Proposal of Candidate System

For

The Globally Important Agricultural Heritage Systems (GIAHS) Programme

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Aohan Dryland Farming System

Location: Aohan Bannery, Chifeng City, Inner Mongolia Autonomous Region, P.R. China

People's Government of Aohan Banner, Inner Mongolia Autonomous Region

April 19, 2012

Summary Information

a. Country and Location: Aohan Banner, Chifeng City, Inner Mongolia Autonomous Region, P.R. China

b. Program Title/System Title: Aohan Dryland Farming System

c. Total Area: 8294 km^2

d. Ethnic Groups: Mongolian (5.34%), Manchu (1.11%), Hui (0.29%), Han (93.21%)

e. Application Organization: People's Government of Aohan Banner, Chifeng City, Inner Mongolia Autonomous Region, P.R. China

f. From the National Key Organization (NFPI): Ministry of Agriculture, P.R.China

g. Governmental and Other Partners

- Centre for Natural and Cultural Heritage (CNACH) of Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS)
- Department of Agriculture of Inner Mongolia Autonomous Region, P.R. China

h. Summary

Aohan Bannery is located in the southeast of Chifeng City, Inner Mongolia Autonomous Region, China. It is the interface between China's ancient farming culture and grassland culture. From 2001 to 2003, carbonized particles of foxtail and broomcorn millet were discovered by archaeologists in the "First Village of China", Xinglongwa in Aohan Bannery. These grains dating from 7700 to 8000 years ago are proved to be the earliest relics of cultivated foxtail and broomcorn millets known to the world. Because millets are grown on dryland slopes, their plant type is small, which makes it difficult to use mechanized farming methods. That's why traditional techniques have prevailed until now. As a result, many skills and experiences have been accumulated over the long years of farming practice, and unique local dry farming cultures have been formed, including farming proverbs, food cultures and seasonal customs. These have been inherited for generations. Nevertheless, due to the effects of modern economic, social, and value changes, this traditional farming culture is facing threats and challenges from various sources. It is urgent to explore the values of this important system and protect it in a dynamic way.

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1. Description of the System

1.1 Location and Natural Conditions

Aohan Banner is located in the southeast of Chifeng City, Inner Mongolia, N41°41′-43°02′and E119°30′-120°53′. The total area is 8294km^2 with an irregular diamond shape. Aohan Banner is on the northside of Nuluerhu Mountain, the east part of Yanshan Mountain range, and on the south edge of Horqin sandy land. Aohan Banner is connected to Naiman Banner in the east, to Jianping County of Liaoning Province in the west, to Beipiao County and Chaoyang County of Liaoning Province in the south, and finaly to Wengniute Banner in the north (Fig. 1). Aohanqi currently governs 15 towns. Among them, Xinglongwa village in Baoguotu town is the place where the carbonized particles of foxtail and broomcorn millet from 8000 years ago were discovered by archaeologists.

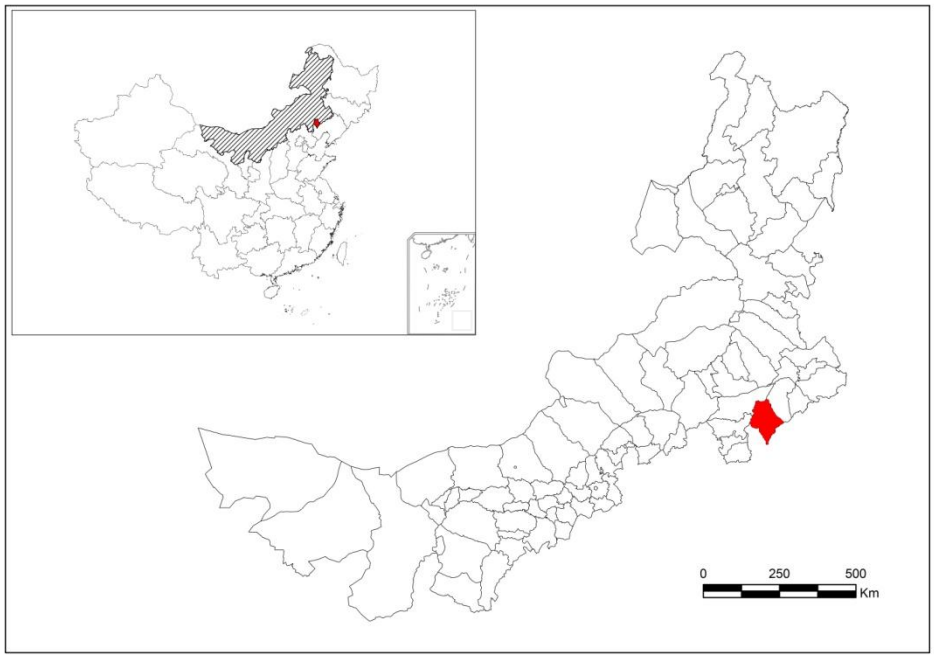

Fig. 1. The location of Aohan Banner

The geographic characteristics of Aohan Banner are complicated, with low mountains and hills in its south part, loess hills in the center, and desert plains in its north part. The southwest terrain is higher than the northeast. The elevation is approximately 350-800m, and the highest mountain peaks at 1255m. Aohan Banner's main rivers include Laoha River, Mengke River, Aolaihe River, Mangniu River, and Laohushan River, with an average flowing capacity of 320 million m^3 and a total groundwater recharge capacity of 260 million m^3 annually. Among them, the total length of Laoha River within Aohan Banner is 149km, and its primary tributaries include Bang River, Yinma River, and Shuiquan River, with the total drainage area of 1900km^2; the total length of Mengke River within Aohan Banner is 157km, with the total drainage area of 2742km^2; The total length of Aolai River within Aohan Banner is 149km, and its primary tributaries include Baitazi River, Kelidai River, Tengkeli River, Shelihu River, Qiangouzi River, Julingou River, Yima River, Shuangwopu River, Gaoliban River, and Lijia Wopu River, with the total drainage area of 2550km^2. The suitable natural environment makes it one of the major places for human activities in the history.

Aohan Banner is located in the transition zone, from warm temperate semi-humid climate zone to temperate semi-arid climate zone. It is also in the ecological transition zone, from semi-humid forest landscape to semi-arid grassland. It belongs to the temperate continental monsoon climate area, with an annual average temperature of 4.9℃-7.5℃ and a ≥10℃ accumulated temperature of 3000-3200℃. The frost free period is 145-166 days and the freeze period is 100-135 days per year, with a cryosphere of 40-60cm. The annual precipitation is 310-460mm. This region has sufficient sunshine; most areas have 2800-3100 hours of sunshine annually, and the sunshine rate is 67.8%. This type of climate is ideal for the dryland farming system.

1.2 Crop Cultivation Situation

Aohan Banner is an important crop production area, which forms an agriculture structure that combines farming, forestry and animal husbandry together, among

which farming is dominant. This Banner is a typical dry farming area and abounds with green grains such as foxtail millet, broomcorn millet, buckwheat, sorghum, beans, etc. Millet is the second largest crop, following corn, and is also the largest grain crop (Fig. 2). In 2003, Aohan Banner started the million-acre green grain base development project, and completed a production base with 400 thousand acres of foxtail millet, 100 thousand acres of buckwheat, 150 thousand acres of sorghum, and 300 thousand acres of beans. Currently, registered brands of grains of Aohan Banner include “Niu Li Gao” buckwheat noodle, “Tian Ran” millet, “Lao He” rice, “Bei Guo Xiang” sunflower, and “Xin Zhou” black beans, etc.

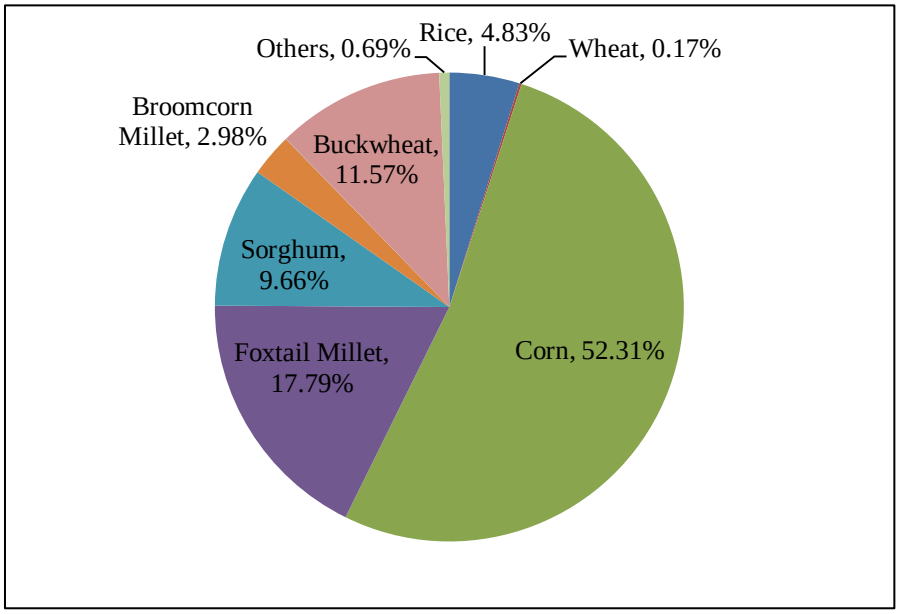

Fig. 2. Planting Structures in Aohan Banner

According to information provided by Department of Agriculture of Aohan Banner, the millets is mainly planted in the southeast part, grain and bean are mainly planted in the central and western part, corn is mainly planted in the northeast part, and only a small area of rice is planted in the northwest part.

1.3 Biodiversity

1.3.1 The Diversity of Dry Farming Crops

Aohan Banner is a typical dry farming area with a wide variety of crop types with foxtail millet and broomcorn millet as representatives, which has a long history for over 8000 years (Annex 1). Those species is unique and irreplaceable in terms of biodiversity.

Fig. 3. Foxtail Millet

Foxtail millet (Setaria *italica*, Fig. 3), known as Ji or Su in ancient China, is commonly called Guzi in northern China. China is the largest foxtail millet producer, with almost 80% of the world's total millet yield. Ninety percent of the world's millet trade is from China. Foxtail millet is one of the main dryland crops in drought and semi-drought regions of northern China. It accounts for 5% of total area of crop planting in China, 10-15% in northern China, and 30-40% in some mountainous areas. It is only preceded by wheat and corn, which guarantee its important position in agricultural production. After the long term natural selection, its structure and physiological characteristics have adapted to the drought and semi-drought conditions. Indeed, foxtail millet has developed characteristics such as strong anti-drought ability,

high resistance ability, wide adaptability, high storage tolerance, high water saving ability and water utilization rate, adjustable sowing period, high tolerance to barren soil and salt. Moreover, it is nutritious and delicious, and has a high commercial and economic value, which contributed significantly to its economic development. Therefore, foxtail millet is a very important crop type in the Dryland Farming System. There is a wide variety of foxtail millet. Foxtail millet has many different colors, including white, red, yellow, black, orange, and purple. There is also sticky foxtail millet.

Fig. 4. Broomcorn Millet

Broomcorn millet (Panicum *milaceum*, Fig. 4) is also one of the main dryland crops in drought and semi-drought regions of northern China. It has similar physiological characteristics as foxtail millet, for example strong anti-drought ability and high storage tolerance, which make it an important crop in the Dryland Farming System. The world's cultivation area of broomcorn millet is approximately 5.5-6.0 million hm^2, mainly in Russia, Ukraine, and China. It can also be found in India, Iran, and Mongolia with small area of cultivation. China is the second largest broomcorn millet producer, with the total area of 1-1.2 million hm^2. The broomcorn millet in China is mainly planted in Inner Mongolia, Gansu, Shaanxi, Heilongjiang, Jilin, Hebei, Shanxi, Ningxia, etc. It is spreading from Hailar of Inner Mongolia

Autonomous Region in the north to Qionghai of Hainan province in the south, crossing around 30 latitudes, and from Tongjiang and Hulin of Heilongjiang province in the east to Habahe, Atushi, and Kashi of Xinjiang Autonomous Region in the west, crossing 67 longitudes; it is vertically distributed from Rizhao of Shandong province at 200m to Zhada and Pulan of Tibet Autonomous Region at more than 3000m, with an elevation difference for more than 2800m. There is a wide variety of broomcorn millets, such as Da Li Huang (large yellow grain), Da Zhi Huang (large yellow plant), Da Bai Shu (large white), Xiao Bai Shu (small white), Geda Shu (lump-like), Gaoliang Shu (sorghum-like).

Besides foxtail millets and broomcorn millets, the Aohan Dryland Farming System also cultivates crops such as corn, sorghum, wheat, barley, buckwheat, and rice; beans such as soybeans, black beans, lima beans, peas, broad beans, cowpea, red beans, green beans, and kidney beans; economic crops such as peanuts, rapeseed, sesame, sunflower, castor, flax, tobacco, and black melon seeds; and fruits and vegetables such as apples, pears, carrots, and Chinese cabbages, etc. Furthermore, there are also farm animals such as chickens, ducks, gooses, horses, cows, and sheep, etc.

1.3.2 Relevant Biodiversity

The biodiversity of Aohan Banner is very rich. The Dahei Mountain Natural Reserve, in Aohan Banner, is a comprehensive conservation area that protects diverse ecological systems including grasslands, forests, wetlands, historical landscape remains, rare wildlife habitats and the west Liaohe River water conservation land. Due to the unique geographic location and the environmental conditions of Aohan Conty, diverse ecosystems were formed, including mountain forest ecosystem, grassland ecosystem, wetland ecosystem, farmland ecosystem, and artificial forest ecosystem. There are more than 600 plant species within 6 vegetation types composed by grasslands, forests, shrubs, semi-shrubs, and meadows. There are 142 bird species, including 1 international protected bird, 1 national first class protected bird, and 21

national first class protected birds. There are also 29 mammal species and 158 insect species. Additionally, there are species of amphibians and reptiles, which provide the high biodiversity of this area.

1.4 Landscape Characteristics

Aohan Banner is a typical ecotone between agriculture and animal husbandry with complex geographic characteristics. The terrain features of the area vary greatly (Figure 13), including water (0.2%), alluvial plain (6.7%), valley (24%), loess tableland (27.9%), hills (24.3%), mountain (4.5%), pluvial plain (3.5%), and sands (8.9%).

Agriculture is the most important industry in Aohan Banner. The diverse geographic environment and the suitable climate provide favourable conditions for the dry farming cultivation. In Aohan Banner, dryland crops, such as foxtail millet and broomcorn millet, can be seen everywhere, which form a special sightseeing of the Aohan Dryland Farming System (Fig. 5).

Fig. 5. Landscape of the Aohan Dryland Farming System

Many records of the Dryland Farming System in Aohan were found. Su Song, whom served as an envoy to Liao twice in 1068 and 1077, has mentioned the

agriculture and husbandry of Liao in his poem, such as "farming and husbandry exist everywhere " and "fields are reclaimed from top to bottom as terraces", etc. The most typical poem is called “Niu Shan Dao Zhong” (Paths between the Mountains), which described agriculture and animal husbandry sights and a unique terrace field in the drought area.

Traditionally, different crops are interplant in the Aohan Dryland Farming System (Fig. 6). This type of interplanting or rotation of various crops makes the crops adapt to wet and drought conditions more easily, increase food security, and forms the colorful landscape.

Fig. 6. Intercropping in Aohan Banner

1.5 Traditional Dry Farming Technique

Aohan Banner has a long dry farming history for 8000 years. Ancestors have accumulated large amounts of skills and experiences through farming practice, on which is based the current unique agriculture production and culture system. Foxtail and broomcorn millets are not suitable for mechanical operations because of their small plant types and area. Traditional farming technique using cows and human labor has been applied for thousands of years. From ancient stone shovels, stone plows,

stone knives, and stone millstones used by the ancestors, to agricultural tools used for planting, plowing and harvesting nowadays, the modes are basically the same, which preserved the natural essence of the millets. The field management of foxtail and broomcorn millets is complicated. It requires a series of production process. Through the different stages of the process, it is possible to feel the strong influence of old techniques.

1.5.1 Sowing

Foxtail millet requires well-structured and soft soils, such as sandy loam or clay loam. The soil needs to be dry, with well drainage ability, low pesticide residuals, high fertility, and over 1.5% organic matter. The appropriate period for the sowing of foxtail millet is April to May.

Broomcorn millet is a thermophilic crop and is very sensitive to low temperature. The sowing period of broomcorn millet is the major factor that affects its production. If the broomcorn millet is sowed too early, lower temperature can delay the emergence of seeds and lead to rotten or frozen seeds. If the seedling is too late, seeds cannot be mature before the frost arrival and can easily be damaged, which would reduce the production yield and the quality too. Therefore, appropriate sowing is the key in its cultivation. The appropriate sowing period is usually around the middle of June. Generally, the broomcorn millet seeds are spread on mats and exposed to the sun for 2-3 days in order to increase germination rate before sowing. In order to prevent smut disease, seed dressing need to be applied before sowing, and the total weight is 0.2-0.3% of the millet seeds. Usually, 3 Kg of millet seeds per acre are needed in dry fields.

Fig. 7. Plowing

Fig. 8. Sowing

1.5.2 Cultivation and Management

Foxtail millet was generally sowed in a straight line along plowed ditches with 0.40m distance between ridges before 1950s. The density of plant was 225 thousands per hectare. The yield was 300-750kg·ha^{-1} without fertilizer and watering. In the beginning of the 1950s, field management was reformed and the distances between ridges were reduced, so that the density of plant was increased to 300-700 thousands per hectare and the yield to 600kg·ha^{-1}. In 1958, this technique was widely promoted and each ha yield was increased to 750kg. In the 1970s, fall deep plowing and spring water-conservation raking techniques were introduced, and the yield is up to 1500kg·ha^{-1}.

Broomcorn millet has the similar sowing method as foxtail millet with denser plants and with 0.36m distance between ridges. The appropriate amount of broomcorn millet seeds is 1.5 kg·mu^{-1}. After being pressured by stone roller twice, human treading can be applied. If extreme drought occurs after sowing and the soil is very dry, pressure can be applied multiple times to increase the water content in 0-20cm soil, which is an effective traditional way to fight drought.

Fig. 9. Raking

Fig. 10. Thinning

Fig. 11. Digging

1.5.3 Harvest

The foxtail millet will be harvested when over 90% of the grain granules turn into the appropriate color with few green ones. The millet can come out without powder if grinded by hand. The leaves of the lower parts are yellow with 2-3 green leaves on the top, and a small amount of straws start to break. The grains should be exposed to sun in the field or at home for 2 days after harvest.

The maturation periods for different parts of broomcorn millets are not at the same. Normally, the broomcorn millets are ready to be harvested when most granules are hard enough, the greenness disappears, the skin becomes glossy, the shells become white-yellowish while the stems have some green and the leaves are light green.

Fig. 12. Manual Harvesting

Fig. 13. Cutting the Spike

Fig. 14. Threshing Grains

Fig. 15. Winnowing

Fig. 16. Husking

1.6 The Advantages of Traditional Dry Farming Techniques

1.6.1 Water Saving

A great deal of water-saving experiences was accumulated on the dry farming agriculture of Aohan Banner.

(1) Alternative irrigation, alternatively irrigating one side of the crop roots each time, can not only control over irrigation and water lose, but also send signals to the dry side of the roots to control evaporation while the wet side absorb water, which can avoid leakage and reduce fertilizer losts.

(2) In drought areas and during dry seasons, sets of farming techniques such as interplanting and replacing plowing with softer soils, can increase the depth of water penetration and moisture level, which can reduce water usage.

(3) Covering the soil with plastic films, straws, or other materials that can reduce evaporation and run-off, and increase moisture, ground temperature, fertilizing ability and improve the physical characters of the soil. By doing so, water utilization rates and production are increased. Straw covering can usually save 15~20% of water and increase production by 10~20%.

1.6.2 Utilization of the Whole Plant

(1) Both the grains and the stems of foxtail millet can be used, which relieves the conflicts between farming and animal husbandry, and provides more food varieties.

(2) After harvested, the stems are placed back into the field directly, or chopped and combined with water and soil, and evenly distributed in the field after fermentation.

(3) The secondary conversion of straws is that straws can be used as forage for farm animals at first, and then animal sewages are applied as fertilizer. This technique can not only increase the utilization rate of the straws, but also avoid some of the problems of using the straws directly: especially, it can adjust the ratio of carbon and

nitrogen content in the organic matter, which is good for the conversion of organic matters in the soil and the adsorption of effective state nitrogen.

1.6.3 Disease and Pest Control

Farm fertilizer application, rotation and inter-planting are the main techniques used in the Aohan Dryland Farming System to control the pest diseases. Rotation is a scientific system that combines arable crops and soil improving crops, such as the rotation planting of broomcorn millets--potatoes--grains--beans--broomcorn millets, where broomcorn millets are cultivated every four years. This cycle can increase the soil fertility and reduce diseases and pests. Foxtail millet is also not suitable for replanting every year; it would not only cause damaging diseases and weeds, but also consume massively some key nutrients of the soil, causing unbalanced soil nutrition. It is very important to select fields to plant foxtail millet in a rotation way. A proverb says "repeated cultivation of foxtail millet in the same field would make you cry". An appropriate rotation is needed in order to adjust soil nutrients and regain growing ability while reducing diseases, pests, and weeds. The good pre-growing crops for foxtail millet include beans, potatoes and wheat. After a few years of alternate cultivation, semi-plowed or plow free fields need to be plowed deeply once during late fall before farming in order to solve issues such as uneven distribution of soil nutrients, thinness of the ground layer, parasitic diseases and pests.

Meanwhile, inter-planting techniques can control diseases and pests. For example, the shades provided by corn straws can reduce the rate of weed growth by 80%. The suppression of weeds reduces the parasitic sources for pests and therefore reduces the damage to crops.

1.7 Local Farming Culture

Unique local dry farming cultures of Aohan Banner were formed after a long term farming practice, including folk songs, techniques and other custom cultures that have been inherited from generations.

1.7.1 Farming Proverbs

The people of Aohan Banner summarized many farming proverbs over the long process of fighting against nature, and these are all precious treasures for farming practice.

Long-term proverbs for weather predictions include: “If it rains in August, then drought will continue till the May of next year”; “If clouds cover the moon during mid August, then there will be snow during January”; “Rainy July means dry August”; “Now rain during Lantern Festival means early spring, and no rain on Qing Ming Festival means cloudy June, no clouds on summer solstice means hot summer and no rain on Chong Yang Festival means sunny winter (all months are in lunar calendar)”.

Mid-term proverbs include: “You cannot buy drought with money in May”; “There will be enough food if it rains continuously in June”; “Droughts and floods are indicated in mid-July, and harvest is indicated in mid-August”.

Short-term proverbs include: “The air temperature increases two days after snow, and wind comes after the snow”. “If the clouds shaped like fish scales, then there is no need to turn over the grains when drying it”.

1.7.2 Seasonal Customs

Farming cultures have been famous since they were formed, and each activity is closely connected to farming, from the sacrifice activities in ancient times to the custom of blessing in modern times. Heaven worship, Fire worship, and aobao worship are common customs of Mongolians, furthermore, the star worship in January is a unique custom of the Mongolians in Aohan, and it is still preserved by the Niuxihe village in Sijiazi town. The Record of Aohan Banner wrote: the Mongolians held the star worship on January 8th in lunar calendar to prey for fortune. The national culture protection unit, the Shanchengzi relics in Aohan, is named the largest sacrifice center of northern China. During Qing Dynasty, Emperor Qianlong sent the Meixing Rock ("rock like a star") to Qingcheng Temple on January 8th in lunar calendar, so the star worship and sacrifice ceremony take place on that day each year. Everybody in

Niuxihe village gathers in front of Qingcheng Temple for this event every year. Before the ceremony begins, the monks need to make sculptures of the twelve zodiac animals, people, bowls, and lamps with flours as sacrifice objects. The process includes reading the sacrificial oration, grain spreading, and worshiping in hopes of fortune and good weather. The temple fairs, star worship, rain pray, light festivals, dragon dance, yangko dance, stilts, and local operas are all praying for fortune and celebrating good harvest. In addition, many archaeological findings are related to sacrifice.

Fig. 17. Rain Pray

Fig. 18. Dragon Dance

Fig. 19. Temple Fair

Fig. 20. Yangko Dance

Fig. 21. Stilts

1.7.3 Food Culture

Both foxtail millet and broomcorn millet are nutritious food source. Chinese people use them to make porridge considering their high nutrient values. The particles of foxtail millet are small, which make it easy to be processed and absorbed. There are many ways to consume broomcorn millet, including making rice, wine brewing, and local flavor snacks.

Fig. 22. Traditional Food

1.7.4 Relevant Activities of Weddings and Funerals

People have recognized agriculture as the foundation for survival at the very beginning, and they worship the agriculture god through sacrificial ceremonies to pray for good harvests. A pair of large stone shovels was found at the Xinglongwa relics. There is no evidence of use of the blade and its weight indicates that it is not suitable for farming, so it might be a type of special object that was used in sacrificial ceremonies to worship the so-called "shovel god" to pray for good harvests.

In today's condolence event, there is a square table in front of the coffin with four bowls of rice, and four 20cm straws are inserted in the rice. An incense burner is placed in front of the rice. A small straw-made basket with grains is placed on the left side of the coffin's head, and it is called grain storage. The relatives of the deceased go to the Jiu Shen Temple (Temple of Nine Gods) three times per day to pay, which is called "Bao Miao" ("temple reporting"). They also bring food to the temple, which is called "Jiang Shui".

2. Products and Services Provided by the System

2.1 Livelihood Service Functions

2.1.1 Food Safety

The crops of Aohan Dryland Farming System such as grains, green beans, buckwheat, and millets can provide food with various nutritional characteristics.

Aohan Banner is famous for its high food productivity. In 2010, the total area of crop cultivation in Aohan was 3 million acres, completing around 2.594 million acres of grain crops, 0.266 million acres of economic crops, and 0.145 million acres of other crops. The total yield was 0.8 billion kg. Aohan was named the "2010 pioneer county of crop production in China".

The effective accumulated temperature is high and the night/day temperature difference is large in Aohan Banner. Besides, most crops are planted where the soil and the air are unpolluted and farm fertilizers are used. Therefore, the food produced in Aohan has high quality and nutrition. It was said that "The grains of China are mostly from Chifeng, and high quality grains are mostly from Aohan Banner" and "the grains of Aohan Banner are originated from the nature"). Nowadays, Aohan's millets have been granted the famous organic millets and geographic landmarks that are protected by the banner.

The crops cultivated in Aohan are nutritious, especially foxtail and broomcorn millets. Foxtail millet is commonly named "best of hundreds of gains". It is very nutritious and valuable; it contains 11.42% protein, 4.28% fat, 0.19mg/100g of vitamin A, 0.63mg/100g of vitamin B1, sufficient amount of amino acid (Chart 3), and minerals including iron, Zn, Cu, phosphorus, and Ca. Millet has become very popular and is one of the most important foods for consumers. The very famous foxtail millets in Aohan Banner are nutritious millets in black, white, yellow, or green color.

The protein content of broomcorn millet is very high, usually around 12% and can sometimes reach above 14%, especially for glutinous millet, which usually contains around 13.6% and can reach 17.9%. Starch content is approximately 70%, while glutinous types contain 67% and above and non-glutinous types contain 72% and above. Fat content is normally around 3.6%. The contents of the 8 types of necessary amino acid in broomcorn millet are all higher than wheat, rice and corn, especially for methionine. Every 100g of wheat, rice, and corn contains 140mg, 147mg, and 149mg of methionine, respectively, while broomcorn millet contains 299mg of methionine. Broomcorn millet also contains B-carotene, vitamin E, vitamin B2, B2 and B6, and rich minerals such as calcium, magnesium, phosphorus, iron, zinc, and copper, which make it very excellent nourishment.

2.1.2 Providing Bio Fuel

Except for providing food products, the crops can also be used as farm fertilizer, forage, and fuel.

2.1.3 Securing Animal Husbandry Development

Aohan Banner is an interlaced zone of agriculture, forestry and animal husbandry. The high production of forage grass has provided security for animal husbandry in the area. In 2008, the total production of meat reached 100085 tons, milk 19016 tons, wool 3557 tons, and 1.598 million livestock animals.

2.1.4 Providing Employment Opportunities

Aohan Banner is a crop production region, and 90% of the population is rural. The regional dry farming mostly relies on human labor, which could be valuable on employment issues in rural areas. In addition, the manufacture of basic rural facilities, food processing, and animal husbandry have provided more job opportunities for Aohan people. The unemployment rate of Aohan Banner was only 3.6% in 2008.

2.2 Environmental Service Functions

2.2.1 The Values of Biodiversity Hereditary

Biodiversity is the treasure for future medical and life science research, the material foundation for the earth's life supporting system, and the foundation for maintaining the stability of the ecosystem. The foxtail and broomcorn millet cultivation in Aohan are original. They are particulary adapted to dry farming thanks to their short growth periods and their drought resistant capacity. Besides foxtail and broomcorn millet, Aohan has a wide variety of crops, and wild plants and animals. They are all valuable species and material assurance for food safety in the future.

2.2.2 Ecological Adaptation

Foxtail and broomcorn millets are resistant to drought, heat, salt and alkline, barren lands, and pre-maturation, which determined their significant place in the Dryland Farming System.

(1) Strong drought resistance. The water requirements for foxtail and broomcorn millets to sprout are equal to 26% and 25% of their seeds' weight, which are less than any other common crops (Table 5). They require less water since their plants are small, the growth of the above ground parts are relatively slow. The evaporation coefficients of foxtail and broomcorn millet are significantly smaller than other common crops. Regarding water usage, those two crops are the most economical.

(2) Less water requirement. Compared to corn and wheat, the growth period of foxtail and broomcorn millet is shorter and requires less water, which makes them more adapted to dry environmental conditions.

(3) Not strict sowing period. Foxtail and broomcorn millet can efficiently use the post-growth natural precipitation, which can offset the water lack during previous drought conditions. Foxtail and broomcorn millet can also be sowed earlier or later depending on the breed, depending on the weather conditions. Therefore, they are said to be the best drought resistant crops.

(4) Strong heat resistance. According to research results, the leave air holes of millets can tolerate 48 hours without opening when the air temperature is 38-40 ℃, while barley can only tolerate 20 hours and wheat can only tolerate 10-17 hours under the same temperature.

(5) Strong salt and alkaline tolerance. According to the Inner Mongolia Agricultural Science Institute, broomcorn millet can live normally on fields that have less than 35% of salt content and less than 0.06% of chlorine ion. According to the list of salt tolerant crops categorized by the Liaoning Branch Institute, the top ten crops are foxtail millet, sunflower, castor-oil plant, cotton, broomcorn millet, buckwheat, corn, wheat, potato, and soybean.

(6) Flexible sowing period. Foxtail and broomcorn millet have short growth period and can efficiently use summer precipitation, which not only enable the spring sowing in cold areas that have short growth period, but also can be sowed in warmer areas after summer crops harvest. If some spring crops miss the appropriate sowing time due to drought, millets can be sowed to grant a harvest. Additionally, the soil requirement for millets is not strict.

(7) High productivity. Like corn and buckwheat, foxtail and broomcorn millet are C4 crops that have strong photosynthesis ability. Even their growth period is short, their plant structures ensure them produce high amounts of nutrient contents and high yields.

(8) The production variation coefficients of foxtail and broomcorn millets are smaller compared to others. It is 17.94% for broomcorn millet, 20.71% for grains, 23.55% for corn, and 57.03% for wheat. This indicates that the production of millet is stable. The dryer the area is, the more significant they are.

2.2.3 Wind Prevention and Sand Stabilization

Aohan Banner is located on the border of the Horqin Sandy Land. Due to historical and natural reasons, it has become the most deserted area in Chifeng City. Aohan people have continued to plant grass and trees to prevent wind and fix sand

since the People's Republic of China was founded in 1949. For their great accomplishments, Aohan Banner was named the "Global Top 500" in ecological development by the UN in 2002, which increased the popularity of millets in Aohan and pushed their production and sales. Currently, the main tree species in Aohan include poplar, apricot, sea buckthorn, yellow willow, mulberry, sand pine, Chinese pine, pinus sylvestris, and larch, etc. These species can usually tolerate drought, sand, wind erosion and provide ecological protection.

2.2.4 Water and Soil Maintenance

The geographical features of Aohan Banner include 2/3 mountains and 1/3 plains. Many mountainious areas are consisted of sandy rock mountains and a few areas are consisted of loess hills. Due to the topographical differences between north and south, there are 2 forms of soil erosion. The precipitation for southern Aohan Banner is higher than that for the north areas, which is a typical water erosion area. The center area is a pluvial plain. As for the north, wind and sandy areas are distributed along the shore of Laohahe River, which make it a wind erosion area. The Aohan people took their efforts to control the soil erosion over the past decades and significantly improved agricultural production conditions and environment. Experiment results had showed that the soil erosion area of Aohan was 94% of its total area in 1987, and over 60% of it was above moderate level. From 1987 to 1995, moderate and extremely intense soil erosion was decreased 2 times.

2.3 Social and Cultural Functions

2.3.1 Cultural Heritage

The cultivation of foxtail and broomcorn millets has a long history and takes a very important place in Chinese ancient agriculture. It is recorded in Chinese historical records, ancient agriculture books, poetry, and regional records.

2.3.2 Distinguishing Agriculture

As people's living standard continues to improve, the level of consumption experiences qualitative changes. Dry farming crops such as foxtail and broomcorn millets have become a very important kind of food. People are used to consume yellow millets, yellow millet flour, fry millets, etc. Aohan represents an opportunity for developing millet production and has a good reputation in national and international markets. Therefore, speeding up the development of traditional millets through quality millet growth and promotion are particle needs for unique agriculture development.

2.3.3 Scientific Research

Aohan Banner is a typical dry farming area and has a wide variety of quality dry farming crops, which provided the basis for scientific researches on dry farming. Foxtail and broomcorn millet have experienced long terms of natural selection under disasters and barren environmental conditions: they are natural gene storage units.

2.3.4 Popular Science Education

Aohan Banner is one of the origins of foxtail, broomcorn millet and of dry farming in northern China. Both the carbonized millet particles from 8000 years ago that were discovered by archeologists and the various dry farming crops that are planted all over the area can provide science education for the youth and help them recognize the significance of dry farming culture and resources.

2.4 Quality of Livelihood

Over thousands of years of cultivation and heritage, green millets have become a large brand in Aohan Banner; foxtail and broomcorn millet are the best among them. Chemical fertilizers and pesticides are almost never used during crop development, producing a healthy and nutritious food. Furthermore, the area's ecosystem is well

preserved, without industrial pollution. The clean water and air have provided good living conditions for the residents.

3. Global Significance

3.1 The Significance of Dry Farming Agriculture in China

China is a large agriculture country with long history. The Chinese people have used their intelligence to build brilliant agricultural systems and inherite them. Agriculture is the economic foundation of Chinese. China is one of the origins of agriculture. Crops originated from China include rice, foxtail millet, broomcorn millet, soybean, and sorghum, etc.

The world's drought and semi-drought area is 48 million km^2, 35% of the total area, and spreading over 50 countries around the world. Among the 21 billion acres of farm fields in the world, 42.9% is located in drought and semi-drought areas, and only 15.8% is capable of irrigation. The drought and semi-drought areas in China are distributed along the north side of Kunlun Mountain-Qinling-Huai River. The area of farm fields is 45.55 million hm^2, 48% of the country's total farm field area. Among them, approximately 65% are not capable of irrigation.

3.2 The Significance of Dry Farming in Aohanqi

3.2.1 The Origins of Dryland Farming

Aohan Banner is the interchange zone of ancient farm culture and grassland culture, with a long agriculture history. A series of archeological cultures were discovered by scientists over around 3400 human settlement sites in the history and shocked the world. Those archeological cultures include "Xiaohexi Culture (~8200 years)", "Xinglongwa Culture (~8200-7400 years)", "Zhaobaogou Culture

(~7200-6400 years)", "Hongshan Culture (~6700-5000 years)" and "Xiaoheyan Culture (~4500-5000 years)" (Fig. 23).

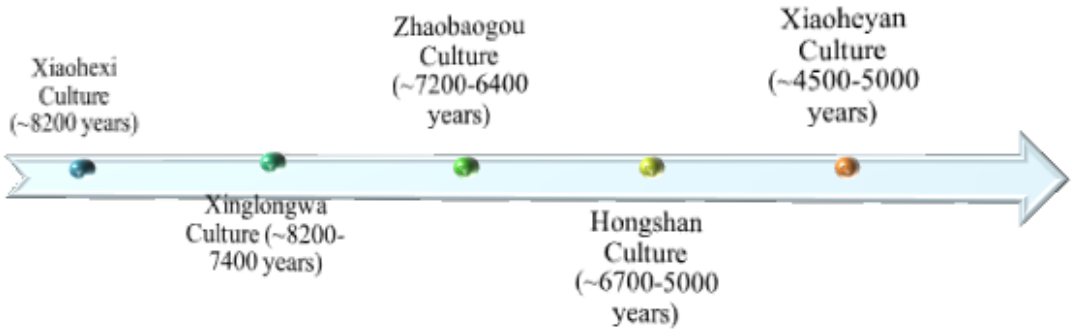

Fig. 23. Archeological Cultures in Aohan Banner

During the extensive excavation conducted by scientists at Xinglonggou during 2002-2003, more than 1500 carbonized grain particles formed 8000 years ago were discovered (Fig. 24 and Fig. 25). Among them, 90% were broomcorn millets and 10% were foxtail millets. Xinglongwa relics where the carbonized particles were discovered is named the "first village of China" by archeologists. Scientists proved that Aohan Banner is the origin place of foxtail and broomcorn millets and one of the origins of dry farming in ancient northern China.

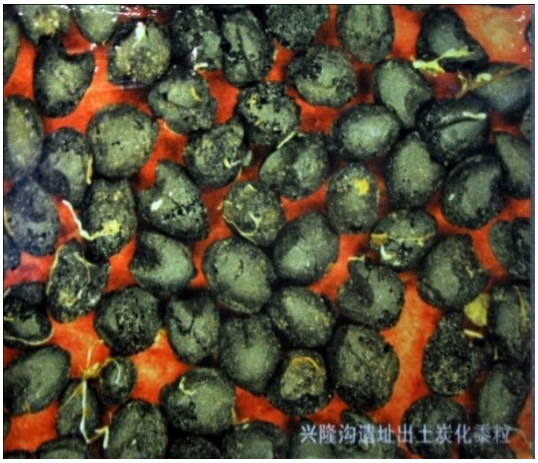

Fig. 24. Carbonized Broomcorn Millet Particles

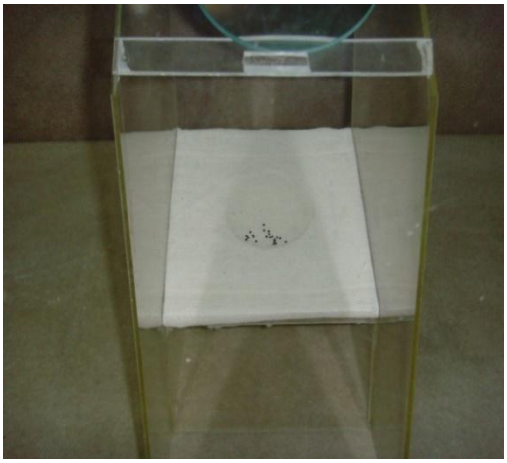

Fig. 25. Carbonized Foxtail Millet Particles

3.2.2 The Long History Dry Farming in Aohan

Through years of ancient relics investigations and archaeological works, 697 Neolithic relics were discovered in Aohan so far. Dry farming related tools such as hoe-shaped objects, shovels, knives, millstones, grinding rods, and axe-shaped objects, etc, were discovered in all of the five archaeological culture sites, which witness the origin and development of Aohan's agriculture.

(1) Stone implements discovered in Xiaohexi cultural relics include smashing devices, hoe-shaped objects, polished stone axes, chisels, ring-bladed tools, millstones, and grinding rods (Fig. 26 and Fig. 27). It indicated that hunting, fishing, and picking were the main economic activities at that time, and agriculture was in its very early stage.

Fig. 26. Stone Shovel from Xiaohexi

Fig. 27. Bone Tools from Xiaohexi

(2) During the Xinglongwa culture period, hunting had a very important place. Large quantities of ground-digging tools (stone hoes and stone shovels) and grain processing tools (millstones and grinding rods) (Fig. 28, 29, 30) were discovered in Xinglongwa. It indicates that agriculture had developed and reached a new stage: the cultivation one. The processing system started to emerge and a preliminary production pattern has been formed. Moreover, a number of fishing tools, plant and fruit stones were found in the housings of Xinglongwa; this indicates that farming, fishing, and picking co-existed during that period.

Fig. 28. Stone hoes from Xinglongwa

Fig. 29. Stone shovels from Xinglongwa

Fig. 30. Millstones and grinding rods from Xinglongwa

(3) Stone axes and stone spades were discovered in almost every house of Zhaobaogou Relics. Millstone and grinding rod sets were also discovered in large quantities. In addition, there were also some stone knives and compound knives (Fig. 31, Fig. 32). The discovery of these relevant tools indicated that agriculture has developed significantly during this period compared to Xinglongwa period. It was already very important in Zhaobaogou's economic structure.

Fig. 31. Stone spades from Zhaobaogou

Fig. 32. Pottery container from Zhaobaogou

(4) The agricultural production tools discovered in Hongshan were much more developed compared to those in Zhaobaogou; one of the remarkable signs is that large digging tools that were used for deep excavation and knives for grain harvest were commonly discovered (Fig. 33 and Fig. 34). The emergence of harvest tools is no doubt the result of agriculture development. The improvement of tools greatly increased the production efficiency, and the warm and humid environment provided the necessary conditions for agriculture development. Therefore, the agriculture of Hongshan culture has undergone an unprecedented development. The economic pattern of Hongshan culture is mainly agriculture, supplemented by hunting, picking, and fishing economy.

Fig. 33. Stone spades from Hongshan

Fig. 34. Harvest tools from Hongshan

(5) In addition to the appliances discovered in Xiaoheyan such as pottery pots, cans, vessels, object stands, bowls, and plates, production tools and art objects were also discovered, such as stone axes, adz, shovels, knives, round devices with holes, millstones, pestles, fine stoneware, and pottery spinning wheels, pottery pigs or dog heads (Fig. 35). The existence of various tools in different materials and for different purposes indicates how diverse the socioeconomic patterns of Xiaoheyan culture were. Multiple economic patterns were shaped at that time, including hunting, fishing, picking, agriculture, animal husbandry, and handcrafts.

Fig. 35. Pottery statue from Xiaoheyan

Agriculture has been one of the most important activities throughout the long history of human development. The evolution of agriculture was accompanied by the development of production tools. Signs of these ancient tools still remain in some of the farm tools used by people nowadays. Although some of these tools have evolved, their nature has not changed much. Those tools invite us to deepen our understanding about the ancient agriculture.

3.2.3 The Environmental and Biological Diversity of Aohanqi

With its diverse geographical features and complex biological environments, Aohan Banner has high biodiversity. As one of the origins of foxtail and broomcorn millet, Aohan has a long history of cultivation of those crops in extensive areas and

diverse ecological environments. Over long periods of natural and artificial selections, an abundant foxtail and broomcorn millet genetic resources has been formed. Diverse foxtail and broomcorn millets have become an important foundation for Aohan's systematic cultivation selection. In addition to foxtail and broomcorn, there are lots of other dryland farming crops. On one hand, the rich animal and plant resources can satisfy people's living needs, and on the other hand, the area has provided rich gene storage of plants and animals.

3.2.4 The Significance of Foxtail and Broomcorn Millet in Dry Farming

Foxtail and broomcorn millet are the main crops for disaster relief in the dry farming area of northern China. They have formed physiological mechanisms adapted to the ecological environment of drought and semi-drought areas, including drought resistance, early matured, and tolerance to barren conditions. They have become the backbone of continuous agricultural development in drought and semi-drought areas and determined their important place in dry farming. Meanwhile, foxtail and broomcorn millet have an interesting balance of nutrients and contain proteins, amino acids, and vitamins, and microelements such as selenium, calcium, copper, iron, zinc, iodine, and magnesium, etc. As people's diet structure changed over the past years, foxtail and broomcorn millet have received wide attentions as it is thought to be the ideal source of healthy foods.

3.2.5 Special Characteristics of Aohanqi's Dry Farming Technique

Drought and water shortage are global issues. Aohan Banner is located in the dry farming area of northern China, and drought is one of the key factors that affect the development of local agriculture. The Aohan Dryland Farming System has a long history and has witnessed the development of farming techniques, forming an anti-drought and soil saving farm solution, centered on plowing and raking. As for water saving techniques, a series of actions including building weirs, reducing water runoff on ground surface, and increasing the water storage ability of soils by

thickening the plow layer, were developed. The soil erosion was solved by reducing the frequency of plowing and applying straw coverage on the surface instead of loose soil on the surface. Rotations not only restrain degeneration and desertification trends of drought fields, but also ensure the sustainable development of soils and the graduate increase of crop production.

3.2.6 Heritage of Aohan's Dry Farming Culture

Aohan's agricultural heritages, such as dry farming historical relics, unique ethnic customs, civil crafts, and local languages, are essences inherited from traditional agriculture. They reflect the theories, techniques, mechanisms, and cultures of traditional agriculture, and provide references for contemporary agriculture in many aspects. The farm culture of Aohan includes techniques and management methods that correspond with the natural resources related to this area. It reflects the ecological relationship between farmers, soils and crops.

4. Development Opportunities

Developing the dry farming industry can not only fight drought threats, but also increase the value of traditional dry farming crops and improve the diet structure, which is extremely significant for national and international food safety issues.

4.1 Governmental Concerns

For the past few years, the government of Aohan Banner has attached great importance to agriculture heritage, organized several seminars and conferences with experts, assigned investigation teams to relevant areas to learn advanced experiences, and established GIAHS office to help applying for GIAHS pilot site and facilitate the conservation of this valuable system.

4.2 Public Attentions to Agriculture Heritage

The protection of agriculture heritage has raised a high level of concern worldwide. Since FAO initiated "globally important agricultural heritage systems" (GIAHS) project, 16 ancient agriculture systems around the world were already selected as GIAHS pilot sites by FAO. These traditional agriculture systems have increased their publicities and earned significant economical and social benefits after they became pilot sites, and in turn promoted the dynamic conservation and adaptive management of the systems. It is no doubt a great opportunity for the protection of the Aohan Dryland Farming System to apply for GIAHS pilot site.

4.3 Unique Hereditary Resources

Agricultural resources are important strategic supplies for ensuring food safety; protecting them is protecting food supplies for humans. Aohan Banner is a special dry farming supply resource and its abundant traditional agriculture varieties have provided conditions for the conservation of agricultural species, especially foxtail millet and broomcorn millet, which have 8000 years of history and developed characters such as resistance for drought, heat, salt and alkaline, and barren tolerance. It is very significant in the protection of heredity diversity.

4.4 More Attentions for Protection of Agricultural Species Resources

Specie resource crisis is an important part of the world's biological resource issues. Once species resources are gone, it means that many excellent genes that experienced billions of years of evolution would be lost. The data provided by the Food and Agriculture Organization of the UN is astonishing: from the early 20th century to the end of the 20th century, 75% of the world's agriculture species have disappeared, and today, thousands or even more species are disappearing from the earth annually. China is one of the most important agriculture origins in the world, with thousands of agricultural crops and related wild plant varieties nationwide.

Approximately 1200 cultivated species have made the number of specie resources in China one of tops in the world. However, due to rapid population growth, excessive resource exploitation over the past few decades, environmental pollution, climate change, and invasion of foreign species, China's agricultural species resources experienced unprecedented damages. The proportion of important species lost in China is 1/4 of the world, and large numbers of species are endangered. Currently, agricultural specie resources are receiving more concerns.

4.4 Advantages of Dryland Farming

The severe water issues have become one of the largest factors that hinder the sustainable development of northern China. That’s why dry farming techniques are the necessary choice for China, especially northern China, to fight water shortage and achieve sustainable agricultural development. The dry farming technology development enforces the efficient usage of water resources and higher crop production. The development of dry farming not only involves technological issues, but also socioeconomic issues. The economic benefits involve two main aspects: resource protection benefits, represented by water saving benefit, and production benefits, represented by high production benefit. The ecological benefits of dry farming are presented by two aspects: water/soil maintenance and ecological environment protection. Dry farming can reduce water usage, prevent runoffs, and protect the ecosystem by using appropriate farm mechanisms, water saving measures, and dry farming techniques. It has a positive effect in promoting local ecological environment development.

4.5 Public Awareness on Food Safety

As agricultural production standard continues to increase, the food security issue has been significantly relieved. Current food safety issues have turned to quality issues, and agricultural production development has transformed from quantity

assurance to quality requirements: ecological health and cultural diet. Residues of pesticides can directly affect human health, and pesticide poisoning has occurred repeatedly. According to the random checks on 362 kinds of foods from 7 categories conducted by the Chinese Bureau of Quality and Technical Supervision in 2001, the average qualification rate was only 70.7%. Under this serious situation, people started to search for the development of uncontaminated, green, and organic foods. People are more confident toward products that come from a place where agricultural heritage techniques and culture are maintained. The dry farming crops produced in Aohan Banner are organic and match people's requirements for food safety.

4.6 High Development Potentials of Dry Farming Products

Grain processing plants are all over the towns and villages of Aohan Banner. Grain brands such as "Woye", "Tianran", "China's Number One Village", and "Mengkehe", etc., have an annual processing capacity of over 10 million tons in total. As processing technology continues to improve, they will become important local enterprises. Those plants provide multi function and comprehensive services that cover the entire process of grain and bean productions, integrating production, processing, storage, transportation, and marketing into one. Over the past few years, the government of Aohan has made great efforts in promoting the industrialization of agriculture, including building bases for farm products, developing grain industries, and establishing various grain cultivation cooperative associations.

Currently, Aohan has signed long term supply contracts with multiple organizations including the Chinese Council for the Promotion of International Trade and Chinese Expert Assessment Center for Agricultural Produce Processing. With the guidance and help from the Research Center of Organic Agriculture at the Chinese Agricultural University, Beijing Orient Jiahe Certification Co., Ltd, and the Organic Agriculture Industry Alliances of China, the grains in Aohan will have great development prospects.

5. Threats and Challenges

5.1 The Values of Millets Have Not Been Fully Reflected

According to the data provided by Aohan Banner's annual statistical yearbooks, the cultivation areas for foxtail and broomcorn millet are relatively stable, with approximately 400 thousand acres of foxtail millets and 100 thousand acres of broomcorn millets. Because foxtail and broomcorn millets have well hereditary characteristics, rich nutrients, typical nature due to unique dry farming techniques, and deep cultural heritages, they have a great potential and require further explorations.

5.2 Unbalanced Input-Output Ratio

Because of their small size, the sowing of small quantities of millet particles by machines is complex. And because most areas are hilly, mechanized techniques are difficult to be applied. Most work for the Aohan Dryland Farming System is done by hand, for example thinning and weeding, which have led to intensive labor works. However, the income from millet cultivation is not very good. More people chose to plant other crops instead of millets.

5.3 Impacts of Modern Agriculture Technology

Modern agricultural technologies, such as the promotion of hybrids and the application of chemical fertilizers and pesticides, have significantly affected the traditional production of foxtail and broomcorn millets. Modern urbanization and industrialization have also affected the traditional techniques and culture of millets, which are now disappearing. The production of imported varieties is much higher than the traditional ones and can bring more economic profits: more farmers cultivate imported varieties.

Over the past few years, the prices of China's grain market have increased continuously and cultivating traditional varieties have brought in more profits than before, which have changed the situation. A series of production base were built for high quality grain and incubated a number of internal and external trading enterprises that use high quality grains as the dominate industry. Grain productions have formed a pattern that includes regional cultivation, large-scaled productions, and industrialized operation.

5.4 Not Perfect Market for Traditional Crop Varieties

Broom millet is cultivated in very large quantities in hills and sloppy areas in the northwest part of China with high yields and low prices. Nevertheless, knowledge regarding its deep processing is very limited. There are only few companies that use it for brewing and making fry rice, not to mention the other ways of deep processing. It will take a long way to make broom millet become one of the nutritious food resources in urban families. Moreover, due to weak research, inadequate investments, dispersed operations, and inaccessible transportation and communication, it is difficult for broom millet to enter the commercial trading market, and its diet values are not being reflected as they should.

As a type of cooked rice, the flavor of foxtail millet is similar to porridge; millet tastes better compared to rice. The place of it has dropped from staple food grain to supplementary one. Although foxtail millets are high in nutrients and have distinct pharmacological effects, 80-90% of the millets are used as raw materials for cooked rice and porridge, because the deep processing technology of millets in China is still at the initial stage, and some individual processing sites are concentrated in small businesses and family workshops.

The development of traditional local farming system is extremely valuable and has significant global effects on the protection of agricultural biodiversity and sustainability. However, these valuable effects have not been recognized at the national level. People have not fully realized the importance of the traditional

management system and knowledge, and the protection of agricultural biodiversity. The social pattern and traditional rules of adaptive management are usually not taken in consideration, which have caused the homogenization of nature laws, systems, and cultures.

6. Protection and Development

6.1 Actions in Progress

In order to promote the agriculture heritage of the Aohan Dryland Farming System, the Aohan Banner government has given high priority to apply GIAHS pilot site. Several committee meetings were organized to discuss this issue. The local government listed this program as one of the most important works. They also issued documents, organized leading groups and special offices to bring this work into right track. Moreover, all departments are supporting experts and scholars to gather information regarding Aohan Dryland Farming System. They also participated in various agricultural heritage events to learn valuable lessons from other GIAHS sites. Specific events are shown below:

(1) In 2010, the work of GIAHS declaration was started.

(2) In June, 2010, the Aohanqi governmental investigation group visited Beijing and organized a conference meeting with experts. Experts agreed on the fact that the traditional Dryland Farming System of Aohanqi qualifies for GIAHS declaration.

(3) In April, 2011, participated in the GIAHS dynamic and suitability management conference, and verbally applied for GIAHS declaration.

(4) In May, 2011, officially applied for GIAHS declaration and established the GIAHS work group led by the government of Aohanqi, and formed the GIAHS office.

(5) On June 9, 2011, participated in the FAO's international GIAHS forum in Beijing.

(6) In November, 2011, participated in the FAO's Agricultural Heritage and Tourism Development forum held in Honghezhou of Yunnan province.

(7) In December, 2011, accompanied by Dr. Qingwen Min, the deputy director from the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences, the representative of FAO's China, Mongolia, and North Korea offices, Mr. Percy Misika, and program officials, Mr. Weidong Dai and others, were invited for a two-day field investigation to the GIAHS candidate site, Aohanqi, in Inner Mongolia.

6.2 Work Plan

6.2.1 Formulate Protection and Development Plan

From the perspective of the protection and development of the Aohan Dryland Farming System, a series of plan would be worked out. The protection area will include three levels, including the core zone, buffer zone, and radiation zone. The core zone was set to Baoguotu town, the place where the carbonized particles of foxtail and broomcorn millet from 8000 years ago were discovered by archaeologists (Fig. 36). The buffer zone includes the place where millets and other grains are mainly planted (Fig. 37). The radiation zone covers the entire Aohan Banner. The core zone is emphasizing on the protection and development of organic agriculture, as the ecological dryland farming demonstration areas, and then gradually influences the buffer zone, and the entire Aohan Banner.

Fig. 36. Location of the core zone (Baoguotu Town)

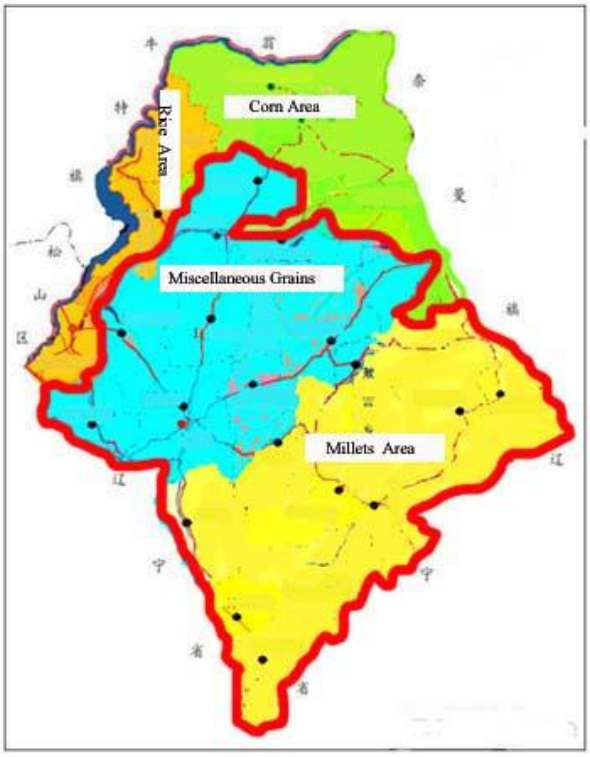

Fig. 37. Location of the buffer zone

Currently, Aohan's grain production has achieved better economic and social benefits than before. However, the research, production, and export of grains have not formed a good system: the enthusiasm of farmers for planting traditional crops is affected because of the low production, dispersed cultivation, disordered market trades, poor circulation, blind production, and unstable market prices. The government will pay more attention to the development of grain production.

In the conservation area, the grains will be cultivated in a large scale. The production standards will be unified and the production will be regulated and standardized by following the international market requirements. A strict follow-up is necessary to ensure the food quality. It is also necessary to establish a number of comprehensive leading enterprises with modern business systems and strength to effectively cooperate with research, cultivation, processing, and trading. It will form a new type of industrial group pushing the development of grain industry forward.

6.2.2 Establish Encouragement Mechanisms

A series of reasonable ER measures for agriculture have been taken by Aohan government, which bring great social and ecological benefits. First of all, the government has established preferential policies, for instance, giving subsidies to farm households that cultivate traditional grains for their expenses for seeds, plastic films, and fertilizers. Secondly, the agriculture and food department can carry out various measures to support the market development of traditional grains. For instance, the company sign order with farmers to tell them what crops to plant, the total areas they need to plant, and the standards they need to use for planting, etc. This kind of order agriculture has been developed by national food marketing enterprises. They can get loans from the Agricultural Development Bank and determine the order purchase prices based on the well-quality and well-prices principle. In this way, they can decide the types and the areas of traditional grains they will plant according to orders from the enterprises.

6.2.3 Increase Technological Support and Investment in Dry Farming

The diverse varieties of millets have been cultivated in Aohan for several thousands of years. It is necessary to deepen research on these resources in the future, which will provide a powerful scientific support for the development of the dryland farming in Aohan.

The priority is to improve the breeding system of quality crops. It is necessary to establish stable production bases at different levels, following the concentration and isolation principles. Production operations must closely follow technical regulations. The recovery and improvement of traditional breeding promotion system, strict quality assurance, and concerns on new and relevant crop productions are also important. The second step is to promote quality and unique new breeds, shorten the replacement cycle of quality breeds, and arrange reasonable distributions. The third step is to ensure the quality of experiments, demonstrations, promotions, and improve cooperation between researchers and agricultural breeding departments to push the industrialization of traditional crops forward, and establish standardized production technologies. The fourth step is to socialize seed services by developing multiple operation services revolving around the "pre-production, production, and post production".

Increase technological investments and accelerate research paces are important for the improvement of technological support on traditional millet breeds. By aiming at the problems in production, processing, conversion, and trading, technological support can solve a number of technical challenges and problems during millet production.

Developing researches on grain processing and industrialization are important for increasing the added values of the products. Grain production and food processing should be combined closely with the support of research. Grains for city markets, especially for exporting, should go through initial processing and their packaging quality should be improved in order to increase the value of the products. Food processing techniques should be improved in order to develop flavorful millet-based

organic food and nutritious food. Market sales can be extended by introducing fundings, technology, and operation patterns.

6.2.4 Improve the Quality of Agricultural Products and Market Competition Ability

Because of the household-based dispersed management and operation, grain production is still in a lagging situation with scatter planting, low harvest, and extensive management. As a result, it is difficult to promote and apply practical technology timely. To improve crop quality and market competitive ability, quality breeding and supply system should be established under the leadership of local governmental by providing management trainings to farmers, practicing reasonable prices based on quality.

The establishment of traditional grain deep processing system can rely on the leading enterprises. The guidance from leading enterprises is an important part in the development of industrial systems. Those enterprises can provide services to farmers and guide farm households. It is the key to develop the industrialize operations of traditional products. Leading enterprises and farm households are two separated economic bodies, and a win-win situation can be accomplished through cooperation.

As living standard increases, people tend to have diverse demands for millets. In addition to traditional yellow millet, green millet, black millet, and white millet they are now interested in new consumer. Currently, disadvantages such as low production and poor taste usually exist in green millet, black millet, and white millet. Improving the production quantity and quality of these special products should be the priority in order to have high yields and good quality products.

As the processing technology of millets develops, it is necessary to cultivate millets that match special processing needs. For example, millets with high oil content for bran oil (beauty product) processing, millets for puff foods processing, and millets for nourishment and vitamin processing, etc.

The goal is to increase the quantity and quality through breed selection, technology integration and promotion, large scale cultivation. The marketing will be improved by the leading enterprises, and an industrialized production pattern will be formed by combination of production based companies and farmer households.

6.2.6 Construct Relevant Policies and Legislations

The adjustment between the industrial structure and regional distribution will take place. Meanwhile, the local government will fully support the development of quality millet production bases, efficient water saving crops, grain productions in drought areas of northern China, and ensure the application of national food safety policies. It is necessary to fully understand the importance of foxtail and broomcorn millet in adjusting the cultivation structure in the drought areas of northern China. The industrial development of millet must build better millet production bases.

The promotion of the establishment of a standardized millet industrial system and technical services are the essential assurances for industrial development. The government should encourage and support the cooperation between agricultural technology promotion units and leading enterprises, professional farmer groups, research institutions, and colleges to form a new complementary technology pattern between promotional organizations and other groups. Guidance and encouragements should be provided to farmers to make them participate in technology trainings, in order to increase their knowledge of technology, marketing, cooperation, credit, and quality, etc… The government should also improve the conversion, commercial, and contribution rates of agricultural technology to enable technology to enter every step of the industrial chain.

The government and the relevant organizations should be highly concerned about the development of the grain industry and should combine it with the national great western development strategy and the "getting out of poverty" plan. By fully using the preferential policies, grain industrialization can become an important measure in developing the western rural economy and increasing farmers' incomes.

Traditional foxtail and broomcorn millet are nutritious, safe and healthy, and they can be used for food and pharmacological purposes. They are not only traditional foods, but also modern nourishment resources. Moreover, grains are a type of uncontaminated natural food because most of them are planted in remote mountain regions where the soils and air are still unpolluted, without any pesticide residues. These advantages indicate the high potential of the grain industry. As people's living standard improves, the demand for quality grains in China is increasing, and the medical and diet functions of grains can meet consumers' health requirements. The demand for grains in the national and international market will continue to grow, and the grain industry will definitely be welcoming new development opportunities.

Annex I. Agricultural Biodiversity

Crop	Variety	Growth Period (Days)	Variety Type
Foxtail Millet	Daqingmiao (Large Green Crop)	130-135	Traditional
	Ba Gou Dao	120-125	Traditional
	Dabaimao	139	Traditional
	Ganjian	115-120	Traditional
	Erqingmiao (secondary green crop)	125-130	Traditional
	Daobaqi (green)	125	Traditional
	Daobaqi (red)	105	Traditional
	Qitoubai	120	Traditional
	Laolaibian	125	Traditional
	Yapoche	120-130	Traditional
	Shengtoujin	115	Traditional
	Foshouben	110-120	Traditional
	Kuaifacai	124-130	Traditional
	Dahongmiao (major red crop)	125	Traditional
	Dabaigu (Large White Grain)	130	Traditional
	Erbaigu (secondary white grain)	130	Traditional
	Bodigao	125-130	Traditional
	Dalihong	125-130	Traditional
	sixty-day harvest	80	Traditional
	Hongmiao Xiaobaimi (Red Seed White Millet)	110-120	Traditional
	Heishatan	90-100	Traditional
	Red seed Zhusha	130	Traditional
	Green seed Zhusha	130	Traditional
	Foshou Sticky Grain	110-120	Traditional
	Golden Pendant	90-110	Imported
	Bangzihun	110	Imported
	No.2 Zhao Grain	125	Imported
	No.2 Zhao grain	130	Imported
	Shaanxi White Sticky Grain	134	Imported

	Daye Grain	130-135	Imported
Meizi	Small Yellow Meizi	80-90	Traditional
	Red Meizi	80-85	Traditional
Broomcorn Millet	Shu Grain	80-90	Traditional
	Yangliuban (Small White Millet)	100	Traditional
	Dabaishu (Large White Millet)	110	Traditional
	Dahongshu (Large Red Millet)	125	Traditional
	Sorghum Millet	90-100	Traditional
	Dahuangshu (Large Yellow Millet)	120	Traditional
Corn	Tongliao Huangmaya (Horse Teeth)	125	Imported
	Large Golden Cover	125	Imported
	Huangbatang	110-115	Traditional
	Large Straight Corn	118	Traditional
	Baibatang	110	Traditional
	Sidanba	135	Imported
	No.4 Jishuang	120	Imported
	Jishuang 101	120	Imported
Sorghum	Huangluosan (Yellow Umbrella)	125	Imported
	Daqingmi (Large Green Sorghum)	125	Traditional
	Jinmahuang	125	Traditional
	Guandong Green	120-130	Traditional
	Large White Sorghum	125	Traditional
	Small Green Sorghum	110-120	Traditional
	Bodigao	125	Traditional
	Xiaobaise	120	Traditional
	Dahuangke (Large Yellow Shell)	120-125	Traditional
	Heiwoda	120	Traditional
	Large Red Sorghum	122	Traditional
	Dasheyan (Large Snake Eye)	118-125	Traditional
	Daluochui	110-115	Traditional
	Waibozi Zhang	105-110	Traditional
	Bayeqi	103-110	Traditional
	Sticky Sorghum	110	Traditional

	No.1 Aohanqi Hybrid	120	Imported
	No.2 Aohanqi Hybrid	120	Imported
	No.3 Aohanqi Hybrid	120	Imported
	No.4 Aohanqi Hybrid	120	Imported
Rice	Mirong	120-180	Imported
	Xiaohongmang	110	Imported
Wheat	Gansu 96	100-110	Imported
	Liao 25-3	100	Imported
Buckwheat	Small Granule	85	Imported
	Large Granule	80-90	Imported
Soybeans	Mancangjin	120-125	Imported
	Jingshanpu	120	Imported
	No.5 Jilin 12	135	Imported
	Dabaiqi	110-120	Traditional
	Daheiqi	120-130	Traditional
Black Beans	Large Black Bean	120-130	Traditional
	Small Black Bean	110-120	Traditional
Lima Beans	Small Lima Bean	120	Traditional
Peas	White Pea	110-120	Traditional
Broad Beans	Local Broad Bean	100	Traditional
Cowpeas	Large Cowpea	125-130	Traditional
	Flower Cowpea	80-90	Traditional
	Red Cowpea	90-120	Traditional
Red Beans	Red Bean	90-110	Traditional
	Flower Red Bean	90-110	Traditional
	White Red Bean	100-110	Traditional
Mung Beans	Large Mung Bean	80-90	Traditional
	Small Mung Bean	80-90	Traditional
Kidney Beans	Red Kidney Bean	120-125	Traditional
	Small Yellow Kidney Bean	70	Traditional
Sesames	Bawangbian	110	Traditional
	Batongbai	110	Traditional
Sunflowers	Peredovik	100	Imported

	Sandaomei	115-125	Traditional
Castors	Thorn Castor	130	Traditional
	Non-Thron Castor	120	Traditional
Flax	Local Flax	100-110	Traditional
Tobacco	Small Kuihua Tobacco	110	Traditional
	Large Kuihua Tobacco	125	Traditional
Watermelon Seeds	Dingxinbai (White Top)	100	Traditional
	Yiwofeng	100	Imported

Annex II. Associated Biodiversity

Pteridaphyta	
Family	**Species**
Selaginellaceae	*Selaginella sinensis* (Derv.) Spring
	Selaginella anlariscina (Beauv.) Spr. var. u-lanchotensis Ching.
Equisetaceae	*Equisetum arvense* L.
	Equisetum pretense Ehrh
Pteridiaceae	*Pteridiurm aquilinum* (L.) Kuhn var. Latiusculum (DeSv.) Underw. ex Heller
Sinopteridaceae	*Aleuritopteris argentea* (Gmel.) Fee
	Aleuritopteris argentea (Gmel.) Fee var. Obscura (Christ.) Ching
	Leptolepidium kuhnii (Milde) Hsing
Athyriaceae	*Athyrium berviflons* Nakai ex rnori
	Gymnocarpium disjuncturn (Rupr.) ChIng
	Gymnocarpium drypteris (L.) Newan
Aspleniaceae	*Camptosorus sibiricus* Rupr.
Polypodiaceae	*Pyrrosia davidii* (Gies.) Ching
	Pyrrosia petiolosa (Christ) Ching
Angiospermae	
Family	**Species**
Salicaceae	*Populus davidiana* Dode
	Populus pseudo – simonii kitag.
	Salix linearistipularis (Franch.) Hao
	Salix pentandra L.
	Salix raddeana lahsch. ex Nas
Juglandaceae	*Juglans mandshurica* Maxim.
Betulaceae	*Betula chinensis* Maxim.
	Betula dahurica Pall
	Corylus heterophylla
	Corylus rnandshurica Maxim. et Rupr.
	Ostryopsis davidiana Decne
Fagaceae	*Quercus mongolica* Fisch. ex Turcz
	Quercus liaotungensis Koidz

Ulmaceae	*Celtis bungeana* Blume
	Ulmus japonica
	Ulmus macrocarpa Hance
	UImus pumila L.
Moraceae	*Cannabis sativa* L.
	Humulus scandens (Lour.) Merr.
	Morus alba L.
	Morus mongolica Schneid.
Urticaceae	*Pilea pumila* (L.) A. Gray
	Urtica angustifolia Finch. ex Hornem.
Santalaceae	*Thesium longifolium* Turcz.
Aristolochiaceae	*Aristolochia contorta* Bunge
Polygonaceae	*Fagopyrum tataricum* (L.) Gaertn.
	Polygonum alopecuroides Turcz. ex Bess.
	Polygonum aviculare L.
	Polygonum bistorta L.
	Polygonum bungeanum Ttircz.
	Polygonum convolvulus L.
	Polygonum dentato—alatum Fisch. ex Maxim
	Polygonum divaricatum L.
	Polygonum hydropiper L.
	Polygonum koreense Nakai
	Polygonum lapathifoliwn L.
	Polygonum maackianum Regel.
	Polygonum manshuricola Kitag.
	Polygonum manshuriense V. Petrov
	Polygonum persicaria L.
	Polygonum sieboldii Meisn.
	Polygonum viviparum L.
	Rumex crispus L.
Chenopodiaceae	*Axyris arnaranthoides* L.
	Chenopodium album L.
	Chenopodium aristatum L.
	Chenopodium foetidum Schrad.
	Chenopodium hybridum L.

	Kochia stoparia (L.) Schrad.
	Kochia scoparia (L.)Schrad. var. Sieversiana (Pall.) Ulber ex Archers. et Graehn.
	Salsola collina Pa11.
Amaranthaceae	*Amaranthus retroflexus* L.
Portulacaceae	*Portulaca oleracea* L.
Caryophyllaceae	*Arenaria capillaris* Poir.
	Arenaria juncea Bieb
	Dianthus chinensis L.
	Dianthus chinensus L. var. versicolor (Fisch. ex Link) Y. C. Ma
	Dianthus chinensis L. f . ignescens (Nakai) kitag.
	Lychnis fulgens Fisch
	Lychnis cognate Maxim
	Melandrium apricum (Turcz.) Rhrb.
	Melandrium brachypetalum（Horn.) Fenzl
	Melandrium firmum (Sieb. et Zucc) Rohrh.
	Melandrium finnum (Sieb. et Zucc.) Rohrb. var. pubescens (Makino) Y. Z. Zhao
	Pseudostellaria davidii (Fr.) Pax. Et Hoffm.
	Silene jenisseensis Willd.
	Silene repens Part.
	Stellaria dichntoma L.
	Stellaria dichltoma L. Var lanceloata Bunge
	Stellaria discolor Turcz. ex Fenzl
Ranunculaceae	*Aconitum oreanum* (Lev1.) Rapaics
	Aconitum kusnezoffii Reichb.
	Cirnicifuga dahurica (Turcz.) Maxim.
	Clematis brevicaudata
	Clematis heracleifolia DC.
	Clematis hexapetala Pall.
	Clematis sibirica (L.) Mill.
	Delphinium grandiflorum L.
	Paeonia lactiflora Pall.
	*Pulsatilla chinensis (*Bunge) Rgl.
	Ranunculus chinensis Bunge
	Ranunculus japonicas Thunb.

	Ranunculus rigescens Turcz. ex Ovcz.
	Ranunculus sceleratus L.
	Thalicfrum aquilegifolium L.
	Thalictrum baicalense Turcz.
	Thalictrum foetidum L.
	Thafictrum minus L.
	Thalictrum petaloideum L.
	Thalictrum petaloideum L. var. suprade-compositurn (Nakai) Kitag.
	Thalicfrum simplex L.
	Thalictrurxi squarrosum Steph. ex Willd.
Menispermaceae	*Menispermum dahuricum* DC
Magnoliaceae	*Schisandra chinensis* (Turcz.) Baill
Papaveraceae	*Chelidonium majus* L.
	Corydalis sibirica (L. F.) Pers.
Cruciferae	*Arabis pendula* L. var. hypoglauca Franch.
	Capsella bursa—pastoris (L.) Medic
	Clausia trichosepala (Turcz.) Dvorak
	Descurairia solhia (L.) Webbex.
	Dontostemon dentatus (Bungs) Ledeb
	Dontostemon micranthus C. A. Mey.
	Erysimum bungei Kitag.
	Erysimum cheiranthoides L.
	Eruca sativa Mill.
	Lepidium apetalum Willd.
	Rorippa globosa (Turcz.) Thell.
	Rorippa islandica (Oed.) Borbas
	Sisymbrium heteromallum C. A. Mey.
	Thlaspi thlaspidioides (Gall.) Kitag
Crassulaceae	*Hylotelephium erythostictum* (Mia.) H. Ohbo
	Orostachys fimbriatus (Turcz.) Berger
	Sedum aizoon L.
	Hylotelephium tatarinowii (Maxim) H.Oh-ba
Saxifragaceae	*Astilbe chinensis* (Maxim.) Franch. et Sa-vat.
	Deutzia amurensis (Regel.) Airy-shave
	Deutzia grandiflora Bunge

	Deutzia parviflora Bunge
	Deutzia prunifolia Rehder
	Parnasia palustris L.
	Philadelphus pekinensis Rupr.
	Philadelphus tenuifolia Rupr. et Maxim.
	Ribes pulchellum Turcz.
Rosaceae	*Agrimonia pilosa* Ledeb.
	Chamaerhodos canescens J. Krause
	Chamaerhodos erecta (L.) Bunge
	Crataegus pinnatifida Bunge
	Fragaria orientalis Lozink
	Geum aleppicum Jacq.
	Malus baceata (L.) Borkh
	Potentilla anserina L.
	Potentilla betonicaefolia Bornm.
	Potentilla bifurca L.
	potentilla chinensis Ser.
	Potentilla flagellaris Willd. ex Schecht.
	Potentilla fragarioides L.
	Potentilla longifolia Willd.
	Potentilla multicaulis Bunge
	Potenfilla multifida L.
	Potentilla nudicaulis Willd. ex Schlecht.
	Potentilla simulatris Wilf.
	Potentilla sugina L.
	Potentilla tanacetifolia Willd. ex Schlecht.
	Potentilla verticillaris Steph. ex Willd.
	Prunus humilis Punge
	Prunus tomentosa Thunb.
	Prunus sibirica L.
	Pyrus ussuriensis Maxim.
	Rosa davurica Pall.
	Sanguisorba officinalis L.
	Sanguisorba tenuilolia Fisch. var. alba Trautu
	Spiraea aquilegifolia Pall.

	Spiraea blumei G. Don
	Spiraea flexuosa Fisch. ex Cambess.
	Spiraea fritschiana Schneid var. angulata (Schneid.) Rehd.
	Spiraea pubescens Turcz.
	Spiraea trilobata L.
Leguminosae	*Amphicarpaea trispeea* (Miq.) Baker. ex Jack-son
	Astragalus adsurgens Pall.
	Astragalus chinensis L.
	Astragalus complanatus R. Br.
	Astragalus dahuricus (Pall.) DC.
	Astragalus meliiotoides Pall.
	Astragalus melilotoides Pall. var. tenuis Turcz
	Astragalus mongholicus Bunge
	Astragalus scaberrimus Bunge
	Caragana sibirica Fabr.
	Glycine soja Sieb. et Zucc.
	Glycyrrhiza uralensis Fisch.
	Gueldenstaedtia verna (Georgi) Boriss.
	Indigofera kirilowlii Maxim. et Palibin
	Kummerowia stipulacea (Maxim.) Makino
	Lathyrus davidii Hance
	Lespedeza bicolor Turcz.
	Lespedeza davurica (Laxm.) Schindl.
	Lespedeza floribunda Bunge
	Lespedeza hedysaroides (Pall.) Kitag.
	Lespedeza tomentosa (Thunb.) Sieb. ex Maxim
	Medicago lupulina L.
	Melilotoides ruthenica (L.) Sojak
	Melilotus albus Desr.
	Melilotus suaveolens Ldb.
	Oxytropis hirta Bunge
	Oxytropis leptophylla (Pall.) DC.
	Sophora flavescens Soland.
	Vicia amoena Fisch.
	Vicia cracca L.

	Vicia japonica A. Gray
	Vicia psendorobus Fisch. et C. A. Mey.
	Vicia unijuga A. Br.
Geraniaceae	*Erodium stephanianum* Willd.
	Erodiurxx stephanianum Willd. var. atran-Thum Nakai et Kitag
	Geranium sibiricum L.
Linaceae	*Linum stelleroides* Planch
Zygophyllaceae	*Tribulus terrestris* L.
Rutaceae	*Dictamnus albus* L. subsp . dasycarpus (Turcz.) Wint.
Sizxzarubaceae	*Ailanthus altissima* (Mill.) Swingle
Polygalaceae	*Polygala sibirica* L.
	Polygala tenuifolia Willd
Euphorbiaceae	*Acalypha australis* L.
	Euphorbia esula L.
	Euphorbia fischeriana Stend.
	Euphorbia humifusa Willd.
	Securinega suffruticosa (Pall.) Rehd.
	Speranskia tuberculata Baill.
Celastraceae	*Euonymus alatus* (Thunb.) Sieb. var. pubescens Maxim.
	Euonymus bungeanus Maxim.
Aceraceae	*Acer aimala* Maxim
	Acer truncatum Bunge
	Acer truncatum Bunge subsp. mono (Max- im.)E. Murr.
Rhamnaceae	*Rhamnus arguta* Maxim.
	Rhamnus dahurica Pall.
	Rhamnus parvifolia Bunge
	Rhamnus ussuriensis J. Vass
	Rhamnus Viridifolia Liou
	Zizyphus jujube var. spinosa (Bunge) Hu
Vitaceae	*Vitis amurensis* Rupr.
	Ampelopsis aconitifolia Bunge var. glabra Diels et Gelg
	Ampelopsis humulifolia Bunge
Tiliaceae	*Tilia mandshurica* Rupr. et Maxim.
	Tilia mongolica Maxim.
Malvaceae	*Abutilon theophrasii* Medic.

	Hibiscus trionum L.
	Malva verticillata L.
Hypericaceae	*Hypericum ascyron* L.
	Hypericum attenuatum Choisy
Violaceae	*Viola acuminate* Ledeb.
	Viola biflora L.
	Viola collina Bess.
	Viola dissecta Ledeb.
	Viola japonica Langsd.
	Viola mandshurica W. Beck.
	Viola Mongolica Franch.
	Viola pekinensis W. Beck
	Viola prionantha Bunge
	Viola yedoensis Makina
	Viola variegate Fisch.
Thymelaeaceae	*Darthron linifolium* Turcz.
	Stellera chamaejasme L.
Onagraceae	*Circaes cordata* Royle.
	Circaea quadrisulcata (Maxim.) Franch. Et Sav.
	Epilobium palustre L.
Umbelliferae	*Angelica dahurica* (Fisch.) Benth. Et Hook. ex Franch.et Sav.
	Bupleurum bicaule Helm.
	Bupleurum chinense DC.
	Bupleurum scorzonerifolium Willd.
	Bupleurum sihiricum Vest.
	Bupleurum smithli Wolff.
	Czernaevia laevigata Turcz.
	Ostericum sieboldii (Miq.) Nakai
	Heracleum lanaturn Mickx
	Ligusticum jeholense (Nakai et Kitag.)
	Ligusticum tachiroei (Franch. et Sav.) Hiroeet Constance
	Oenanthe japonica (B1.) DC
	Peucedanum terebinthaceum (Fisch.)Fisch. Ex Turcz
	Saposhnikovia divaricata (Turcz.) Schischk
	Sphallerocarpus gracilis (Bess.) K. Pol.

Pyrolaceae	*Hypopitys monotropa* Crantz.
Ericaceae	*Rhododendron dauricum* L.
	Rhododendron micranthum Turcz.
Primulaceae	*Cortusa matthiolii* L.
	Lysimachia barystachys Bunge
	Primula maximowiczii Regel.
Oleaceae	*Fraxinus bungeana* DC.
	Fraxinus rhynchophylla Hance
	Syzygium aromaticum
	Syringa reticulata (Blume) Hara var. mand-Shurica (Maxim) Hara.
Gentianaceae	*Gentiona dahurica* Fisch.
	Gentiana macrophylla Pall.
	Gentianopsis barbata (Froel.) Ma
	Halenia corniculata (L.) Cornaz
	Swertia diiuta (Turcz.) Benth. et Hookf
Apocynaeae	*Apocynum venetum* L.
Asclepladaceae	*Cynanchum atratum* Bunge
	CynanchuFn bungei Decne
	Cynanchum chinense R. Br.
	Cynanchum panicuiatum (Bunge) Kitag.
	Cynanchum purpureum K. Schum
	Cynanchum thesioides（Freyn.) K. Schum.
	Melaplexis japonica (Thunb.) Makino
Convolvulaceae	*Calystegia pellita* (Ldb.) G. Don
	Calystegia sepium (L.) R. Br
	Convolvuius arvensis L.
	Cuscuta chinensis Lam
	Cuscuta lupuliformis Krocker
	Merremia sibirica (L.) Hall. f. var. vesicalosa C. Y. Wu
Folemoniaceae	*Polemonium caeruleum* L.
Borraginaceae	*Cynoglossum divaricatum* Steph.
	Lappula sp.
	Lithospermum erythrorhizon Sieb. et Zucc.
	Lithospermum officinale L.
	Stenosolenium saxatile (Pall.) Turcz

Verbenaceae	*Vitex negundo* L. var. heterophylIa (Franch.) Re-hd
Labiatae	*Amethystea coerulea* L.
	Clinopodium chinense O. Kuntze
	Dracocephalum moldavica L.
	Dracocephalum rupestre Hance
	Elsholtzia ciliate (Thunb.) Hyland.
	Elshothzia densa Benth. var, ianthina (Maxim. et Kanitz.) C. Y. Wu et S. C. Huang
	Lamium album L. var. barbatum Fr. Et Sav.
	Leonurus sibiricus L.
	Leonurus tataricus L.
	Lycopus lucidus Turcz. ex Benth.
	Mentha haplocalyx Briq.
	Phlomis dentosa Franch
	Phlomis maximowiczii Regel.
	Phlomis umberosa Turcz.
	Rabdasia japonica (Burm. f.) Hara var.glaucocalyx (Maxim.) Hara
	Scutellaria baicalensis Georgi
	Scutellaria galericulata L.
	Scutellaria pekinensis Maxim.var.us-suriensis (Regel) Hard.
	Scutellaria regeliana Nakai. var. Ikonni kouii (Juz.) C. Y. Wu et H.W.Li
	Scutellaria scordifolia Fisch. ex Schrank
	Stachys riederi Chammisso var. Hispidula (Regel .) hara.
	Thymus serpyllum L.
Solanaceae	*Datura stramonium* L.
	Solanum nigrum L.
Scrophulariaceae	*Cymbaria dahurica* L.
	Euphrasia hirtella Jord. ex Reuter
	Melampyrum roseum Maxim.
	Minulus tenellus Bunge
	Odontites serotina (Lam.) Dum.
	Pedicularis resulpinata L.
	Pedicularis striata Pall
	Rehmannia glutinosa (Gaert.) Libosch.ex Fisch. et Mey.
	Phtheirospermum japonicum (Thunb.) Kanitz

	Siphonostegia chinensis Benth.
	Veronica anogallisaqualtca L.
	Veronica dahrica Stev.
	Veronica linearifolia Pall. ex Link.
	Veronica linearifolia Pall. ex Link. var. dilatata Nakai ex Kitag.
	Veronica longifolia L.
	Veronicastrum sibiricum (L.) Pen.
Bignoniacaeae	*Incarvillea sinensis* Lam.
Orobanchaceae	*Orobanche coerulescens* Steph.
Plantaginaceae	*Plantago asiatica* L.
	Plantago depressa Willd.
Rubiaceae	*Galium boreale* L.
	Galiuzn pseudoasprellum Makino
	Galium verum L.
	Galium uerum L. var. Trachycarpum DC.
	Rubia cordifolia L.
Caprifoliaceae	*Abelia biflora* Trucz.
	Lonicera chrysantha Turcz.
	Lonicera maackii (Rupr.) Maxim.
	Lonicera maximowiczii (Rrpr.) Regel.
	Sambucus latipinna Nakai
	Sambucus manshurica Kitag.
	Vibrunum opulus L. var. calvescens (Rehd)Hara
	Viburnum mongolicum (Pall) Rehd.
	Weigela florida (Sieb. et Zucc.) DC.
	Weigela praecox (Lomovne) Baily
Valerianaceae	*Patrinia heterophylla* Bunge
	Patrinia rupestris Joss.
	Patrinia scabiosaefolia Fisch.
	Patrinia sibirica Juss.
Dipsacaceae	*Scabiosa comosa* Fisch. ex Roemet Schult
	Scabiosa tschiliensis Grunning
Cucurbitaceae	*Thladiantha dubia* Bunge
Campanulaceae	*Adenophora biformifolia* Y. Z. Zhao
	Adenophra borealis Hong et Y. Z. Zhao

	Adenophora diuaricata Franch. et. Savat.
	Adenophora gmelinii (Spreng.) Fisch.
	Adenophora stenophylla Hemsl.
	Adenophora paniculata Nannf.
	Adenophyora pereskiifolia (Fisch, ex Roem. et Schwlt) G. Don.
	Adenophora remotiflora Miq.
	Adenophora tetraphylla (Thub.) Fisch.
	Adenophora trachelioides Maxim.
	Adenophora waureana A.Zahlbr
	Codonopsis pilosula Nannfoldt
	Platycodon grandiflorus (Jacq.) A. DC.
Compositae	*Achillea ptarmicoides* Maxim
	Acbyrophorus ciliates (Thumb.) Sch. Bip.
	Arctium lappa L.
	Artemisia anethifolia Waber
	Artemisia annua L.
	Artemisia argyi Lev1. et Vant.
	Artemisia argyi Levl. et Vant. var. gracilis Pamp
	Artemisia desertorum Spreng.
	Artemisia eriopoda Bunge
	Artemisia frigid Willd.
	Artemisia igniaria Maxim.
	Artemisia japouica Thunb
	Artemisia latifolia Ledeb
	Artemisia lavandulaefolia DC.
	Artemisia manshurica Kom.
	Artemisia mongolica Fisch. ex Bess.
	Artemisia princeps Pamp.
	Artemisia rubripes Nakai
	Artemisia sacrorum Ldb.
	Artemisia scoparia Waldst. et Kit
	Artemisia selengensis Turci ex Bess
	Arternisia sieversiana Willd.
	Artemsia sylvatica Maxim.
	Artemisia tanacetifolia L.

	Aster ageratoides Turcz.
	Aster alpines L.
	Aster sibiricus L.
	Aster tataricus L. f.
	Atractytodes Lancea (Thunb.) DC.
	Bidens parviflozra Willd.
	Cacalia hastate L.
	Carduus crispus L.
	Cirsium chinense Gardn. et Champ.
	Cirsium pendulum Fisch.
	Cirsium segetum Bunge
	Cirsiurn setosunn (Wind.) M.B
	Crepis crocea (Lam.) Babc
	Dendranthema lavandulifolia (Fisch. ex Trautv.) Kitam
	Dendranthema naktongense (Nakai) Tzvel.
	Dendranthema Zawadskil (Herb) Tivel. var. latiloba (Maxim) H. C. Fu
	Doellingeria Scaber (Thunb.) Nees.
	Filifolium sibiricum (L.) Kitam.
	Heteropappus altaicus (Willd.) Novopokr.
	Heteropappus altaicus (willd.) Novopokr. var. millefolius (Vans.) Hand. Mazz.
	Heteropappus hispidus (Thunb.) Less.
	Heteropappus tataricus (Liudl.) Tamarnsch. var. hirsutus (Liug et Wang) H. C. Fa
	Hieracium hololeiom Maxim
	Hieracium umbellatunn L.
	Inula britanica L.
	Ixeris chinensis Nakai var. Graminifolia (Ldb.) H. C. Fu
	Ixeris denticulate (Houtt.) Stebb.
	Ixeris sonchifolia (Bunge) Hance
	Kalimeris incise (Fisch.) DC.
	Kalimeris integrifolia Turcz. ex DC.
	Kalimeris lautureana (Debx.) Kitam.
	Leibnitzia anandria (L.) Turcz .
	Kalimaris mongolica (Franch) kitam

	Leontopodium leontopodioides (Wind.) Beauv
	Ligularia fischeri (Ldb.) Turcz.
	Neopallasia pectinata (Pall.) Doljak
	Picris japonica Thunb.
	Pterocypsela indica (L.) Shih.
	Saussurea amara (L.) DC.
	Saussurea firma (Kitag.) Kitam.
	Saussurea japonica (Thunb.) DC.
	Saussurea mongolica (Franch.) Franch.
	Sanssurea nirea Turcz
	Saussurea odontolepis Sch. Bip. ex Herd.
	Saussurea parritolora (Poir.) DC
	Saussurea pectinata Bunge ex DC.
	Scorzonera albicaulis Bunge
	Scorzonera austriaca Willd
	Scorionera radiata Fisch
	Scorzonera sinensis Lipsch. ex Krasch.
	Senecio ambraceus Turcz. ex DC.
	Senecio argunensis Turcz.
	Serratula centauroides L.
	Sonchus arvensis L.
	Stemmacantha uniflora (L.) Dittrich.
	Syneilesis aconitifolia (Bunge) Maxim.
	Synurus deltoides (Ait.) Nakai
	Siegesbeckia pubescens Makino
	Taraxacum exythropodium Kitag.
	Taraxacum ohwianum Kitam.
	Tephroseris flammea (Turcz. ex DC.) Ho1ub
	Turczaninowia fastigiata (Fisch.) DC.
	Xanthium sibiricum Patrin ex Widder
Sparganiaceae	*Sparganium stoloniferum* Buch Ham
Juncaginaceae	*Triglochin palustre* L.
Gramineae	*Achnatherum extremiorientale* (Hara) Keng ex P. C. Kwo
	Achnatherum sibiricum (L.) Keng
	Agrostis clavata Trin

	Agrostis divaricatissima Mez.
	Agrostis gigantea Roth
	Agrostis sibirica V. Petr.
	Aristida adscenionis L.
	Arthraxon hispidus (Thunb.) Makino
	Arundinella hirta (Thunb.) Tanaka
	Beckmannia syzigachne (Steud.) Fern.
	Bothriochloa ischaemum
	Bromus inermis Leyss.
	Calamagrostis epigejos (L.) Roth.
	Calamagrostis macmlepis Litv.
	Chloris virgata Swartz
	Cleistogenes chinensis (Maxim) Keng
	Cleistogenes hancei keng
	Cleistogeues hacheli Honda. var nakaickengahwi
	Cleistogenes polyphylla Keng ex Keng f . L. Liu
	Cleistogenes squarrosa (Trip.)Keng
	Deyeuxia arundinacea (L.) Beauv.
	Deyeuxia turczaninowii (Litv.) Y. L.Chang
	Digitaria ciliaris (Retz.) Koel.
	Digitaria ischaemum (Schreb.) Schreb.ex Muhl.
	Echinochloa crusgalli (L.) Beauv
	Eleusine indica (L.) Gaertn.
	Elymus cyrlindricus (Franch.) Honda
	Elymus dahuricus Turcz. ex Griseb.
	EIymus excelsus Turcz.
	Elymus sibiricus L.
	Enneapogon borealis (Griseb.) Honda
	Enneapogon minor Host
	Eragrostis piIosa (L.) Beauv. var. imber-Franch.
	Eriochloa villosa (Thunb.) Kunth
	Festuca sp.
	Hierochloe glabra Trin.
	Hierochloe odorata (L.) Beauv
	Koeleria cristata (L.) Pers.

	Leyznus chinensis (Trin.) Tzvel.
	Leymus secalinus (Georgi) Tzvel.
	Melica scabrosa Trin.
	Microstegium vimineum (Trin.) A. Camus var.imberbe (Nees ex Steudel) Honda
	Miscanthus sacchariflorus (Maxim.) Hack.
	Pennisetum centrasiaticum Tzvel.
	Phxagmites australis (Cav.) Trin.
	Poa annua L.
	Poa nemoralis L.
	Roegueria amurensis (Drab.) Nersk.
	Poa sphondylodes Trin. ex Bunge.
	Roegneria kamoji Ohwi
	Roegneria hondai Kitag.
	Roegneria pendulina Nerski var. pubinodis Keng
	Roegneria turcianinovii (Drob.) Nerski
	Roegneria turczaninovii (Drob.) Nevski var. macrathera Ohwi
	Roegneria pendulina Nevski
	Setaria glauca (L.) P. B.
	Setaria viridis (L.) Beauv.
	Spodiopogon sibiricus Trin.
	Stipa bungeana Trin.
	Stipa baicalensis Roshev.
	Stipa grandis P. Smirn
	Tragus berteronianus Schult.
	Tragus racemosus (L.) All.
	Tripogon chinensis (Fr.) Hack.
	Trisefum sibiricum Kupr
Cyperaceae	*Carex dispalata* Boott.
	Carex duriuscula C. A. Mey.
	Carex hancockiana Maxim.
	Carex leiorhyncha C. A. Mey.
	Carex pediformis C. A. Mey.
	Carex siderosticta Hance
	Eleocharis mamillata Lindb. f.

	Pycreus globosus (All.) Reichb.
	Pycreus korshinskyi (Meinsh.) V. Krecz.
	Pycreus setiformis (Korsh.) Nakai
	Juncellus pannonicus (Jacq.) C. B Clarke
	Juncellus serotinus (Rottb.) C. B. Clarke
	Scirpus tabemaemontani Gmel.
Lemnaceae	*Lemna minor* L.
Juncaceae	*Juncus papillosus* Franch. et Sav.
Liliaceae	*Allium anisopodium* ledeb.
	Allium bidentatum Frsch. ex Prokh.
	Allium condensatum Turcz.
	Aillium macrostemon Bunge
	Allium nerinifolium Bak.
	Allium ramosum L.
	Aillum senescens L.
	Album tenuissimum L.
	Album thunbergii G. Don
	Asparagus brachyphyllus Turcz.
	Asparagus dauricus Fisch. ex Link
	Aspargus oligeclonos Maxim.
	Asparagus trichophyllus Bunge
	Anemarrhena asphodeloides Bunge
	Convallaria majalis L.
	Hemerocallis minor Mill.
	Lilium concolor Sieb. var. pulchellum(Fisch.) Regel
	Lilium pumilum DC.
	Polygonatum humile Fisch. ex Maxim.
	Polygonatum macropodium Turcz.
	Polygonatum odoratum (Mill.) Druce
	Polygonatum sibiricum Delar. ex Redoute
	Scilla scilloides (Lindl.) Druce
	Verofrourn nigxvm L.
Dioscoreaceae	*Dioscorea nipponica* Makino
Iridaceae	*Iris dichotoma* Pall.
	Iris lactea Pall. tear. Chinensis (Fisch.) Koidz.

	Iris ruthenica Ker. Gaul.
	Pris tigridia Bunge
	Iris uniflora Pall. ex Link
Orchidaceae	*Epipactis xanthophaea* Schltr.
	Habenaria sagittifera Reichb.
	Herxninium znonorchis (L.) R. Br.
	Neottianthe cucullata (L.) Schltr.
	Spiranthes sinensis (Pers.) Ames

Aves		
Order	**Family**	**Species**
CORACIIFORMES	Upupidae	*Upupa epops*
	Coraciidae	*Eurystomus orientalis*
COLUMBIFORMES	Columbidae	*Streptopelia decaocto*
		Streptopelia orientalis
		Columba rupestris
CHARDRIFORMES	Laridae	*Larus argentatus*
		Larus brunnicephalus
	Scolopacidae	*Tringa ochropus*
		Galliriago megala
		Tringa nebularia
		Gallinago gallinago
		Gallinago stenura
GALLIFORMES	Phasianidae	*Coturnix cotumix*
		Perdix dauuricae
		Alectoris chukar
		Phasianus colchicus
CUCULIFORMES	Cuculidae	*Cuculus canorus*
		Cuculus micropterus
		Cuculus poliocephalus
		Cuculus saturates
PICIFORMES	Picidae	*Dendrocopos major*

		Picus canus
		Picoides minor
		Dendrocopos canicapillus
		Dendrocopos hyperythrus
PASSERIFORMES	Alaudidae	*Galerida cristata*
		Alauda gulgula
	Laniidae	*Lanius cristatus*
	Oriolidea	*Oriols chinensis*
	Motacillidae	*Motocilla alba*
		Motacilla cireola
		Motacilla cinerea
		Dendronanthus indices
		Anthus hodgsoni
		Anthus novaeseelandiae
	Sturnidae	*Sturnus cineraceus*
	Frinfillidea	*Carpodacus roseus*
		Eophona migratoria
		Carduelis spines
		Passer montanus
		Fringilla montif ringilla
	Paridae	*Parus major*
		Poecile palustris
	Bombycillidae	*Bombycilla garrulus*
	Muscicapidae	*Oenanthe pleschanka*
		Turdus naumanni
		Phoenicurus auroreus
		Muscicapa latirostris
		Saxicola torquata
		Ficedula parva
		Tarsiger cyanurus
		Phylloscopus inornatus

		Muscicapa sibirica
	Emberizidae	*Emberiza elegans*
		Emberiza aureola
		Emberiza spodocephala
		Emberiza cioides
		Emberiza pusilla
		Emberiza chrysophrys
	Zosteropidae	*Zosterops erythropleurus*
	Corvidae	*Pyrrhocorax pyrrhocorax*
		Cyanopica cyana
		Pica pica
		Corvus corone
	Hirundinidae	*Hirundo rustics*
		Hirundo daurica
		Hirundo rupestris
	Fringillidae	*Carpodacus erythvinus*
	Sylviidae	*Phylloscopus coronatus*
	Ploceidae	*Carduelis carduelis britannica*
FALCONIFORMES	Falconidae	*Falco columbarius*
		Falco vespertinus
		Falco tinnunculus Linnaeus
		Falco subbuteo
		Falco peregrinus
	Accipitridae	*Accipiter gentilis*
		Aquila rapax
		Accipiter soloensis
		Buteo hemilasius
		Milvus migrans
		Aquila chrysaetos
		Buteo lagopus
		Buteo buteo

		Accipiter nisus
		Accipiter virgatus
STRIGIFORMES	Strigidae	*Bubo bubo*
		Asio flammeus
		Otus scups
		Asio otus
		Strix uralensis
		Athene noctua
CAPRIMULGIFORMES	Caprimulgidae	*Caprimulgus indices*
APODIFORMES	Apodidiae	*Apus pacifices*
Mammalia		
Order	**Family**	**Species**
INSECTIVORA	Erinaceidae	*Erinaceus europaeus* Linnaeus
	Talpidae	*Mogera robusta* Nehring
		Scaptochirus moschatus MiIne Edwards
CHIROPTERA	Vespertilionidae	*Vespertilio murinus* Lirmaeus
LAGOMORPHA	Leporidae	*Lepus capensis* Linnaeus
RODENTIA	Sciuridae	*Sciurus vulgaris* Linnaeus
		Sciuratamias davidianus Milne Eduards
		Eutamias sibiricus Laxmann
		Citellus dauricus Brandt
	Petauristidae	*Pterornys volans* Linnaeus
	Dipodidae	*Dipus sagitta* Pallas
	Muridae	*Apodernus specosus* Temminck
		Apodemus agrarius Pallas
		Rattus morvegicus Berkenhout
		Mus musculus Linnaeus
	Cricetidae	*Cricetulus triton* de Winton
		Cricetulus barabensis Pallas
		Meriones unguiculatus Mime Edwards
		Myospalax psilurus Milne Edwards

		Microtus mandarinus Milne Edwards
CARNIVORA	Canidae	*Canis lupus* Linnaeus
		Vulpes wipes Linnaeus
		Nyctereutes procyonoides Gray
	Mustelidae	*Mustela sibirica* Pallas
		Mustela eversmanni Lesson
		Arctonyx collaris F. Curier
	Felidae	*Felis bengalensis* Kerr
ARTIODACTYLA	Gervidae	*Capreolus capreolus* Linnaeus
	Bovidae	*Procapra gutturosa* Pallas
Isecta		
Order	**Family**	**Species**
MANTODEA	Mantidae	*Mantis relgiosa* Linnaeus
HEMIPTERA	Pentatomidae	*Dolycoris baccarum* L.
		Eurygaster testudinarius Geoffroy
		Eurydema gebleri Kolenati
		Graphosoma rubrolineata Westvvood
		Pentatoma etallifera Motschulsky
		Nexara viridula formatypica Linnaeus
	Urostylidae	*Urochela falloui* Renter
		Urochela quadrinotata Renter
NEUROPTERA	Myrmeleontidae	*Deutoleon lineatus* Fabricius
		Euroleon sinicus Navas
		Heoclisis japonica Maclachlan
	Ascalaphidae	*Ascalaphus sibircus* Fvermann
COLEOPTERA	Buprestidae	*Lampra limbata* Gebler
	Elateridae	*Melanotus Sp.*
		Pleonomus canaliculatus Faldermann
	Coccinellida	*Ailocaria hexaspilota* Hope
		Cocoinella septempunctata Linnaeus
		Cocoinella quatuordecimpu stulata Linnaeus

		Harmonia axyridis Pallas
		Propylaea japonica Thunberg
	Tenebrionidae	*Blaps rugosa* Gebi
	Carabidae	*Calosoma lugens* Chaudoir
		Carabus smaragdinus Fischer
		Calosoma chinense Kirby
	Cicindelidae	*Cicindela chinensis* De Geer
	Meloidae	*Epicauta chinensis* Laporte
		Epicauta megalocephala Cebler
		Mylabris calida Palla
		Lytta suburella MotsChuls
	Cerambycidae	*Aromia moschata orientalis* Plavils
		Dorysthenes hydropicus Pascoe
		Eutetrapha metallescens Motschulsky
		Olenecamptus octopustulatus Motschulsky
		Paraglenea fortunei Saunders
		Purpuricenus petasifer Fairm
		Leptura aethiops pods
	Chrysomelidae	*Apophylia thalassina* Faldermann
		Cryptocephalus kulibini Geblea
		Cneorane ncfipes Wseise
		Cryptocephalus japanus Baly
		Labidostomis bipunctata Mannerheim
		Monolepta hieroglyphics Motschulsky
		Pallasiola absynthii Pallas
		Pyrrhaita aehescens Fairmaire
		Smaragdina semiaurantiaca Fairmaire
	Curculionidae	*Byctiscus princeps* Solsky
		Chlorophanus Sibiricus Gyllenhyl
		Curculio arakawai Motsumura et Kono
		Xylinophorus mongolisas Faut

DIPTERA	Syrphidae	*Eristalis tenax* Linnaeus
		Syrphus baleata De Geer
LEPIDOPTERA	Limacodidae	*Cnodocmpa lavescens* Walker
		Parawa consociu Walker
	Geometridae	*Aspilates smirnovi* Rom
		Aspilates eholaria Oberthiir
		Arichanna haunghui Yang
		Angerona prunaria Linneaus
		Ascotis selenaria Schiffermiiller et Deis
		Bizia aexaria Walker
		Culcula Panterinaria Brener et Grey
		Ouapteryx nivea Butler
		Biston tortuosa Wileman
		Henistila ceneta Butler
		Theridia chlorolhyllaris Hedyemann
		Thalera flavescens Alpheraky
	Lasiocampidae	*Bhima idiots* Graeser
		Dendrolimus tabulaeformis Tsai et Liu
		Dendrolimus superans Butler
		Dendrolimus spectabilis Butler
		Gastropacha populifolia Esper
		Gastropacha guercifolia Linnaeus
		Odonestis pruni Linnaeus
		Paralekeda plagifera Walker
		Malacosoma neustria testauea Motschulsky
	Bombycidae	*Theophila mandarins* Moore
		Oberthiiria caeca Oberthiir
	Sphingidae	*Ampelophaga rubiginosa rugiginosa* Bremer et Trrey
		Amorpha amurensis staudinger
		Callambulgx tatarinovi Bremer et Grey

		Celerio gallii
		Dolkina tancrei staudinge
		Kentrochrysalis sieversi Alpheraky
		Marumba sperchius Menentries
		Marumba gaschkewitschi complacens Walker
		Pergesa askoldensis Rottemburg
		Pergesa elpenor lewisi Butler
		Smerthus planus alticola Clrk
	Arctiidae	*Arctic caja* Linnaeus
		Asura megala Hampson
		Spilarctia caesarea Goeze
	Noctuidae	*Agrotis ypsilon* Rottemberg
		Agrotis trifurca Eversmann
		Agrotis corticea Schiffermululer
		Arnathes cnigrum Linnaeus
		Amathes Kollri Lederer
		Acronicta leucocuspis Butler
		Acronica hercules Felder
		Acronicta major Bremer
		Apamea veterina Lederer
		Argyrograrnrna agnata Staudinger
		Bomolocha stygiana Butler
		Bomolicha obsealis Treitschke
		Catocaia nupta Linnaeus
		Catocala rtaxini Linnaeus
		Chrysorithrum amata Bremer et Grey
		Chadwina sigillata Menerres
		Chasminkdes albonitens Bremer
		Callopistria duplicans Walker
		Craniophora Ligustri Schiffermuller
		Cymatophopsis tnmaeulata Bremer

		Cucullia fraudatrix Eversmann
		Diarsia canescens Butler
		Ephesia davidi Oberthiir
		Ephesia fulinines Scopoli
		Ephesia dissimilis Bremen
		Heliothis viriplaca Hufnagei
		Hypocala subsatura Guenee
		Hypobarathra repetita Butler
		Lagoptera juno Dalman
		Macdunnouhia crrssisigna Warren
		Mamestra brassicae Linnaeus
		Nodaria niphona Butler
		Oncocnemis campuola Lederer
		Parallelia obscura Bremen et Grey
		Parallelia arctotaenois Guenee
		Pygopteryx xuava Staudinge
		Perigrapha circumducta
		Raphia peusteria Piingeler
		Rhynchina kengkalis Bremen
		Scoliopteryx libatrix Linnaeus
		Toxocampa vulcanea Butler
		Trisuloides cornelia Staudinger
	Thyatiridae	*Bombycia ampliata* Butler
	Nymphalidae	*Fabriciana adippe vorax* Butler
		Melitaea protomedia Menetries
		Neptis coenobita insularum Fruhohstorfer
		Pantoporia Sp
	Lycaenidae	*Celastina argiolus* Linnaeus
		Faronius orientalis Murray
		Lycaeides argyrognomon Bergstraescer
		Niphanda fusca Bremer et Grey

		Thecla beluae Linnaeus
	Pieridae	*Aporia crategi* Linnaeus
		Colias erate Esper
		Gonepteryx rhamni Linnaeus
		Gonepteryx aspasia Menetries
		Leptidea amurensis Menetries
		Pieris rapae Linnaeus
		Pontia daplidica Linnaeus
	Hesperiidae	*Ochlodes ylvanus* Esper
		Lobocla kifasciata Bremen et Grey
		Ochlodes subhyalina Bremen et Grey
		Pyrgus maculata Bremen et Grey
	Satyridae	*Crebeta deidaxnia* Eversman
		Coenonympha amaryllis Cramer
		Manargia halinede Menetries
		Minois dryas Scopoli
HYMENOPTERA	Tenthredinidae	*Tenthredo Sp.*

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