per kg** **Textile production (small): 164,470 per kg** **Retail: 38,400 per kg**
		Return on turnover (operating profit/production)	**Small herder: 74 %** **Large herder: 74%** **Middleman: 0.8%** **Washing export: 4.6%** **Dehairing export: 15%** **Textile production (large): 5.6%** **Textile production (small): 22%** **Retail: 3.4%**
		Benchmarks for farmers' net income (minimum wage, livelihood needs, job opportunities…)	**Minimum wage (2022)** • 420,000 MNT **Average wage (2022), national average** • 1,503,800 MNT
Framing Question 1: What is the contribution of the VC to economic growth?		**INDICATORS**	**RESULTS**
CQ1.2	What is the contribution of the VC to the GDP?	**Value of final VC production**	**2,108,676 million MNT** • 1,302,371 MMNT (Export VC) • 806,305 MMNT (Integrated VC)
		Direct VA	**1,851,338 million MNT** • 1,172,504 MMNT (Export VC) • 678,834 MMNT (Integrated VC)
		Total VA	**1,919,139 million MNT** • 1,237,049 MMNT (Export VC) • 682,049 MMNT (Integrated VC)
		Total VA creation per stage	**Farmers: 73.9 %** **Processors: 21.6%** **Traders: 4.5 %**

		Total VA and components:	**Wages/salaries:** • 96,202 million MNT **Financial Charges:** • 185,215 million MNT **Taxes on operations:** • 93,319 million MNT **Depreciation:** • 125,960 million MNT **Operating profits farmers:** • 1,392,655 million MNT **Operating profits processors:** • 1,211,406 million MNT **Operating profit trade** • 2,713,490 million MNT
		Total VA in percentage of the GDP	**3.6%**
		Rate of integration into the Economy (total VA/VC production)	**91%**
CQ1.3	What is the contribution of the VC to the agriculture sector GDP?	**VC agricultural actors' Value Added in percentage of the agriculture sector GDP**	**27.4%**
CQ1.4	What is the contribution of the VC to the public finances?	**Receipts of the government (taxes, etc.)**	**96,112 million MNT**
		Outlays of the government (subsidies, etc.)	**34,056 million MNT**
		Public Funds Balance	**62,056 million MNT**
CQ1.5	What is the contribution of the VC to the balance of trade?	**VC exports**	**1,320,935 million MNT** VC Exports: 3.6% of total MN exports
		VC total imports (goods and services)	**110,915 million MNT** VC imports: 3% of all MN imports
		Balance of trade of the VC	**1,210,020 million MNT**
Framing Question 1: What is the contribution of the VC to economic growth?		**INDICATORS**	**RESULTS**
CQ1.6	Is the VC viable in the international economy?	**Nominal Protection Coefficient (NPC)**	**1.000**
		Domestic Resource Cost Ratio (DRC)	**0.08**

4. IS THIS ECONOMIC GROWTH INCLUSIVE?

4.1 Participation in the value chain governance

The VC is gendered at the level of the herders, where men have a greater role than women, though not complete dominance, role in decision-making on production, marketing and use of household income. Herders have a healthy level of participation in the lower (bagh and soum) levels of local government, and, where they are operating, in cooperatives and PUGs (see Section 5.3.3). With the implementation of the new law on pasture management (see more detailed in the other part), it is anticipated that Pasture User Groups will gain a significant role in pasture management, potentially influencing herd management and cashmere production.

Herders have limited potential to influence prices, facing a power imbalance with middlemen who hold stronger negotiation power. This negotiation power is further diminished by advance payments provided by middlemen to meet compelling social and consumption needs, constraining farmers from seeking better prices or alternative middlemen. The vast territorial size of Mongolia contributes to an oligopsony at the soum (village) level. Discussions with processors revealed that, middlemen also exert their negotiation power against processing companies. Nevertheless, it is evident that processing companies are inclined to establish more direct relations with herders, often facilitated through cooperatives.

In the processing part of the VC, the most powerful entities are the large cashmere processors, capable of lobbying at the government/presidential level. These companies often showcase images from visits by high-ranking Mongolian officials. From this perspective, processing companies advocate for access to cheap and subsidized credits, as well as possible grants for investment activities in new technologies.

4.2 Distribution of the profit and value added

In the cashmere VC, the actors' contributions to net operating profit (NOP) creation are as follows (Table 4-1). Herder households significantly contribute to NOP generation. Small herders account for 56% of the total VC profit, while large herders contribute 34% of the profit. The transformation of cashmere into the final product only contributes 10% to the final profit. The reasons why herders can generate profits are explained above. However, it is important to reiterate that the production process is rather extensive, the process mostly require labour (which is unpaid) to care for the herd, rather than material or service inputs.

Actor	Net operating profit	NOP Share (%)	
Eastern small herder	122,467	8.8%	Small herders (56%)
Central small herder	196,932	14.2%	
Khangai small herder	233,512	16.9%	
Western small herder	216,883	15.7%	
Eastern large herder	76,556	5.5%	Large herders (34%)
Central large herder	121,513	8.8%	
Khangai large herder	143,247	10.3%	
Western large herder	134,879	9.7%	
Middleman	8,399	0.6%	
Export washing	42,139	3.0%	
Export dehairing	41,345	3.0%	
Textile large	10,585	0.8%	
Textile small	27,497	2.0%	
Retail	8,739	0.6%	
Total	**1,384,693**	100.0%	

TABLE 4-1: NET OPERATING PROFIT PER ACTOR, MONGOLIA, 2022

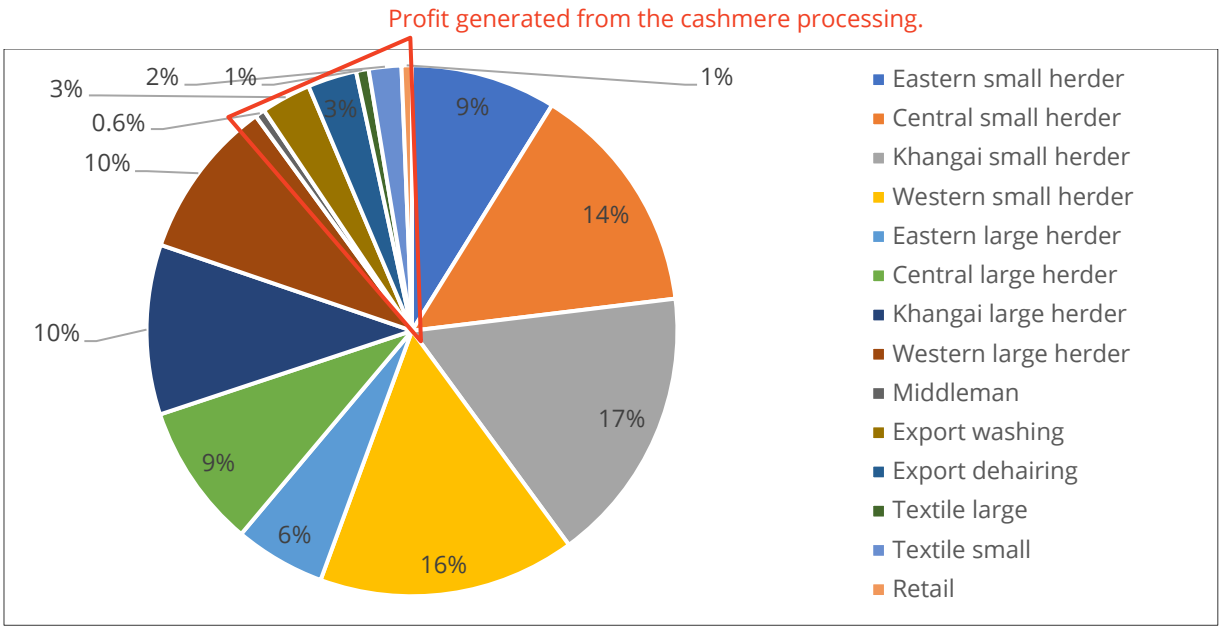


FIGURE 4-1: NET OPERATING PROFIT BREAKDOWN BY ACTORS, 2022, MONGOLIA

Additionally, the distribution of Net Operating Profit and Value Added into regions is outlined below. The central part of the country generates the highest operating profit and the most value added. This can be attributed to Ulaanbaatar serving as a central hub for all cashmere-related activities. In the capital or its vicinity, cashmere is traded, processed, and prepared for export. Moreover, the only national laboratory of the customs office, responsible for quality testing mandatory for each export-ready batch, is situated in the capital. Also, in the capital, there are training centres for skilled labour, which enables companies to hire professionals who have competences for technologically requiring textile industry. Also, service companies are located in Ulaanbaatar, and transportation of professionals to large distance is complicated as well as expensive.

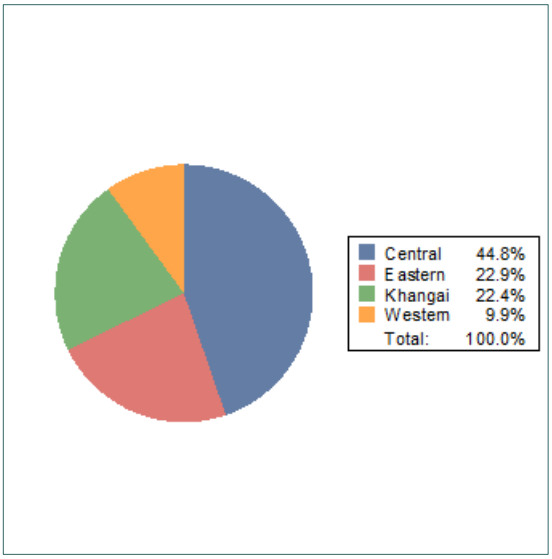


FIGURE 4-2: VALUE ADDED BREAKDOWN BY REGION, 2022, MONGOLIA

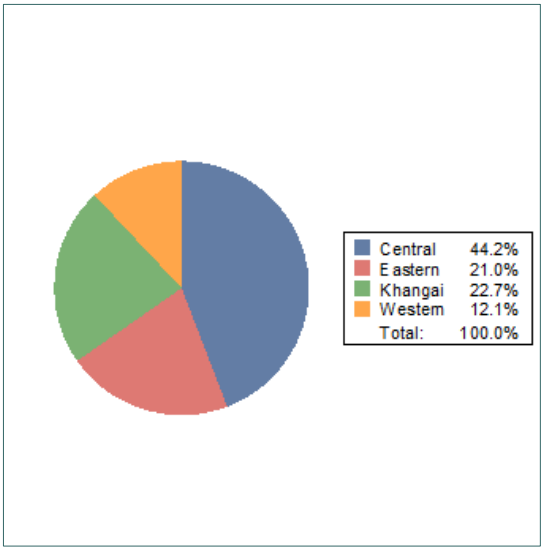


FIGURE 4-3: NET OPERATING PROFIT BREAKDOWN, 2022

4.1 Distribution of wages and employment creation

In Mongolia, a disparity in salaries between males and females is evident. As indicated in the table below, the gender pay gap is smaller for skilled males and females (3%), while it is larger for unskilled labour force (13%). The explanation for this difference may be quite straightforward. Traditionally, males often stay with the family to become herders, while girls are sent to schools and universities to pursue higher education. The higher representation of females in different high positions generally leads to a smaller pay gap. Also, as indicated above, employee as well as employer our subject to social insurance contributions as well as income tax.

Labor type	Gross salary	Net salary	Total contributions to social and health insurance	Pay gap	Salary per day (20.5 days a month)
Permanent Skilled Female*	1,853,400.0	1,451,212	643,130	3%	70,791
Permanent Skilled Male*	1,910,400.0	1,495,843	662,909		72,968
Permanent Unskilled Female*	1,058,700.0	828,962	367,369	15%	40,437
Permanent Unskilled Male*	1,234,300.0	966,457	428,302		47,144
Temporary female					38,000
Temporary male					45,000

TABLE 4-2: BASIC DATA FOR WAGES IN MONGOLIA, 2022

*Page 120 in MN statistical yearbook 2022, skilled labour (Plant and machine operators) and elementary occupation (unskilled)

Based on the reached average wages for skilled males, skilled females, unskilled males, unskilled females, and temporary workers, we can gather information on the wages generated at different levels of the VC. Small herders, relying mostly on temporary workers for seasonal activities, do not significantly contribute to the total wage pay-out. On the other hand, the use of assistant families by some large herders increases the number of wages to be paid out. The average remuneration for assistant families is roughly worth 5.4 million MNT per year (mostly paid in kind), with only a portion of that payment considered for the financial account related to goats (20%).

It is also assumed that middlemen primarily use temporary labour for their short-term cashmere purchase activities, or they utilize only a portion of their temporary labour force. However, the

most employee-intensive stage is textile production, particularly in apparel production. Producing knitted jerseys still requires a high amount of labour input, even though there are existing technologies that can replace labour, albeit at a relatively high cost. Additionally, the use of older machines[25] at the lower levels of the VC (washing, dehairing, spinning) results in a higher demand for labour compared to available advanced technologies.

Actor	Wages (million MNT)	Share (%)	
Eastern small herder	1,221	1.3%	Small herders (8.7%)
Central small herder	2,179	2.3%	
Khangai small herder	2,698	2.8%	
Western small herder	2,254	2.3%	
Eastern large herder	2,979	3.1%	Large herders (21.2%)
Central large herder	5,313	5.5%	
Khangai large herder	6,581	6.8%	
Western large herder	5,498	5.7%	
Middleman	1,177	1.2%	
Export washing	11,683	12.1%	
Export dehairing	5,196	5.4%	
Textile large	27,938	29.0%	
Textile small		14.3%	
Retail	13,781	8.01%	
Total	**96,206**	**100%**	

TABLE 4-3: DISTRIBUTION OF WAGES AMONG ACTORS, MONGOLIA, 2022

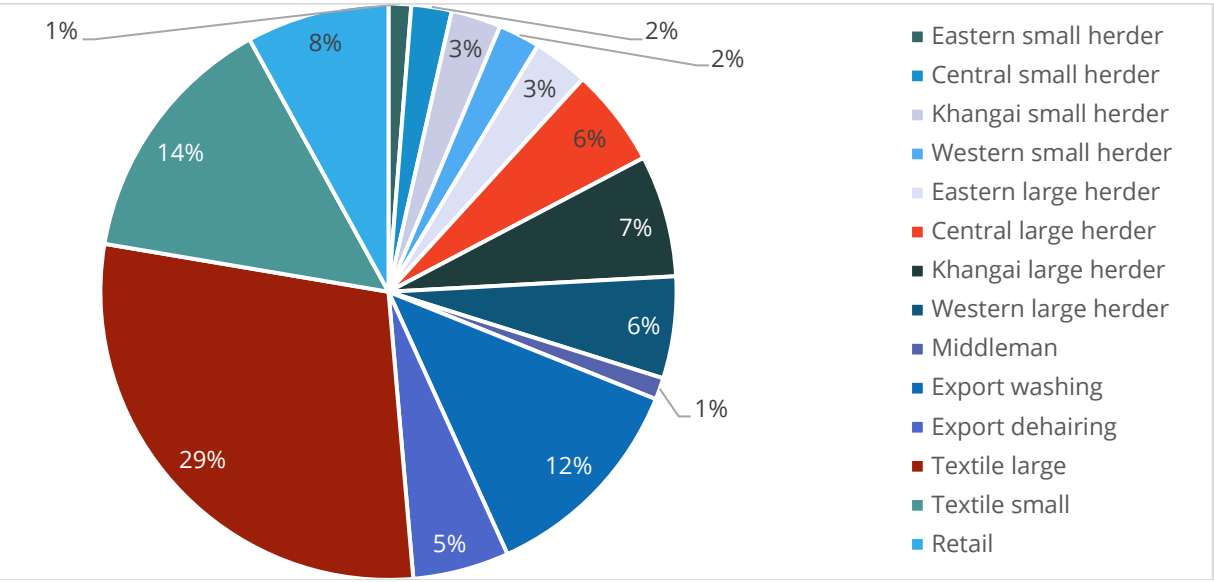


FIGURE 4-4: DISTRIBUTION OF WAGES AMONG ACTORS, MONGOLIA, 2022

[25] While visiting several processing facilities, the team was informed about how older machines can perform effectively if properly maintained. In many cases, these machines were second-hand, often sourced from Japan. Choosing older machines was typically a strategic decision to transition into new processing phases (such as from trading to washing, or from washing to dehairing, etc.), particularly when investment capacity was limited. However, businesses are willing to invest in advanced machines if they have the capability to do so, as evidenced by the adoption of technologies like the Wholegarment Shima Seiki machines.

	Time equivalent (days)	Full time equivalent (245 days a year)		Value of wages (Million MNT)	
Temporary Male	211,926	865	11%	9,537	10%
Temporary Female	21,996	90	1%	8,358	9%
Permanent Unskilled Male	502,926	2,053	27%	23,688	25%
Permanent Unskilled Female	825,476	3,369	44%	33,349	35%
Permanent Skilled Male	115,690	472	6%	8,445	9%
Permanent Skilled Female	180,140	735	10%	12,754	13%
Total Temporary	233,922	955	13%	17,895	19%
Total Permanent Unskilled	1,328,402	5,422	71%	57,037	59%
Total Permanent Skilled	295,830	1,207	16%	21,199	22%
Total Male	830,542	3,390	45%	41,670	43%
Total Female	1,027,612	4,194	55%	54,462	57%
Jobs at Herder level	538,310	2,197	29%	28,724	30%
Jobs in the VC level	1,319,844	5,387	71%	67,483	70%
Total labour force	**1,858,153**	**7,584**	**100%**	**96,131**	**100%**

TABLE 4-4: DISTRIBUTION OF WAGES AMONG EMPLOYMENT CATEGORIES, MONGOLIA, 2022

In total, approximately 7,584 full-time equivalent employees are expected to work in the cashmere VC. They collectively receive a net payment of 96 billion MNT, which exclude income tax and social contributions paid by both employees and employers. In the VC, 55% of workers are female, while 45% are male (in full-time equivalent). Most wages are allocated to permanent unskilled labour. As a significant portion of skilled labour is represented by females, the share of salaries they receive overcounts their share in total employment. The Export sub-chain does not have a particularly high demand for labor. Middlemen and washing capacities employ approximately 1,050 full-time equivalent (FTE) workers, whereas processing in the Integrated sub-chain requires about 4,300 FTE positions. When considering the volume of cashmere inputted into Integrated sub-chain (2,369 tonnes), the labor requirement for processing 1 tonne of cashmere into a higher value-added product equal approximately 1.5 to 1.8 FTE positions. Therefore, if the entire Mongolian cashmere supply were processed (10,000 tonnes), it could potentially create employment for around 18,000 people in full-time equivalent positions.

Not surprisingly, that majority of jobs are created at the level of a central region, mainly due to the fact that the processing companies are in the capital city which is part of the central region. Unfortunately, this negatively affects the development of outer regions, which are facing structural problems also related with the problem of migration to the capital city.

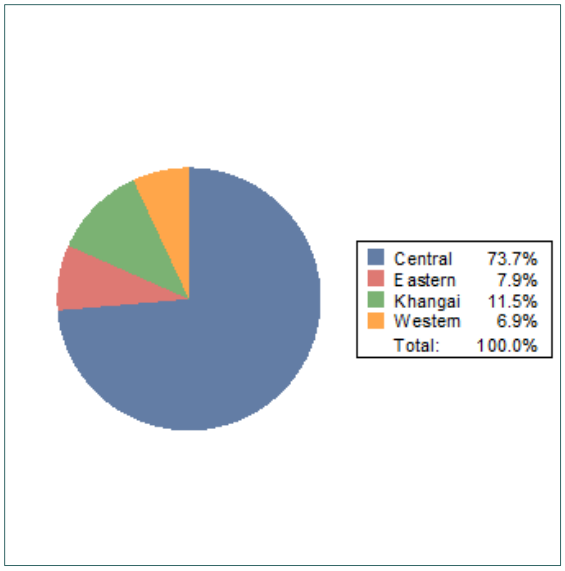


FIGURE 4-5: WAGE BREAKDOWN BY REGION, 2022, MONGOLIA

4.2 Answer to the Framing Question 2

The economic growth driven by cashmere production is inclusive, a fact supported by several arguments. The VC provides employment opportunities for a significant number of women across various age groups. Although a gender pay gap is observed, the difference is not substantial. Salaries in the cashmere transformation sector are on par with the national average, making employment in cashmere processing highly sought after. As a benchmark, salaries in processing factories are approximately 50% higher than those in retail stores in the capital city, Ulaanbaatar.

Furthermore, the high price of cashmere enables herders to increase their income, consequently reducing migration from the countryside to Ulaanbaatar. Herders, considered a vulnerable group due to their challenging nomadic lifestyle, are convinced that the VC contributes to the sustainability and viability of nomadic activities in Mongolia. Also, during the combing season, herders mentioned that they provide temporary employment opportunities (combing, shearing, etc.) to locals who might be unemployed.

The government's recognition of the role of cooperatives, exempting them from VAT, along with the exception for farmers from paying income tax at the standard rate, enhances the willingness of herders to stay in the business. However, despite high profitability and the availability of social, financial, and veterinary support, there is an increase in the number of livestock. Efforts to implement a livestock head tax appear to face challenges, particularly when herders lack the incentive to pay the tax to local government offices.

The distribution of income is depicted on the graph below. The Lorenz curve, which is a base for the GINI coefficient calculation, is closer to 45%-degree line. This means, that the income is distributed to actors more equally. **The Gini coefficient is equal to 0.3510**, which indicates rather more equal distribution of income.

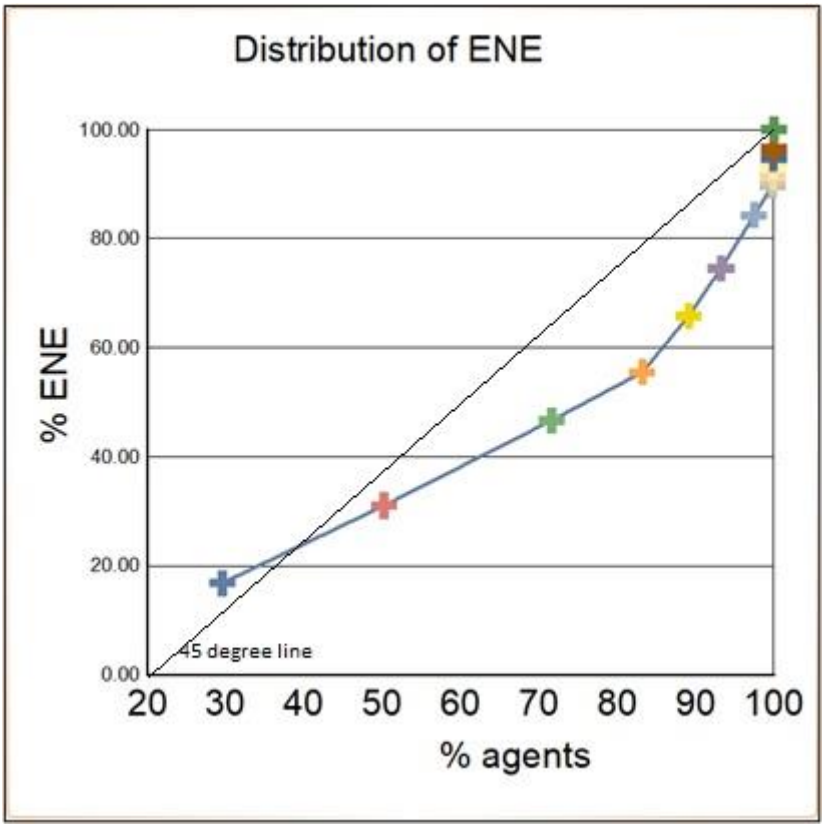


FIGURE 4-6: LORENZ CURVE OF ACTORS, 2022, MONGOLIA

Summary table of indicators for framing question 2 (See definitions of economic terms before the Executive Summary)

Framing Question 2: Is this economic growth inclusive?		INDICATORS	RESULTS
CQ2.1	How is income distributed across actors of the VC?	**Disaggregated Value Added**	**1,834,243 million MNT**
		NOP of herders	**1,245,989 million MNT ()**
		Wages and salaries (at every stage, all activities)	**Value of wages and salaries: 96,131 million MNT**
		Total income accruing to marginalized and vulnerable groups	**Income to temporary workers at the herder level:** 12,427 million MNT (12% of salaries) **Income to the assistant herders:** 16,296 million MNT (16%) **Females in the processing industries:** 42,972 million MNT (47%)
CQ2.2	What is the impact of the governance systems on income distribution?	**Income distribution among actors**	**Share of Operating profit:** • Eastern small herder **8.8%** • Central small herder **14.2%** • Khangai small herder **16.9%** • Western small herder **15.7%** • Eastern large herder **5.5%** • Central large herder **8.8%** • Khangai large herder **10.3%** • Western large herder **9.7%** • Middleman **0.6%** • Export washing **3%** • Export dehairing **3%** • Textile large **0.8%** • Textile small **2.0%** • Retail **0.6%**
		Share of farm gate price in the final price (%)	Farmgate price as Mongolian weighted average: **102,000 MNT/Kg** Share of raw cashmere in Middleman selling: **98%** Share of raw cashmere in Washed cashmere export price**: 87 %** Share of raw cashmere in Dehaired cashmere export price: **56%** Share of raw cashmere in Apparel price in the local market: **18%**
CQ2.3	How is employment distributed across the VC?	**Number of jobs (family, self- and formal employment) at different VC stages (permanent/ temporary, skilled/unskilled…)**	Full-time equivalent (FTE): **7,584** Permanent workers (FTE): **6,630 (87%)** Temporary workers (FTE): **954 (13%)**
		Employment of women	55% of FTE, receiving 57% of salaries
		Gini coefficient	0.3510

5. IS THE VALUE CHAIN SOCIALLY SUSTAINABLE?

This section will answer the framing question "Is the value chain socially sustainable" with reference to the six domains of the VCA4D social analysis methodology: Working Conditions, Land & Water Rights, Gender Equality, Food & Nutrition Security, Social Capital, and Living Conditions. Because of their importance in rural Mongolia, issues of debt and indebtedness, and of livestock insurance, as topics of livelihood security, have been discussed under the heading of food security.

5.1 Working conditions

This sub-section will examine both the rights of workers in cashmere processing enterprises, and issues of labour in cashmere-producing herder households. It starts with a discussion of national policies on labour rights, before discussing other issues in downstream processing enterprises including free association and collective bargaining, contractual arrangements, attractiveness of work, and Occupational Safety and Health. It then discusses issues relating to the labour of herding households, including the engagement by herding households of paid assistant herders.

5.1.1 Working Conditions in Cashmere Processing

Mongolia is a signatory to the 8 fundamental ILO Conventions, having ratified them at various points between 1969 and 2005, and ratified the ICESCR and the ICCPR in 1974. Recent reports of the ILO Committee of Experts on the Application of Conventions and Recommendations (CEACR 2020, 2021, 2022) show a minor range of concerns about application of the conventions, with none directly related to cashmere.[26]

According to the law, Mongolian workers have the right to free association and collective bargaining. Discussions of labour rights in Mongolia conventionally place cashmere processing within a broader category of light industry: nationally there are 40,000 workers in light industry, of which 12,000 are in the wool and cashmere sub-sectors. There is a relevant trade union for the light industry sector, the Mongolian Industrial Trade Union Federation (MITUF), which is a member of the largest union federation in the country, the Confederation of Mongolian Trade Unions.[27] MITUF provided very relevant information on its own activities and its relations with other stakeholders, and the team judge that it has potential to become a more important interlocutor for government, the private sector and external agencies. MITUF has three branches some of the larger cashmere companies: together with a fourth branch in a carpet-producing company these account for about 3000 workers, about a quarter of those in the wool and cashmere sub-sector. Interviewees in both MITUF and ILO agreed there are challenges in establishing union branches in some types of factory: newly established factories (ILO), and smaller factories, where the family business atmosphere is an obstacle to organisation (MITUF). In response to a direct question from the social sector specialist, the MITUF interviewee also said it was very difficult to organise in Chinese-owned factories, where management may not let unions meet their employees.

From our own interviews, one of the larger companies has a union branch, one larger company had an independent staff association, the director of another larger company, which does not

[26] Concerns comprise some instances of forced labour of Chinese and North Korean migrants in the construction sector, definitions of salary for the purposes of the Equal Remuneration Convention, the definition of the minimum work age by years of schooling as well as chronological age, and the employment of children as jockeys.

[27] CMTU has its roots in the soviet era, as a government- and party-approved union, but since 1990 has operated independently (see statement from the Swedish trade union movement at https://web.archive.org/web/20080516013147/http://www.lotcobistand.org/country/136). There is some sense that government is more sympathetic to trade unionism when the Mongolian People's Party is in power as at present, but this has little practical impact.

have a union or staff association, referred in this connection to his personal knowledge of the employees and his "open door policy", a similar explanation being given by a medium-sized washing/dehairing factory, with the other two washing dehairing companies, including one with very close links to Chinese investors, having no staff associations,

MITUF, with funding from the Friedrich Ebert Foundation[28], is currently engaged in a joint activity with the Wool and Cashmere Association to draw up guidelines for baseline salaries for different industrial roles in the sub-sector. This has been difficult as a) no such exercise has happened before – existing MOFALI salary guidelines are very vague, and b) there is great variation between companies in job titles, grading, working hours and salaries, but collaboration with the WCA is constructive. When the guidelines are complete there will be a one-year pilot, and it is hoped a rollout to the entire sub-sector: MITUF see this as the start of a process for the broader light-industrial sector.

While this process is underway, MITUF has little involvement in collective bargaining at the factory level, rather its main work within the sub-sector consists of: individual casework on conflict resolution – free to members, for a small fee to others; awareness-raising on the new Labour Law (see below) and the new law on working environment and safety; promotion of Conflict Resolution Committees, as required by the new Labour Law; and youth engagement.

The new Labour Law passed in 2021, in force from January 2022, specifies that all employees should have a written contract stating as a minimum their job title, salary and location, but also specifies that all employment relations are governed by the law, whether the contract is written or not. It is unclear to what extent employees in processing factories currently hold written contracts – this was the case for all 500 full-time employees of one of the bigger companies, who were described as being on permanent contracts. A one-month notice period was mentioned, although the manager said "the company never lets them go" (i.e. rewards them such that they never wish to leave). The MITUF interviewee noted that written contracts had been very important when factories closed during the Covid pandemic. Otherwise, factory managers tended to stress the permanence of their workforce and the benefits they enjoyed over and above salaries. In another large company, the director noted that 50% of all employees had been there more than five years, and 30% more than ten years, and that 20% lived for free in company housing. All factories also reported employing temporary workers in seasons of high labour demand (mainly at the time of cashmere buying).

Salaries are generally reported to be higher than in other light industries,[29] with a baseline level of MNT 1.5 million/month (higher in some factories), considerably higher than the minimum wage, with employees also benefitting from a variety of additional incentives, including bonus payments, training opportunities (in the case of one company involving visits to Japan), subsidized housing, loans, health care and visits to sanatoria. One large processor has a target of reducing staff turnover to 20%, currently achieving 30%. The salaries and benefits are generally agreed to make the sub-sector attractive, including being attractive to young people. There is a labour shortage in the light industrial sector in general, and MITUF and WCA are jointly organising events to attract school-leavers to the wool and cashmere sub-sector.

Forced labour and discrimination are not significant issues for the sector. CEACR reports discuss forced labour at length, but exclusively in relation to the construction sector. The NHRCM (2017)

[28] A foundation associated with but independent from the German Social Democratic Party.

[29] The NSO https://1212.mn/en/statistic/statcate/48171320/table-view/DT_NSO_0400_022V1 gives 2022 national monthly average salary in the "manufacturing" sector as MNT 1,306,400 for women and MNT 1,554,200 for men, so these comments were presumably talking into account, bonuses, incentives and the salries of more experienced or senior empl yees

report on employment rights in the wool and cashmere sector, and some stakeholders interviewed report some concern about factories keeping employees' personal documents, such as academic qualifications, to prevent them from leaving. Ethnic distinctions in Mongolia are not very salient[30] and ethnic discrimination was not reported by interviewees, including MITUF.

While Mongolian laws on child labour are complex, work in factories is prohibited for under-18-year-olds. Factory managers stated clearly that they did not employ workers under 18, and nothing we saw contradicted this.

The MITUF interviewee told us that light industry in general is regarded as the fourth worst sector for Occupational Safety and Health (after mining, construction and electrical work). Accidents happen but are hidden, and there is a general lack of knowledge of the issues, making industrial injuries a "major risk". MITUF, with encouragement from ILO, is currently organizing a translation into Mongolian of the *ILO Code of Practice on Safety and Health in Textiles, Clothing, Leather and Footwear*[31] which should decrease the knowledge deficit. There is some good practice in the industry: one of the larger companies stated that they employed five safety engineers (for a permanent workforce of 500), gave safety briefings every day and regular training, and took out insurance for their employees against accidents within and outside working areas. The manager knew of only one accident, which had occurred on the way to work and for which the company had paid out MNT 10 million.

5.1.2 Working Conditions in Herding

Labour availability is an important issue for herding households. The labour of herding is generally said to be demanding, and herding goats especially so: they are more likely to head off into mountain areas, and sheep are then prone to follow them: also newborn kids require more care – they are "like babies". Since the end of the *negdel* (herding collective) system, herding households aspire to herd at least four species, and to make four or five pastoral movements per year, which places extra demands on household labour. Depending on the area, either spring (the combing, kidding and lambing period) or winter (when cold and snow makes attentive herding most essential) are regarded as periods of peak labour demand. In addition, increased education rates and the exit of young people from herding are creating additional labour shortages. There is some suggestion that availability of labour is at least one factor (alongside declining cashmere yields from older animals) in deciding the age at which cashmere goats are sold off after their productive lives.

Households respond to these labour challenges in different ways. Over the last twenty years, household ownership of motor vehicles has become relatively high: according to NSA figures 34% of goat-owning herding households own a truck, 40% a car and 45% a motorcycle. This has definitely eased the challenges of herding multiple species. Labour of older children (see below) is still available in school holidays, though the long holiday in summer is not a time of peak labour demand. Households living separately, such as those of a father and his married sons, may combine forces for herding at certain times of year (winter as mentioned to us in Khövsgöl Aimag).

The employment of paid herders ("assistant herders" – which very often means a husband and wife bringing their own children) is a major strategy. Herders characterise this as a fair and mutually beneficial relationship, though Murphy (2015) emphasises its exploitative nature and position in a

[30] 85% of the population consists of a group known as the Khalkh Mongols, and another 10% belong to other Mongol sub-groups.

[31] English version at https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/normativeinstrument/wcms_828429.pdf

broader pattern of patronage, and writes of assistant herders denied midday meals and similar abuses. Some accounts suggest that employment of an assistant herder becomes necessary once household livestock holdings exceed 500 head, but this number is modified by the mix of species herded, and by the availability of assistant herders, which appears to be declining. The only herder we spoke to with a year-round assistant herder, in Khentii Aimag, complained that assistants come and go, and "cannot tolerate the lifestyle", even though the financial returns are higher than for work in Ulaanbaatar. This man gave a figure of herder salary at MNT 1 million per month for winter, MNT 800,000 per month for summer, plus 50% of the newborn animals in the herds assigned to him. On top of these figures, assistant herders are also provided with a *ger* and most meals, and by one account payment of social insurance and health costs. A herder in Arkhangai Aimag with 1300 head of livestock expressed his wish to enter a five-year contract for a year-round assistant on that basis but was currently only able to hire assistants for the period March-June. In Töv Aimag we were told that there are two systems of remuneration, cash payment or a more traditional payment in livestock born, but that both are getting more difficult, and that no-one in the larger group we were interviewing employed an assistant.

Cashmere combing in spring creates a short-term peak in demand for labour, which is dealt with either by mutual assistance between a group of households, or by employment of combers on a casual basis, often unemployed people from the soum centre. Rates (in Khövsgöl Aimag) are MNT 10,000 per male goat combed, MNT 8,000 per female goat.

The legal position on child labour in the agriculture sector is that "light work" (not clearly defined) is allowed for 13–15-year-olds, as long as it does not affect schooling, behaviour or cause physical stress. This needs to be viewed in the context of very high schooling rates, which for herder families means boarding school, or unofficial boarding with relatives in soum centres,[32] from age six. Completion rates for lower secondary school (aggregated rural and urban figures) are 96% for girls, 89% for boys, and for higher secondary school 75% and 66%. We saw virtually no school-age children around herding camps. The figures imply that even if "light work" is being done in school holidays by under-13s, it is unlikely to be detrimental to schooling. A possible exception is for the children of assistant herders, who are expected to help their parents, which may be a cause for concern (ILO, pers.comm.).

The FAO RIMA Report (FAO 2022) and the MNFPUG/SDC Gender Report (Voltolini et al. 2018) confirm evidence from our herder interviewees and elsewhere that the occupation of herding is becoming increasingly unattractive to younger generations, particularly but not exclusively to the daughters of herding families.

5.1.3 Conclusions on Working Conditions

There is a strong dichotomy between the issues that appear in the working conditions in the herding and the processing stages of the VC, although working conditions are relatively good in both the stages. Respect for labour rights in Mongolia is relatively high, and issues of child labour and job safety are being dealt with. Work in the processing sub-sector is well-remunerated and generally attractive. However, while work in the herding sector is positively valued as part of a traditional livelihood, there are clear issues with its lack of attractiveness for younger generations, especially girls and women.

[32] In some cases mothers from herding households choose to live in soum centres to look after younger children at school, which further exacerbates labour shortages for herding, as well as causing psychological stress.

Working Conditions	
Respect of Labour Rights	
Child Labour	
Job Safety	
Attractiveness (processing)	
Attractiveness (herding)	

5.2 Land and water rights

The most important issue for land rights in the cashmere VC is the question of how rights to use pastureland can be organised to promote rangeland health and avoid rangeland degradation, while allowing herders flexibility to cope with a highly variable climate and risk of natural disasters. This sub-section will deal with: the legal basis for rangeland use and current attempts to reform it; current patterns of rangeland use as evidenced by herder interviews; the effectiveness of new forms of organisation governing rangeland use; and threats to rangeland use arising from non-pastoral economic activities.

5.2.1 The Legal Basis for Rangeland Use

The ending in 1991-92 of the *negdel* (herding collective) system, under which herders were paid employees of the *negdel*, generally herding a single species on its behalf and closely directed as to which pasture they used, created considerable uncertainty over how rangelands and pastoral migrations should be managed.[33] The current legal position on land remains the 2002 Law on Land, which replaced the 1994 Law (see Fernandez-Gimenez 1999). The 2002 Law addressed land ownership in the abstract, and many of whose articles are most relevant to urban land. Only one article (Article 52) explicitly addresses pastureland, and clauses within it are in many cases confusing and depend on a not altogether clear distinction between "possession" and "use" (Morton and Ridgway 2003). Article 52 was however used as a basis by environmental projects. In most areas, the use of pastureland by herders mainly depends on the informal mutual agreement of herders backed by decisions of the Soum Assembly and Governor. Herding households generally move within small territories, as discussed in 5.2.2 below.

In this context, there have been efforts to establish a legal basis for rangeland management that is more fit for purpose. For the team, some of the requirements for a new legal framework would include:

- Supporting good pasture management and therefore rangeland health by small herder groups within medium-sized territories with some environmental heterogeneity
- Giving secure tenure to small groups over winter pastures, primarily in terms of preventing summer grazing there by members or non-members
- Allowing for negotiated use of winter pastures by herders from further away threatened by dzud in their customary areas (such longer-distance migration in times of dzud is referred to as *otor*).

A proposal by the National Land Agency suggested simply removing Article 52 from the Land Law, but this was abandoned following lobbying of herders by parliament[34], and the support of the leader of the governing party. Parliament's Standing Committee for Environment, Food and Agriculture and FAO jointly sponsored a Working Group of stakeholders, supported by FAO staff,

[33] As the majority of herders in the pre-Soviet era were vassals of feudal lords and monasteries there was very little tradition of independent family-based herding to fall back on.
[34] Officially the State Great Khural, but "parliament" is used here for convenience.

which carried out, among other consultation activities, four Regional Consultations with Stakeholders and three face-to-face meetings with herders, in each case led by a Member of Parliament. Based on the report on these consultations (Enkh-Amgalan, 2023), Table 5-1 gives the most important results of these consultations (aggregating herder and other stakeholder responses).[35]

Question	Finding
Do you agree that rangelands in your area are degraded?	Yes 97.7%
Is there a need to change the current legal framework for responsible use and protection of rangelands?	Yes 90.6%
Is it right to manage seasonal rangeland use through agreements?	Yes 73.6%
Is it right to legislate on responsibility for using rangelands?	Yes 86.4%
What is the right measure to improve responsible use of rangelands (one response required)?	Rangeland Use Agreement 46.8% Higher taxes 27.3%
Is it right to devote 10% of bag, soum and aimag total rangelands as *otor* reserves?	Yes 73.6%
Is it right to legislate for the establishment of agreements between herder groups and local authorities within the main Land Law?	Yes 86%

TABLE 5-1: STAKEHOLDER RESPONSES ON THE NEED FOR AMENDMENTS TO RANGELAND LEGISLATION
Source: derived from Enkh-Amgalan et al. (2023).

The consultation clearly supported the drafting of new amendments that devolved responsibility to herders in groups, in agreement with local authorities, while maintaining herders' ability to make *otor* in times of necessity. At the time of writing, it has been agreed that the amendments drafted in the wake of this consultation process will be debated in full session of parliament.

The team's summary of the proposed amendments is given in Annex 4. A key point is that the amendments do not alter the clauses of the 2002 Law on Land that land other than that given into "ownership" is the property of the state, and that pastureland may not be given into "ownership". Its control by entities at various scales (Pasture User Groups, herders and herder families) is considered a "contractual arrangement" between those entities and the state. The team's opinion is that the proposed amendments, in combination with the increased promotion of Pasture User Groups (PUGs), will create a sound legal basis for conserving rangelands, while also maintaining the flexibility to make *otor* at various scales.

5.2.2 Pastoral Movements and Rangeland Management Institutions

The ideal migration pattern for most herders is to make four movements a year, keeping to defined dwelling sites for spring, summer, autumn and winter, although there are many individual variations on this. Winter and in some cases spring dwelling sites, with a small surrounding area for household crop cultivation, can be registered as the possession of herding households (nearly always under the husband's name).

The sites where we carried out interviews with soum governors and herders were biased towards areas with functioning cashmere cooperatives for reasons of gaining an entrée to herders and local leaders. Most had some institutionalised form of pasture management, through a PUG or otherwise. There is a lot of variation in perceptions of rangeland degradation, institutions for rangeland management and their functioning, and actual movement practices. Annex 4 gives further details from the six interview sites.

[35] n = between 652 and 689, depending on the question

5.2.3 Otor Migrations

Mongolia suffers from frequent and severe weather events, both dzud in winter and drought in summer and. From NSO data, 9.9% of herders had experienced dzud in the last 12 months, and 8.7% drought. Dzuds can be localised but there are also major dzuds at national level. In the winter of 2009-2010 about 10.3 million livestock – 25% of the national herd – died, and there was a smaller but also national-level dzud in 2018. Dzud and drought are interconnected as summer drought can mean that even a small snowfall completely covers standing vegetation, while there is less opportunity to harvest and store hay before the winter.

Exceptional long-distance migrations, outside the normal seasonal movement pattern, and especially in winter, are referred to as *otor*. Facilitating *otor* at various scales (within-soum, within-aimag and cross-aimag) without weakening community management of rangelands in normal times, is a key concern of the 2002 Land Law and the current proposed amendments to it. At present, *otor* is largely regulated, on a somewhat uncertain legal basis, by soum governors, with herders themselves also proactively using their networks. Murphy (2018a), in a study of Khentii Aimag that also reviews a lot of recent academic literature, shows that *otor* is practiced in a context of traditional reciprocity (with an expectation that those who host *otor* one winter may have to practice it the next), activated by kinship and other ties, and by formal and informal approaches by herders to soum governments. In such a context, wealthier herders are much more likely to negotiate *otor* that is effective in avoiding livestock losses. Annex 4 presents some of the local variations on *otor* practices from our own interviews – for two of the sites these highlighted the demarcation of soum-level *otor* reserves by soum governments, and the occasional exceptional use of protected areas for grazing.

5.2.4 Land Access Issues Relating to Non-Pastoral Activities

Herding is not the only activity practised in the rural Mongolian landscape, and questions of access to rangeland and water require consideration of these other activities. The grant of leases to mineral companies, and their negative environmental impacts, have become a source of controversy in Mongolia, even leading to a violent demonstration in 2013 (Bumochir 2020). Grants of leases are made by central government and neither soum governments nor herders have any say in these matters, as confirmed to us by the governor of Shinejinst Soum.[36] As a result of civil society activism, the "Law to prohibit mineral exploration and mining operations at headwaters of rivers, protected zones of the water reservoir and forest area" of 2009. widely known as "the law with the long name", prohibited mining operations within 200m of rivers and forest areas, which after a period of legal uncertainty closed down several ongoing or planned mining operations. This was followed by an amendment to the Environmental Protection Law of 1995 which made it possible for activists to sue central government for failure to enforce the "law with the long name". There were further legal amendments in 2015. Bumochir (2020) highlights the change in the relevant distance from rivers and forests to 50m from 200m and sees this as "entirely diminishing" the "law with the long name", while the Lexology website[37] provides a more detailed analysis focussing on the possibility for mining companies to continue operations close to rivers and forests subject to obligations to remediate environmental damage, while licenses could still be revoked in headwater areas. However, the legal debate has been about the environmental damage caused by mining, rather than the displacement of herders or the removal of rangeland from pastoral

[36] He did add that the prior establishment of a PUG with a Rangeland Use Agreement might prevent leasing, but this seemed to be hearsay based on a case elsewhere.

[37] https://www.lexology.com/library/detail.aspx?g=924fef95-7ef5-4e1a-81f2-dcc5f8387112

production, and the relevant authority remains the central government (specifically the Mineral Resources Authority of Mongolia, rather than soum governors.

Leases of land for cropping, that can be granted by soum governments, are generally less controversial. In some areas (such as Binder Soum, Khentii Aimag) land that has been fallow and used for grazing since the end of the Soviet era is being returned to cropping, apparently with little local opposition, and in other areas "cropland" is made up of small parcels immediately around herders' winter grazing areas. In Bayankhangai Soum, Tuv Aimag, the cooperative manages legal and regulatory issues relating to cropping, but there was some dissatisfaction over perceived irregularities in leases for cropping and conflicts over livestock access< pesticide use and erosive farming practices (see also Mardesic 2018).

The exceptional use of Protected Areas for *otor* has been noted above. In Alag Erdene Soum, Khuvsgul Aimag, a heavily forested area where forests are Protected Areas, there is no prohibition on grazing and animals are not considered a problem. Tourist resorts can be established in Protected Areas by direct permission from the Ministry of Environment – neither the soum governor nor herders are involved in the decision.

5.2.5 Access to Water

Access to water for livestock is not a significant development issue (water for household use is discussed in Section 5.6 below). Snow cover is an important source of water for livestock in winter, but there are open water sources for winter in Ulziit, hot springs in Alag Erdene, and wells in Shinejinst and Bayankhangai. Open water sources, lakes and rivers, are generally used in summer, with wells in Shinejinst and Bayankhangai. Wells (boreholes or manual wells) may be variously owned by households, small groups of households or PUGs, who will share running and maintenance costs, requiring outside users to provide their own fuel. Some wells date from Soviet times, in which case there may be concerns about diminishing capacity, while others represent investment by soum authorities – Alag Erdene Soum had paid for the construction of ten wells, siting them according to herder recommendations where practical.

5.2.6 Conclusions on Land and Water Rights

While the issue of encroachment on rangelands on the environment is an important topic of debate in Mongolia, it barely arose in our interviews with herders or stakeholders. The issues of governing rangelands so as to promote good rangeland management by herders at a local/community level, while also allowing flexibility for longer-range migrations in time of crisis, is more important. Current agreements between herder groups and soum authorities within the present, uncertain, legal framework are encouraging, the initiative to pass key legal amendments on rangeland governance still more so.

Land & Water Rights	
Adherence to VGGT	
Transparency, Participation and Consultation	
Equity, Compensation and Justice	

5.3 Gender equality

This section deals with issues of gender equality, at a national level, then in cashmere processing enterprises, and in herding households and communities. Mongolia enjoys a high degree of gender equality compared with many middle-income and low-income countries, and it has been observed that women have a wider range of employment options than men (Empson 2020). Educational participation rates are better for girls than for boys (see Section 5.6) and multiple sources state that especially in rural households there is an increasing gender gap in educational participation in favour of girls and women.

The Social Indicator Sample Survey (NSO 2018)[38] presents several indicators that, even given the limitations of large-scale questionnaire surveys into what may be very personal issues, show are equal or better for females than for males, while others show *relatively* low levels for significant gender-related social problems.

Indicator	Female	Male
Indicators relating to children and adolescents		
Involved in child labour (excluding household chores), 5-17 yo	13%	20%
Involved in child labour in hazardous conditions, 5-17 yo	5.4%	10.0%
Life satisfaction score, 15-17 yo	7.0/10	7.0/10
Life satisfaction score, 18-19 yo	6.4/10	7.1/10
Married before age 15	0.9%	0.0%
Married before age 18	12.0%	2.1%
Indicators relating to general population, 15-49 yo		
Exposure to television on a weekly basis	89.6%	89.1%
Use of mobile phone in past 3 months	97.2%	94.5%
Use of internet in past 3 months	73.6%	63.9%
Used at least one significant ICT skill in past 3 months	32%	30%
Prepared to justify domestic violence against women (national)	9%	5%
Prepared to justify domestic violence against women (urban)	7%	7%
Prepared to justify domestic violence against women (rural)	15%	4%
Perceive that their lives are improving	64%	63%
Life satisfaction score (national)	6.7/10	6.7/10
Life satisfaction score (urban)	6.6/10	6.6/10
Life satisfaction score (rural)	6.8/10	6.8/10
Experienced discrimination or harassment (national)	16%	15%
Experienced discrimination or harassment (urban)	17%	12%
Experienced discrimination or harassment (rural)	14%	16%
Married or partnered women using a modern contraceptive method	45%	
Married or partnered women with a met need for family planning	48%	

TABLE 5-2: KEY INDICATORS OF GENDER INEQUALITY (NATIONAL UNLESS OTHERWISE STATED)
Source: NSO 2018. Indicators are national (aggregated urban and rural) unless stated otherwise. For exact definitions refer to the source.

5.3.1 Gender Equality in Cashmere Processing Enterprises

The workforce in cashmere processing factories is estimated (by MITUF among other sources) to be around 90% female. This is particularly marked in the spinning, weaving and knitting operations found in the larger factories, somewhat less so where factories are focused on washing and

[38] A survey co-published with UNFPA and Unicef.

dehairing. A few heavier manual operations such as unloading consignments and using the heavy industrial irons are largely or solely done by men. Women are highly visible in middle- and senior management and in public-facing positions. However, NHRCM reports that workplace harassment of women and younger workers is “relatively common” and underreported.

5.3.2 Gender Equality in Herding Households and Communities

The skills of women, in livestock production, dairy processing and caring for the family and its living space, are crucial for the successful pursuit of a herding livelihood. Women work at all stages of cashmere production, while undertaking other livestock-related and care work, but men are more heavily involved in marketing, giving them more voice and visibility in the VC and policy related to it (Burn 2003 cited in Voltolini et al. 2015). It is also argued that women have an important role in environmental conservation and transmission of environmental knowledge (Ykhanbai et al. 2006 cited in in Voltolini et al. 2015).

The 2015 report by MNFPUG and SDC (Voltolini et al. 2015) is a very important information source on gender relations and gender inequalities. The study surveyed 301 herding households (not limited to goat-herding households) across eight aimags, of which 55 were female-headed. There was only one respondent per household: 171 men and 130 women, which may have biased some responses.

Gender Division of Labour and Workload

The report contains especially significant information on workloads for men and women (though this is subject to reservations about the use of recall data). Women work on average 11.1 hours per day compared to 9.2 hours for men. There is a yearly peak for women of 14.1 hours per day in July and 13.6 hours per day in August, associated with milking and dairy processing, and a peak for men of 13.5 hours in March and 11.6 hours in April, associated with cashmere combing, kidding and lambing.

The genders have assigned roles in production activities (besides women’s roles in reproductive activities, although there is some flexibility, as well as variation by region, by livestock species and by other factors such as proximity to major markets. A more detailed presentation of gender roles, drawn from the report by Voltolini et al. (2015) is presented in Annex 4. The corresponding table in Voltolini et al. (2015) on reproductive activities contains only three activities in which men participate at all.

Otor migration is practised in five of the eights aimags studied, and practised almost exclusively by men, while women remain at the home site. Men spend between 1.2 and 8.9 times as much time as women on *otor* activities.

Table 5-3 shows average hours spent per year by men and women in a) combing cashmere and b) selling cashmere. Depending on the aimag, men spend from just under the time spent by women on combing to around 50% more time. Again, depending on the aimag, men spend from about two-thirds of the time women spent on selling cashmere to seven times as much time, with higher male:female ratio in five of the aimags.

Aimag	Hours spent combing cashmere		Hours spent selling cashmere	
	Men	Women	Men	Women
Bayaan-Ulgii	58.3	60.0	5.7	0.8
Zavkhan	79.4	58.7	6.2	2.1
Govi-Altai	68.6	58.7	5.2	2.1
Khovd	68.5	46.1	3.0	2.6
Mandal	63.8	64.3	8.6	7.7
Tov	102.2	67.2	4.0	4.3
Dundgovi	126.5	107.6	7.0	10.4

TABLE 5-3: HOURS SPENT PER YEAR ON CASHMERE-RELATED ACTIVITIES, MEN AND WOMEN
Source: Voltolini et al. (2015)

Men are also more likely to gain income from activities outside herding. For the 52 households answering this question, outside income came from the husband in 38.5% of households, from the wife in 19.2%, from both spouses in 25.0% percent, from children in 15.4% and from the wife jointly with her children in 1.9% (Voltolini et al. 2015).

Household Decision-Making

In response to a question on decision-making on different aspects of livestock production (for which the sole responses allowed were: husband, wife, sons, daughters – multiple responses not allowed), the findings are presented in Table 5.4. Husbands are most likely to take decisions on all areas of livestock production, and when these figures are combined with those for sons (presumably adult sons) this is even more strongly visible, especially for decisions on longer-term pastureland management and *otor*. However, cases where the wife is taking these decisions are not insignificant.

Decision area	Husband	Wife	Sons	Daughters
Herd management (e.g. breed improvement, herd size, species mix)	47.6	32.2	15.4	4.8
Seasonal grazing movements	44.2	28.8	21.7	5.3
Pastureland management, withdrawal of pastures from grazing use	63.9	20.3	10.5	5.3
Otor migration	45.0	23.5	24.0	7.5
Choosing markets for sale of livestock products	43.0	31.1	15.7	10.2

TABLE 5-4: HOUSEHOLD MEMBERS' DECISION MAKING IN LIVESTOCK PRODUCTION (%, N=215)
Source: adapted from Voltolini et al. (2015)

Who makes decisions on household purchases varies with the precise category of purchase, but tends towards husbands (and adult sons) for all categories except food and clothing (Voltolini et al. 2015).

Decisions on taking out loans are made jointly in 54.1% of households, by the husband in 32.4% and by the wife in 13.5% (Voltolini et al. 2015).[39] Household money management is allocated more equally (see Table 5.5). There is considerable variation by aimag - husbands have sole responsibility for money management in 51.2% of households in Bayan-Ulgii Aimag, but only 12.5% in Zavkhan Aimag. There is some suggestion that husbands are more likely to manage the money where herd size is over 1000 head, and/or when age[40] is over 60, but relevant sub-samples are extremely small.

[39] Two different sets of findings are presented on this question, but that reported here appears the more reliable.
[40] Presumably the age of the head of household, but this is not stated.

Husband	Jointly with husband dominant	Jointly husband and wife	Jointly with wife dominant	Wife	Mother and children
33.4	8.0	21.6	2.8	33.8	0.3

TABLE 5-5: RESPONSIBILITY FOR HOUSEHOLD MONEY MANAGEMENT (%, N= 287)
Source: Voltolini et al. 2015

Household property is generally registered solely under the husband's name. This applies to winter/spring camps (85.5%), livestock (87.2%), motorcycles and trucks (77.8% and 81.8%) but less so for cars or tracters (Voltolini et al. 2015).

In our own interviews, women were present and spoke in our interviews, though not to the degree men did. Responses to our questions on decision-making tended to present a more equitable situation than the survey findings above, but considered in context we feel those survey findings are broadly confirmed.

Participation in Community Activities

The MNFPUG/SDC report also discussed issues of women's participation in community activities. Totalling meetings of the *bagh* assembly, co-operatives and PUGs, men attended on average 1.23 meetings per year, and women 0.72. For *bagh* assemblies and co-operatives, approximately the same number of men and women attended at least one meeting, but women were much less likely to attend subsequent meetings. Women were significantly less likely to attend any meeting of PUGs. The reasons for non-attendance most viewed (by female and male informants) as applying to women were: the impossibility of delegating household tasks (33%), the unavailability of transport/inability to drive (21%), inappropriateness of meeting times and places (20%) and traditional norms (16%) (Voltolini et al. 2015).

More detail is given on reasons for women's non-attendance at PUG events (attendance being markedly lower than for *bagh* assemblies and co-operatives): men are closer to herding and other activities that take place outside the household, some PUG activities involve communal physical labour, PUG membership is registered in, then name of the household head. The majority of PUG leaders are men. Herders (women and men aggregated) prefer men to women as leaders of PUGs and cooperatives, but a large percentage (34% for PUGs and 41% for co-operatives) are happy with either. Key areas which are seen as problems for women leaders include lack of time/conflicts with home responsibilities, and lack of mobility (Voltolini et al. 2015).

Our observations and interviews generally bear out the findings discussed above. However, as is shown in Annex 4, in three of the soums we visited, women's participation in cooperative leadership was very marked.

Gender and Education

Two other aspects of gender dynamics concern education. A small (10%) but significant proportion of households feel the need for the mother to live separately in the soum centre, usually to look after children (Voltolini et al. 2015). From our own interviews, the use of boarding schools is the norm, not all schools have sufficient boarding spaces, and many parents see boarding as a poor solution for younger children. Both factors have been exacerbated by the recent dropping of the compulsory school starting age from eight to six.

Herders generally express negative or cautious attitudes about who will inherit the family herds and herding enterprise, but the answer is much more likely to be a son than a daughter, and parents have higher aspirations for daughters with 38% hoping that they would become teachers or doctors – but parents are more likely to see this as their own decision in the case of daughters, and the sons' decision in the case of sons (Voltolini et al. 2015).

5.3.3 Conclusions on Gender Equality

Summarising gender equality in the cashmere VC is not easy. The cashmere processing sub-sector is a major employer of women, with favourable salaries and benefits, and opportunities for leadership within enterprises. In herding communities, women work at all stages of cashmere production. While herding women are less likely to be registered owners of land, livestock and major household assets, or to directly access credit, they access the benefits of these assets as members of herding households. Herding women suffer some discrimination in terms of their roles in household decision-making, in leadership of community organisations, and in their workload, but it is important to note that there are important exceptions and qualifications to these judgements, and that gender inequality is nothing like as marked as in many of the value chains analysed elsewhere by VCA4D (De Faria et al. 2023).

Working Conditions	
Economic Activities	
Access to Resources and Services	
Decision Making	
Leadership and Empowerment	
Hardship and Division of Labour	

5.4 Food and nutrition security

This sub-section not only covers food security in the strict sense, but also the concerns about dietary diversity frequently raised for Mongolia, and two important issues of broader livelihood security: debt and indebtedness; and livestock insurance.[41]

5.4.1 Nutritional and Dietary Diversity Indicators

Food insecurity in Mongolia is much rarer than in many of the countries where VCA4D studies have been carried out. At a national level severe food insecurity (e.g. skipping meals) only affected less than 5% of the population, and moderate food insecurity (anxiety about obtaining food) less than 25%, with figures being significantly higher in urban and peri-urban areas than in rural areas for both categories (interview with FAO staff). Nationally, according to the Social Indicator Sample Survey by NSO, UNFPA and Unicef, stunting only affects 9.4% of children under five, wasting only 0.9%, underweightness only 1.8%, but overweightness 10.5% (NSO 2018). However, there is evidence that extreme climate events have long-term impacts on children's nutritional status (as well as their school enrolment) (FAO 2022).

There is widespread concern about lack of dietary diversity and risks associated with a restricted and unvaried "wheat and meat" diet (FAO 2022, FAO, EU and CIRAD 2022). Herder households are particularly prone to a high-protein and high fat diet, accompanied by white wheat flour or rice,

[41] In addition to the topics covered here, it should be noted that around 11% of herders opt into voluntary social insurance, and also are eligible for certain universal benefits, especially retirement and maternity benefits.

and where family budgets allow, juices and sweetened beverages. Obesity is growing among both children and adults, accompanied by increasing risks of non-communicable diseases such as hypertension, diabetes, strokes and cancer. There is very little extension advice available for herders to increase vegetable production on the plots they can maintain, and register legally, around their winter camps (FAO 2022).

5.4.2 Debt and Indebtedness

Indebtedness has been a major concern of recent academic writing on Mongolia (e.g. Sneath 2012, Waters 2023), with much discussion of how households have to engage in "debt stacking", taking on one formal or informal debt in order to service another, a situation which has reportedly got worse since the economic downturn of 2015-16. From our own interviews, loans, especially herder loans were seen as a normal part of herder life in Tuv, Khentii, and Bayankhongor aimags, but indebtedness and debt stacking were not seen as problems. In Arkhangai a herder told us that sometimes he really worries about not being able to repay loans. Bank loan interest rates have increased from 1.8% to 2.4% per month, and many people there take out non-bank loans from individuals, for which rates are 6% and increasing, and indebtedness was also seen as a problem in Khuvsgul.

From the NSO Household Socio-Economic Survey data of 2021, the 3502 goat-owning households in the sample had in the past 12 months taken out 1508 loans (respondents could report multiple loans) with an average amount of MNT 6.94 million. 29% of the sample had taken out a herder loan from a bank, with an average amount of MNT 7.62 million. This suggests that loans were more common in the communities where we carried out interviews (well-integrated into cashmere value chains and familiar with bureaucratic processes) than in the general goat-owning population. No other category of loan had been taken out by more than 4% of the sample (with salary loans and pension loans the next most reported categories).

Herder loans are one-year, in some cases two-year loans that allow herders to manage cashflow. This is particularly important for the major social obligations herders are under to provide hospitality at the time of Lunar New Year. Some herders also mention university fees for their older children falling due in September as an expenditure to be managed. New loans are taken out in July or August. Loans are collateralized against livestock: banks collaborate closely with soum authorities and have access to records of livestock holdings maintained by the soum. Crucially repayment is not monthly, as is the case with other formal and informal loans, but can be made twice a year, at the time of livestock sales in autumn and after receipt of cashmere proceeds in spring.

Waters (2023) in a detailed description of the debt-stacking problems affecting rural Mongolians, excludes herder loans from her negative comments, and Murphy (2018b) shows that availability of formal credit to cashmere producers can lead either to virtuous cycles of investment or vicious cycles of indebtedness, differences linked to region, variations in wealth, and the natural conditions for producing quality cashmere. NSO data (2021) show that 97.3% of goat-owning herders who had received herder loans stated that they felt able to repay them.

5.4.3 Livestock Insurance

Mongolia has become well-known in development circles as one of the few places (together with Northern Kenya) to have a system of Index-Based Livestock Insurance (IBLI), which pays out not against individual herd losses but against soum-level average losses, thus avoiding the high transaction costs and moral hazards associated with indemnity insurance (see Mahul et al. 2009).

Interest in IBLI in Mongolia dates back to the early 2000s, with the first legislation enabling it in 2004, and the design of a pilot project funded by the World Bank for three years starting in 2006 (the Bank is no longer involved in this sector), extended until 2013 by which time five insurance companies were participating (CDKN 2013). The major dzud of 2009-2010 increased policy and herder interest in IBLI, with further legislation in 203. IBLI is now provided by the parastatal Mongolian Re company through nine private insurance companies which in turn use as agents 2611 local branches of the State Bank and Khaan Bank (NEMA 2022). Herders state the number of livestock they are insuring (this can be checked against soum records to prevent over-insuring) and pay a premium per head differentiated by species and also by soum. There is considerable variation by soum based on historic mortality figures – the minimum premium per goat is MNT 75 charged in several soums of Selenge, Khovd, Khuvsgul and Darkhan-Uul, and the maximum is MNT 745 charged in a soum of Bayankhongor (rates supplied by Mongolian Re). Compensation is paid when soum-level mortality exceeds 6% or 10% depending on the exact model.

However, national uptake of IBLI is still less than 20% of herders, according to the Mid Term Review of the Sendai Framework (NEMA 2022)[42] – see Table 5.6. There are suggestions that figures are increased by absentee herdowners in town taking out IBLI (Murphy and Ichinkhorluu forthcoming, Daniel Murphy pers.comm.).

Year	No. of insured herder households	% of total herder households	No. of insured livestock (millions)	% of total livestock	Fee income (billion MNT)	Compensation (million MNT)
2016	18738	11.7	4.2	7.5	1.77	79.6
2017	24148	15.3	5.7	9.2	2.33	1091.9
2018	33719	19.8	7.8	11.8	3.46	323.3
2019	32337	18.8	7.4	11.2	3.85	600.9
2020	28527	16.6	7.1	10.2	3.48	2593.3
2021	34709	19.2	7.4	11.0	3.92	(not available)
Total	172178		39.6		18.81	4689.0

TABLE 5-6: COVERAGE OF INDEX-BASED LIVESTOCK INSURANCE
Source: NEMA 2022

Our interviewees generally stated they had not taken out insurance and knew few people who had, as they felt the 6% threshold of average soum mortality was very rarely exceeded. One herder in Ulziit referred to the assessment system as a "fake" and "just business". A World Bank interviewee pointed out that a 6% mortality rate could mask lower mortality for wealthier herders who could afford to make *otor* and take other mitigation measures, and poorer herders who could not. This point is also made by Murphy and Ichinkoorloo (forthcoming) who point to broader issues of lack of understanding of the index system, a lack of trust, and a disconnect between the IBLI concept and herders' notion of the moral economy.

The uptake that there is of IBLI is strongly linked by an IBLI contract being a requirement for herder loans. This may lead to herders being ignorant of the fact they are insured, as this is bundled with the loan application - in one interview in Khuvsgul aimag, the husband of a herding household was unaware they had IBLI, while the wife was able to tell us they did. But IBLI being a requirement for herder loans does not explain the low uptake: NSO figures show 29% of goat-owning households

[42] A slightly higher figure of 22% is given in the 2022 FAO RIMA Report, other interviewees agreed with the NEMA figure.

having taken out herding loans, against several sources giving a 20% uptake for IBLI.[43] While information from Mongolian Re stated categorically that all banks require IBLI as a precondition for all herder loans, there are different accounts of the discretion of individual bank branches, and exemptions for herders with good credit records (interviews in Arkangai soum, World Bank interviewee, Daniel Murphy pers.comm.)

5.4.4 Conclusion of Food and Nutrition Security

This section has covered the issues of food security in a narrow sense, where rural Mongolia has very low rates of undernutrition, of lack of dietary diversity and overnutrition, which are major problems, and also the issues of indebtedness and of livestock insurance. Use of herder loans is a factor in smoothing consumption for a significant proportion (but certainly not a majority) of the herding population without raising the problems of indebtedness faced by urban and small-town Mongolians. Livestock insurance has had disappointing uptake by herders.

Food and Nutrition Security	
Availability of Food	
Accessibility of Food	
Utilisation and Nutritional Adequacy	
Stability	

5.5 Social capital

5.5.1 Strength of Producer Organisations

In the field sites we visited, the cashmere VC is characterized by an array of active and impressive producer organisations – primary cooperatives and PUGs. However, we recognize this was partly due to the accessibility of these communities. Cooperatives have been discussed in Section 2 above: only around one third of goat-herders are members of cooperatives, poorer herders are probably less likely to be cooperative members (though evidence from the literature is uncertain on this point) and many cooperatives are owned by a very small number of shareholders (while taking the legal form of a cooperative and benefitting from certain advantages. Voltolini et al. (2018) show that only 14% of male herders and 13% of female herders had attended a cooperative meeting in the past 12 months, with average number of meetings of those who did attend being 2 for men and 1.5 for women.

The cooperatives we interviewed during field visits appear to operate well and to herders' satisfaction, negotiating prices and paying dividends. With the qualification that some cooperatives distinguish between members and shareholders, membership appears to be open to all engaged in the activity the cooperative organizes.

PUGs and similar organisations for rangeland management are more widespread. The largest organization facilitating PUGs, the Mongolian National Federation of Pasture User Groups (MNFPUG)[44], represents 1575 PUGs with membership of 91,000 herder households. There may be one or more PUGs within a bagh. Where they exist, PUGs achieve good coverage of herder households within their designated areas, and work well with soum authorities either under formal Rangeland User Agreements or other forms of regulation by the soum. MNFPUG-sponsored PUGs

[43] The fact that the NSO figures we present are for goat-owning households is very unlikely to explain this anomaly.
[44] Declaration of Interest: one of the authors of this report, writing in her individual capacity, is the Chief Executive of the MNFPUG.

are found in 18 of Mongolia's 21 aimags, and 169 of its 330 baghs (figures provided by MNFPUG). The MNFPUG encourages its constituent PUGs to follow sustainable practices in rangeland management, animal health, animal welfare and raw material quality to comply with the Responsible Nomads Standard.

PUGs or similar organisations are found sponsored under other initiatives – these include the rather smaller Herder Groups sponsored by UNDP. PUGs achieve similar overall levels of participation but as noted in Section 5.3 above this participation is more skewed by gender. Voltolini et al. show that 18% of male herders and 7% of female herders had attended a PUG meeting in the past 12 months, with average numbers of meeting for those who did attend being 2 for men, 1.9 for women.

5.5.2 Information and Trust

FAO (2022) note that only 4.6% of the herders they surveyed received any training in livestock farming in the 12 months before the survey, and this was generally borne out by our own interviews. Some herders stated that they were happy relying on their own knowledge and experience on livestock husbandry. Some herders felt they received little information on policies. There was little evidence that herders were benefitting greatly either from information on maintaining animal health, or from effective veterinary services – this was reinforced during meetings with other stakeholders and informed observers. When herders do obtain information on agricultural technologies, agricultural policies and market prices, it is from a great range of sources and media, which varied across field sites. Sources mentioned include:

- Television (included by FAO 2022 as a key asset associated with resilience capacity, and cited by Voltolini et al. 2018 as the leading source of information for both women and men: NSO 2018 also note that nationally 89% of the population watch television on a weekly basis)
- Social media (one herder said that most herder families use Facebook)
- Development projects (as a source of technical information on rangeland management, animal husbandry and feeding)
- The soum government and the soum centre more generally (for different sorts of information)
- Bagh assembly meetings (especially for new laws and policies – also cited by Voltolini et al. 2018 as the second most important information source for women and men)
- Friends (for information on prices)
- Cashmere middlemen (for information on prices)
- Direct contact with factories (for information on prices – especially in Tuv Aimag).

One herder told us that herders were getting much better information (generally) than ten years ago.

Our interviews in general revealed a reasonable level of trust between VC actors within the Vertically Integrated sub-VC, including trust held by herders in cooperatives and PUGs, and trust held by cooperatives in major cashmere processing enterprises. There were generally strongly negative perceptions of Chinese companies, and the Mongolian middlemen who buy cashmere on their behalf, held by herders, cooperative staff and processing managers, though this was not universal, as some herders appreciate the ability of the middlemen to pay advances.

We asked the individual herders we interviewed in the field sites which, of all the organisations they had contact with, they trusted the most. The answers were extremely disparate. Two mentioned their respective local cooperatives – seen as closer and more trustworthy, liked for their hard work, with dairy as well as with cashmere, the dividends they pay, and their long-term

collaboration with cashmere brands. Other organisations highly trusted by individual herders included:

- An EU-funded project
- MNFPUG
- A small cashmere processing factory in the aimag centre.

One herder, to general agreement of others, said he trusted none of the organisations named, but maybe the bagh leader more than the others.

5.5.3 Social Involvement

Despite the low population densities and patterns of pastoral movement, there is a healthy level of participation in producer organisations (discussed above) and in bagh assemblies, the lowest tier of local government, and also a respect for soum-level institutions. To this extent communities are able to participate in decisions about their livelihoods. Although one herder felt that government is distant except for tax, there was an absence of major criticisms of soum-level or higher-level policies. The recent consultation exercise on potential amendments to the law on rangelands (Enkh-Amgalan et al. 2023 – see Section 5.2 above) shows the extent to which civil society, in concert with a major donor, can facilitate herder voice in policy discussions. Participation in bagh meetings is somewhat higher than for producer organisations. Voltolini et al. show that 26% of male herders and 25% of female herders had attended a bagh meeting in the past 12 months, with average numbers of meeting for those who did attend being 2.3 for men, 1.6 for women.

Where we were able to ask herders about whether they felt their own knowledge (for example on animal husbandry) was respected, three implicitly or explicitly felt it was not while one was more positive. While herders are involved in various initiatives to monitor rangeland health, this appears to be based more on their employment to collect data based on scientific conceptions than harnessing of their indigenous knowledge.

There is an ethos of mutual support among herders, although when neighbours join each other for cashmere combing this is paid labour. Voltolini et al. (2015) mention certain PUG activities, undertaken on a voluntary basis, as reasons for the greater participation of men in PUG activities in comparison with women: digging or maintaining wells, protecting water sources, planting and harvesting livestock feed crops, building and maintaining roads, harvesting hay.

5.5.1 Conclusion of Social Capital

As regards producer organisations, the cooperative movement only reaches a third of Mongolian herders, though it was important for our interviewees, but PUGs are increasingly strong. There is a mixed but generally favourable picture on information flows on agricultural technologies, policies and practices, and on trust, at least within the more integrated sub-VCs. Social involvement, especially through bagh meetings, is high.

Social Capital	
Strength of Producer Organisations	
Information and Confidence	
Social Involvement	

5.6 Living conditions

Findings on living conditions are primarily derived from the 2018 Social Indicator Sample Survey Infographic (NSO 2018) co-published by NSO, UNFPA and Unicef, and data from the NSO Household Socio-Economic Survey of 2021. The former presents indicators from a sample of 14,000 households, either on a national basis or disaggregated to rural and urban, while for the latter we have used statistics for goat-owning households, who constitute the great majority of herding households. In addition, the 2022 FAO *Resilience Capacity Analysis of Mongolian Herder Households* is used for some indicators and findings.

5.6.1 Health Services

Health services in rural Mongolia are well-organised and effective, especially considering the low population densities. Our interviews found almost universal satisfaction with access to health services. All the locations benefit from clinics at bagh level staffed by qualified doctors[45], generally female, and small to medium-size hospitals at soum level. Taking natal and ante-natal care as proxies for health service quality, monthly antenatal check-ups start at 5 months. Women generally deliver babies in soum- or aimag-level hospitals. 86% of rural mothers receive 4 or more antenatal care visits, and aggregating rural and urban rates, 99% of births are attended by skilled personnel, 94% of newborns and 94% of mothers receive a health check within two days (NSO 2018).

5.6.2 Housing, Water and Sanitation

76% of goat-owning households own a *ger* (yurt) (NSO 2021). The team did not observe any herding households with accommodation less satisfactory than a *ger* – some herders, particularly in ethnically Buriad areas, live in log-houses, particularly during the winter.

Table 5-7, derived from NSO (2021) data for goat-owning households, shows sources of water for household use, distance travelled to drinking water, and type of toilet facility. Indicator levels may appear low, but low population densities and seasonal movement make investment in water and sanitation expensive. Sanitation facilities especially are generally rudimentary, but the long distances between homesteads reduces the significance of this.

[45] Ratios of nurses to doctors appear low by international standards, but this is an accepted norm

Indicator	% of goat-owning households
Source of water	
Tubewell/Borehole	23.3
Water Kiosk	15.7
Protected Dug Well	14.6
Protected Spring	1.5
Other High-Grade sources	3.2
Unprotected Dug Well	7.1
Unprotected Spring	4.1
Surface Water	29.8
Rainwater	0.9
Distance travelled to drinking water	
<200 m	24.4
200 – 1000 m	35.3
>1000m	32.7
No Answer	7.7
Type of toilet facility	
Linked to Sewage System	2.4
Ventilated Improved Pit Latrine	10.1
Pit Latrine with Slab	26.6
Pit Latrine without Slab	20.5
Hanging Latrine	15.4
No Facilities	24.3
Other	0.7
Is toilet shared?	
No	78.9
Yes	21.1

TABLE 5-7:WATER AND SANITATION INDICATORS FOR GOAT-OWNING HOUSEHOLDS (N=3502)
Source: NSO 2021

5.6.3 Education

Mongolia has good indicators for school attendance and completion, especially for girls. Five years of primary education and 4 years of lower secondary education are normally provided in soum centres, three years of upper secondary education is more likely to be in aimag centres. Primary participation rates are very high with Gross Enrolment Rates of 103% for girls and 106% for boys.[46] Secondary attendance and completion rates are presented in Table 5-8. The gender gap at these levels in favour of girls has already been noted.

Indicator	Female	Male
Lower Secondary Attendance (Rural)	96.6	90.1
Lower Secondary Attendance (Urban)	92.9	92.9
Lower Secondary Completion (National)	95.6	89.3
Upper Secondary Attendance (Rural)	86.1	66.7
Upper Secondary Attendance (Urban)	93.5	89.9
Upper Secondary Completion (National)	75.0	65.9

TABLE 5-8: SCHOOL ATTENDANCE AND COMPLETION INDICATORS. SOURCE: NSO 2018.

[46] Gross Enrolment Rates represent children attending school divided by the number of children in the age cohort officially associated with the level of schooling, so can exceed 100%. These are UNESCO figures from 2017 cited by the Education Policy and Data Centre (2018) https://www.epdc.org/sites/default/files/documents/EPDC_NEP_2018_Mongolia.pdf

Given low population densities and pastoral mobility, Mongolia has long used boarding schools to provide education in rural areas. In many areas boarding places are inadequate, and buildings may be of poor quality. These factors, and the recent drop in school starting age from eight to six, lead to family separation as mothers choose to live in soum centres with primary-age children. Education is free, including provision of books, but excluding boarding or other living costs, transport and uniforms. We were told in two locations that insufficient teachers are employed.

Vocational training in skills relevant for light industries such as cashmere processing is provided for students of 16 years or older in two public-sector Technical Colleges, the Korean-Mongolian Technical College in Ulaanbaatar and the Erdenet Institute of Technology in northern Mongolia. Tuition is free and scholarships are available. In addition, the Mongolian University of Science and Technology has established the Shima Seiki Training Centre, 50% funded by Japanese private industry, and in particular by Shima Seiki, the leading company manufacturing advanced knitting machines, to "strengthen the human capital of the Wool and Cashmere industry, to develop models and quality products that meet the requirements of the international market, [and] to introduce advanced technology of Japan".[47] Factory managers interviewed for the study mentioned extensive training opportunities offered to staff, up to and including training visits to Japan.

Access to information on livestock production technologies, laws and policies, and market conditions has been discussed in Section 4.5 above.

5.6.4 Other Aspects of Living Conditions

Table 5-9 presents NSO data on possession of selected other household items, by goat-owning households.

Item	%
Diesel Generator	9.5
Solar Generator	67.6
Wind Generator	0.3
Motorcycle	44.9
Car	40.0
Truck	34.2
Smart Phone	0.9
Other Mobile Phone	74.0
Internet Access at Home	13.3

TABLE 5-9: PERCENTAGE OF GOAT-OWNING HERDER HOUSEHOLDS OWNING SELECTED ITEMS (N=3502)
Source: NSO 2021

FAO (2023) stresses the importance of possession of agricultural tools (e.g. haymaking equipment, tractors, shelters) and transport vehicles for overall resilience. As mentioned above, the increase in motor transport has transformed the labour of herding. FAO (2023) states that only 14% of herders have access to the national electricity grid, but by our own observations and the NSO data, solar generators are very common and fitted to batteries to provide a more continuous supply. This in turn allows the use of mobile phones and the internet – our own observations suggest that smartphone usage, at least among cashmere producers, is much more prevalent than the NSO figures state, allowing the use of social media as an information channel for herders.

[47] See http://www.sitech.edu.mn/en/page/78

5.6.5 Conclusion on Living Conditions

Living conditions, as expressed in the VCA4D sub-domains, are good, especially around health service provision, housing and education, despite some continuing issues around school boarding provision. Drinking water and sanitation indicators are low by international standards, but the context of very low population densities and mobility make improvement difficult.

Living Conditions	
Health Services	
Housing	
Education and Training	

5.7 Answer to the Framing Question 3

Analysis of the social aspects of the cashmere VC is complicated by the very different social characteristics of the production stage and the processing stage, but overall, the analysis shows a VC where social indicators are favourable, especially in comparison with other low- and middle-income countries in which VCA4D analyses have been carried out.

In the processing sector, improvements in working conditions can undoubtedly be made, but there are signs of progress in activities being undertaken by MITUF and by employers, and the sector is attractive, especially for women, in comparison with other sectors of the Mongolian formal economy. Key problems identified in the social analysis (see Table 5-11) relate more to herding livelihoods.

	Key problems identified in the VC	Mitigation measures
Working conditions	* Unattractiveness of herding as a livelihood, especially for girls and women. * Possible exploitative conditions for assistant herders	* Improvements in connectivity (internet availability etc.) and training * Increased regulation of this practice
Land and Water Rights	* Current uncertainties in legal framework	* Support for amendments currently with parliament
Gender Equality	* Heavier workloads and relative lack of decision-making power for women	* Education and training programmes promoting conversations on gender equality
Food and Nutrition Security	* Lack of dietary diversity * Unattractiveness of current insurance system	* National dietary policies * Non-insurance alternatives for drought and dzud resilience
Social Capital	* Underdevelopment of member-owned cooperatives * Relative lack of information on policies and laws	* Greater differentiation in standards, labelling and incentives between member-owned and investor-owned cooperatives * Increased communication through cooperatives and PUGs
Living Conditions	* No key problems	

Table 5-10: *KEY PROBLEMS IDENTIFIED IN THE VALUE CHAIN*

Herding in Mongolia has a special social, historical and cultural status. Herding is associated with economic and environmental problems discussed in other sections, but also with problems highlighted above, especially the linked issues of gender inequality and the unattractiveness of the herding livelihood to younger generations especially girls. A lack of dietary diversity is a major problem across rural and small-urban Mongolia, that needs to be tackled by measures outside the VC. The development of community-level institutions for herders, PUGs and member-owned cooperatives, is progressing but still present in a minority of communities. The important issue of rangeland governance is being addressed through measures now progressing through parliament. A further issue, which does not easily fit in the VCA4D structure, but was raised by herders and other informed observers, is that animal health services are not working optimally. Overall, the analysis suggests that there are no major social factors militating against further investment by international donors in the VC and that such investment can enhance social wellbeing.

6. IS THE VALUE CHAIN ENVIRONMENTALLY SUSTAINABLE?

6.1 Aims and Methods for the Environmental Assessment

Within the framework of this study, the environmental analysis aims specifically to answer the structuring question: "Is the Mongolian cashmere VC environmentally sustainable? The approach to assessing the environmental sustainability of the VC is twofold: (i) a quantitative assessment of the LCA Areas of Protection (AoP: human health, ecosystems and resources) and the VC's contribution to climate change, and (ii) an exploratory study of the risks to biodiversity.

To answer these questions, this analysis is therefore composed of 5 structuring sub-questions:

- What is the potential damage of VC to Natural Resources depletion?
- What is the potential impact of VC on Ecosystem Quality?
- What is the potential impact of VC on Human Health?
- What is the potential impact of VC on Climate Change?
- Does the potential impact of VC on Biodiversity need specific studies?

6.1.1 Impact assessment methods for LCA

Impacts on Natural Resources depletion, Ecosystems Quality and Human Health

Impact assessment of the VC on the three AoP, i.e. **Natural Resources depletion, Ecosystems Quality and Human Health**, has been led through a LCA approach with the ReCiPe 2016 method (v1.1 Endpoint World H/A [Hierarchist/Average]). This method has been chosen because it presents endpoint indicators in the three AoP, on the basis of several relevant impact indicators (Huijbregts et al. 2016). The links between the environmental mechanisms, i.e. the midpoints, and the three AoP are summarized in Figure 6-1.

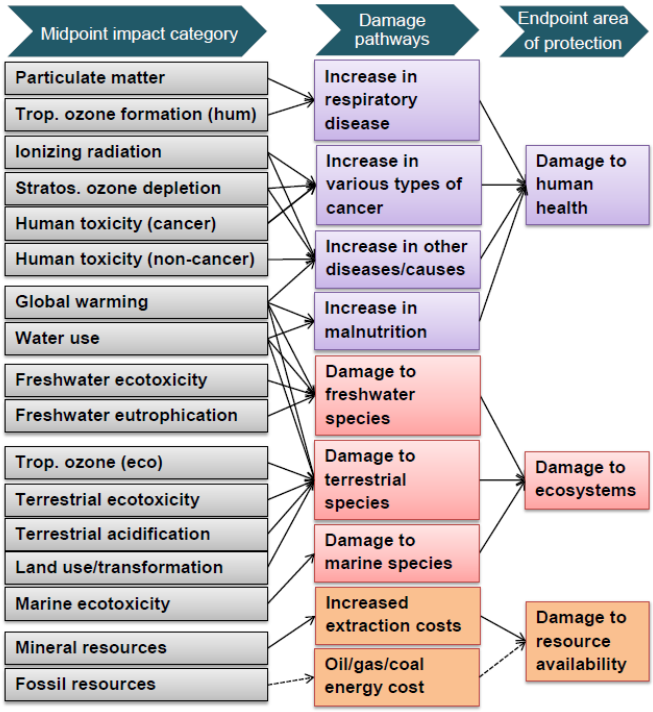


FIGURE 6-1: OVERVIEW OF THE IMPACT CATEGORIES THAT ARE COVERED IN THE RECIPE2016 METHODOLOGY AND THEIR RELATION TO THE AREAS OF PROTECTION

Source: Huijbregts et al. (2016)

The AoP are expressed in different units. Impacts on Human Health are expressed in DALYs (disability adjusted life years), which represent the years that are lost or during which a person is disabled due to a disease or accident. The unit for Ecosystem Quality is the local species loss integrated over time (species year). The unit for Natural Resources depletion is the dollar ($), which represents the extra costs involved for future mineral and fossil resource extraction. The hierarchist perspective (H) has been chosen because it is based on scientific consensus with regard to the time frame and plausibility of impact mechanisms (Goedkoop et al. 2013).

To note, impacts on AoP have been also aggregated and expressed in a single unit called "points" (Pt). This unit enables to address the relative contribution of each step on the global environmental damage of the VC. It aims to highlight main environmental hotspot along the VC and identify the main steps to be taken to reduce the overall environmental impact of the VC.

Impacts on Climate Change

Impacts on **Climate Change** have also been calculated through an LCA approach and following the Intergovernmental Panel on Climate Change (IPCC) 2021 method based on the IPCC report AR6. It is the successor to the IPCC 2013 method. It contains the Global Warming Potential (GWP) climate change factors of IPCC with a timeframe of 100 years. Note that the GWP 100 factors are recommended as default by Frischknecht et al. (2016). To note, this version of the method excludes CO_2 uptake and biogenic CO_2 emissions considering the uptake and emissions of biogenic CO_2 are part of a short cycle and has net zero impact. The different references for emissions factors are reported in Table 6-1.

Gases	Emissions sources	References
CH_4	Enteric Fermentation	IPCC 2019 Tier 2
	Manure Management	IPCC 2019 Tier 1
	Coal combustion	IPCC 2019 Tier 1
N_2O	Direct	IPCC 2019 Tier 1
	Indirect from volatilization	IPCC 2019 Tier 1
	Indirect from leaching	IPCC 2019 Tier 1
	Coal combustion	IPCC 2019 Tier 1
CO_2	Fuel combustion	IPCC 2019 Tier 1
	Coal combustion	IPCC 2019 Tier 1

Table 6-1: References used for the GHG emissions

It is worth noting that carbon (C) sequestration has not been accounted for in this study. Literature shows large difference in annual C balance for different ecosystem types, ranging for instance from – 160 to 187 $gC.m^{-2}.yr^{-1}$ according to Shao et al. (2017). Even for a same ecosystem type, these values can widely differ. For instance, annual C balance for *Stipa krylovii* temperate steppe could be – 41 (Li et al., 2005), 68 (Wang et al., 2008) and 187 (Shao et al., 2017).

Impacts on Biodiversity

Quantitative and qualitative data for impact assessment on **Biodiversity** have been harvested through interviews during the two field missions and literature review.

6.1.2 System boundaries, functional unit and allocation rules for LCA

System boundaries

System boundaries are the basis for an LCA. They can be divided into a time, space and technology boundaries. Regarding the temporal boundaries, all data has been selected to as closely represent conditions in 2022 as is practical. The spatial boundaries deal with the national cashmere VC. Finally, faced with the difficulty of obtaining precise operating data based on the diversity of players at each stage, the technological limits of the system were set from the cradle of inputs to the production of clothes for the local market (Figure 6-2).

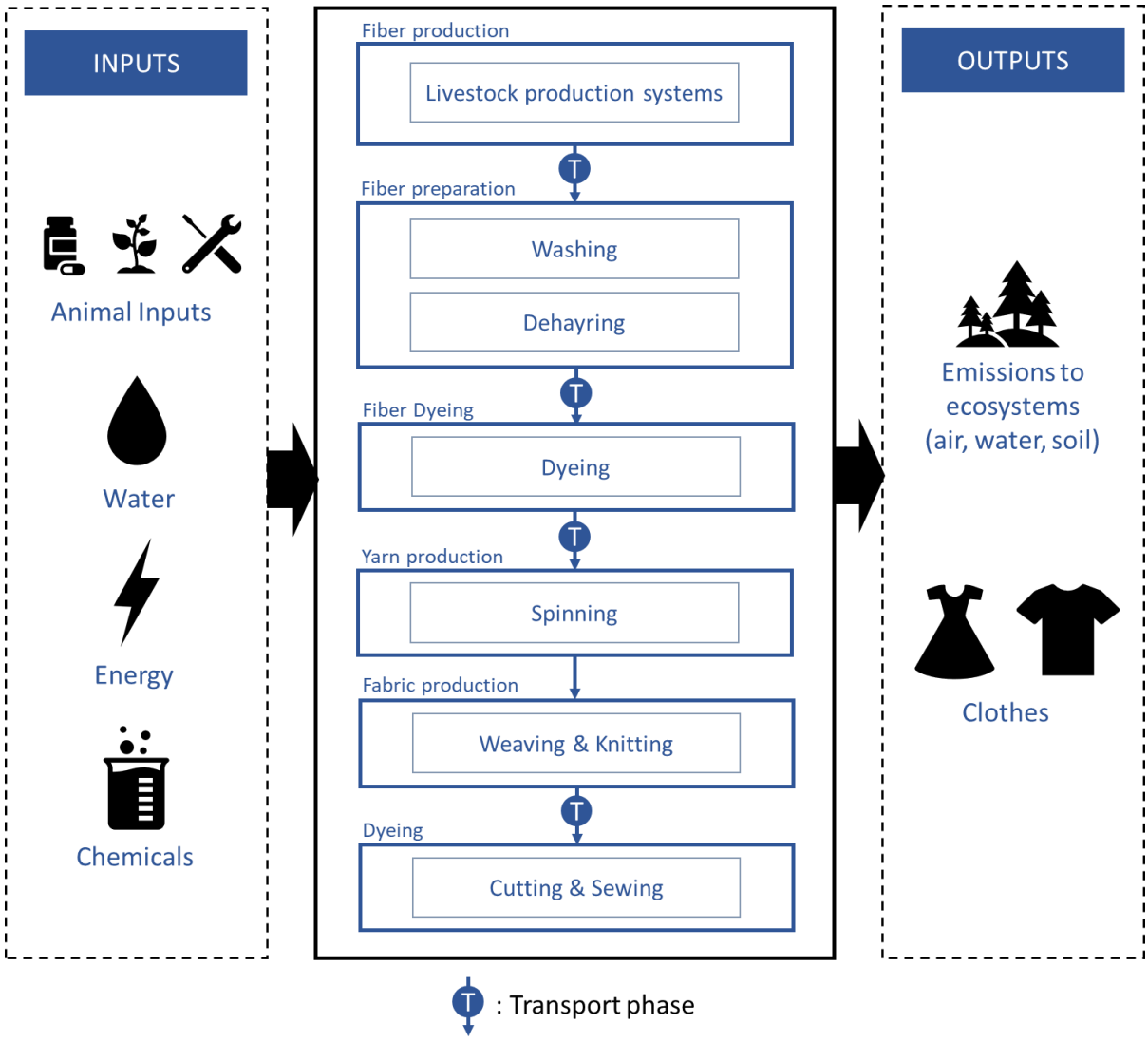


FIGURE 6-2: SYSTEM BOUNDARIES AND ACCOUNTED STAGES FOR THE STUDY (MODIFIED FROM 2030 ROADMAP REPORT)

These therefore begin upstream of the production or processing systems, from the production and transport of inputs and energy (on Mongolian territory or abroad) through to making the products available to local consumers. In line with the functional analysis (see section 2), the technological boundaries take into account the following processes and phases:

- The production of raw cashmere on farms, considering only processes related to goat rearing,
- Raw cashmere fibre preparation, including scouring and dehairing,
- A fibre dyeing process

- The yarn production phase with the spinning process,
- A first phase of garment assembly with the weaving and knitting processes, followed by a second phase with the cutting and sewing processes.
- And finally, transport between these different phases.

With the absence of data, the phases of retailing, use and waste disposal out of the factories and packaging have not been taken into account.

Functional unit

Functional unit is the kilogram of cashmere made clothes outing from the factories (kg of cashmere clothes).

Allocation

Allocation is the process of partitioning the environmental burdens of a system between its different co- or by-products. For instance, when regarding livestock production systems, the global environmental burdens should be distributed between its different outflows as milk, meat, manure, wool, etc. The basic methodology for allocation in LCAs is dealt with in ISO 14041: " Where physical relationship (i.e. kg, m2, m3, etc.) cannot be established or used as the basis for allocation, the inputs should be allocated between the products and the functions in a way which reflects other relationships between them. For example, environmental input and output data might be allocated between co-products in proportion to the economic value of the products ".

In our study, concerning the processes we modelled the distribution of impacts between co-products, based on an **economic allocation** (i.e. the weight multiplied by the market price of the different fractions). The prices used are identical to those used in the economic analysis (see section 3.2). Concerning background processes (i.e. processes already available in life cycle inventory database), the economic allocation method was also preferred when the choice was left to the user.

6.2 Life Cycle Inventories

Lifecycle inventories have been built to represent the various processes involved (Figure 6-2).

6.2.1 Primary data on Livestock production systems

Herd structure and management is mainly based on national livestock census completed by data harvested during interviews. The livestock production system has been modelized at the national level and is described in the Table 6-2.

Data category	Parameter	Unit	Value	Source
Herd structure	Total number of animals	10^3 Head	27 569	National Stastics Office
	Adult females (>2yrs)	10^3 Head	11 579	Calculated from census
	Bucks (>2yrs)	10^3 Head	232	Calculated from census
	Other adult males (>2yrs)	10^3 Head	9 329	Calculated from census
	Yearlings (0-1 yrs)	10^3 Head	7 144	Calculated from census
	Male and female (1-2 yrs)	10^3 Head	6 430	Calculated from census
Animal weight	Adult females	Kg	28	Tsevegmed (2016)
	Bucks	Kg	45	Interviews
	Other male adults	Kg	38	Tsevegmed (2016)
	Yearlings	Kg	20	Interviews
Herd dynamic	Adult females share	%	42	Calculated from census
	Female goats per buck	head	50	Tsend-Ayush, nd
	Birth rate	%	62	National Stastics Office
	Annual adults mortality	%	5	National Stastics Office
	Annual yearlings mortality	%	10	Interviews
	Sales age for male adults	Year	6	Interviews
	Sales age for female adults	year	7	Interviews
Equipments	Solar pannels	day of use	35	Calculated from census[a]
	Electric generator-diesel-based	day of use	2	Calculated from census[a]
	Car	day of use	11	Calculated from census[a]
	Truck	day of use	12	Calculated from census[a]
	Motorcycle	day of use	14	Calculated from census[a]
	Shed (wood)	m²	84,020	Interviews
	Waterwell	day of use	180	Interviews
Herd Inputs	Drinking water for animals	m3	1,861	Calculated[b]
	Gas fuel	l	165,414	Calculated from census[a]
	Dung use for heating	kg	1,700	Calculated from census[a]
	Biomass for feeding	kgMS	8,050,148	Based on 292kgDM per head per year
	Land use - Desert	ha	2,312,442	Own calculation[e]
	Land use - Desert Steppe	ha	4,037,333	Own calculation[e]
	Land use - Steppe	ha	3,573,681	Own calculation[e]
	Land use - Forest Steppe	ha	1,461,614	Own calculation[e]
	Land use - High mountains	ha	264,525	Own calculation[e]
	Land use - Taiga	ha	454,980	Own calculation[e]
	Hay	t	248,121	Calculated from interviews[c]
	Wheat bran	t	104,211	Calculated from interviews[d]
Herd Outputs	Raw cashmere	Ton	9,672	National Stastics Office
	Bucks	10^3 Head	46	Calculated
	Other male adults	10^3 Head	2,572	Calculated
	Female adults	10^3 Head	2,488	Calculated
	Milk	ton	81,068	Calculated[f]

TABLE 6-2: AVERAGE HERD STRUCTURE AND MANAGEMENT CONSIDERED FOR THE ENVIRONMENTAL ANALYSIS (ANNUAL DATA)

[a] Based on total use and share of incomes from goats. [b] Drinking water: Considering water intake of 0,250l per day per animal during 9 months (excluding winter) (source: interviews). [c] Based on 300g of hay per weak animal (1/3 of the herd) per day during 3 months (winter) (source: interviews). [d] Wheat bran: Based on 150g of wheat bran per goat for 2 months (post-winter) (source: interviews). [e] Based on ecotypes share areas estimated through geographical system information and degradation level and biomass yield per ecotypes from Densambuu et al. (2018). [f] Based on interviews (only milking in Desert and High-Mountaneous regions) and on an average production per goat of 60l.goat.year (Narangerel et al., 2016). To note, National milk production for 2021 from FAO stat: 115 007 t

6.2.2 Primary Data on Processors

Similarly to livestock production systems, each processing stage has been modelized at national level. Due to lack of data, diversity of processors has not been accounted. Primary data for each processing stage is available in Annex 5. To note, data on global energy and water uses per kg of processed cashmere along the whole processing stages has been given by StepEcoLab project managers. However, as values have been harvested in 13 from the larger factories in Mongolia, processing around 70% of cashmere in UB, and due to privacy policy, these values are not indicated in this report. To note, both values have been divided between the different processing stages according to the STeP EcoLab report (STeP EcoLab project, 2022) for water use and share of Climate Change contribution in the global textile VC provided by UNEP (2020) for energy use. Water losses have been calculated as default according to the literature.?

6.2.3 Data quality

In this LCA, potential errors and uncertainties mainly concern:

- Failure to take into account the diversity of goat production systems
- Values for each processing stage, estimated using questionable proxies
- Difficulty in obtaining information on Chinese companies: in particular on emissions.

To assess potential impacts of uncertainties on results, and considering the difficulty of carrying out a full uncertainty analysis, quality of the dataset has been assessed according to ILCD handbook recommendations (European Commission et al., 2011). This evaluation is based on 6 data quality indicators: technological representativeness (TeR), geographical representativeness (GeR), time-related representativeness (TrR), completeness (C), precision and uncertainty (P), and methodological appropriateness and consistency (M). For each indicator, a score between 1 and 5 is given (1 as the best score, 5 as the worst). Then, the general data quality representativeness is calculated following this equation:

DQR = (TeR + GeR + TrR + C + P + M + Xw*4) / (i + 4)
With :
Xw: Lowest quality score (i.e. highest value) among all the indicators
i: Number of data quality indicators applied (unequal to 0)

For our dataset, values given for the different data quality indicators are: TeR = 3; Ger = 3; TrR = 1; C = 3; P = 4; M = 2. This results in a global score for DQR of 4,0 corresponding to a “basic” quality level (between 1.6 and 5).

6.3 Impacts on Natural Resources depletion, Ecosystems Quality and Human Health

The global impact of the Mongolian cashmere VC, expressed in a single score, is **44.74 Pt**. Impacts on the three areas of protection is given in Table 6-10.

Areas of protection	Unit	Value
Human health	DALY	1,85E-03
Ecosystems	species.yr	7,98E-05
Resources	USD2013	3,65

TABLE 6-3: IMPACTS OF THE MONGOLIAN CASHMERE VC ON THE THREE AREAS OF PROTECTION: HUMAN HEALTH, ECOSYSTEMS QUALITY AND NATURAL RESOURCES (PER KG OF CASHMERE MADE CLOTHES OUTING FROM THE FACTORIES)

Beyond these global results, it is more interesting to investigate the contribution of each stage to these impacts. Regarding the whole impact expressed in single score, livestock production systems are the major contributors to the whole impacts (70%), followed by Dyeing process (14%) (Figure 6-3). Other stages account for less than 10%.

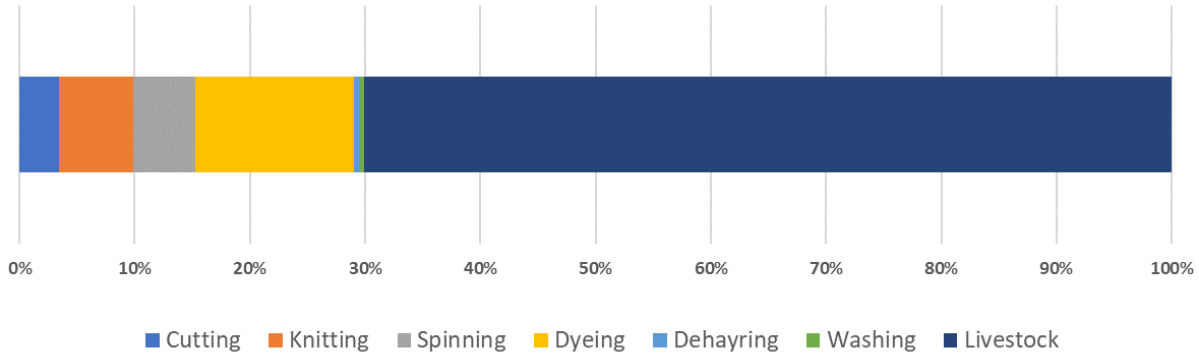


FIGURE 6-3: CONTRIBUTION OF THE DIFFERENT STAGES TO THE OVERALL IMPACTS OF THE MONGOLIAN CASHMERE VC

To note, the Livestock and Dyeing stages do not make their major contributions on the same AoP (Figure 6-4). The Dyeing process remains a large contributor to Human Health and Natural Resources depletion (respectively 26% and 36%), Livestock production systems represent the largest impact on Ecosystems Quality (99%), despite also contributing to Human Health (44%) and Natural Resources (13%). Other stages contribute mainly to Natural Resources depletion (for instance 19% for Knitting and 17% for Spinning) and to a lesser extent to Human Health (12% for Knitting for instance).

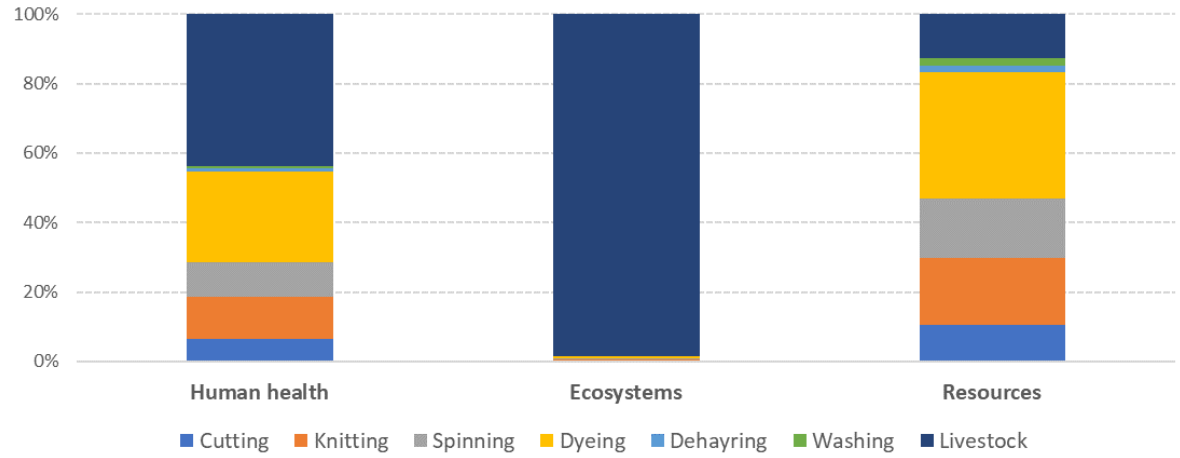


FIGURE 6-4: CONTRIBUTION OF THE DIFFERENT STAGES OF THE MONGOLIAN CASHMERE VC ON THE THREE AREAS OF PROTECTION: HUMAN HEALTH, ECOSYSTEMS QUALITY AND NATURAL RESOURCES

These results are confirmed when investigating more deeply the contribution of the different impacts to the AoP, and of the different stages to these impacts (Table 6-4). We can observe

Livestock stage contributes to close to 100% of Land use impact. Relations between the total area used by a process and its potential impacts is not obvious. Main relation deals with potential land grabbing by an activity, preventing development of others, potentially more sustainable. This is especially counter-intuitive in the Mongolia context. Indeed, around 80% of the country is rangeland which is not or little adapted for other activities in addition to low population density. In this sense, large land occupation by extensive livestock production systems would be potentially without consequences. However, rangeland degradation has been identified as the main environmental pressure caused by cashmere goat production. Livestock is also a large contributor to all impacts related to Global Warming. This is relevant as we know production systems is known to be a large contributor to livestock VC around the world (see next section for more results) (Gerber et al., 2013).

Concerning Dyeing, this process contributes largely to the three different AoP through different categories of impact. Its contributions to Human non-carcinogenic toxicity, Freshwater ecotoxicity and Marine ecotoxicity are especially very high (respectively 70, 66 and 67%). We assume this is related to use of chemical and pollutant discharges. Indeed, some interviewees notice potential water pollution related to low treatment of effluent during cashmere processing (especially during Washing). In addition, Dyeing is also the major contributor to Fine particulate matter formation (42%) and fossil scarcity (37%) and is often the second contributor after Livestock to the different impacts related to Global Warming. Those contributions could be explained by the use of large amount of coal, both directly with electric-generator-coal-based units or indirectly as a large share of national electricity is produced with coal-fired power plants.

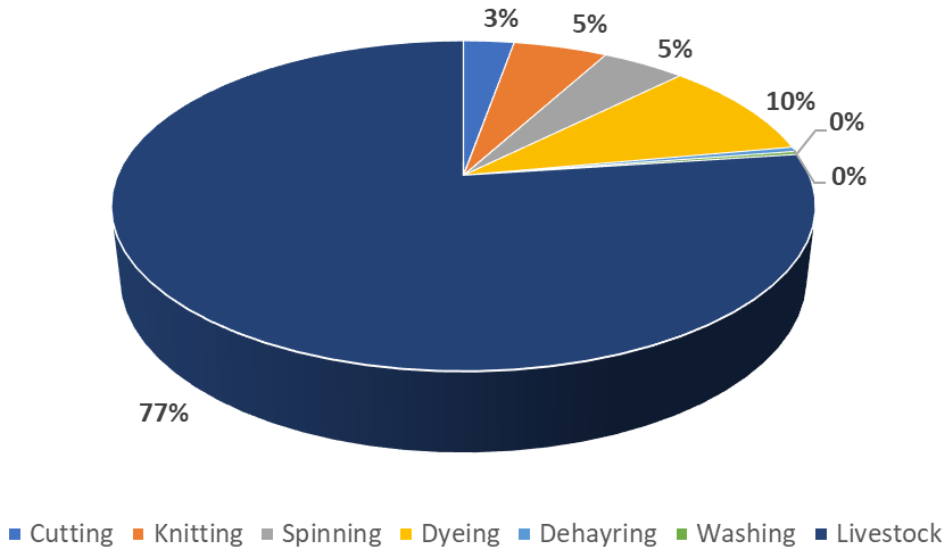
Areas of protection	Impacts: Categories	Unit	Value	(% of the AoP)	Share: Cutting & Sewing	Knitting	Spinning	Dyeing	Dehayring	Washing	Livestock
Human Health	Global warming, Human health	DALY	9,87E-04	*53*	2	4	4	8	0	0	80
	Stratospheric ozone depletion	DALY	9,04E-07	*0*	0	1	1	1	0	0	97
	Ionizing radiation	DALY	1,38E-08	*0*	11	20	18	39	2	1	9
	Ozone formation, Human health	DALY	4,48E-07	*0*	12	21	19	40	2	2	5
	Fine particulate matter formation	DALY	6,60E-04	*36*	12	23	19	42	2	1	1
	Human carcinogenic toxicity	DALY	5,30E-05	*3*	12	22	18	41	2	1	5
	Human non-carcinogenic toxicity	DALY	1,38E-04	*7*	6	11	9	70	1	1	2
	Water consumption, Human health	DALY	8,97E-06	*0*	11	28	13	45	1	0	2
Ecosystems Quality	Global warming, Terrestrial ecosyst.	species.yr	2,98E-06	*4*	2	4	4	8	0	0	80
	Global warming, Freshwater ecosyst.	species.yr	8,12E-11	*0*	2	4	4	8	0	0	80
	Ozone formation, Terrestrial ecosyst.	species.yr	6,42E-08	*0*	12	21	19	40	2	2	6
	Terrestrial acidification	species.yr	2,26E-07	*0*	12	22	18	40	2	1	5
	Freshwater eutrophication	species.yr	2,10E-07	*0*	11	19	16	49	1	1	2
	Marine eutrophication	species.yr	6,73E-11	*0*	5	10	10	45	1	1	29
	Terrestrial ecotoxicity	species.yr	2,51E-09	*0*	9	16	14	32	1	1	26
	Freshwater ecotoxicity	species.yr	1,15E-08	*0*	6	11	9	66	1	1	7
	Marine ecotoxicity	species.yr	2,41E-09	*0*	6	10	9	67	1	1	7
	Land use	species.yr	7,62E-05	*96*	0	0	0	0	0	0	100
	Water consumption, Terrestrial ecosyst.	species.yr	5,59E-08	*0*	11	27	13	44	1	0	4
	Water consumption, Aquatic ecosyst.	species.yr	7,43E-12	*0*	5	12	7	20	1	0	55
Natural Resources	Mineral resource scarcity	USD2013	3,40E-02	*1*	7	12	11	27	1	2	41
	Fossil resource scarcity	USD2013	3,62	*99*	10	19	17	37	2	2	12

TABLE 6-4: CONTRIBUTION OF THE DIFFERENT IMPACTS TO AREAS OF PROTECTION AND CONTRIBUTION OF THE DIFFERENT STAGES OF THE VC TO THESE IMPACTS (DARK GREEN: FROM 0 TO 20%), LIGHT GREEN: FROM 21 TO 40%, YELLOW: FROM 41 TO 60%, ORANGE: FROM 61 TO 80%, RED: FROM 81 TO 100%)

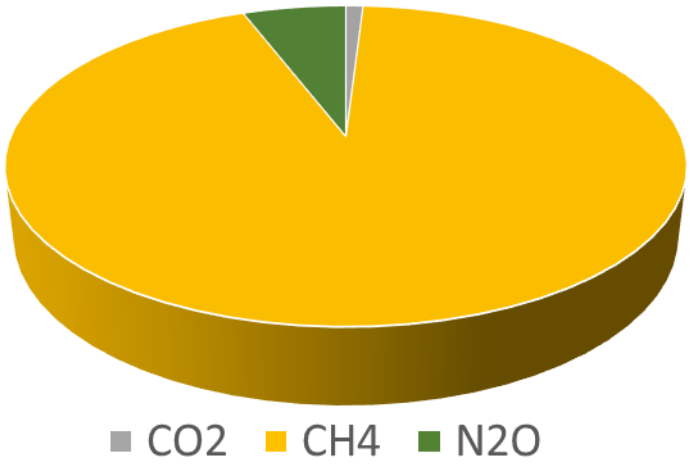
6.4 Impacts on Climate Change

Contribution of the Mongolian Cashmere VC is related to GHG emissions. Total GHG emissions intensity reaches 904.9kg CO2-eq per kg of cashmere-made clothes. This value is far higher than emission intensities from other textile commodities. Comparisons with other data from the literature are difficult, as few LCA studies on the cashmere chain are available. However, when addressing the emissions intensities of the different co-products at livestock systems stage, we obtain 7,8 kgCO2e per kg of milk and 25.7kgCO2e per kg of carcass weight. These values are in line with global assessment provided by Gerber et al. (2013) who obtained emissions intensities for goat grazing production systems of 6.13 kgCO2e per kg of milk and 24.23 per kg of carcass weight.

Indeed, the contribution of each stage of the VC and the different GHG emissions are given in Figure 6-5A. Livestock remains the main contributors to the GHG emissions of the VC (77% of the total GHG emissions).



(A)



(B)

FIGURE 6-5: SHARE OF GHG EMISSIONS BETWEEN THE DIFFERENT STAGES OF THE MONGOLIAN CASHMERE VC (A) AND THE DIFFERENT GREENHOUSE GASES AT LIVESTOCK LEVEL (B)

Livestock contributes to the total GHG emissions mainly through CH_4 emissions. Regarding the GHG emissions share at livestock production systems stage, CH_4 emissions represents 96% of the emissions and results both from enteric fermentation and manure management (Figure 6-5B). However, this needs to be seen against a lack of knowledge of the counterfactual – if domestic livestock were not on the rangelands would wild ruminants (e.g. antelope) or some other methanogenic fauna be living there instead (See Rivera-Ferre et al., 2016 and Hristov et al. 2013)?

Dyeing contributes at a lower level to CO_2 emissions from coal combustion, as mentioned previously either directly with electric-generator-coal-based units or indirectly as a large share of national electricity is produced with coal-fired power plants. Regarding GHG emissions as a whole, electricity uses all along the VC are responsible of around 22% of the total GHG emissions.

6.5 Impacts on Biodiversity

As the transition to a democratic system led to a move to a market economy, herders gradually increased their herds. Traditional norms, such as resting pastures through mobility, were more commonly infringed. Wealth disparities among herders tended to widen, and veterinary aid previously provided by the government was privatized (Fernandez-Gimenez, 2000). Families moved and concentrated around villages or the capital, increasing pressure and concentration around housing areas (Gunin et al., 1999). Combined effects of such dynamics have led to overgrazing and consequently increase in rangeland degradation.

Beyond socioeconomic impacts[48], many articles and reports have pointed out changes in edible species diversity on rangeland, decrease in plant cover and increase in soil erosion due to overgrazing (see for instance Dashbal and Thorsson, 2010; Densambuu et al., 2018; Munkhzul et al., 2021, Seinnemekh et al., 2022). For instance, by studying impacts of different factors on biodiversity of different steppes from eastern Mongolia, Seinnemekh et al. (2022) show a decrease in species richness and Shannon–Wiener diversity index with grazing and low distance to the camp. We can assume thus that the increasing grazing pressure could decrease the global plant biodiversity of Mongolian steppes. This is in line with testimony from herders interviewed by Mardesic (2018) who consider a replacement of edible plants by less nutritious plants, which they observe by a reduction in thin plants and a replacement of these by thick plants. In addition, they consider the medicinal plants, for both human and animals, are the first to disappear in overgrazing situation. This phenomenon is a double issue. As the incomes of tens of thousands of herder households rely on these resources, such a degradation results in an increase in the vulnerability of local population. It is widely known and has been a priority topic in past and present research and development projects but also in national and local policies.

There is a knowledge gap on the impact of grazing practices on forest cover. Sukhbaatar et al. (2021) assert the threat to forests from livestock but their field site was a strictly protected area from which livestock are excluded and which is grazed by wild horses and deer. Tsogtbaatar (2013) lists "uncontrolled grazing" as a driver of deforestation, but of lower importance than either climate change or logging, and with mainly indirect evidence and a suggestion that the threat is to be regenerating rather than mature forests the evidence. In our own fieldwork, neither herders

[48] The combined effect of these factors is a deterioration in pastureland, observed as early as the late 1990s (Gunin et al., 1999; UNEP, 2002). The vulnerability of Mongolian herders to this new situation was highlighted by the catastrophe resulting from the three years of successive *dzuds* in 1999-2003, which decimated 30% of the national herd and led to the departure of a large number of herders to the cities (Khishigbayar et al., 2015).

nor local authorities in Khuvsgul, which is a heavily forested area, saw a problem with grazing within forests. The issue was not raised in other field sites or by informants in government, civil society or academia, although we did not interview specialists in forest management or forest-related research.

Furthermore, we can also speculate on how pasture degradation could impact animal biodiversity. In most production areas, livestock shares rangeland with wildlife, especially with other wild ruminants. For instance, Berger et al (2013) suggest ecosystem degradation due to the increasing number of goats for cashmere production led to a decreased capacity for persistence of native species, and so a decline in large wild mammals. Though this relation is debated (Von Wehrdem et al., 2015) and not really expressed by interviewees, it could be investigated more deeply.

No georeferenced data with the protected areas in Mongolia has been found enabling overlaying with goat densities at different scales. However, a quick geographical comparison between the location of different types of protected areas (strictly protected areas, national park, national reserve and monument) (Figure 6-6) and goat density at province level (Figure 6-7) show two simplistic situations:

- Desert, desert steppes and mountainous areas with large protected areas and low goat densities.
- Steppes and forest steppes areas with smaller protected areas but higher goat densities.

We assume in both cases, restricted access for herders can impact the grazing resources availability, either because resources are scarce in desert, desert steppes and mountainous areas (which explains partly the low goat densities), or because competition for feeding resources is high (due to high goat densities). For instance, some herders close to the Khustain Nuruu National Park have testified of changes in grazing management, and decrease in rangeland accessibility, due to its foundation in 1993. this constraint is added to the increase in areas cultivated by large firms in the area. If this testimony could be only representative of this situation, a broader study about relations between herders and protected areas should be relevant to analyse how they impact herd management and how herders are involved in the implementation and the management of these areas.

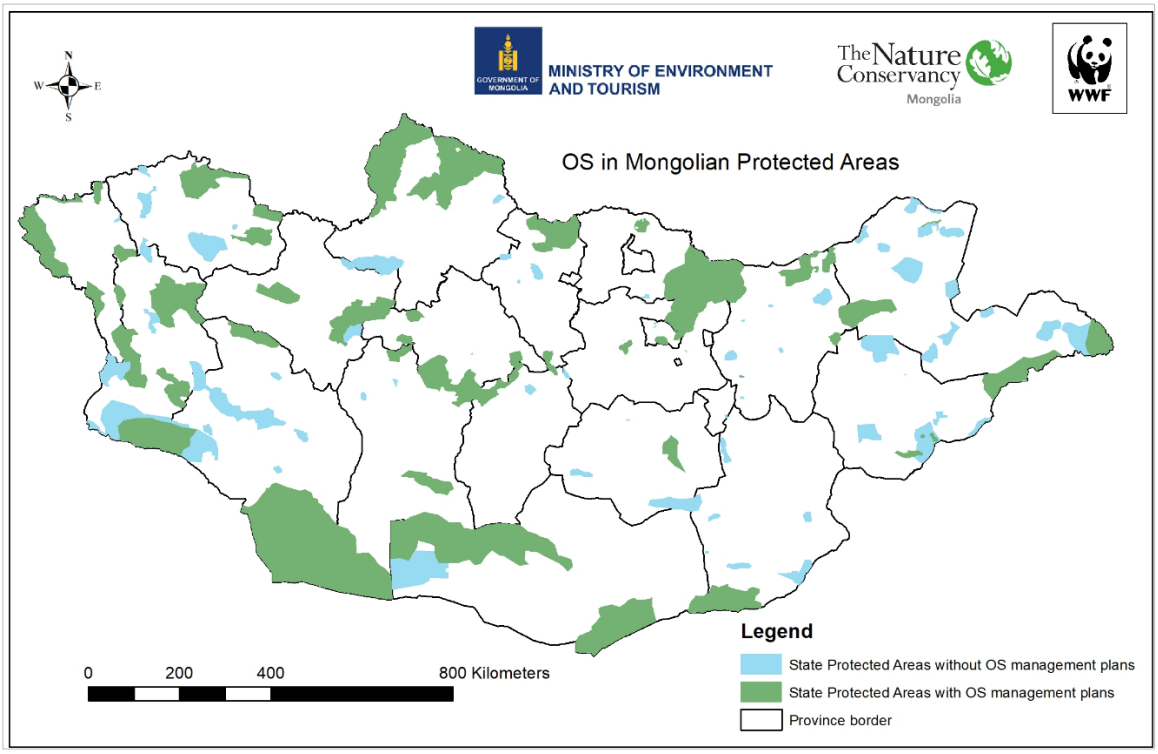


FIGURE 6-6: PROTECTED AREAS IN MONGOLIA
Source: https://www.ccnetglobal.com/2020/02/28/building-capacity-for-the-second-generation-of-protected-area-management-plans-in-western-mongolian/

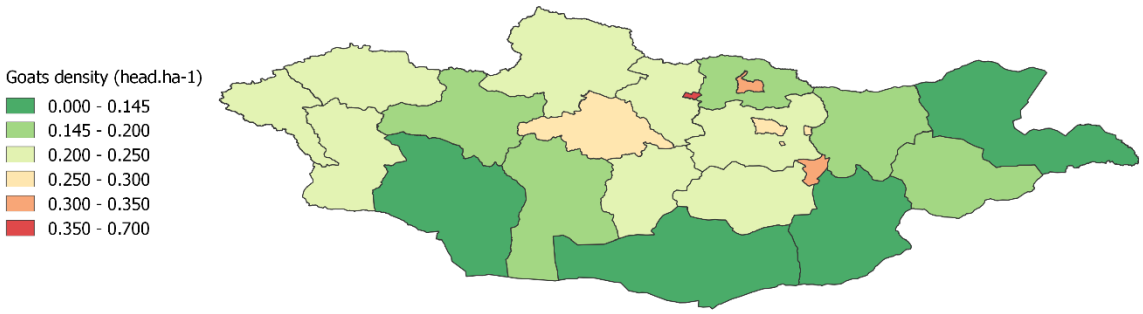


FIGURE 6-7: GOATS DENSITY (IN HEAD.HA-1) IN THE DIFFERENT AIMAG
Source: based on National Satistics Office data for 2022

6.6 Answer to the Framing Question 4

An approach to answer the framing question should be to compare obtained values with other references. However, the lack of public studies on environmental impacts of cashmere production prevents such comparison. Another approach could be to compare with other textile VCs but this is challenging due to differences in goal and scope, methods used, raw materials origins, etc. For this reason, it is more useful in this conclusion to address the key information about contribution at the different stages and some recommendations to improve the sustainability of the VC. In this sense, we have seen previously, environmental impacts mainly occur at two stages of the VC: cashmere livestock production systems and the dyeing process. Both contributions could be different. For cashmere livestock production, there needs to be more awareness about CH_4

emissions and rangeland degradation. Concerning the dyeing process, it should be more relevant to focus on potential pollution by water waste discharges and energy use, especially coal.

6.6.1 Struggling with Rangeland Degradation

According to White et al. (2000), rangelands in Mongolia form about 2.5% of the world's total rangeland area. According to FAO stat (year 2021), rangelands represents 71.5% of the total land area and 98.9% of agricultural land in this country. While the reality of degradation is undisputed, there is no consensus in the scientific community on the predominance of the anthropogenic or "natural" factor in pasture degradation. Bao et al. (2014) believe that these changes are mainly attributable to rising temperatures and drought episodes, intensification of sandstorms, disruption of precipitation, and extreme winter episodes. Liu et al. (2013) also estimate that 60% of the decline in vegetation index can be attributed to climate change. On the contrary, Hilker (2014) estimates through normalized difference vegetation index (NDVI) analysis[49] that 80% of land degradation can be attributed to overgrazing.

Among anthropogenic factors, the most cited is the increase in number of goats. However, increase in household sedentarization has also appeared in some areas. One of the reasons for this sedentarization is economic. Unlike the Soviet era, when relocation was financed and organized by the *negdel*, today herders are solely responsible for their own moves. The poorest families do not have sufficient resources to organize removals and borrow transport vehicles. There may also be an issue in some locations (this was mentioned in Tuv Aimag and is also discussed by Mardesic, 2018) of competition for land between herders and people who have obtained (formally or informally) permission to use land for cropping – as well as taking land out of herding use this may also lead to conflicts around animals entering the croplands at night, over pesticide use, and over farming practices causing erosion

Whatever the share of responsibility, this degradation dynamic is therefore fast-moving. According to Desambuu et al. (2018), 10.3% of the rangeland in Mongolia were at a fully degraded level in 2016, showing an increase of more than 3 points in only 2 years. The first phase of degradation is defined as a change in the plant composition of pastures in favour of species that are less or not edible by animals, or even a drop in plant production. The intermediate phase corresponds to a decline in leaf cover. If it continues, degradation may finally evolve towards desertification, which corresponds to the annihilation of the soil's primary functions of nutrient supply and water retention through modification of its physical structure. These different degrees of degradation are associated with differing degrees of reversibility and recoverability. A simple change in species composition is reversible, provided the pasture is left to rest for a few years. The recovery of a pasture where a drop in leaf cover is observed is also possible but requires a longer resting period. Finally, once the soil's physical and hydric properties have been altered, a return to the initial state is virtually impossible. These different stages suggest that degradation can therefore be "managed" if it is dealt with quickly enough (Kishigbayar, 2015). In this sense, most part of degraded pastures would be able to recover their full ecological potential in just a few years.

As discussed in Section 5.2 the 2002 Land Law of Mongolia covers rangeland management and protected areas but the case for amendments to increase its effectiveness has increased. Specific amendments on rangeland management are thus in discussion in parliament and supporting it should be a major objective for the different institutions operating to the VC sustainability.

[49] The normalized difference vegetation index (NDVI) is a widely-used metric for quantifying the health and density of vegetation using sensor data. It is calculated from spectrometric data at two specific bands: red and near-infrared. The spectrometric data is usually sourced from remote sensors, such as satellites.

In addition, animal head tax is implemented since 2021. The purpose of this law is to regulate the number of livestock thanks to an annual tax equal to MNT 2,000 per head of livestock per year for herders and other livestock owners, which could be paid in two instalments (July and December). Slowing the increase in number of goats is mainly targeted. Indeed, if no study describes the feeding behaviour of goats in Mongolian rangeland, those are known to pull out the plants, which reduces their ability to regrow and thus the resilience of the pasture (Khishigbayar et al., 2015). The number of livestock to be taxed in a given tax year shall be determined based on the results of the previous year's livestock census conducted in accordance with the Law on Statistics. In order to impose tax and determine the number of livestock, local authorities shall provide the tax administration with information on livestock census, registration information and information on livestock genetic resources. However, according to the different interviews led during the study, this tax reform faces different administrative limitations in some areas: difficulty to count the livestock, lack of information about the law and reuse of taxes, difficulties for local authorities to keep a record payment, etc. Supporting the decentralization of the implementation of this law by national government should be improved. Moreover, according to another breeder, the pressure to increase the size of the herd is all the greater because it represents the quality of work that families provide. Succeeding in enlarging your herd is proof that you're a good breeder, because you work well. In contrast to the socialist period, when only the ability to fill quotas counted, since decollectivization the number of animals has become the new indicator of social success. Most of the time, farmers' strategy is to increase herd size as much as possible, in order to withstand price volatility, vulnerable livelihood conditions and meteorological hazards already described.

Finally, local and international institutions have helped to support the setting up of pasture user groups (PUG) aiming at establishing better local resource management. This initiative started with the GreenGold project on 5 pilot soums and is now developed in around half of soums at national level, supported by the creation of the National Federation of Pasture User Groups (NFPUG) in 2015. In 2018, a study aimed to compare two soums, one where PUGs have been implemented and another one where no PUGs has been implemented (Mardesic, 2018). Results shown the introduction of PUGs has failed to stem the degradation of grazing land even if the degradation seems lower in PUG areas. Better analyzing theses reasons of fail should be interesting.

6.6.2 Mitigating GHG Emissions at Different Levels

Reducing GHG emissions in all sectors is a major issue for Mongolia. According to Asian Development Bank (2014), the mean temperature has risen by 2.1°C since 1940, i.e. 1.3°C above the global average, increasing climate variability and a growing number of extreme weather events. As mentioned previously, climate change is one of the main drivers of rangeland degradation even if specific contribution to each factor is hard to assess. In addition to rangeland modification, herders testify to different phenomena related to climate change. Particualrly importantly, summers are said to be getting shorter, while winters are said to be getting longer, with fewer resources available, especially due to snow. Moreover, dzud events are likely to be more frequent and intense in the coming years.

Developing renewable energy sources in processing stages

Environmental impacts of the VC strongly depend on coal as an energy source, either directly in factories or in power plants to produce electricity. Over 93 percent of energy in Mongolia comes from coal-fired power plants. Even if the removal of coal from the global energy mix has been internationally prioritized as governments seek to reduce greenhouse gas emissions, and restrict the development of coal mines, power plants, and associated infrastructure (Brown and Spiegel, 2019), Mongolia's dependence on coal is far from over. Mongolia produced 32.3 million metric

tonnes in 2021 and increased its production by 22% according to Radio Free Asia[50]. Government officials even consider export as a "window of opportunity" considering the increase in natural gas prices due to the Ukraine-Russia war.

Coal is well known as the most polluting source of energy. Along with adding to greenhouse gas pollution, burning coal emits toxic and carcinogenic substances into our air, water and land, severely affecting the health of miners, workers and surrounding communities. Ulaanbaatar used to experience these impacts regularly. During the extreme winters when temperatures routinely fall below −20 °C the level of air pollution can reach 80 times the WHO recommended safe level (Badarch et al., 2021). Even if the most significant sources of pollution come from coal-burning stoves in the residential settlements known as the ger districts, energy use by factories contributes significantly to this phenomenon.

Studying and promoting technical innovations to increase feed quality

In most areas, the decline in forage availability consequently to overgrazing is linked to quality, not quantity. For instance, Mardesic (2018) has shown that NDVI is increasing in these two study regions, despite what farmers say. In reality, therefore, a pasture can degrade at the same time as its biomass increases (see MNFPUG report). This finding is in line with that of Kishigbayar (2015), who, comparing data between 1993 and 2013 in the Bayankhongor region, also found an increase in biomass in the mountain steppe zone, despite a decline in biodiversity and a change in the composition of species indicative of pasture degradation.

Such decrease in feeding quality has impacts on both quantity and quality of cashmere production. Some studies have shown supplement feeding can improve both factors (Johnson et al., 1994; McGregor, 1998; Momem et al., 2021; Wang et al., 2023). According to the interviews, most of the herders already supplement animals, especially during harsh seasons as winter. Most of supplement feeds cited are natural hay or crop co-products but are priority given to weak animals. Improving the feeding quality is a double stake. Beyond improving quantity and quality in cashmere production, this can result in global decrease of enteric CH_4. Indeed, it is widely known that the more digestible the feed, the less CH4 is emitted from ruminal fermentation (Hristov et al., 2013).

In this sense, it should be useful to investigate technical innovations on feeding systems, assessing their technico-economic and environmental limitations, without supporting high level of sedentarization and intensification of these systems. In Inner Mongolia for instance, such dynamics, including increasing the herder dependence to external feeds, have incurred in high supplemental feed costs, marginalized net household income, and promoted larger flock sizes to create a feedback loop driving to rangeland degradation.

6.6.3 Facilitating Sustainable Use of Chemicals and Water Treatment in Processing

Large-scale pollution of rivers in Mongolia has been already reported (see for instance Altansukh and Daava, 2011, Battogtokh et al., 2014; Batsaikhan et al., 2017 or Golubkina et al. 2018). No direct evidence in Mongolia of water pollution due to cashmere VC is available to date, but Chen et al. (2021) have highlighted a large contribution to water eutrophication (due to chemical oxygen demand, total phosphorus and total nitrogen and NH3-N discharges) and water ecotoxicity (due

[50]https://www.benarnews.org/english/news/indonesian/mongolia-coal-open-pit-mine-climate-change-fossil-fuel-08132023093718.html

to chromium, aniline and adsorbable organic halogens discharges) of cashmere fabrics in similar context in China.

By the past, some initiatives tried to implement changes to reduce these pollutions. For instance, the Sustainable Fiber Alliance (SFA) developed their standard to reduce the environmental impact of cashmere fibre processing, especially by ensuring harmful chemicals, specifically alkylphenol ethoxylates (APEOs), are eliminated from the washing and dehairing process[51]. StepEcoLab project has developed a voluntary code of practice for sustainable production (VCP). The VCP consists of three sets of criteria each of which aims at creating a sustainable value chain, efficient use of resources, and ensuring green financing conditions [52]. In 2021, 18 firms joined this initiative.

However, SFA membership is only based on declarative information with no or few controls and VCP is based on a voluntary basis. In this sense, Mongolian Agency for Standardization and Metrology approved a National Standard MNS 6926: 2021 for Sustainable Textile Production, which was elaborated based on the VCP concept. It aims to establish basic principles and requirements for sustainable production of textiles and evaluation and certification against the established requirements. Among requirements, we can cite:

- The quality of wastewater supplied to the sewerage system shall meet the requirements of "MNS 6390:2013 Pre-treated wastewater from wool and cashmere processing plants to be supplied to the central sewerage system. Technical requirements" standard.
- Waste water treatment plant shall meet the requirements of "MNS 4288-1995, Basic requirements for the location, treatment technology and level of wastewater treatment plant" standard.
- Select and use internationally recognized green certified dyes and chemicals[53]
- Chemical warehouse shall meet the requirements of MNS 6458: 2014 standard.

If these requirements fit with international standards, numerous stakeholders have testified to failures in water treatment controls in Ulaanbaatar, including cashmere factories. A major stake will be so to ensure frequent controls. While, in addition to the product quality, the importance of environmental friendliness, social well-being and ethics in its production is being emphasized, large firms seem to adopt more sustainable management. These controls should thus focus on smaller units.

[51] https://sustainablefibre.org/
[52] https://en.avsfmongolia.org/
[53] such as REACH, ZDHC, MRSL, RSL, Blue sign, GOTS, GreenScreen Certified, OEKO-TEX.

7. SYNTHESIS & RECOMMENDATIONS

7.1 Answering the Framing Questions

The answer to the question regarding the economic sustainability of the cashmere VC can be both positive and negative. There are contrasting trends that are easily discernible. While farmers do not have many costs related to cashmere goat breeding, and cashmere contributes a significant portion to their cash flow, the situation downstream is markedly different. Local cashmere manufacturing needs to operate with financial credits to finance the purchase of cashmere during the combing period, with financial interests representing a significant cost that pushes companies to the edge of profitability. This limits further development of the sector, while industry was dominated by Chinese traders who has access to cheap capital available in PRC and export most of the produced cashmere out of the country.

At the same time, the cashmere industry has the potential to generate high value-added, offer employment with attractive salaries, and promote inclusivity among vulnerable groups, including herders, unemployed individuals in villages, and females. The gender pay gap at the processing level is negligible. However, the distribution of income, salaries, and jobs lacks regional inclusivity, with the majority of industries concentrated in the capital city, Ulaanbaatar, leaving the outer regions without any benefits from cashmere processing.

The question of the social sustainability of the cashmere VC is complicated by the very different social characteristics of the production stage and the processing stage, but overall the Social Analysis shows a VC where social indicators are favourable, especially in comparison with other low- and middle-income countries in which VCA4D analyses have been carried out. In the processing sector, improvements in working conditions can undoubtedly be made, but there are signs of progress in activities being undertaken by MITUF and by employers, and the sector is attractive, especially for women, in comparison with other sectors of the Mongolian formal economy. Major issues in the herding sector include gender inequality and the unattractiveness of the herding livelihood to younger generations especially girls. A lack of dietary diversity needs to be tackled by measures outside the VC. The development of community-level institutions for herders, PUGs and member-owned cooperatives, is progressing but still present in a minority of communities. The important issue of rangeland governance is being addressed through measures now progressing through parliament. Overall, the Social Analysis suggests that there are no major social factors militating against further investment by international donors in the VC and that such investment can enhance social wellbeing.

The cashmere VC as currently operating involves impacts on human health, ecosystems and resource depletion. Livestock production is the major contributing stage, being responsible for around 70% of overall impacts on these three pillars, virtually all of the impacts on ecosystems, and over 40% of impacts on human health. This impact is largely through overgrazing. The dyeing process contributes 36% of the impacts on resource depletion and 26% of the impacts on human health, especially through human non-carcinogenic toxicity, freshwater ecotoxicity and marine ecotoxicity. We also see impacts on climate change mainly (with certain caveats) through methane emission from livestock, and on biodiversity from grazing practices. Addressing rangeland degradation through improved institutions, increasing renewable energy use in processing, reducing GHG emissions from livestock, and facilitating sustainable chemical use and water treatment in processing are key areas of intervention.

7.2 From a Vicious to a Virtuous Cycle

The current state of the cashmere VC can be characterised at a broad level as a vicious cycle. Increasing goat numbers are driving a decline in rangeland health, which in turn drives a decline in both yields of cashmere per goat and a decline in quality, leading to decreasing herder incomes. Faced with this situation, and the relative scarcity of other income sources associated with herding, herders are investing in more goats, perpetuating the cycle.

Our analyses suggest that this can be turned into a virtuous cycle, where increased incomes allow herders to reduce goat numbers and the proportion of goats in their herds, improving rangeland health and thus fibre quality and yields per goat. Important additional benefits would include improved rangeland biodiversity and increased carbon sequestration, at a rangeland level, and increased processing employment in urban areas and an increased contribution to national finances.

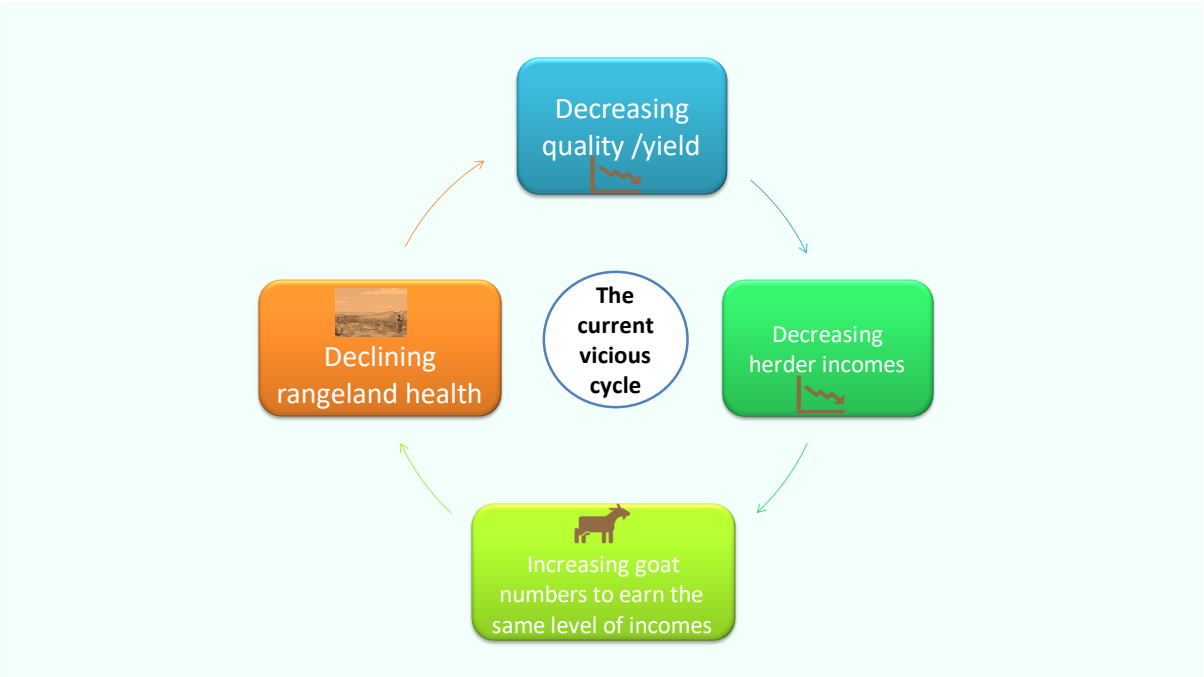


FIGURE 7-1: THE CURRENT VICIOUS CYCLE

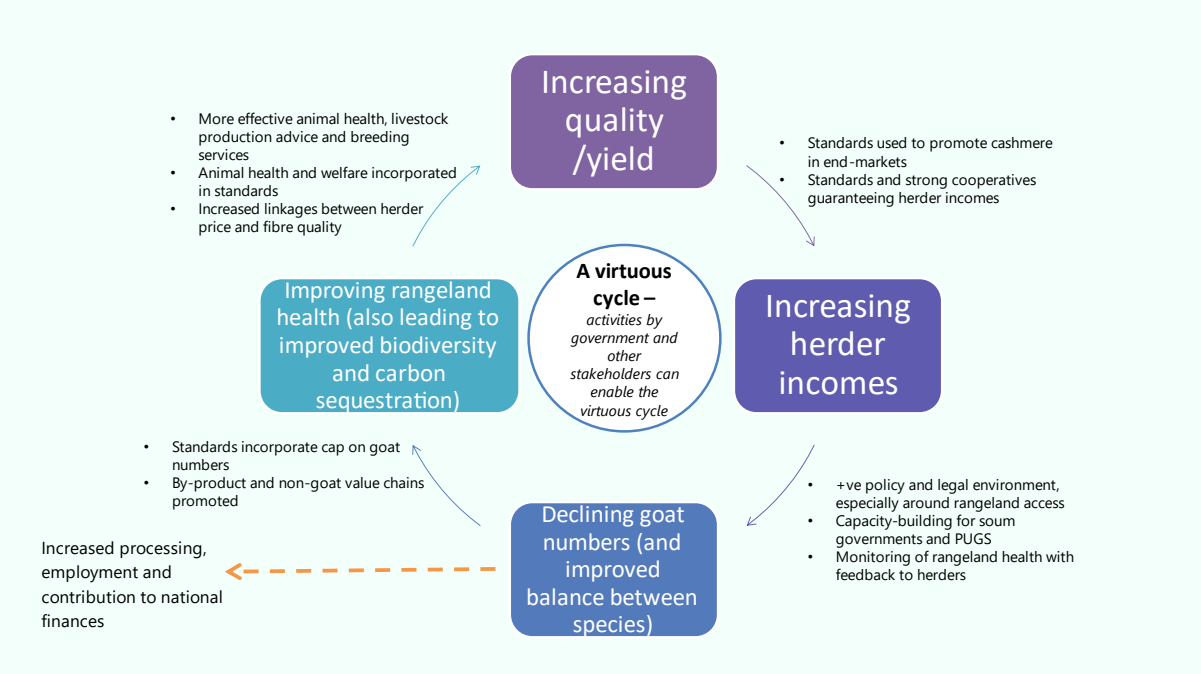


FIGURE 7-2: THE VIRTUOUS CYCLE

Creating this virtuous cycle requires a range of enabling activities by different VC actors, including civil society, the government, and international donors. These enabling actions are presented as recommendations in the next section.

7.3 Analysis of Key Risks

Table 7-1 presents some of the key risks identified, which generally overlap with the negative trends presented in the "Vicious Cycle" diagram above. The risks judged to have the highest severity (i.e.) their impacts will be most negative if they occur) are, from the point of view of growth, a lack of dehairing capacity to meet new regulations requiring dehairing in-country, and a rise in in interest rates making domestic processing more costly. From the point of view of environmental sustainability, there is a risk that continued weak regulation of pollution from factories will have negative environmental impacts. Continued rangeland degradation from overgrazing is a major risk across all the domains.

Risk description	Probability	Severity			
		Growth	Inclusiveness	Social sustainability	Environmental sustainability
Insufficient dehairing capacity to meet new ban on raw cashmere export					
Illegal smuggling of unprocessed cashmere to China					
Further interest rate increase which can make the capital-intensive domestic processing more costly					
Further currency depreciation leading to increased costs of imports (of machinery).					
Currency appreciation leading to decreased price of cashmere					
Lack of skilled labour to operate advanced machines in the processing industry.					
Increase in frequency and/or severity of dzud and other extreme weather events.					
Environmental pasture degradation leading to increased number of animals and/or decreased income of small and medium herders.					
Continued high negative environmental impacts at processing stage					

SEVERITY ASSESSMENT			
Low	Moderate	High	Extreme

PROBABILITY ASSESSMENT		
Low	Moderate	High

Table 7-1: Presentation of Key Risks

7.4 Recommendations

The most important recommendation of this report is that international development donors should continue to support the cashmere VC in Mongolia as a source of rural livelihoods, high-grade urban employment and as an important contributor to national economic growth and diversification from mineral exports.

7.4.1 Recommendations for Livestock Services

While soum governments, backed by line departments, are investing in efforts to support livestock production, especially in breeding services, there is evidence that technical advice is not being well communicated to herders, or is not well designed for them. **Support to herders through the improved design, management and communication of herder-level animal health services and livestock production advice is recommended.**

7.4.2 Recommendations Concerning Standards

The harmonization of standards and labelling schemes is a key enabling action for various stages of the virtuous cycle presented above. **Multiple VC actors need to collaborate on enforceable standards and well-promoted voluntary labelling schemes** that:

- Incorporate animal health and welfare
- Guarantee herder incomes
- Incentivise higher quality production
- Incentivise caps on goat numbers relative to rangeland resources.

Such standards and labelling schemes should be actively promoted to exporting companies and used by them to drive increased demand for high quality Mongolian cashmere.

7.4.3 Further Recommendations Concerning Livestock Production and Herder Livelihoods

Both to diversify herder livelihoods and to mitigate the current environmentally damaging imbalance between goats and other livestock species, **it is recommended that government, civil society and international partners promote livestock-based value chains beyond cashmere**. This includes value chains for dairy, meat of various species, and other fibres, as well as for hair and other cashmere by-products. Finding a market for mature goats that can be profitably culled at around five years of age is also important.

The policy and legal framework for governing herder access to rangelands needs to be strengthened, in the direction of strengthening local management by community-level groups, while ensuring the possibility of otor in times of extreme weather events. The rangeland amendments to the 2002 Law on Land will be an important basis for this. In order to realise the potential for such locally-based governance of land, **programmes of capacity-building for soum governments and PUGS need to be supported**. In addition, the active involvement of herder in the monitoring of rangeland health needs to be strengthened, with herders' own knowledge being incorporated into monitoring frameworks and systematic feedback to herders of monitoring findings.

7.4.4 Recommendations Regarding Marketing between Herder and Factory Level

Cash flow is a constraint at all levels of the VC, though the herder loan system appears to provide a substantial minority of herders with working capital without raising repayment concerns. However, **mechanisms need to be put in place for increased availability of cash flow to intermediate actors**.

Member-owned cooperatives need to be promoted through a favourable policy environment and through capacity-strengthening, to play a role in negotiating prices and increasing herder income from cashmere.

There needs to be an increased linkage between herder price and fibre quality. **Piloting an auction model at herder level is recommended**.

7.4.5 Recommendations at Processing Enterprise and Trade Policy Levels

- The negative environmental impacts of processing enterprises need to be mitigated through increased use of renewable energy.
- Existing standards on sustainable use of chemicals and waste water treatment in processing need to be enforced, and greater use made of existing internationally recognised green certified chemicals.
- Within the VC, there needs to be increased attention to the quality of washing and dehairing – some current washing operations are superficial and aims to meet minimal requirements for export.
- Incentives need to be offered for the development of regional processing (washing and dehairing) centres to offer more jobs outside Ulaanbaatar. This would increase geographical inclusiveness of the sector.
- While the sector is inherently capital intensive, and commercial credit remains relatively costly, it is highly advisable to offer targeted subsidised loans for both investment and operational purposes. Furthermore, in light of climate change concerns and the environmental footprint of the sector, providing credits with positive environmental impacts, such as green loans, could significantly enhance sectoral resilience.
- The government needs to engage in increased trade diplomacy to promote industries and offer feasible investment conditions to generate more FDI in (not only) animal product processing.
- While there is significant training offered both by government institutions and private companies, at the highest level, a need exists for training of highly qualified specialists.
- The government also bears the responsibility of ensuring that SMEs are equipped to manage risks associated with exchange rate fluctuations. As the expected value of exports is projected to rise, particularly for small exporters, the absence of adequate capacity building measures could result in adverse consequences.

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ANNEX 1: Mission Itineraries and Persons Met

First Mission

18.06.23	Morton and Kotyza arrive Ulaanbaatar
19.06.23	Meetings with MNFPUG, and EU Delegation
20.06.23	Meeting: Ministry of Food and Light Industry, Mongolian University of Life Sciences, Wool and Cashmere Association
21.06.23	Gobi LLC (with factory visit) UNDP Cashmere Platform National Statistical Office FAO Country Representative
22.06.23	Country Director, Sustainable Fibre Alliance Mongolian University of Life Sciences Research institute of Animal Husbandry
23.06.23	GIZ Light Industry Department Country Representative, Textile Exchange Agricultural Commodity Exchange World Bank
24.06.23	Director and others, Snow Field (with factory visit)
25.06.23	Visit to Undurshireet Soum, Tuv Aimag. Meetings with Soum Governor, President of Shireet Hugjil Co-operative, and herding household. Vigne arrives in Ulaanbaatar
26.06.23	Jinst Murun LLC Jonon Od LLC Mongolian University of Life Sciences Director, and others, Khan Bogd Cashmere LLC (with factory visit) AVSF
27-29.06.23	Travel to Binder Soum, Khentii Aimag. Meetings with Soum Governor and staff, President of Uguuj Bayan Binderya Co-operative, and herding households. Return travel to Ulaanbaatar
30.06-01.07.23	Travel to Shinejinst Soum, Bayankhongor Aimag. Meeting with Soum Governor and staff, President of Tsarmin Tsagaan Suvd Co-operative, and herding households
02-03.07.23	Travel to Ulziit Soum, Arkhangai Aimag. Meetings with Soum Governor, President of Tselmeg Orkhon Co-operative, and herding household
04-07.07.23	Travel to Khövsgöl Aimag. Murun town: meeting with Melkhii Khadni Tsuurai Co-operative and visit to Jinst Murun factory. Alag Erdene Soum: meetings with Soum Governor, representative of Erhel Khurd Co-operative, and herding household. Rest day. Return travel to Ulaanbaatar
08.07.23	Vigne departs. Morton and Kotyza working in Ulaanbaatar
09.07.23	Kotyza departs. Morton working in Ulaanbaatar until 11.07.23
12.07.23	Morton departs

Second Mission

20.09.23	Kotyza arrives Ulaanbaatar
21.09.23	Mongolian Customs Administration Tax Office

	AVSF
22.09.23	Economic expert, WCA
23-24.09.23	Working on data
25.09.23	Goat specialist
	Economic expert, Asian Development Bank
26.09.23	Morton arrives Ulaanbaatar
	Meeting with Chamber of Commerce
27.09.23	Briefing at EU Delegation
	Ministry of Labour
	Insurance department, MOFALI
	Vigne arrives Ulaanbaatar
28.09.23	Tuya washing and dehairing factory
	Spark Cashmere washing and dehairing factory (oriented to Chinese market)
	Uguuj Shim washing and dehairing factory
29.09.23	Field trip to Bayankhangai, Tuv Aimaig: group interview with herders
30.09.23	Kotyza departs, Morton and Vigne working on data
01.10.23	Working on data
02.10.23	ILO
	AVSF
	Representative, Mongolian Industrial Trade Union Federation
03.10	Senior Social Protection Specialist, World Bank
04-10.10.23	Work on data. Debriefing with EU Delegation 06.10. Vigne departs 07.10, Morton departs 10.10

ANNEX 2: Supplementary Material for the Functional Analysis

Aimags and number of goats between 1989 and 2022.

Region	Aimag	1989	2022	Difference	% change
Khangai	Arkhangai	174.7	1,526.9	1,352.2	774%
Khangai	Bayankhongor	507.3	2,182.7	1,675.4	330%
Western	Bayan-Ulgii	308.3	967.4	659.1	214%
Khangai	Bulgan	99.3	1,189.5	1,090.2	1098%
Central	Darkhan-Uul	4.8	102.6	97.8	2033%
Eastern	Dornod	44.2	898.4	854.2	1931%
Central	Dornogovi	203.1	1,278.3	1,075.2	529%
Central	Dundgovi	374.1	1,603.4	1,229.3	329%
Western	Govi-Altai	495.6	1,987.3	1,491.6	301%
Central	Govisumber	-	179.8	179.8	--
Eastern	Khentii	185.2	1,650.2	1,465.1	791%
Western	Khovd	475.3	1,845.9	1,370.6	288%
Khangai	Khuvsgul	274.6	2,241.3	1,966.7	716%
Khangai	Orkhon	2.3	58.6	56.3	2504%
Central	Selenge	24.1	626.7	602.6	2500%
Eastern	Sukhbaatar	135.2	1,482.4	1,347.3	997%
Central	Tuv	166.2	1,628.7	1,462.5	880%
Ulaanbaatar	Ulaanbaatar	12.9	121.5	108.6	845%
Central	Umnugovi	431.6	1,649.6	1,218.1	282%
Western	Uvs	303.8	1,353.3	1,049.5	346%
Khangai	Uvurkhangai	397.5	1,708.2	1,310.6	330%
Western	Zavkhan	339.2	1,286.7	947.5	279%
Total		4,959.2	27,569.4	22,610.2	456%

AIMAGS AND NUMBER OF GOATS BETWEEN 1989 AND 2022.
SOURCE: (NATIONAL STATISTICAL OFFICE, 2023B)

Principal Actors in Value Chain Governance

Government sector

Presidential office

The President's Office in Mongolia plays a significant role in the development of the cashmere and agricultural sectors. It participates in initiatives like the Sustainable Cashmere Platform, which aims to make Mongolia's role in the global cashmere business sustainable and inclusive. The office also collaborates with organizations implementing sustainable cashmere projects, which can improve the lives of herders. Those efforts are part of the new agricultural development policy initiative formulated by the presidential office.

The Ministry of Food, Agriculture and Light Industry

The Ministry of Food, Agriculture, and Light Industry oversees a department that plays a crucial role in the agriculture, light industry, and leather sector. Their primary focus is on developing key policies and strategies. By strategically defining and implementing agricultural and industrial policies, they aim to efficiently utilize raw material resources, reduce dependence on imports, foster export-oriented production, enhance value chains, boost production income and productivity, improve competitiveness, and promote sustainable growth within the industry. These efforts will ensure that the population has access to healthy, secure, and nutritious food, while also creating conditions for clothing and tools that meet hygiene and utility standards. To achieve sustainable development in the light industry, the emphasis lies on deep processing of materials such as wool, cashmere, leather, and hides, all while minimizing reliance on imports. This includes increasing production of knitted, woven, and sewn garments, as well as leather goods and tools.

MOFALI oversees several programs including the National Animal Health Program, support for intensive livestock development, cashmere production, vegetable farming, fruit cultivation, industrialization efforts, and Mongolian exports. These programs aim to ensure food security, boost productivity, and increase incomes for herders by promoting exports and substituting imports. Up until 2019, three funds managed by MOFALI provided subsidies and soft loans: the Livestock Conservation Fund (LCF, established in 2001), the Crop Protection Support Fund (CPSF, established in 2005), and the Small and Medium Enterprise Development Fund (SMEDF, established in 2012). In 2020, Resolution No. 16 established the Agriculture Development Fund (ADF) to streamline fund administration. The ADF integrated the CPSF and the feed reserve from the LCF and took over outstanding loans from both funds (Haile, Machiraju, & Gill, 2022).

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2022
135	535	239	192	170	135	202	277	266	247	

THE MOFALI BUDGET, BILLION MNT
Source: World Bank (2022)

The Ministry of Food, Agriculture, and Light Industry has developed and ratified the 'Technical Regulations for the Dehairing and Trade of Goat Cashmere' project to maximize factory capacity utilization, enhance domestic value addition, and boost employment opportunities. The technical regulation mandates that goat cashmere intended for export and import must not exceed 0.3% of coarse hair and intermediate fibres, with fat content lower than 1% and humidity below 17%[54]. This technical regulation serves as the primary guideline for combed cashmere crossing international borders.

[54] The Annex to Government Resolution No. 380/2022, dated October 19, 2022

At the same time, the MOFALI manage the Small and Medium Enterprises Development Fund of Mongolia, established in 2009, with the purpose to support micro, small, and medium sized enterprises to expand their operations, establish new jobs, meat market expectations and improve their operational management capacity (Amar, 2019). The fund provided loans between 20 million and 1 billion MNT, for 5 years with the annual interest rate of 3%. The fund includes the following lending sectors:

- Milk and milk products processing plant.
- Potato, vegetable, and fruit processing plant.
- Food cellar and warehouse.
- Intensive animal husbandry.
- Pig, chicken, beekeeping.
- Greenhouse farming-Seeding of trees, fruits and vegetables.
- Wood pressed board factory.
- Manufacturing of sewing products.
- Integrated Centre for Household Services.

Between 2011 and 2021, the total amount of issued loans to cashmere industry equalled to 821.7 million MNT, supporting in total 208 projects (MOFALI, 2022).

Under the MOFALI, **The Mongolian Commodity Exchange** (MACE) was established for export purposes in 2013. Its primary goals are to (i) enhance herders' income by creating a centrally located, regulated market for commodities based on consistent quality standards and (ii) boost the supply of raw materials to national processing industries by providing services such as market information, quality inspection, laboratory certification, transportation, warehouse storage, insurance, and banking. Currently, MACE issues certification for export. Without the MACE documents, cashmere material cannot be legally exported. However, the real function of the commodity exchange is questionable. MACE does not initiate any contracts or contribute to price negotiations, it merely licenses export based on contracts already agreed by the parties (Kimura et al., 2022). The MNCE requires any international transaction to be registered and requires a free from transactions even if the transactions are done without MNCE involvement.

Ministry of Environment and Tourism

The mission of the Ministry of Environment and Tourism is to safeguard economic growth and social development while preserving ecosystem balance. It aims to facilitate the responsible utilization of natural resources, promote natural regeneration, and uphold environmental stability through the development of eco-friendly and sustainable tourism practices. Additionally, the ministry seeks to ensure citizens' rights to reside in a healthy and secure environment by fostering collaboration among the government, citizens, enterprises, and organizations to achieve green development objectives.

Ministry of Economy and Development

Defining the tax policy and possible distribution of finance into sectors. The mission of the ministry is to facilitate the stable and inclusive enhancement of Mongolia's social and economic potential by offering comprehensive methodologies and management for long-term, medium-term, and short-term development planning, as well as for the formulation and execution of integrated development policies.

The ministry of economy and development, among others, overlooks the state budget, defines the tax rates and possible exceptions. More information on tax policy related to the cashmere, see the section 3 (economic analyses).

Mongolian Agency for Standardisation and Metrology (MASM).
MASM serves as Mongolia's National Standards and Metrology Body. Its objective in standardization is to enhance Mongolia's societal, economic, industrial, and trade development by establishing standards through mutual understanding and voluntary agreement among governmental authorities, industries, and businesses. This commitment prioritizes consumer rights while ensuring ongoing development of standardization practices in alignment with market dynamics.

For the Cashmere, mainly it contributed to standards of dehaired cashmere quality (MNS 3683:2015), and voluntary standards for pasture management (Sustainable Nomad Standard, RNS 6891:2020) and textile production (Sustainable Textile, MNS 6926:2021). For more information see below.

National Development Agency
The Purpose of the Business Council of Mongolia (BCM) is to deliver value for the public, the members, and the employees by advocating economic freedom and property rights provided by the Constitution of Mongolia and protecting and promoting common lawful interests of members for a fair, stable, and internationally competitive business environment.

Private sector

Mongolian National Federation of Pasture User Groups
The Mongolian National Federation of Pasture User Groups (MNFPUG) is a pivotal organization dedicated to the preservation and sustainable management of Mongolia’s pasturelands. Comprised of numerous local pasture user groups across the country, MNFPUG serves as a unified voice for herders and pastoral communities, advocating for their rights and interests while promoting environmentally sound practices. By fostering collaboration among stakeholders and facilitating knowledge exchange, MNFPUG plays a crucial role in safeguarding Mongolia’s delicate ecosystems and ensuring the livelihoods of those dependent on pastoralism. Through its initiatives and partnerships, MNFPUG contributes to the resilience and prosperity of Mongolia’s pastoral communities amidst evolving socio-economic and environmental challenges.

At the same time, the MNFPUG is organising trainings and seminars for herders how to use and protect range lands. From that perspective, considering the scope of activities and geographical presence, the MNFPUG is an important knowledge provider to rural locations.

Also, the MMFPUG is responsible for the Sustainable Nomad Standard (RNS 6891:2020), the standard that certifies sustainable practices of grazing among herders. This aims to ensure animal welfare, sustainable livestock production and establish, evaluate and validate basic principles, requirements and criteria for implementing a responsible nomadic system at the primary level of the livestock producer. The Mongolian National Federation of Pasture User Groups (NFPUG) also developed a livestock raw material traceability system “Responsible Nomads” (RMTS). This system helps to identify where the raw material came from, and provide all information related to traceability and quality of the product. In 2022, the system is not used for cashmere production traceability, but was technically ready to be implemented.

Mongolian Wool and Cashmere Association

The Mongolian Wool and Cashmere Association (WCA) is a leading entity in Mongolia's textile industry, dedicated to advancing the production, quality, and global competitiveness of Mongolian wool and cashmere products. Established to represent the interests of both producers and manufacturers, WCA serves as a platform for collaboration, innovation, and market development within the wool and cashmere sector. Through initiatives focused on sustainability, quality assurance, and value-added processing, WCA strives to enhance the reputation of Mongolian wool and cashmere in international markets while fostering equitable benefits for all stakeholders along the supply chain. By promoting best practices, standards, and market access, MWCA plays a crucial role in supporting the livelihoods of herders and artisans while contributing to the economic growth and sustainability of Mongolia's textile industry.

WCA is also one of the organisations, aims to contribute to knowledge development among cashmere processing companies. It developed, in cooperation with the Italian governments, the Textile Technology Center, aiming to improve the spinning knowledge, technology to compete on the global markets.

Similarly, to MNFPUG, WCA developed the voluntary standard specifically aimed to assess the sustainability of operations among the textile industry (Sustainable Textile, MNS 6926:2021). The National Standard has received official approval from the Textile Technical Committee of the Mongolian Agency for Standardization and Metrology. Its primary aim is to foster an environmentally friendly, socially responsible, and ethical textile sector.

Mongolian Chamber of Commerce and Industry

The Mongolian Chamber of Commerce and Industry (MNCCI) is a key organization supporting businesses in Mongolia. It helps businesses by representing their interests, promoting entrepreneurship, and aiding economic growth. MNCCI offers various services like advocacy and networking to facilitate trade and investment both locally and internationally. By fostering communication between government and businesses, MNCCI helps create a better environment for businesses to thrive, contributing to Mongolia's economic development and competitiveness on the global stage. MNCCI developed programmes for exporters, including exporters of cashmere, as well as created the Wool and Cashmere Council.

Mongolian Sustainable Finance Association

The Mongolian Sustainable Finance Association (MSFA) was formed by the Mongolian Bankers Association (MBA) in December 2017. It aims to encourage sustainability and green growth within its member financial institutions and businesses, with the goal of making the financing system more environmentally friendly. As of October 2022, MSFA comprises various financial entities, including commercial banks, non-bank financial institutions, and insurance companies. Together with its members and partners, MSFA works to develop policies and initiatives aligned with international sustainability goals and Mongolia's green development objectives. The association supports green loans to the herders, primarily cooperatives, processing companies certified with one of the voluntary sustainability certifications[55].

Mongolian National Co-operative Associations

The Mongolian National Cooperative Associations (MNCA) play a significant role in fostering collaboration and collective action among various sectors of society. These associations promote

[55] As interviewed the Khaan Bank, they provided in 2022 pilot project to finance primarily cooperatives certified by the SFA, with a green loans of reduced interest rates. This initiative was supposed to support the sustainable cashmere production as well as support local cooperatives supplying to Mongolian processing companies.

cooperative principles, facilitate economic cooperation, and support the development of cooperative enterprises across Mongolia. By advocating for the interests of cooperatives and providing resources and training, they contribute to socio-economic development, empower communities, and promote sustainable practices. The MNCA, as an umbrella organisation, also includes the Association of Private Herders Co-operatives.

2022 was the indicated to be the "Year of Cooperative Promotion". The government prepared new law on cooperatives. Changes were also related to the VAT. While cooperatives previously paid value-added tax like other businesses (10%), their sales revenue is now exempt from value-added tax. Since a cooperative operates as an agent, no tax is imposed on its products (Kimura et al., 2022)[56]. It is important to note that cooperatives do not generate profits from the sale of wool and hides belonging to their members. Only non-member products that are marketed through the cooperative are eligible for VAT payment (Unurzul, 2023).

Facilitators and Development Partners

UNDP Mongolia

UNDP Mongolia, with backing from the UNDP Green Commodities Program, saw the importance of making the cashmere sector more sustainable. They launched the Sustainable Cashmere Platform[57] to position Mongolia as a leader in sustainable cashmere production. However, despite progress in setting standards and improving supply chains, there are obstacles in the overall environment that hinder large-scale change.
The platforms mission is to ensure a strong and coherent legal and institutional framework for the sustainability of cashmere production in Mongolia.

Asian Development Bank

In Mongolia, The Asian Development Bank ADB's support inclusive, climate-conscious development, and improving infrastructure to help diversify the economy and build resilience. It closely cooperates with the EU, European Investment Bank, Green Climate Fund, Japan Special Fund, etc. ADB Lately supported the Aimags and Soums Green Regional Development Investment Program (no. 49430-005), which supports high-carbon sequestration rangeland management. Further it approved the project to finance capacity building in the Agricultural Value Chain (no. 55218-003) with subsidised loans; approved loan to Gobi Cashmere company of 30 million USD (no. 57156-001), etc. Between 1992 and 2023, the ADB approved 69 projects related to agriculture, natural resources, and rural development.

The European Union

The European Union has permanent delegation to Mongolia since 2017, and over this time it represents the European Union in its relations with the Mongolian Government and coordinate the actions of the EU and EU countries. In 2022 – 24, the EU focused on the sustainability of ecosystems in cooperation with GIZ and FAO (STREAm project), improving labour conditions of assistant herders, in collaboration with AVSF sustainable textile production (see STeP EcoLab project, below), supporting SMEs in their development. At the same time, the EU and Mongolia are in the process of negotiations of an agreement on the protection of geographical indications (GI), started in 2022. In 2024, the EU provided grant of 500,000 EUR to mitigate effects of harsh winter and signed the initiated the MoU between European Investment Bank and Government of Mongolia on Forestry Partnership, supporting the One Billion Trees initiative by the Mongolian president.

[56] Government of Mongolia. 2021. Law of Mongolia on Value-Added Tax (revised). Ulaanbaatar.
[57] http://sustainablecashmereplatform.com/

The World Bank

In 2021, the World Bank Group completed its latest Country Partnership Framework for Mongolia, outlining its strategy for the fiscal years 2021 to 2025. This plan was designed to assist Mongolia in addressing the immediate challenges posed by the COVID-19 pandemic while also fostering a sustainable, inclusive, and resilient recovery for the future. The World Bank (WB) has 3 main focus areas: (i) Strengthening economic governance, (ii) Boosting competitiveness (iii) Improving quality of life. In relation to cashmere, the 2 projects are important to mention. Livestock and Agricultural Marketing Project for Mongolia (P125964) and Livestock commercialization project (P165945), which aims to improve livestock health and productivity.

Global Environmental Facility.

The Global Environment Facility (GEF) is an international organization dedicated to addressing global environmental challenges. Established in 1992, GEF provides financial support and facilitates partnerships to tackle issues such as climate change, biodiversity loss, and land degradation. Within its initiatives, the ENSURE project was funded, which was used, among others, to initiate the Sustainable Cashmere Platform of the UNDP. As well supports other aspects related to herder households, as land degradation, rehabilitation of rangelands, etc.

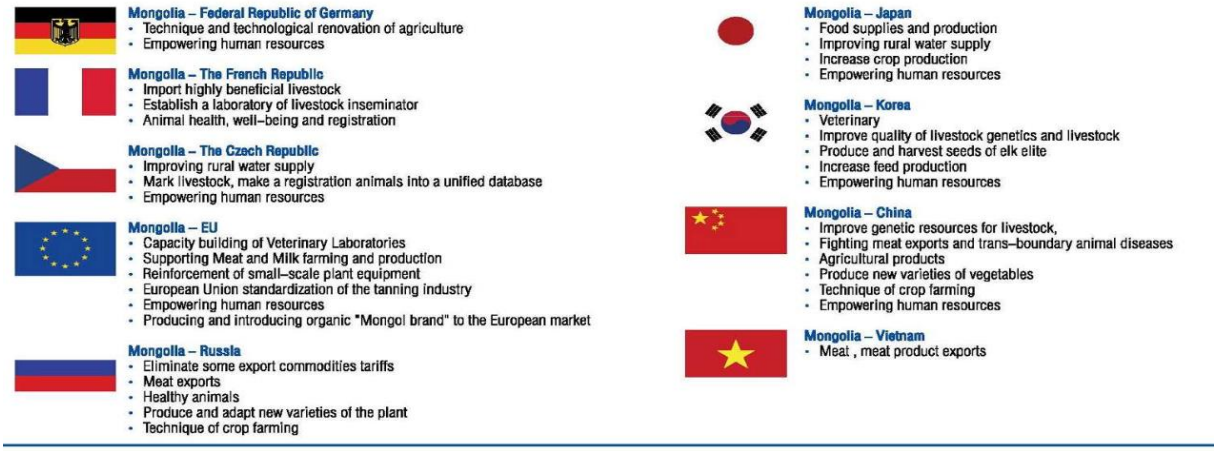
FAO

The Food and Agriculture Organization of the United Nations (FAO) has a longstanding partnership with the Government of Mongolia (GoM) aimed at reducing poverty and malnutrition by advancing the agriculture sector. Additionally, FAO has collaborated closely with the government to safeguard the environment and foster sustainable development, including disaster risk management strategies, within the country. Among others, the FAO worked on the projects related to strengthening animal health and food safety systems (supported by WB), Mainstreaming biodiversity conservation (GEF support) or supported to employment creation in selected livestock and vegetable value chains (EU support).

International Labour Organization (ILO)

The International Labour Organization focuses on three main priorities: (i) Creating jobs to help people earn a living and reduce poverty in both formal and informal sectors; (ii) Improving collaboration between governments, workers, and employers to develop and implement social and economic policies; and (iii) Ensuring the rights and protection of vulnerable groups such as child labourers, people with disabilities, and those subjected to forced labour.

Bilateral donors are also present in Mongolia; the table below shows the principal donors and a summary of their programmes.



SELECTED MONGOLIAN COOPERATION PARTNERS AND THEIR AGENDA
Source: Amar (2019).

Civil Society

Agronomes et Vétérinaires Sans Frontières (AVSF) is a non-governmental organization committed to sustainable agricultural and livestock development in vulnerable communities worldwide. Through capacity building, technical assistance, and knowledge sharing, AVSF empowers local farmers to improve food security, livelihoods, and resilience to climate change. With a focus on participatory approaches and agroecological principles, In Mongolia the AVSF worked on the topic of cashmere sustainability as became part of the UNDP cashmere initiative. The **STeP EcoLab**[58] project aimed at supporting the supply chain and the textile industry in adopting more sustainable sourcing and production practices and simultaneously improve the branding for sustainable products, optimise cost-saving measures and reach out to climate finance and diversify the portfolio of customers. The information of AVSF collected among herders and processing companies was found as a very useful insight into specific sections of the VC.

Sustainable Fibre Alliance (SFA) is a non-profit standard holding and membership organisation. The SFA represents a global alliance of supply chain actors, stakeholders, and industry experts with a mission to ensure the long-term viability of the cashmere sector. SFA provides own certification of a voluntary standards (SFA Cashmere Standard, Cashmere Standard and Clean Fibre Processing Standard). At the same time, SFA developed the fibre tracking system (Chain of Custody) that operates both in China and Mongolia.

The Nature Conservancy (TNC) is an international nonprofit dedicated to ensuring a healthy balance between people and nature. Started in the U.S. in 1951, The Nature Conservancy (TNC) has become a powerful global force for environmental protection. With over a million members and a team of over 400 scientists, we work in 79 countries and territories, directly impacting conservation in 37 places and supporting partners in 42 others. The Nature Conservancy started its operations in Mongolia in 2008 with the aim to protect the vast, unspoiled landscape of the grasslands. Now TNC cooperates with the Mongolian government to protect 30% of the country by 2030. Among others, TNC completed Ecoregional Assessments mapping, supported national and local governments in establishing new protected areas in the Eastern Steppe grasslands, demonstrated sustainable grassland management practices at Toson Hulstai Nature Reserve, Trained hundreds

[58] https://www.switch-asia.eu/project/step-ecolab/

of managers and herders and help in the policy process to minimize or offset development impacts.

Similarly, to TNC, the **Wildlife Conservation Society (WCS)** is a global organization with the mission is to conserve biodiversity, protect habitats, and inspire people to value nature. In Mongolia, the Wildlife Conservation Society (WCS) collaborates with communities in the Gobi Desert. Here, cashmere, which serves as the main income source for herders, acts as a gateway to involve local communities in sustainable livestock practices and wildlife-friendly approaches. WCS offers technical assistance on livestock health, breeding, nutrition, pasture management, and wildlife conservation. Additionally, they connect herders with the Kering Group, a luxury fashion company.

Mongolian University of Life Sciences (MULS) is a respected institution focused on education, research, and innovation in agriculture and environmental sciences. It collaborates with local and international organizations to improve agricultural practices, rural development, and environmental sustainability. Additionally, MULS is involved in national and international projects related to the cashmere sector.

Mongolian University of Science and Technology (MUST) is a polytechnic university training broad range of topics. With respect to the cashmere industry, 2 important centres are part of its teaching activities. The Shima Seiki Training Center train specialists to proficiently utilize design, calculation, and programming of automatic knitting machines used in cashmere industry. The Clothing Research Center focuses on conducting basic and apprenticeship training, as well as advancing scientific and technological research in clothing production. In 2023, The MUST in collaboration with the UNDP and the EU support funded 13 students' scholarships majoring the textile and cashmere sector.

ANNEX 3: Supplementary Material for the Economic Analysis

Financial Accounts for a Small Herder (National Average)

Per 100 goat, Small farms (less than 600 animals)		Price	Units	Years / Ratio	Final costs/ Revenues
Production	Cashmere (87% goats)	102,000	35.1	1	3,580,200
	Skins	35,000	7	1	245,000
	Animal sale	90,000	11	1	990,000
	Self consumption	90,000	8	1	720,000
	Milk (litres) - Sold	2,417	3.4	1	8,121
	Milk (litres) - Used	2,417	80.6	1	194,907
	Sold pieces of goat	649	100	1	64,900
Subsidies	Indirect subsidies (incl. veterinary)	900	100		90,000
Total production					**5,893,128**
Consumables	Petrol	14,651	11.55	1	169,217
	Fodder	36,109	11.55	1	417,054
	Water, stream, electricity	289	11.55	1	3,340
Services	Veterinary	3,028	11.55	1	34,977
	Animal Washing	200	100	1	20,000
	Insurance	165	11.55	1	1,906
Wages	Salary	3,876	11.55	1	44,762
Interest on loans	Herders loan & other business loans	54,133	11.55	0.12	75,029
Taxes	Animal head tax	617	100	50%	30,850
	Personal income tax	4,675,262	1.00%		46,753
	Social insurance	68,750	1	24%	16,500
Depreciation	Buck	350,000	0.8	7	40,000
	Car	76,773	11.55	5	177,346
	Motorcicle	20,536	11.55	3	79,064
	Truck	55,326	11.55	5	127,803
	Winter shed (for 200 animals)	7,000,000	50%	15	233,333
Total Costs					1,517,932
Profitability Ratios					
Gross Operating Profit					5,032,742
Net Operating Profit					4,375,196
Gross Value Added					5,246,635
Profit Margin					74%

Total value added of cashmere goats (Mongolia, 2022) in billions	850.10
Total value added of Agriculture (Mongolia, 2022) in billions	7,003
% in Agricultural GDP (current prices)	12.1%

Financial Accounts for a Large Herder (National Average)

Per 100 goat (11.55 CU)		Price	Units	Years	Final costs/ Revenues
Production	Cashmere (86% goats)	102,000	35.1	1	3,580,200
	Skins	35,000	6	1	210,000
	Animal sale	90,000	10	1	900,000
	Self consumption	90,000	3	1	270,000
	Milk (litres) – Sold	2,417	0.9	1	2,127
	Milk (litres) – Used	2,417	43.1	1	104,221
	Sold pieces of goat	350	100	1	35,000
Subsidies	Indirect subsidies (incl. veterinary)	900	100	1	90,000
Total production					**5,191,548**
Consumables	Petrol	9,752	11.55	1	112,640
	Fodder	21,991	11.55	1	254,000
	Water, stream, electricity	463	11.55	1	5,350
Services	Veterinary	2,200	11.55	1	25,410
	Washing	200	100	1	20,000
	Insurance	260	11.55	1	3,003
Wages	Salary	15,516	11.55	1	179,210
Interest on loans	Herders loan & other business loans	42,371	11.55	0.12	58,726
Taxes	Animal head tax	617	100	0.5	30,850
	Social insurance	68,750	1	20%	13,750
	Income tax (1.56%)	4,215,707	1.56%		65,765
Depreciation	Buck	350,000	1	7	50,000
	Car	41,291	11.55	3	158,970
	Motorcicle	8,646	11.55	3	33,287
	Truck	41,770	11.55	5	96,489
	Winter shed (for 200 animals)	7,000,000	50%	15	233,333
	Ger for assisting family	8,298	11.55	15	6,389
Total Costs					1,347,173
Profitability Ratios					
Gross Operating Profit					4,422,844
Net Operating Profit					3,844,375
Gross Value Added					4,771,145
Profit Margin					74%

Total value added of cashmere goats (Mongolia, 2022) in billions	542
Total value added of Agriculture (Mongolia, 2022) in billions	7,003
% in Agricultural GDP (current prices)	7.7%

Animal Head Tax by Aimag

Aimag	Region	Head tax	To be collected
Darkhan-Uul	Central	2,000.0	205,200,000.0
Dornogobi	Central	400.0	511,328,000.0
Dundgobi	Central	400.0	641,368,000.0
Gobisumber	Central	650.0	116,883,000.0
Umnugovi	Central	400.0	659,852,000.0
Selenge	Central	1,800.0	1,127,988,000.0
Tuv	Central	650.0	1,058,655,000.0
Ulaanbaatar	Ulaanbaatar	0.0	0.0
Dornod	Eastern	800.0	718,736,000.0
Khentii	Eastern	700.0	1,155,161,000.0
Sukhbaatar	Eastern	600.0	889,458,000.0
Arkhangai	Khangai	550	839,789,500.0
Bayankhongor	Khangai	550.0	1,200,485,000.0
Bulgan	Khangai	600.0	713,700,000.0
Khuvsgul	Khangai	520.0	1,165,486,400.0
Orkhon	Khangai	500.0	29,300,000.0
Uvurkhangai	Khangai	1,250.0	2,134,700,000.0
Bayan-Ulgii	Western	500.0	483,695,000.0
Gobi-Altai	Western	600.0	1,192,368,000.0
Khovd	Western	500.0	922,950,000.0
Uvs	Western	500.0	676,640,000.0
Zavkhan	Western	450.0	579,015,000.0
TOTAL		**617** (Average)	**17,022,757,900.0**

ANIMAL HEAD TAX BY AIMAGS, 2021
SOURCE: MFPUG (2023)

CONSOLIDATED ACCOUNT OF THE VC

Operating accounts per actor and for the value chain

Actor	Production	Subsidiy	IGS	Wages	Taxes	Interest on loan	Land Fee	Depreciation	Net Operating Profit	VA	VA/Product	Nb of Actors
Eastern small HH	288 564	2 132	159 101	1 221	1 629	1 778	0	4 500	122 467	129 463	45%	24 651
Central small HH	481 054	3 804	266 900	2 179	2 717	3 171	0	12 959	196 932	214 154	45%	43 974
Khangai small HH	574 826	4 711	320 089	2 698	3 261	3 927	0	16 049	233 512	254 737	44%	63 018
Western small HH	524 113	3 936	289 278	2 254	2 944	3 281	0	13 408	216 883	234 835	45%	45 539
Eastern Large HH	180 791	1 496	97 109	2 979	1 435	976	0	3 232	76 556	83 682	46%	4 915
Central Large HH	298 864	2 668	161 364	5 313	2 376	1 741	0	9 225	121 513	137 500	46%	8 767
Khangai Large HH	355 440	3 305	192 507	6 581	2 828	2 156	0	11 425	143 247	162 933	46%	12 652
Western Large HH	327 731	2 761	176 165	5 498	2 604	1 802	0	9 545	134 879	151 565	46%	9 074
East Middleman	129 558	0	157 570	187	0	0	0	130	-28 328	-28 012	-22%	99
Central Middleman	271 570	0	252 228	392	1 868	0	0	272	16 810	19 342	7%	186
Khangai Middleman	288 823	0	294 802	417	0	0	0	289	-6 685	-5 979	-2%	291
West Middleman	315 892	0	285 736	182	3 056	0	0	316	26 602	30 156	10%	193
Washing EXP	899 610	7 302	772 423	11 683	15 503	62 973	0	2 191	42 139	127 187	14%	39
Dehaired EXP	279 070	1 528	166 185	5 196	8 715	39 439	0	19 719	41 345	112 886	40%	46
TEXTILE	186 253	247	100 730	27 938	9 810	26 075	0	11 362	10 585	85 524	46%	24
Retail	256 922	0	190 083	7 708	27 269	20 554	0	2 569	8 739	66 839	26%	81
TEXTILE small	125 114	166	50 587	13 781	7 304	17 342	0	8 770	27 497	74 527	60%	84
VALUE CHAIN	**2 108 676**	**34 056**	**257 338**	**96 206**	**93 319**	**185 215**	**0**	**125 960**	**1 384 693**	**1 851 338**	**88%**	**213 634**

Consolidated Account for Both Sub-Chains

	Export VC		Integrated VC		Total VC
Raw cashmere input	7,303	76%	2,369	24%	9,672
Production	1,302,371	62%	806,305	38%	2,108,676
IGS	129,867	50%	127,471	50%	257,338
Wages	34,262	36%	61,944	64%	96,206
Taxes	34,168	37%	59,151	63%	93,319
Interest on loan	77,199	42%	108,016	58%	185,215
Depreciation	63,615	51%	62,345	49%	125,960
Net Operating Profit	989,298	71%	395,395	29%	1,384,693
Direct VA	1,172,504	63%	678,834	37%	1,851,338
VA/Product	90%		84%		88%
Nb of Actors	161,140	75%	52,493	25%	213,634

CONSOLIDATED ACCOUNT FOR BOTH SUB-CHAINS IN MONGOLIA (2022)

ANNEX 4: SUPPLEMENTARY MATERIAL FOR THE SOCIAL ANALYSIS

Summary of Proposed Amendments to the Land Law

Article of 2002 Law proposed for amendment	Summary of Amendments
3	Addition of definitions of fundamental terms
6	Clarification of lands for common use to include transit grazing pastures, pastures with surface water and water points formed naturally. Management of the major categories of pastureland to be managed based on "contractual arrangements"
11	Definition of categories of pastureland; seasonal pastureland to be used by PUGs under contract, otor pastures to be used by herder families under contract, pastureland for intensive animal husbandry to be used by "citizens and legal entities" under contract, transit and riparian pastures to be open for common use.
18	Cabinet to approve boundaries of cross-aimag *otor* land
19	MOFALI to have a significant role in *inter alia* determining carrying capacities of pastures and administering cross-aimag *otor.*
20 and 21	Clarification of the powers of councils and governors at soum and aimag level. • Soum councils to approve boundaries of seasonal pastures, *otor* reserve pastures, transit pastures and intensive animal husbandry areas, subject to approval by aimag councils. • Soum governors to approve contractual use of pastures based on proposals from PUGs, to decide on inclusion of new herders and incoming families in PUGs, and to govern the use of *otor* pastures at soum and bagh level. • Aimag governors to govern the use of cross-soum *otor* pastures. • Governors "of the respective administrative unit" to approve the boundaries of transit pastures, to approve monthly and seasonal grazing schedules, take measures (e.g. planting, fertilization) to prevent desertification, provide jointly with other governors temporary access in emergencies for livestock herds for outside, and jointly resolve issues that arise. • The governor of the highest relevant unit, or the national government to resolve the latter issues if they cannot be resolved at a lower level.
21	Soum governors to ensure compliance with non-grazing of autumn and winter pastures during summer and autumn (sic).
22	Bagh councils to discuss PUG proposals on the boundaries of land to be used under contractual arrangements by PUGs, and to develop and implement monthly and seasonal grazing schedules and *otor* arrangements.
23	Land Departments at aimag level and land officers at soum level to have additional duties around mapping of pastures and their registration in the land database, preparation of proposals for soum councils, and reviewing of contractual use by photo monitoring and rangeland health assessment.
29	Soum governors, based on bagh and soum council proposals, to have the power to grant up to 0.1 ha per herder family for exclusive use including fodder cultivation (NB a considerable increase on the limit in the existing law).
52	Replacement of existing Article: miscellaneous provisions. • Need to ensure that pasture users are involved equitably in use, conservation and restoration of pasture land. • Need to set 10% of pastures at aimag, soum and bagh level as *otor* pastures. • Specification of contracts, including boundaries of pasture, contract term, information on carrying capacity, plans for protection, improvement and restoration of pastures, plans for allowing use of pastures to others on *otor.* • PUG to invite newly engaged herder families and immigrant herder families to join.

	• Contract term to be set at 15 years, subject to renewal for another 15 years on satisfactory performance. • Herd tax to be paid to the budgetary authority of the soum or bagh according to the Livestock Tax Law • Prohibition without appropriate authorisation of the following activities on pasture land: building shelters, fencing, making roads, disturbing or polluting the soil, harvesting medicinal plants and gemstones, drilling wells, refusing access to those in need from emergency. An additional clause specifies that the "person in charge" shall develop plans for resettlement of herders displaced by mining.
53	Rights and obligations of pasture users and PUGs (an entirely new Article) • Rights to use pasture land according to law and contract, and to file formal complaints for non-compliance (i.e. by authorities) and to request compensation for damage to pastures. • Rights of herders to join and leave PUGs. • Obligations of pasture users and PUGs to fulfil contractual obligations, to take and implement actions to keep livestock numbers in line with carrying capacity, to comply with seasonal grazing schedules and *otor* arrangements, to protect winter and spring pastures in summer and autumn. • Obligations to protect pastures from rodents, to avoid building in transit pastures, salt marshes, natural water points, and in ways that interfere with the movement of wild animals, to respect the legitimate interests of others, to compensate for damage to grazing land, to avoid disturbing and polluting pasture, land, soil and water resources, and to protect heritage and wildlife.

Source: authors' summary of material made available by MNFPUG

Findings from Interviews on Rangeland Management and Pastoral Movements

Undershireet, Tuv Aimag
(Cooperative leader) The soum has eight PUGs, with either two or four PUGs to a bagh, established in 2007. Each has a leader, with the eight leaders forming a soum-level steering committee. All herding households in the soum are members – about 400 households in all. The PUGs could not carry out marketing activities, so a strongly overlapping cooperative was formed in 2009. The cooperative has the same steering committee, but only around 70% of herding households are members. There are Rangeland User Agreements (RUAs) for all the PUGs – these are 11 years into a 15 year period of validity. RUAs set out a detailed set of restrictions on pastoral movement, with five technical annexes. Husband and wife of each herder household are required to sign. In one PUG there is an additional GCF-funded project on rangeland carbon sequestration. (Herder) Herders move at least four times a year, in some cases five. The household we spoke to in July was living around 10km from its winter quarters.
Binder, Khentii Aimag
(Soum Government) The soum government is trying to maintain the four-season movement system (with spring and autumn spent at the same site) but people are tending to shift to a two-season system. The number of livestock is seen by the soum government as very high, causing rangeland degradation, but it was also said that only one bagh was over carrying capacity, four baghs were more or less at carrying capacity. There is no rangeland law in operation, and no plan to reduce numbers. A land management plan is revised each year by the soum government on the basis of herders' views and approved by the soum assembly. (Cooperative leaders) A PUG established by the EU IMPACT project is responsible for rangeland management, not all PUG members are cooperative members. (Herder and PUG leader) People are too busy to come together to follow rangeland management recommendations.

Shinejinst, Bayankhongor Aimag
(Soum government) There are 19 PUGs established under the Green Gold Project. By soum-level regulation each household should leave its winter camp by June 1st. (Cooperative leaders) All herders from three PUGs, and some herders form another three PUGs are cooperative members, amounting to 89 members. (Herder) An RUA was approved in 2017. In normal years herders follow the agreement. In a normal year this herder moves five times, in a difficult year more than ten times.
Ulziit, Arkhangai Aimag
(Soum government) Herders have been organised by the UNDP ENSURE project into 28 Herder Groups (HG) of c.4 herding households each, all of which have RUAs. It is difficult to manage overgrazing, and most herders do not migrate, but ENSURE is working with HG leaders to encourage reduction in herd numbers, and the RUAs specify that households should reduce livestock numbers by 5% per year, and move 2-3 times a year. (Herder and PUG leader) he would like the HGs to be combine into bigger PUGs. 42 households have unofficially formed a PUG in order to comply with the Responsible Nomad Standard. Starting this year, they are attempting to rest winter pastures, only 25% of households had not moved away by July. Summer and spring pastures more difficult to rest because herders need to water livestock at the river. He actively monitors non-use of winter pastures in summer.
Alag Erdene, Khuvsgul Aimag
(Soum government) They have problems with rangelands as livestock numbers are higher than carrying capacity. The soum government monitors rangeland conditions. There was originally a four-season movement system, but now two baghs have three-season movement, two have two-season movement. There are nine PUGs over five baghs, of which four are working well. This depends on leadership. There may be some association of performance with ethnic group but each PUG is a mixture of ethnic groups. Two PUGs have RUAs for resting pastures, these are arrangements between herders and the soum government which specify punishments for those who do not move on time. The soum government can do nothing with the other groups as there is no law to follow. (Cooperative leader) The PUG is working on yak down marketing more than on rangeland management. There are soum-level regulations which exit on paper, e.g. moving to summer pastures before June 15th , but nobody follows these, they go where there is pasture. Some people come from aimag centre for winter, it is not clear why (it is not *otor*).
Bayankhangai, Tuv Aimag
(Group interview with herders) They were a PUG since 2008, but since last winter they are a cooperative sponsored by the nearby National Park, about to supply meat to the market and also implementing rangeland management. Rangeland management is in line with soum government policy. Generally May 15th is the date for movement to summer pastures, the date can be amended by the soum assembly. The bagh assembly brings rangeland issues to the soum government.

Source: authors' interviews

Findings from Interviews on Otor Migrations

Binder, Khentii Aimag
(Soum government) There are three sites for *otor*, one very close to the Russian border, all reserved for soum residents.
Shinejinst, Bayankhongor Aimag
(Soum government) Sometimes herders have to go on "short *otor*". In 2020 they moved as far as Khentii (c.1000 km). There is a Strictly Protected Area nearby which can be opened up until April 1st on the authority of the aimag governor. (Herder) In times of drought and dzud "borders are not considered". This area receives little snow but with a summer drought even 2cm of snow can cause a grazing shortage. In 2020 he went to another soum of Bayankhongor 250 km away. In such a case he goes to check grazing and get agreement from the soum governor and local herders – this process takes seven or eight days. In some years people come here from other aimags.
Ulziit, Arkhangai Aimag
(Herder) They have no reserve for *otor* because of high livestock numbers. In 2016 he went to a Protected Area in a different soum of the aimag
Alag Erdene, Khuvsgul Aimag
(Herder) There is now no *otor* area, he would like there to be, now he can only buy forage and hay.

Source: authors' interviews

Gender Division of Productive Activities in Most Soum, Khovd Aimag

Gender associated with activities	Activities
Activities conducted only or mainly by men	Shaving camels, the sale of camel wool, the sale of livestock (live animals) and meat, the growing of forage and preparation of animal feed, hay making, livestock-supporting material/craft production, taking camels (horses, sheep, goats, cows, yaks) to pasture and bringing them back again, giving water to animals or taking animals to water, *otor* movements, looking for lost/stolen animals, training animals for riding and for household use
Activities conducted mainly by men with women's participation about half of men's time	Animal shelter repairs and winter preparation, combing yaks and goats, the sale of goat skins, sheep wool, yak down, the collection and sale of medicinal herbs, washing livestock (bathing animals to remove parasites), feeding animals
Activities for which men and women spent about an equal amount of time	Ger repairs/winter preparation, milking horses, shaving sheep, the sale of milk and dairy products, the sale of cashmere and wool, caring for animals during the birthing period, veterinary activities (mainly injections against worms/parasites), the marking of animals, the slaughtering of animals and clearing out the carcasses, the castration of animals, seasonal household movements (packing, moving, settlement in a new location)
Activities conducted mainly by women with men's participation about half of women's time	Milking cows, yaks, goats and sheep, cleaning animal shelters
Activities conducted only or mostly by women	Processing dairy products, feeding baby animals

Source: Voltolini et al. 2015, some footnotes omitted

Interview Findings on Women's Participation in Community Activities

Undershireet, Tuv Aimag
All staff of the linked marketing cooperative, NGO and Credit and Savings Association are women. The Steering Committee was originally all male, but is now six women and two men. The women say that men prefer horse-racing to community affairs.
Binder, Khentii Aimag
50% of the cooperative's 32 members are women, the Steering Committee is two women and two men, and the financial control group is one woman and two men.
Shinejinst, Bayankhongor Aimag
The Steering Committee has two women and three men, and the financial control group one woman and two men.
Ulziit, Arkhangai Aimag
All nine cooperative Steering Committee members are men. NB this cooperative resembled a private company with the Steering Committee members as shareholders.

ANNEX 5 – Primary Data on Processing Stages Used for the Environmental Analysis

Water and energy use shared between the different processing stages (% of the total use for processing) and water losses (mainly by evaporation) at each stage (% of water use).

Processing stages	Water use share (%)	Water losses (%)	Energy use share (%)
Washing	33	25	12
Dehairing	0	0	4
Dyeing	37	25	48
Spinning	11	25	16
Knitting	11	25	13
Cutting & Sewing	8	1	7

Main parameters and data used for washing process.

Data category	Parameter	Unit	Value	Source
Equipments	Electric-generator-coal-based units	unit	-[a]	Different sources[b]
	Industrial area	m2	1,343	Observations
Inputs from technosphere	Raw cashmere	ton	9,672	National Stastics Office
	Transport	km.t	7,050,888	Own calculation[c]
	Freshwater	m3	-[a]	Estimated from StepEcoLab project data[d]
	Coal	kg	-[a]	Estimated from StepEcoLab project data[b]
	Electricity	kWh	-[a]	Estimated from StepEcoLab project data[b]
	Soap	liter	9,672	Interviews[e]
Outputs to technosphere	Washed cashmere	Ton	8,085	
	Dirt	ton	1,209	
Emissions to water	Total N	kg	447	MNS 6561:2015
	Fatty acids	kg	11,171	MNS 6561:2015
Emissions to air	Evaporation	m3	-[a]	Default values[f] from Simapro®
Waste	Waterwaste	m3	-[a]	Default values[f] from Simapro®

[a] Confidential data

[b] Based on (i) number of wool & cashmere processing entities (n=78), (ii) 2/3 of units are connected to electricity general network and others owned Electric-generator-coal-based units (source: Interviews) and (iii) proportion of electricity used for washing (StepEcoLab project)

[c] Based on GIS data treatment (distance from province centroids to UB by road) and data from National Stastics Office (cashmere production per province)

[d] Based on proportion of electricity used for washing (StepEcoLab project)

[e] 1L of soap per ton of raw washed cashmere

[f] 25% of water losses through evaporation, the remainder is discharged to the wastewater network directly or by tanker truck

Main parameters and data used for dehairing process.

Data category	Parameter	Unit	Value	Source
Equipments	Electric-generator-coal-based units	unit	-[a]	Different sources[b]
	Industrial area	m²	115	Observations
Inputs from technosphere	Washed cashmere	ton	1,658	
	Coal	kg	-[a]	Estimated from StepEcoLab project data[b]
	Electricity	kWh	-[a]	Estimated from StepEcoLab project data[b]
	Bags	kg	24,870	Interviews[c]
Outputs to technosphere	Dehaired cashmere	Ton	1,244	Interviews[d]
	Coarsed hair	Ton	415	Interviews[d]

[a] Confidential data

[b] Based on (i) number of wool & cashmere processing entities (n=78), (ii) 2/3 of units are connected to electricity general network and others owned Electric-generator-coal-based units (source: Interviews) and (iii) proportion of electricity used for dehayring (StepEcoLab project)

[c] On an average, a bag contain 50kg of cashmere and weight 1kg.

[d] Final products of washed cashmere dehairing is 75% of dehaired cashmere and 25% of coarsed hair; 5% of losses

Main parameters and data used for dyeing process.

Data category	Parameter	Unit	Value	Source
Equipments	Industrial area	m²	6,76	Ecoinvent 3 database[a]
Inputs from technosphere	Spinned cashmere		417	
	Freshwater	m³	-[b]	Estimated from StepEcoLab project data
	Electricity	kWh	-[b]	Estimated from StepEcoLab project data
	Chemicals	l	413,000	StepEcoLab project[c]
Outputs to technosphere	Knitted cashmere	Ton	413	Interviews[d]
Emissions to water	Nitrogen		-[b]	MNS 6561:2015
	Sulfide		-[b]	MNS 6561:2015
	Copper		-[b]	MNS 6561:2015
	Zinc		-[b]	MNS 6561:2015
	Phosphorus		-[b]	MNS 6561:2015
Emissions to air	Evaporation	m3	-[a]	Default values[e] from Simapro®
Waste	Waterwaste	m3	-[a]	Default values[e] from Simapro®

[a] Based on "bleaching and dyeing, yarn RoW" process

[b] Confidential data

[c] 1kg of chemicals per kg of clothes (Lanaset and Lanasol)

[d] 1% of losses

[e] 25% of water losses through evaporation, the remainder is discharged to the wastewater network directly or by tanker truck

Main parameters and data used for spinning process.

Data category	Parameter	Unit	Value	Source
Equipments	Electric-generator-coal-based units	unit	-[a]	Different sources[b]
	Industrial area	m²	6,57	Ecoinvent 3 database[c]
Inputs from the technosphere	Dehaired cashmere		444	
	Transport	km.t	2,220	Interviews[d]
	Freshwater	m²	-[a]	Estimated from StepEcoLab project data[e]
	Coal	kg	-[a]	Estimated from StepEcoLab project data[b]
	Electricity	kWh	-[a]	Estimated from StepEcoLab project data[b]
Outputs to the technosphere	Spinned cashmere	Ton	422	Interviews[f]
Emissions to air	Evaporation	m3	-[a]	Default values[g] from Simapro®
Waste	Waterwaste	m3	-[a]	Default values[g] from Simapro®

[a] Confidential data
[b] Based on (i) number of wool & cashmere processing entities (n=78), (ii) 2/3 of units are connected to electricity general network and others owned Electric-generator-coal-based units (source: Interviews) and (iii) proportion of electricity used for washing (StepEcoLab project)
[c] Based on "yarn production, cotton, open end spinning IN" process
[d] 10t trucks transport dehaired cashmere on 50 km
[e] Based on proportion of electricity used for spinning (StepEcoLab project)
[f] 5% of losses
[g] 25% of water losses through evaporation, the remainder is discharged to the wastewater network directly or by tanker truck

Main parameters and data used for knitting process.

Data category	Parameter	Unit	Value	Source
Equipments	Industrial area	m²	16	Ecoinvent 3 database[a]
Inputs from technosphere	Spinned cashmere		422	
	Freshwater	m³	-[b]	Estimated from StepEcoLab project data
	Electricity	kWh	-[b]	Estimated from StepEcoLab project data
Outputs to technosphere	Knitted cashmere	Ton	417	Interviews[c]
Emissions to air	Evaporation	m3	-[b]	Default values[d] from Simapro®
Waste	Waterwaste	m3	-[b]	Default values[d] from Simapro®

[a] Based on "textile production, cotton, circular knitting IN" process
[b] Confidential data
[c] 1% of losses
[d] 25% of water losses through evaporation, the remainder is discharged to the wastewater network directly or by tanker truck

Main parameters and data used for cutting and sewing processes.

Data category	Parameter	Unit	Value	Source
Equipments	Industrial area	m3	28	Observations
Inputs from technosphere	Dyed cashmere	ton	413	
	Transport	km.t	826	Interviews[a]
	Freshwater	m3	-[b]	Estimated from StepEcoLab project data
	Electricity	kWh	-[b]	Estimated from StepEcoLab project data
Outputs to technosphere	Apparels	Ton	413	
Emissions to air	Evaporation	m3	-[b]	Default values[c] from Simapro®
Waste	Waterwaste	m3	-[b]	Default values[c] from Simapro®

[a] 10t trucks transport dehaired cashmere on 50 km

[b] Confidential data

[c] 10% of water losses through evaporation, the remainder is discharged to the wastewater network directly or by tanker truck