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Faculty of Tropical AgriSciences

Current status of Agrobiodiversity in Central Asia: a literature review

BACHELOR THESIS

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Declaration

I hereby declare that I have wote this thesis, entitled *Current status of Agrobiodiversity in Central Asia* independently, all texts in this thesis are original, and all the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague,

.....19.4.2019.....

Tolgonai Sopukeeva

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Abstract

This thesis is a qualitative literary review on agrobiodiversity in Central Asian region. It was created in order to estimate the current status of agrobiodiversity in Central Asian region. Additionally, to provide a broader knowledge about five understudied Post-Soviet central Asian countries: Kazakhstan, Kyrgyzstan, Tadzhikistan, Turkmenistan and Uzbekistan. Paper describes the region and its specific features, including climate and environment. Also, characterizes the concept of agrobiodiversity and documents the current status of agrobiodiversity in Central Asia. Furthermore, this paper was meant to draw attention to unique traditional, and mainly, underutilized species and traditional knowledge. Moreover, it presents information on environmental legislation and related laws of listed countries. In a form of a literature review it represents both summary and evaluation of previously published scientific articles and researches relevant to specific theme and study area of agrobiodiversity and ethnobotany of Central Asian republics.

Key words: Central Asia, agrobiodiversity, traditional knowledge, ethnobotany.

Abstract:

Tato práce je kvalitativní literární rešerši o agrobiodiverzitě ve středoasijském regionu, která byla vytvořena s cílem stanovit současný stav agrobiodiverzity v Centralní Asii. Navíc k tomu poskytnout širší poznatky o pěti bývalých zemích sovětského svazu: Kazachstánu, Kyrgyzstánu, Tadžikistánu, Turkmenistánu a Uzbekistánu. Prace popisuje region a jeho specifické rysy, včetně klima a životního prostředí. Taký defenueuje koncept agrobiodiversity a dokumentuje její současný stav v Centralní Asii. Dále, tato prace by měla upozornit na především méně využívané druhy rostlin a tradiční znalosti. Navíc k tomu předkládá informaci o legislativě a zákoném v oblasti životního prostředí v uvedených zemí.

Klíčová slova: Centralní Asie, agrobidisersita, tradiční znalosti, etnobotanika

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1. Introduction

Agricultural biodiversity, or agrobiodiversity is a complex term. It is a part of a more broad term biodiversity (also known as biological diversity), which refers to extend variety of all living organisms, including – microorganisms, plants, animals [1].

According to FAO, agrobiodiversity is a part of general biodiversity related to agricultural production, defined as variety of microorganisms, plants and animals that are directly or indirectly used in agriculture and food production. Including crops, livestock, forestry and fisheries. Diversity of non-harvested production support species, as well as environment supported agroecosystems are also included in this term [2]. It started developing more that 10,000 years ago by farmers' selection and breeding. Who have been constantly improving genetics of crops and livestock in order to improve its qualities. This traditional knowledge that has been passing for centuries from generation to generation.

The importance of agrobiodiversity lies in conservation, which is crucial for sustainable development in constantly changing word, especially for rural areas that mainly rely on agriculture. Furthermore, traditional crops that have all the quality characteristics that perfectly fulfill local needs, can also be utilized with minimum input. It provides variety of environmental services and contributes to human health by providing more nutritious diet [3].

This study explores the current status of agrobiodiversity in region of Central Asia. Study area is a large region that contains five post-Soviet countries and located in the middle of Eurasian continent. Thesis focuses on defending the region itself, it specific features, diversity of nature and ecosystems.

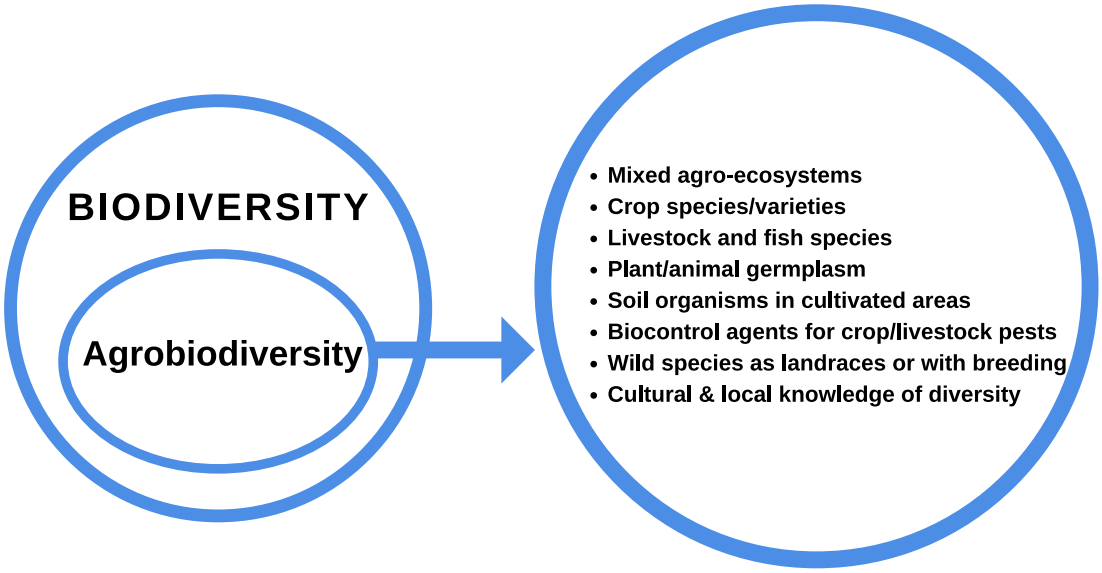

Figure 1. Agrobiodiversity (Adapted from www.fao.org)

1.1 Study area

Definition of Central and Middle Asia was always ambiguous. English-language publications have been using the term 'Central Asia' to refer to areas of the five former USSR countries, to areas of China and Mongolia and to areas that cross the former-Soviet/Chinese border. Soviet literature usually defines Middle Asia as a territory, which includes Uzbek SSR, Kirghiz SSR, Tajik SSR and Turkmen SSR, which form the Middle Asian economic region.

As a geographical concept, Central Asia has a long history. It can be defined as a geographical region, which includes desert and semi-desert plains, plateaus and highlands of western China and Mongolia, south Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan and northern Afghanistan [4].

However, at UNESCO meeting held in 1978, it was agreed that to describe Central Asia from a historical point of view, studies should deal with the civilizations of

Afghanistan, northeastern Iran, Pakistan, northern India, western China, Mongolia and the former Soviet Central Asian republics [5].

Due of the cultural, historical, economic characteristics of the region, and taking into concidiration the terminology using in western publications and increasingly in Russian literature of the past few decades, Central Asia should be defined as five Asian republics of the former Soviet Union: Kazahstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan [6].

Figure 2. Map of Central Asia (adapted from www.un.org)

1.1.1 Location and geographical description

Study area covers the territory of modern Kazakhstan, Kyrgyzstan, Tadzhikistan, Turkmenistan and Uzbekistan. Several large mountain ranges are located in Central Asian region. Major ones are Pamir and Tien Shan. The total area of the mountains is about 860,000 square kilometers [7]. The highest peak, which is located in Tian Shan mountain system in Issyk-Kul region of Kyrgyzstan, is at 7,439 meters [8]. The average height of both mountain ranges is more than 3,000 m, only about 10% of the area below 1,000 meters [9].

The Tian Shan mountains have a length of 2,600 km and a maximum width is of 600 km. The mountain range lies between 39-46 ° north latitude and 69-95 ° East in China, Kazakhstan, Kyrgyzstan and Uzbekistan [10]. It differs from the other highland systems by its age. It is believed to be formed during Variscan orogeny followed by orogenesis within the Alpine-Himalayan folding. At different heights old and aligned surfaces of an alpine type relief, with typical rocky shields and high height differences can be found. The mountain range consists of a series of vast ridges with predominantly parallel course. Formally it is divided into Western, Central and Eastern Tian Shan [9].

The Pamir Mountains have an average elevation of over 4,000 meters and its central parts are more plateau-like. On the other hand, sharp ridges and steep slopes with deep valleys and canyons are typical for the western and eastern parts of the Pamir. 70 kilometers long Fedchenko Glacier, which world's longest non-polar glaciers, is part of Pamir mountain range. Number of other mountain ranges, including Alai, Hissar, Turkestan and Zeravshan lie between the Pamir and the Ferghana Valley [11].

1.1.2. Climate

Central Asia is known for its continental arid and semi-arid climate. Characterized by relatively hot and dry summers and also by warm, humid winters in the southern part; and much colder in the north [6]. Glaciers spread throughout the mountains cover

approximately four percent of Kyrgyzstan and six percent of Tajikistan, which make them essential in maintaining water flow during typically hot and dry summer months.

Majority of precipitation that fall in winter and spring is in the range between over 1,000 mm in the Hissar and Ferghana in the west, and below 100 mm in the east. The southwestern area of Central Asia is under the influence of subtropical air, characterized by mild winters. The coldest parts are high plateaus of Tien Shan and Pamir with average annual temperatures below zero, that can reach -40^{o}C [11].

The main rivers of Central Asia are Amudarja, which is originating from the confluence of Vachsa and Puja rivers; and Syrdarja, which is originating from the confluence of Naryn and Karadarja rivers. Their catchments and tributaries secure main water needs of the region - irrigation, electricity generation and regular water consumption. Excessive water consumption from these sources has caused drastic reduction of the Aral Sea [12].

Table 1. Long-term average annual renewable water resources (Adapted from FAO Water Report 39 AQUASTAT 2013 www.fao.org)

Country	**Average annual precipitation mm**	**Fresh water resources km^3**	**Fresh water resources per capita km^3**	**Total annual consumption of fresh water km^3**	**Irrigated land thousands of km^2**	**Irrigated agricultural land %**
Kazakhstan	250	64	3777	21.1	12	0.6
Kyrgyzstan	533	49	8555	8	10.2	9.4
Tadzhikistan	691	63	7732	11.5	7.4	14.8
Turkmenistan	161	1.4	268	28	19.9	5.9

Uzbekistan	206	16.3	540	56	42	15.5

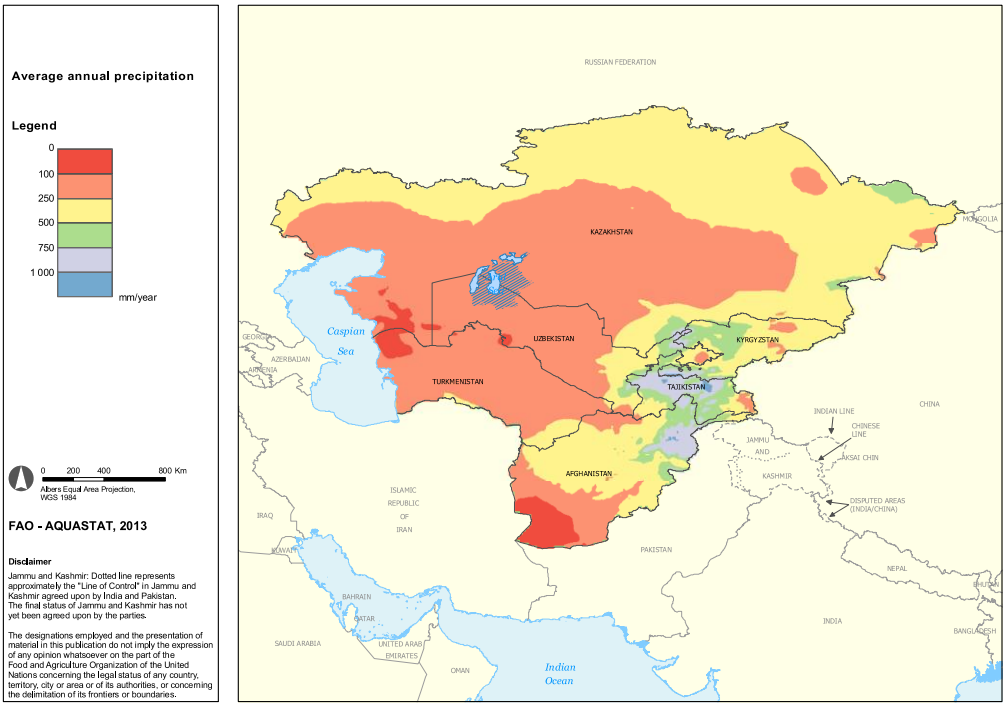

Figure 3. Map of average annual precipitation (Adapted from www.fao.org)

1.1.3. Population

Current population of Central is 61.44 million people, which represents 0.85 % of the total world's population. Uzbekistan and Kazakhstan are the most, and respectively second most, populated countries in the region. Average population density is approximately 20 people per square kilometer. Interestingly, comparing to other parts of the world, Central Asian population is predominantly rural, around 60%. Relatively larger percent of population is working in agriculture [13].

Table 2. Population characteristics (2011). (Adapted from Irrigation in Central Asia in figures AQUASTAT Survey-2012)

Country	Total population	% of rural population	Density of population	Economically active	Economically active population in	Human Development Index %

				population %	agriculture %	
Kazakhstan	6 207 000	41	6	54	14	0.745
Kyrgyzstan	5 393 000	65	27	46	20	0.615
Tadzhikistan	6 977 000	74	49	42	27	0.607
Turkmenistan	5 105 000	50	10	48	29	0.686
Uzbekistan	27 760 000	64	62	47	21	0.641
Central Asia	**61 442 000**	**61.6**	**20**	**43**	**30**	**-**

1.1.4. Natural biodiversity

Due to very diverse geographic conditions flora and fauna of Central Asia are remarkably desperate. Ecosystems are widely range from deserts to forests, from subtropical valleys to icy mountain picks. The World Wildlife Fund (WWF) has distinct several common ecoregions of unique biodiversity in Central Asia. Those are: mountainous and hilly areas, steppes, forests, desert plains, and river valleys. However, the rise of agricultural development that started in 20th century, has led to extinction of several plants and animal species.

Eurasian steppes are the largest grasslands in the world. Perennial grasses are dominant in these steppes. Comparing to other steppes from different regions, Eurasian steppes get significantly less amount of precipitation annually [14]. Steppe is a most common ecosystem type in Kazakhstan. In the past, they were inhabited by constantly moving nomad tribes and were used mainly for pastoral purposes. Later they have become property of Soviet Union. Central landownership and management aimed to end nomadism in Kazakh steppes and start using it for agricultural production [15].

It is estimates that deserts make up more that 40% of the surface. Extreme differences in day and night temperature are typical. Deserts in southern parts of Central Asia are the most biodiverse, in particular those that include parts of southern Kazakhstan, Turkmenistan and Uzbekistan. Black saxaul (*Haloxylon ammodendron*) and white saxaul (*Haloxylon persicum)* tree shrubs are distinctive plant species for this ecosystem. Eurasian deserts are inhabited by a small number of unique endemic species of animals such as Bactrian camels *(Pterostichus camelus),* tolai hare *(Lepus tolai Pallas),* sand lynx *(Felis caracal)* and others [15].

Central Asian region have several famous fertile valley located in piedmont (foothill) areas [15]. One of them is Fergana Valley, shared between three countries: Kyrgyzstan, Tajikistan and Uzbekistan. Climate of the valley can be described as semi-arid with annual precipitation in a range between 100-300 mm. Temperatures vary between minimum of -18°C and maximum of +45°C. The valley washed by multiple mountain rivers and have four different water source types and: water-glacier, snow-glacier, snow and snow rain [16]. The valley is surrounded by Chatkal and Kurama mountain ranges in northwest, by Fergana range in northeast, Turkestan and Alay in the south [17]. Two major time periods in crop production were identified in the Fergana Valley. The first period can be defined as cotton/alfa-alfa rotation period, which lasted until the beginning of 1990s. This type of crop production dominated irrigated land. The water demand was supplied by water resources of Fergana Valley. However, after 1995 cotton/alfa-alfa production was replaced by cotton/wheat production, as Central Asian countries' economies started focusing more on grain production and food security [18].

One of the largest walnut forests in the in the world can be found in southern Kyrgyzstan. Those forests are spread at the elevation mainly between 1400 m and 1800 m above the see. With the annual perception about 1090 mm; with the average winter temperatures around -3.1^0 C and $+20.5^0$ C in summer relatively. The walnut tree (*Juglans regia*) is predominantly the most common tree the forest, other typical tree is apple (*Malus pumila*). Among other plants are various types of shrubs: barberry (*Barberis*), dog rose (*Rosa canina*), cherry palm (*Prunus cerasifera*) and hawthorn (*Crataegus*); and herbs [19].

As a result of their location in the middle of the the sub-region, the mountains of Central Asia, with its typical comprehensive range of altitude belts, are extremely rich in biological ecosystem diversity. They are the place of origin of many local cultivated plant and animal species [20]. Endangered species of high attitude settings of Central Asian mountains include snow leopard (*Panthera uncia*) [21]. The population of its main prey, argali (Ovis ammon) has also been declining due to overharvesting and poaching in their natural habitats and poorly managed hunting programs [22]. The two main mountain systems are Pamir in Tajikistan and Tien Shan in Kyrgyzstan, whihc make these countries the most mountainous in the region. Mountain ecosystems also cover the eastern Kazakhstan (Kazakh Uplands, Dzhungarsk Alatu, Tarbagatay and Altai), southeastern Uzbekistan (Western Tien Shan and the Gissar Mountains), extending to Afghanistan (Hindu Kush) and China. In general, the area occupied by mountains is 800 thousand km2 or 20% of the whole area [23].

Caspian Sea is situated in the remote part of Eurasia and is isolated from the ocean. With a surface area of 390 000 km^2 and a volume of 66 780 km^2, it is the world's largest inland water body. More than 130 rivers flow into the Caspian Sea, Volga being the most important one of them [24]. Some of unique endemic species of Caspian Sea ecoregion are the Caspian seal (*Phoca caspica*), which can reproduce both on ice (during winter months) and on land (on the Turkmenistan shore islands). It is also major migration road for large number of bird species, the most common among them are coot (*Fulica atra*), long-tailed duck (*Clangula hyemails*), grey-lag goose (*Anser anser*), goldeneye (*Bucephala clangula*) and others [25].

Another remarkable large lake of Central Asia is Aral Sea, which is a saline lake lying at the border of Kazakhstan and Uzbekistan. The lake used to be fed mainly by Syr-Darya and Amu-Darya rivers [26]. The decline of river inflows led to various environmental problems, impacts of which have had huge impacts on local economies, public health and everyday life. Those dramatic changes in ecosystem started in early 1960 caused downfall of crop production due to high salinity of soils, devastation of fishery industry, decrease in biodiversity [27].

Issyk-Kul lake is situated in the eastern part of Kyrgyzstan and surrounded by Kungey Ala-Too and Terskey AlaToo mountainous chains. The elevation of the lake is 1609 m above the sea level, and it covers area of more than 6200 km2. n. As a result of minimal exposure to industrial pollution the atmosphere over the Issyk-Kul basin is very typical for rural conditions of the central Asia mountainous region [28]. Of more than 80 rivers bringing their waters into the lake none flows out of it, and only two of those permanent - Jergalan and Tup Rivers. 1,500 plant species were identified in the Issyk-Kul Biosphere Reserve, 30 of which are considered to be valuable wild medicinal plants. The fauna of the region includes a range variable species: 54 mammal species, 267 birds species, 28 fish species (among which 11 species are indigenous and 1 endemic) [29].

1.1.5. Agriculture

Since the collapse of Soviet Union various parts of agricultural sector have experienced some changes. Those include: land ownership, agricultural production efficiency, farm sizes and others [30]. Unwise water-use policies during Soviet Era have led to dramatic changes and problem in the Central Asian region. One of the biggest mistakes being tremendous shrinking of the Aral Sea, that once used to be the fourth largest lake in the world [31]. Since the independence of Central Asian countries some extensive changes in crop production took place. However, cotton is still one of the most crops, even though its share of irrigate lands have decreased from 45 to 25 percent in 1990s. At that time, land dedicated to other cereal crops such as wheat, maize and rice has increased from 12 to more than 50 percent. During that period wheat had become the main crop in the region [32], currently it represents 39 percent. Cotton is the second most widespread harvested crop primarily cultivated in Uzbekistan, Tadzhikistan and Turkmenistan. Followed by fodder, permanent grass and vegetables [13].

Table 3. Harvested irrigated crops. (Adapted from Irrigation in Central Asia in figures AQUASTAT Survey-2012)

Crop	Kazakhstan	Kyrgyzstan	Tadzhikistan	Turkmenistan	Uzbekistan
Wheat	208 000	360 700	179 742	917 000	1 295 000
Barley	92 000	86 600	18 017		
Maize	95 600	61 500	14 743		
Rice	94 000	5 000	14 126	11 000	52 000
Other cereals		1 600	7 225		
Vegetables	182 600	40 600	37 162	29 400	
Potatoes	60 000	76 000	29 901	8 800	
Pulses		20 800	4 667		
Oil crops	40 000	59 200	3 493		
Cotton	134 200	45 500	237 130	652 000	1 406 000
Sugar beet	8 720	14 500		12 000	
Temporary fodder		35 800	8 323	93 000	300 000
Permanent grass and fodder	26 000	73 400	34 043		100 000
Other temporary crops	6 430	33 300	886	100 100	247 000
Other permanent crops	54 000		98 957	65 000	200 000

Permanent meadows, pastures	180 550	106 900	40 868	125 500	100 000
Total	**1 182 100**	**1 021 400**	**729 283**	**2 013 283**	**3 700 000**

Post-Soviet Kazakhstan economy and society had been dealing with massive changes after 1991 and subsequently transitioned from a planned to a market economy, which had a severe impact on the state-controlled agricultural system. During the 1990s, this had led to extensive declines in not only livestock population, but also and in population of wild ungulate [33]. New grazing system and overall changes in livestock mobility had caused abonnement of arable lands and overall changes in steppes of Kazakhstan [33][34].

Sudden independence from Soviet regime in Kyrgyzstan, led to burst of agricultural production [35]. Rich household that were using accumulation strategies, the key element of which is buying and sharing the land, were the only ones capable of venturing into rain fed agriculture[36]. A persevering strategy was more common among less wealthier households that were not able to afford to buy or rent additional land; often they were forced to sell the land or o return it back to the communities [37]. A coping strategy includes primarily poor households that are usually headed by single mothers or consist of elderly pensioners. Agricultural production is relatively low and hardly covers family's subsistence needs, as the result of limited economic and labor power; in this case social allowances and pensions form the backbone of these households[38].

2. Legislation and laws

In Central Asian republics the institution that regulate laws and legislations on plants and plant protections are usually are Ministries and Departments of Environment and Water Resources, Agriculture, Forestry.

2.1. Kazakhstan

The Law of the Republic of Kazakhstan "On specially protected natural territories" is aiming to regulates social relations in the creation, expansion, protection, restoration, sustainable use and management of specially protected natural territories and objects of the state natural reserve fund, which represent special ecological, scientific, historical, cultural and recreational value, as well as being a component of the national, regional and global ecological network.

According to law on scientific research in the field of environmental protection on the territory of the Republic of Kazakhstan, scientific researches can be carried out. Only with the obligatory implementation of the requirements of the legislation of the Republic of Kazakhstan, by both Kazakh and foreign individuals and legal entities, as well as international organizations [39].

State government identifies objects of flora such as: single specimens in the natural environment or in artificial conditions and (or) separate groups of trees, shrubs and herbaceous plants, characterized by unique properties (origin, life expectancy, shape and size of the trunk, crown, size of flowers, fruits and seeds and other properties) with special scientific, historical, cultural significants as unique single objects of flora, having special scientific and (or) historical and cultural value [40].

Import and export of plants, their parts and derivatives, including plant species classified as rare and endangered, is carried out on the basis of a permit issued by an authorized body [41].

2.2 Kyrgyzstan

General rules and laws on environment are described in Collection of regulatory legal acts in the field of environmental protection in Kyrgyzstan, published by the State Agency of Environment and Forestry under the Government of the Kyrgyz Republic.

Agency describes traditional knowledge as summation of knowledge and methods, including utilization of genetic resources used in various areas human activities that were passed down from one generation to other in a certain order and having value. The

possessors of traditional knowledge are local communities, individuals and legal entities of any organizational or legal forms, and forms of ownership, who possess the traditional knowledge. Local community is group of Kyrgyz citizens permanently residing in the territory of a particular administrative unit, united by their own interests and at their own responsibility to solve local issues independently through representative and executive bodies of local self-government. Genetic resources are the resources that include the whole animal and plant kingdoms of earth, water and other origins that can be used by possessors of traditional knowledge to obtain certain practical results in a particular field of activity.[42].

The right to use the registered traditional knowledge may be granted to an individual who is not the possessor of it in accordance with the procedure established by this Law, provided that a contract is concluded between him/her and the holder of traditional knowledge, who had registered the traditional knowledge with the authorized body [43].

Fees to an authorized legal body needs to be paid for obtaining the right to use traditional knowledge [44]. It is allowed to use traditional knowledge without obtaining the holder of it only for educational and research purposes with the indication of the source [45].

2.3 Tadzhikistan

Rare and endangered plant species and natural communities that they form are noted in the Red Book of endangered species of the Republic of Tadzhikistan and are a subject to special protection. No actions that lead to destruction, reduction of stocks or disturbance of the growing environment of rare and endangered plant species and their communities are allowed. In order to preserve plant species, the reproduction of which in natural conditions is extremely difficult, measures should be taken to reproduce them in other conditions, according to the decision of the authorized body[46].

Use of plants for research, cultural, educational, aesthetic, recreational, medical and tourist purposes (through various forms of observation, measurement, photography, etc.) is

allowed with or without withdrawal of wild plants, their parts and products from the natural environment, if it does not harm the plant world and does not violate the rights of users, except in cases where such use is prohibited [47].

The creation and replenishment of botanical collections by removal of wild plants from their natural environment by individuals and legal entities should be complied in compliance with the requirements of the Law in the manner established by the authorized body. Botanical collections of scientific, cultural, educational or aesthetic value are subjects to state registration. Individuals and legal entities who own such collections are obliged to comply with the rules of storage, accounting and use of botanical collections. The rules for creating, storing, recording and using botanical collections, as well as trading, sending and withdrawing them outside of the republic, are determined by the Government of the Republic of Tadzhikistan [48].

The right to use plant world objects may be terminated in the following cases:

- non-compliance with the rules of transplantation and export of botanical collections abroad

- the actions that have become or may be the reason for the destruction and reduction of plant species in danger of extinction (as amended by the Law of the Republic of Tajikistan on January 5th, 2008 No. 353).

The right to use plants or parts of them is terminated by the authority that issued the land for use, or an authorized body. [49].

2.4 Turkmenistan

The use of plants for scientific research, educational and experimental purposes is allowed on following terms. The use of plants for research and educational purposes can be carried out with or without withdrawal of the wild plants.

- plants and (or) their parts, if it does not adversely affect any objects of

- plant world and their environment, if does not limit the rights of users

- plants, except when such use is

- prohibited in accordance with the laws of Turkmenistan.

It is allowed with the removal of wild plants and (or) their parts in

- order determined by the authorized government body in

- areas of protection, rational use and reproduction of flora.

In the case when certain types of uses of plants are incompatible with the objectives of the research and educational processes, such types of uses plants can be restricted or suspended in accordance with this Law [50].

Use of the plants listed in the Red Book of endangered species of Turkmenistan is permitted only in exceptional cases for research purposes, for the purposes of cultivation and their reproduction in natural conditions by the conclusion of the authorized body of state administration in the field of protection, rational use and reproduction of flora by the solution of Cabinet of Ministers of Turkmenistan. All the rare and endangered plant species and their natural plant communities are listed in the Red Book of Turkmenistan and are subject to special protection. Harvesting and collecting of such plants (their fruits, parts, and other products) is prohibited. With the exception of commercial plantations and forest crops created in artificial way. In exceptional cases for reproduction under natural conditions, the extraction of these plants for research and other purposes is allowed by the permission of the authorized body of state administration in the field of protection, rational use and reproduction of the plant world [51].

Introduction of wild plants of Turkmenistan to the new places of growth, acclimatization of wild plant species that are new to Turkmenistan in natural for conditions , as well as hybridization activities of wild plants in natural conditions are allowed only for research and economic purposes, on the basis of the conclusions of a relevant scientific institutions and the decision of the authorized state body on quarantine plants [52].

Botanical Collections representing scientific, cultural, educational or aesthetic value are subject to state registration. Legal entities and individuals who own such collections are obliged to follow the rules of storage, accounting and use of botanical collections [53].

2.5 Uzbekistan

In the special use of plants are provided on the basis of permits for a fee to legal entities and individuals for the implementation of production and other activities. The permit for the use of the plants, which establishes the object, type, volume and period of use within a certain territory, is issued by the Cabinet of Ministers of the Republic of Uzbekistan, authorized by state bodies. The procedure and conditions for the special use of the plants are determined by the law [54].

It is allowed to use plants for research, cultural, educational, educational, recreational, recreational and aesthetic purposes [55].

The use of plants is for research purposes is allowed with and without the withdrawal of wild the plants, their parts and products from their growing environment in the manner prescribed by law. In order to conduct research in natural communities, relevant legal entities in accordance with the procedures established by the law may be provided special areas, where the use of plants is restricted or prohibited to other legal entities and individuals, if this is incompatible with the goals of research [56].

Botanical collections of scientific, cultural, educational, educational or aesthetic value are subject to state registration [57].

3. Aim of the thesis

The aim of the thesis was to create a qualitative literary review on agrobiodiversity in Central Asian region. To describe the region and its specific features, including climate and environment.

Also, to characterize the concept of agrobiodiversity and to document the current status of agrobiodiversity in Central Asia. Furthermore, to draw attention to unique traditional, and mainly, underutilized species and traditional knowledge.

4. Methodology

A literature review is both summary and evaluation of previously published scientific articles and researches relevant to specific theme and study area. To search the articles focused on agrobiodiversity and ethnobotanical researches in Central Asian republics the following combinations were used: (ethnobot* OR ethnobiol* OR ethnoecol*) AND Kyrgyz*, "heritage" AND Kyrgyz*, (agricultur* AND diversity) AND Kyrgyz*. Repeated for remaining Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan.

Found articles were put into the Microsoft Excel file. The articles' data were put into the table in the following order: article, key words, authors, journal, year. As a result, all the articles in the table were divided into two main groups, which are ethnobotany and diversity.

5. Results

5.1. Kazakhstan

Number of unique plant genetic resources of global importance are concentrated in Kazakhstan. They include 226 species of wild relatives of different cultivated plants that determine the genetic potential 24 crops. A number of these are of considerable to have value for both agricultural development and to expand export potential [58].

5.2. Kyrgyzstan

The richest plant families in the country are: *Asteracea* (383 species), *Fabaceae* – (400), *Poaceae* – (293), *Brassicaceae* –(198), *Lamiaceae* – (182), *Liliaceae* – (141), *Rosaceae* –(138), *Caryopyllaceae* – (1 266), *Ranunculaceae*, *Scrophulariaceae* – (101). At least 200 species are identified as medical. Moreover, number of various plant species represent valuable genetic material, others have valuable economic potential to country [59].

5.3. Tadzhikistan

Wild fruits species of Tajikistan, especially in mountainous areas, are the basis of breeding and practical use in agriculture. They represent 1,457 varieties: apples (Malus), pears (Pyrus), cherries (Cerasus), plums (Prunus) and others. On this basis, it is necessary to organize the use of biodiversity, combining it with conservation and sustainable development [60].

5.4. Turkmenistan

Flora of Turkmenistan is very rich, however it is under the thread. Among some of valuable species are *Amygdalus communis and A. scoparia, Cerasus microcarpa, C. erythrocarpa, C. blinovskii, Crataegus spp., Ficus carica, Punica granatum, Prunus divaricate, Punica granatum, Pyrus boisiieri* [61].

5.5. Uzbekistan

Flora of Uzbekistan contains at least 4,500 species, nonetheless endemic plant species represent only 10-12% [62].

5.6. List of plant species of key importance, possessing important genetic value, economic potential, or are unique and endemic .

Table 4. Plant species of key importance

Country	Botanical name	Botanical family	Common name	Growth habit	Part used	Value
Kazakhstan	*Malus sieversii*	*Rosaceae*	wild apple, sivers apple	tree	fruit	genetic value
Kazakhstan	*Malus niedzwetzkyana*	*Rosaceae*	niedzwiecki apple	tree	fruit	genetic value
Kazakhstan	*Armeniaca vulgaris*	*Rosaceae*	common apricot	tree	fruit	genetic value
Kazakhstan	*Pistacia vera L*	*Anacardiaceae*	natural pistachio	tree	nut	genetic value
Kazakhstan	*Amygdalus communis L.*	*Rosaceae*	common almond	tree	seed	genetic value
Kazakhstan	*Vitis vinifera L.*	*Vitaceae*	wine grapes	liana	fruit	genetic value
Kazakhstan	*Linum spp*	*Linaceae*	flax	flowering plant	seeds, fibers	economic
Kazakhstan	*Carthamnus spp*	*Asteraceae*	safflower	flowering plant	seeds, flowers	economic
Kazakhstan	*Eruca spp*	*Brassicaceae*	eruca	flowering plant	leaves	Economic

Table 5. Continued

Kazakhstan	*Brassica spp*	*Brassicaceae*	mustard plant	weed	seeds	economic
Kazakhstan	*Medicago spp*	*Fabaceae*	medick, burclover	flowering plant	whole plant	economic
Kazakhstan	*Daucus carota L*	*Apiaceae*	wild carrot	flowering plant	root, leaves	economic
Kazakhstan	*Portulaca oleracea L*	*Portulacaceae*	pursley	succulent	leaves, stems, flowers	economic
Kyrgyzstan	*Thalictrum foetidum*	*Ranunculaceae*	meadow rue	grass	leaves, stems	medical
Kyrgyzstan	*A.karacolicum*	*Ranunculaceae*	aconits	flowering plant	leaves, flowers, stems	medical
Kyrgyzstan	*Inula grandis M.kirghisorum*	*Asteraceae* *Rosaceae*	elecampane, inula kyrgyz apple	flowering plant tree	stems, roots, flowers, fruits	medical
Kyrgyzstan	*Leonurus turkestanicus*	*Lamiaceae*	motherwort	herb	leaves, stems	medical

Table 6. Continued

Kyrgyzstan	*Thermopsis turkestanica*	*Fabaceae*	thermophasis	herb	leaves, stems	medical
Kyrgyzstan	*Hypericum perforatum*	*Hypericaceae*	saint-johns wort	herb	leaves, stems, flowers	medical
Kyrgyzstan	*Origanum vulgare*	*Lamiaceae*	marjoran	herb	leaves	medical
Kyrgyzstan	*Hippophae rhamnoides*	*Elaeagnaceae*	sea-buckthorn	shrub	fruit	medical
Kyrgyzstan	*Ephedra equisetina*	*Ephedraceae*	ephedra	shrub	stems	medical
Kyrgyzstan	*Veratrum lobelianum*	*Melanthiaceae*	hellebore	flowering plant	roots, stems	medical
Kyrgyzstan	*Tussilago farfara*	*Asteraceae*	colt's foot	flowering plant	stems, leaves, flowers	medical
Kyrgyzstan	*Polygonum coriarium*	*Polygonaceae*	polygonum	grass		economic
Kyrgyzstan	*Glycyrrhiza glabra*	*Fabaceae*	Liquorice	herb	roots, leaves	Economic

Table 7. Continued

Kyrgyzstan	*Anabasis aphylla*	*Amaranthaceae*		herb, subshrub	whole plant	economic
Kyrgyzstan	*Euphorbia ferganica*	*Euphorbiaceae*	spurge	shrub	leaves	economic
Tadzhikistan	*Hordeum bulbosum*	*Poaceae*	barley	grass	seeds	genetic value
Tadzhikistan	*Fritillaria regelii*	*Liliaceae*	fritillaria	flowering plant	flowers, blubs	genetic value
Tadzhikistan	*Tulipa subquinquefolia*	*Liliaceae*	tulip	flowering plant	flowers, bulbs	genetic value
Tadzhikistan	*Punica granatum*	*Lythraceae*	pomegranate	shrub	fruits	genetic value
Tadzhikistan	*Ficus carica*	*Moraceae*	fig	tree	fruits	genetic value
Tadzhikistan	*Juglans regia*	*Juglandaceae*	persian walnut	tree	fruits, seeds	genetic value
Tadzhikistan	*Pistasio verae*	*Anacardiaceae*	pistachios	tree	fruits, seeds	genetic value

Table 8. Continued

Tadzhikistan	*Ungernia victoris*	*Amaryllidaceae*	ungernia	flowering plant	stems, leaves	unique, endemic
Turkmenistan	*Haloxylon persicum*	*Amaranthaceae*	white saxaul	tree	wood	genetic value
Turkmenistan	*Poa bulbosa*	*Poaceae*	poa	grass	stems	genetic value
Turkmenistan	*Carex pachystylis*	*Cyperaceae*	carex	grass	stems, seeds	genetic value
Turkmenistan	*Ephedra intermedia*	*Ephedraceae*	ephedra	shrub	stems, seeds	genetic value
Turkmenistan	*E.equisetina*	*Ephedraceae*	mongolian ephedra	shrub	stems, seeds	genetic value
Turkmenistan	*Elytrigia sp*	*Poaceae*	elytrigia	grass	seeds	genetic value
Turkmenistan	*Artemisia ciniformis*	*Asteraceae*	sagerbrush	shrub	leaves, fruit	genetic value
Turkmenistan	*A.Gypsacea*	*Asteraceae*	sagerbrush	shrub	leaves, fruit	genetic value
Turkmenistan	*A.badhysi*	*Asteraceae*	badhys sagebrush	shrub	leaves, fruit	genetic value
Turkmenistan	*Salsola dendroides*	*Amaranthaceae*	salsola	shrub, subsharub	leaves	genetic value

Table 9. Continued.

Turkmenistan	*S.orientalis,*	*Amaranthaceae*	salsola	shrub, subsharub	leaves	genetic value
Turkmenistan	*S.gemmascens*	*Amaranthaceae*	salsola	shrub, subsharub	leaves	genetic value
Turkmenistan	*Morus alba*	*Moraceae*	white mulberry	tree	leaves, fruit	economic
Turkmenistan	*M. Nigra*	*Moraceae*	black mulberry	tree	leaves, fruit	economic
Uzbekistan	*Amygdalus bucharica*	*Rosaceae*	wild almond	tree	seeds	economic
Uzbekistan	*Pyrus turcomanica Maleev*	*Rosaceae*	turkemen pear	tree	fruit	economic
Uzbekistan	*Ziziphus jujuba L*	*Rhamnaceae*	red date	tree	fruit	economic
Uzbekistan	*Ajuga turkestanica*	*Lamiaceae*	ajuga	flowering plant	leaves	medical
Uzbekistan	*Leonurus turkestanicus*	*Lamiaceae*	motherwort	flowering plant	leaves	medical

Table 10. Continued.

Uzbekistan	*Leonurus panzerioides* Popov	*Lamiaceae*	shell shaped motherwort	flowering plant	leaves	medical
Uzbekistan	*Marrubium alternidens* Rech	*Lamiaceae*	horehound	flowering plant	leaves, stems	medical
Uzbekistan	*Phlomis bucharica* Rgl.	*Lamiaceae*		flowering plant	leaves, flowers	medical
Uzbekistan	*P. Thapsoides bge*	*Lamiaceae*		flowering plant	leaves, flowers	medical
Uzbekistan	*Scutellaria ramosissima* M. Pop	*Lamiaceae*	stachys	flowering plant	leaves, flowers	medical
Uzbekistan	*Stachys betoniciflora* Rupr	*Lamiaceae*	stachys	flowering plant	leaves, flowers	medical
Uzbekistan	*Thymus seravschanicus* Klok	*Lamiaceae*	thymus	flowering plant	leaves, flowers	medical
Uzbekistan	*Allium verticellatum* Rege	*Amaryllidaceae*		herbaceous perennial	bulbs	unique, endemic
Uzbekistan	*Astragalus thlaspi* Lipsky	*Fabaceae*	astragalus	flowering plant	stems, leaves	unique, endemic
Uzbekistan	*Zygophyllum bucharicum* B. Fedtsch.	*Zygophyllaceae*	buhara beancaper	shrub	leaves, fruits	unique, endemic

Table 11. Continued

Uzbekistan	*Cleome gordjaginii* Popov	*Cleomaceae*	gorjanin cleome	flowering plant		unique, endemic
Uzbekistan	*Fumariola turkestanica* Korsh.	*Papaveraceae*		flowering plant	leaves, flowers	unique, endemic
Uzbekistan	*Dionysia hissarica Lipsky*	*Primulaceae*		flowering plant	Leaves	unique, endemic
Uzbekistan	*Cephalorhizum oopodum* Popov & Korovin	*Plumbaginaceae*		flowering plant		unique, endemic
Uzbekistan	*Ostrovskia magnifica* Regel	*Campanulaceae*		flowering plant		unique, endemic
Uzbekistan	*Thesium minkwitzianum* B. Fedtsch.	*Santalaceae*		flowering plant		unique, endemic
Uzbekistan	*Kamelinia tianschanica*	*Apiaceae*		flowering plant		unique, endemic
Uzbekistan	*Nanophyton botschantzevii* U.P. Pratov	*Amaranthaceae*		undershrub		unique, endemic
Uzbekistan	*Kuramosciadium corydalifolium* Pimenov, Kljuykov & Tojibaev	*Apiaceae*		flowering plant		unique, endemic

References: [58], [63], [64], [59], [65], [66], [67], [68], [69].

6. Discussion

The main threat to biodiversity and ecosystem services is human conversion of those natural habitats [70]. It is commonly known that loss of biodiversity and poverty are linked and those problems should be approached together [71]. However, it is possible to manage agricultural landscapes to host wild biodiversity with positive effects on agricultural production and livelihoods [72]. Studies suggest two approaches: broad stroke, globalized biophysical-technical solutions, and more complex, locally contextualized social-ecological solutions [73]. Another great source of solution is traditional knowledge, the advantage of which is long time observing by indigenous people, opposing to relatively short-term scientific researches [74]. Some action plans and strategies have been proposed already. Among them is the Preservation Biodiversity Strategy for the Region of Europe and Central Asia proposed by World Bank. For Central Asia the areas of priority are: increasing efficiency management of ecosystems and local commercial activities involving local communities; integrating ecosystem restoration into agricultural land use and water use; support and strengthening the state and public institutions; supporting the development of external cooperation for raising the funds to finance biodiversity conservation activities [75].

7. Conclusion

The main objective of this study was to document the current status of agrobiodiversity in Central Asia. Central Asian region covers a large and remote area of land, therefore containing unique ecosystems being home for wide variety of plant and animal species. From all the documented species representing current state of agrobiodiversity number of species possessing broader key importance for the world were listed in the table above. 6 species of genetic value, 7 species having economic value were found in Kazakhstan. In Kyrgyzstan 11 medical species and 7 species of economic value were documented. In Tadzhikistan there currently are 6 species of genetic value, 2 species of economic value and 1 unique and endemic value, representing key importance were identified, for Turkmenistan those number are: 9 species of genetic, 2 species of economic value. Species possessing great importance in Uzbekistan are 9 medical, 3 economically valuable and 12 unique and endemic species. Those plant species contribute to the greater biodiversity of our planet. Conversation of which is crucial for our future. Traditional knowledge plays a great role in this. The main

possessor which are usually vulnerable local rural communities. It can be concluded, that the best strategy for biodiversity conversation would be saving and using traditional knowledge, supporting local communities and reducing poverty and promoting sustainable development among them.

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