

Status of Mountain Pastures, Including Geobotanical Description of the Main Vegetation Associations in Western Pamir-Alay

Mukaddas B. Tirkasheva

Djizak Polytechnical Institute, Djizak, Uzbekistan

Email: ozodbek88@bk.ru

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Abstract

The article gives a brief description of the vegetation cover of the Western Pamir-Alai range, as well as a method of describing the phytocenosis of the vegetation of the studied region.

Keywords

Western Pamir-Alai, Pastures, Phytocenosis, Formation, Association, Flora

1. Introduction

The studied region is one of the most interesting regions of Uzbekistan, characterized by a kind of floristic richness and a high percentage of endemic species. A large variety of trees and shrubs and herbaceous plants is concentrated here, much of which is of high value for the national economy. In order to preserve the diversity of vegetation and maintain them in a sustainable productive state, knowledge of the patterns and characteristics of the formation, spatial distribution of vegetation and their communities, their current state, trends and rationing of natural plant resources are of particular relevance.

2. Material and Methods

As a result of the analysis of generally accepted and modern methods for the implementation of goals and objectives for the study of the state of mountain pastures it is recommended to use the following methods:

- Itinerary reconnaissance studies. When they were carried out, it was supposed to give the most general geobotanical characteristic of the vegetation cover of the surveyed territory. In this case, the most important, the most

common formations and their connections with the relief of soil conditions should be characterized in general terms. The spatial distribution of the main formations is given in the description of large geobotanical regions, which are also outlined only tentatively [1] [2].

- Reconnaissance studies are usually carried out with the purpose of the primary or a specific region. Their task is the general qualitative characteristic of vegetation on the basis of taking into account local peculiarities of its formation and placement. As a result, materials characterizing the main features of the vegetation cover are obtained, areas differing in geobotanical terms are allocated, the most important forest, pasture, meadow and other funds are identified for further development, and forecasts of land use are outlined. These data open up the possibility of scientifically based planning and zoning of certain economic important measures.

Methods for the Description of Phytocenoses

When describing vegetation cover, it is necessary to indicate the conditions of its formation: geological features, geographical location of the studied area, its climatic conditions. The description process includes floristic composition, total number, weight of plants and quantitative relationships between species and groups of species, the condition of individuals of each species (“vitality”), spatial—vertical and horizontal—distribution of plants and structural parts of the phytocenosis.

3. Result and Discussion

As a result of the analysis of literature sources and on the basis of common experience, it was found that the phytocenotic diversity of mountain pasture vegetation cover consists of 3 types, 4 subtypes, 7 cenotypes, 8 formations and 27 associations.

To test this methodology and obtain primary data, we carried out two expeditions together:

The first route passes through the territory of the forestry of the Yakkabag region. The second route passes through the territory of the Gissar reserve Miraki area of Kashkadarya region.

According to the results of work in the study area (Yakkabag forestry and Gissar reserve, Miraki site) the following plant species are endemic: *Acantholimon butkovii* L i p with z. (Khorasan-mountain-Middle Asian community), *Cousinia allolepis* Tschern. et Vved. (Iran-Central Asian community), *C. bobrovii* J u z. (Southern Pamir-Alai community), *C. hoplophylla* Tschern (Pamiro-Alay community), *Oxytropis vvedenskyi* Filim, (high mountain community Asia *O. savellanica* Bg), *Tanacetopsis botschantzevii* Kovalevski (Pamiro-Alay community). According to the references, as well as, when fixing in this study area, there are several plant species listed in the Red Book of Uzbekistan: *Astragalus butkovii* Popov, *A. komarovii* Lipsky, *Cicir incanum* Korotkova, *Oxytropis*

tyttantha Gontsch, *Ferula sumbul* Kauffm.

The region we are studying is located in high-altitude areas, mainly in the zone of adyrs, in the middle mountains and in the highlands, each of which has its own landscape components. When classifying the phytocenoses of the studied areas, the classification of P. K Zakirov [2] [3] [4] [5] was adopted.

Type: Hill—*Imioreophyton* (Adyrophyton) Hill—alpine;

Coenotype: Herbal ephemeroïds—*Ephemeroidopoiã*;

Formation: Bluegrass—*Poaeta bulbosae*.

Associations:

1) Bluegrass-sedge-grass (*Poa bulbosa*, *Carex pachystylis*, *Phlomoïdes labiosa*, *Hypericum elongatum*), area 10 × 10 m. The soil is mixed with simple gray, small pale earth. Plant coverage is 60% - 65%: Edifier *Poa bulbosa*, Cop² abundance, non-specific *Carex pachystylis*, Sp³ abundance. They constitute the lower part of the vegetation cover. Their height is 15 - 20 cm.

2) Bluegrass-fenugs-forbs (*Poa bulbosa*, *Trigonella grandiflora*, *Achillea millefolium*, *Cousinia microcarpa*). The area is 10 × 10 m. The soil is small, soft, and some parts of the soil are dark. Plants of this type in the community account for 70% - 75% of the total. Bluegrass edifier, Cop² abundance, *Trigonella grandiflora* subedifier, Sp³ abundance constitute the lower half of the vegetation cover (20 - 25 cm). Herbs *Cousinia microcarpa*, *Ixiolirion tataricum*, *Galium verum*, *Achillea millefolium*, which height is 35 - 40 cm, make up the upper tier. These two associations met in Yakkabag forestry at an altitude of 1500 m above sea level.

Formation: *Perovskieta scrophularifoliae*.

The semi-shrub plant belongs to the Lamiaceae Lindl family.

Associations:

3) Panicle grassy grass (*Perovskia scrophularifolia*, *Cynodon dactylon*, *Poa bulbosa*, *Elytrigia repens*, *Eryngium macrocalyx*, *Achillea millefolium*). Communities are common on dark gray soils, where there is a little grass on the surface. The prevalence of *Perovskia—scrophularifolia* edifier is Cop², Sub-equalizers *Cynodon dactylon*, abundance of Sp³, *Poa bulbosa* Sp³, *Elytrigia trychophora* Sp³. *Erigeron macrocalyx*, *Alhagi psevdohagi*, *Plantago lanceolata*, *Achillea millefolium* and others, participate in this association. Their abundance is Sp¹, but on the field there are many ephemeral, ephemeroïd, Sol-Sp¹. This association was found in Yakkabag forestry in 1 site at an altitude of 2100 - 2200 m above sea level.

Formation: Hairy wheat grass—*Elytrigieta trichophorae*.

As a result of our research in the Hissar ranges, the following 5 associations of wheatgrass flora were found at an altitude of 1800 - 1900 m above sea level, and in rare cases up to 2000 m above sea level.

Associations:

4) Misting grass (*Phlomis olgae*, *Haplophyllum perforatum*) association, in the foothills of the Gissar mountains, distributed at an altitude of 1700 - 1800 m above sea level. Its fields are in the range of grain fields and are used as “grass”.

The soil is dark gray, small, soft, rich in humus. Vegetable coverage is 80% - 90%. *Elythrigia trichophora* participates in the community, which accounts for 60% of the total vegetation cover. The vegetation cover of this community is Cop², height 60 - 70 cm. Subdefinators are *Haplophyllum perforatum* and *Phlomis olgae*, and their abundance is Sp²-Sp³. *Hordeum bulbosum*, *H. leporinum* are also found.

5) Forbs and mixed shrubs—wheatgrass (*Elythrigia trichophora*, *Rosa maracandica*, *Cerasus erythrocarpa*, *Amygdalus spinosissima*, *Lonicera altmannii*, *Ferula kokanica*, *Daucus carota*). This is an association 2.5 - 3 km south of the village of Suvlisay). The area is 10 × 10 m. The height is 1900 m above sea level, the vegetative cover of the community is 45%. The edificator is *Elythrigia trichophora*, Cop¹ abundance, *Rosa maracandica*, *Cerasus erythrocarpa*, *Lonicera altmannii* abundance Sp² abundance. Herbal blend *Ferula kuhistanica*, *Daucus carota* Sp¹. Stones are thrown from places where the soil is covered with dark soil. In such places grow shrubs.

6) Forbs-grass-grass-prairie (*Elythrigia trichophora*, *Poa bulbosa*, *Scabiosa songorica*, *Phlomis olgae*) were recorded in Yakkabag forestry. This association is located at an altitude of 1800 meters above sea level. The soil is light brown, carbonate, the surface is sufficiently washed. In the community, vegetation cover is 60%, Pyrei, Cop², height 40 - 50 cm. Sub grass fertilizer Cop¹ abundance, height 25 - 30 cm. *Scabiosa songorica*, *Phlomis olgae* abundance of Sp¹ and also astragalus Sol abundant, 35 - 40 in height. See Community represented on two tiers.

7) Herb-grass-eremuros-wheatgrass (*Elythrigia trichophora*, *Eremurus olgae*, *Poa bulbosa*, *Cousinia microcarpa*, *Phlomis salicifolia*). This association is common at an altitude of 1900 m. Plot 10 × 10 is a dark gray soil, fine, some places are cartilaginous. Plants cover 55% - 60%. Edificator *Elythrigia trichophora*, height 40 - 45 cm, the abundance of Cop². Subedifiers *Poa bulbosa* and *Eremurus Olgae*, their abundance Sp³ Cop¹. Herb height is 25 - 30 cm, and Eremurus is 30 - 40 cm. From the herb *Cousinia microcarpa*, *Alhaghi pseudalhari*, *Tarxacum officinalis* and from the shrubs *Artemisia tenuisecta*. The community of plants consists of 2 tiers. The upper tier is the Bluegrass, Eremurus, and in the lower tier there are grasses, dandelion and field bindweed.

8) Herb-fescue-couch grass (*Elythrigia trichophora*, *Festuca valesiaca*, *Phlomis salicifolia*, *Centaurea squarrosa*). This association was recorded in two areas studied at an altitude of 1700 - 2000 m and more. m., The area is 10 × 10 m, the soil is dark gray, fine, on the surface is rocky and small gravel stones, the plant coverage is 65% - 70%. The edificator is *Elythrigia trichophora*; it grows evenly on the square, Cop² abundance, 45 cm high. *Festuca valesiaca* subedifier, its height is 20 - 25 cm, Cop¹ abundance, cereal 25 - 30 cm high. Sp¹. On the square, both species are distributed evenly and form the lower tier of the vegetation of this association. Of the mixed herbs are represented by a white-leaved, zopnik, eremurus Olga, which form the upper tier. It is in this tier Samarkand rosehip, is rare. This association can be found on the Gissar ridge, 10 km from the village of

Tamshush, at an altitude of 2000 and more meters above sea level. The soil is light brown, fine, soft. Vegetation cover, 75% - 80%, and cereals make up 55% - 60%, the upper tier with an abundance of Cop³, 50 - 60 cm high. Tipchak is a subedificator, with an abundance of Cop¹, 30 cm high. From the raznotravva met *Carex pachystylis*, *Phlomis salicifolia*, *Cichorium intybus*, *Heteropappus canescens* and others.

Vegetation of the middle mountains

Type: Plants of middle mountains (Oriofil)—*Medioriphyton* (*Oreophyton*);

Subtype: Oreomesophilic plants—*Oreomesophyta*;

Genotype: Mesophilic shrubs—*Oritherothamna*;

Formation: Mixed Bearing—*Rosarieta* (*Therotheramna*).

Mountain vegetation cover is located in Yakkabag forestry, as well as 3 - 5 km from the village of Tamshush. From 1500 to 1600 m to 2000 - 2700 m above sea level, there are many rubbing stony and cobblestone areas on the southern slopes, and therefore plant communities are diverse. Mesophilic plant communities contain 2 prices and 3 formations (**Figure 1**).

Associations:

9) Motley grass mixed spines (*Rosa kokanica*, *R. maracandica*, *Elytrigia trichophora*, *Origanum tythanthum*, *Ferula kuhistanica*, *Perovskia scrophularifolia*, *Achillea millefolium*) 8 - 9 km south of Tamshush (Gisar's plane; above sea level). The area is 20 × 20 m; the soil is dark gray; there are small fertilizers on the surface. Vegetation covers 65% - 70%. *Rosa kokanica* *R. maracandica* copil are abundant at the height of 1.5 - 2 m; Subradiator *Cerasus erythrocarpa*, *Lonicera nummulariifolia*, Sp², height 1.5 m; abundance of oregano and couch grass Sp¹-Sp², height 40 - 50 cm (second tier). *Ferula kuhistanica*, *Perovskia scrophularifolia*, *Achillea millefolium*, Sp¹ are also involved. They, too, on the 2nd tier and on the lower tier there are grass, bluegrass, silverweed, 20 - 25 cm high.



Figure 1. Plant communities of *Juniperus* (Gissar reserve).

10) *Rosa kokanica*, *R. maracandica*, *Origanum tytthanthum*, *Ferula kuhistanica*, *Perovskia scrophularifolia*, *Achillea millifolium* *Elytrigia trichophora*, *Poa bulbosa*), area 20 × 20 m gray, in some places brown soil with dark brown and stony rocks. The community is *Rosa maracandica*, *R. kokanica* cop¹ abundance, height 1.5 m. Subradifier *Cerasus erythrocarpa* abundance of Sp², height 1.0 m. And in the first tier *Elytrigia trichophora*, *Origanum tytthanthum*, abundance of Sp², *Poa bulbosa*, *Phleum phleoides*, *Bromus macrostachys*, abundance of Sp¹ Height 30 - 40 cm. They are evenly distributed in the community, followed by *Ferula kuhistanica*, *Perovskia scrophularifolia*, *Achillea millifolium*, *Cousinia microcarpa*.

11) *Rosa kokanica*, *R. maracandica*, *R. nanothamnus*, *Origanum tytthanthum*, *Elytrigia trichophora*. 20 km from the village of Suvlisay (Yakkabag), this association is located at an altitude of 1900 - 2000 m above sea level. m on the eastern slope. The soil is light brown, fine, soft, and some places are covered with stony rocks. Vegetation cover is 55%. *Rosa kokanica* is abundant in Cop², *Rosa maracandica*, Cop¹, *R. ecae*, Sp², height 1.0 - 1.5 m. All three species of wild rose grow evenly over an area of 20 × 20 m: *Rosa canina* subedifier abundance of Sp², height 1 - 1.5 m. *Rosa fedtchenkoana*, abundance of Sp¹, in addition, *Cerasus erythrocarpa*, *Cotoneaster songorica*, *Lonicera nummulariifolia*, *Berberis oblonga*, *Prunus divaricata*, *Amygdalus spinosissima* (for the first time). In the second tier (40 - 50 cm), cereals, astragalus (covered with stone bark) Sp², *Bromus danthonia* and *B. macrostachys* were found in abundance of Sp² 3 tier (25 - 30 cm). There are many shrubs and other plants in this community. Almonds are planted on the terraces—5 - 8 summer trees. The area is in good condition. Therefore, there are many species of wild rose and other shrubs here.

Cenotype: *Juniperus*—*Arceuthodendra*;

Formation: Zarafshan Archa—*Junipereta sarawschanicae*.

Juniperus sarawschanica is a Zeravshan juniper of the *Juniperus* family (juniper). This species of juniper is found in the studied areas at an altitude of 2000 - 2500 m, in mountain slopes.

Associations:

12) *Juniperus sarawschanica*, *Elytrigia trichophora*. This association occurs at an altitude above 2000 m above sea level in the areas studied by us. Brown soils on the slopes, on the surface of rubble, on the slopes on brown soils there are shrubs up to 1 m high. In this association, the edifier is *Juniperus sarawschanica*, abundance, Sp³, density 0.3 - 0.4, height 4 - 5 m, subedifier *Elytrigia trichophora*, 40 - 50 cm high in Cop¹, members of this community *Rosa maracandica*, *Lonicera nummulariifolia*, *Poa angustifolia*, *Artemisia tenuisecta*, *Perovskia scrophularifolia*, *Cousinia microcarpa*, *Hordeum bulbosum* and many others, *Poa bulbosa*—Sp¹. In the community, vegetation cover covers 40% - 60% (excluding juniper).

13) *Forbs-Pirein-Zarafshan juniperus* (*Juniperus sarawschanica*, *Elytrigia trichophora*, *Poa bulbosa*, *Phlomis thapsoides*, *Centaurea squarrosa*), is similar to the above association, but the majority of the vegetation falls on the wheatgrass—Cop¹, *Poa bulbosa* Sp¹, *aphorus*, Cop, *Poa bulbosa* Sp¹, the crop association, but the majority of the vegetation falls on the wheatgrass—Cop¹, *Poa bulbosa* Sp¹, the crop association, Copyra, *Poa bulbosa* Sp¹, the share of the above mentioned association, but the majority of the vegetation accounts for the wheatgrass. Grass covers 60% - 80%. Unlike the previous community, the grass is 20% more abundant, and the trees of *Juniperus sarawschanica* are higher and reach a height of 2 - 3 m. Subaeditor *Poa bulbosa* and forbs. Obviously, the location on the northern slopes has an impact on the development of this association.

14) Mint-wormwood-shrub-zarafshan juniper (*Juniperus sarawschanica*, *Rosa maracandica*, *R. kokanica*, *R. hissarica*, *Lonicera altmanii*, *Artemisia tenuisecta*, *Poa bulbosa*, *P. angustifolia*, *Elytrigia trichorahorachera*, *Elythriia trichorahotecta*, from the village of Suvlisay and covers an area of 20 × 20 m, the soil is brown, in some places the stones are washed out. Herbal cover of plants is 60%. Edificator of *juniper zarafshanskaya*, Cop¹ abundance, density 0.5, bonitet 4, height 5 - 6 m. Subedifiers *Rosa canina*, *R. maracandica*, *R. hissarica*, *Lonicera altmannii* Sp³, *Artemisia tenuisecta* Sp¹ (Figure 2).

15) Forbs-shrubs-juntaus sarawschanica, (*Juniperus sarawschanica*, *Rosa fedtschenkoana*, *R. hissarica*, *R. maracandica*, *Lonicera sarawschanica*, *Phlomis olgae*, *Eremurus regeli*). It is widespread in the Suvlisay Valley and in the Gissar Reserve. The soil is brown, soft, finely gravelly cartilaginous. Grass cover in association is 60% - 70%. *Juniperus sarawschanica* edificator, Cop¹-Cop² abundance, density 0.5 - 0.6, height 6 - 8 m, rarer also *Acer pubescens* (5 - 6 m) and *Prunus divaricata* (5 m), Sol abundance. Barberry ordinary, *Rosa kokanica*, *R. maracandica* are 1.5 - 2 m high. *R. hissarica*, *R. fedtschenkoana*, and others, whose number Sp¹, grass cover is 65% - 70%.

16) *Juniperus sarawschanica*, *Rosa hissarica*, *R. maracandica*, *Lonicera sarawschanica*, *Elytrigia trichophora*, in Yakkabag forestry distributed. The soil is dark brown, edificator archa zarafshan abundance of Sp³, height 5 - 6 m. The second tier is similar to the composition of the association 15, but the plants are rare.

17) *Juniperus sarawschanica*, *Ziziphora pamiroalaica*, *Poa bulbosa*, *Elytrigia trichophora*.

These 3 associations we noted in department Yakkabag forestry No. 1 at altitudes of 1800 - 2000 m asl. The area is covered with brown soils. In some places the stones lie on the ground. The edificator is the archa zarafshanskaya, the abundance of Sp³, the density is 0.3 - 0.4, the height is 5 - 6 m. The wheatgrass Sp¹, bluegrass abundant Sp³, *Astragalus bactrianus* Sp¹, *Cousinia microcarpa* Sol, *Plantago lanceolata* Sol and others grow in the second tier with less common shrubs.



Figure 2. *Acantholimon butkovii* (Suvlisay).

Formation: Hemispheric Juniper—*Junipereta semiglobosae*.

20) *Juniperus semiglobosa*, *J. sarawschanica*, *Festuca valesiaca*, *Elytrigia trichophora*, 15 km south of the village of Tamshushsay. The area is 20 × 20 m, the soil is typical, brown, in places small jackdaws. The edificator is *Juniperus semiglobosa*, Cop¹ abundance, height 8 - 9 m, density 0.5. *Juniperus sarawschanica* subedificator, abundance of Sp², density 0.4, height 6 - 7 m. Herbs are *Elytrigia trichophora* Cop³-Cop¹, Sp² bluegrass, Sp¹ fire, and shrubs are less common.

Associations:

21) *Juniperus semiglobosa*, *J. sarawschanica*, *Festuca valesiaca*, *Elytrigia trichophora*, *Cousinia umbrosa*, *Potentilla asiatica*, *Scabiosa chirophiothora* 15 km south of the village Tamshush. The area is 20 × 20 m, the soil is typical, brown, small, in places small jackdaws. The edificator is *Juniperus semiglobosa*, Cop¹ abundance, height 8 - 9 m, density 0.5. *Juniperus sarawschanica* subedificator, abundance of Sp², density 0.4, height 6 - 7 m. Herbs are *Elytrigia trichophora* Cop³-Cop¹, Sp² bluegrass, Sp¹ fire, and shrubs are less common.

22) Forbs-bluegrass-fescue—zarafshan's junipers—hemispherical junipers (*Juniperus semiglobosa*, *J. sarawschanica*, *Festuca valesiaca*, *Poa bulbosa*, *P. angustifolia*, *Bromus paulsenii*, *Arenaria griffithii*, *Allium chashes*, and a few-four-four-five-a-year-olds) south of the Suvlisay. Area 20 × 20 m, typical brown soils are well pronounced. In the community, the *Juniperus semiglobosa* Cop² edificator has a density of 0.4, a bonitet IV, a height of 7 m. A subdued *Juniperus sarawschanica*, a Cop¹ strength, a density of 0.6, a bonitet 4, a height of 7 m. The grass cover is 70%. *Festuca valesiaca* with abundance of Cop¹, bluegrass Sp¹, wheat grass Sp¹, *Poa angustifolium* Sp¹, *Hordeum brevisubulatum* Sp¹. From mixed grass *Geranium collinum* Sp¹, *Convolvulus lineatus* Sol, *Bromus macrostachys* Sol, *Galium pamiralaicum* Sol.

23) *Juniperus semiglobosa*, *J. sarawschanica*, *Festuca valesiaca*, *Geranium collinum*, *Plantago lanceolata*, Area 20 × 20 m. Small brown soil. In the vegetation cover of this association, two junipers are edificators growing on the 1st tier, 4 - 5 m high. Abundance—Cop¹, density 0.5, bonitet IV. Herbal coverage is 55% -

60%. The dominant is *Festuca valesiaca*, the abundance of its Sp³, wheat grass and bluegrass are subdominant, the abundance of Sp². Of mixed herbs found in *Convolvulus lineatus*, *Plantago lanceolata* Sol.

Highland plants:

Type: Highland plants—*Ipsiloreophyton*;

Subtype: subalpine—*Ipsilorimesophyta*;

Coenotype: nasnokserofitnye meadows—*Cryofriganopoa*;

Formation: Kuzinia whorled—*Cousinieta verticillaris*.

Associations:

We met 20 - 25 km from the village of Suvlisai of the Yakkabag forestry at an altitude of 2900 - 3000 m above sea level. m. 24. Akantolimonovo-feschakovo-cousine (*Cousinia verticillaris*, *Festuca valesiaca*, *Acantholimon butkovii*), 25) *Wormwood-acantholimone-cusine* (*Cousinia verticillaris*, *Acantholimon butkovii*, *Artemisia lehmanniana*). The edifier of *Cousinia verticillaris* by the abundance of Cop¹, the subedificator *Acantholimon butkovii* Sp², *A. erythraeum* Sol. The participant of these associations is, *Cerasus erythrocarya* Sol, *Convolvulus lineatus* Sol, less common is the juniper spawning Sol, *Juniperus semiglobosa* Sol, the plant cover of herbs is 50%.

Subtype: Highland freegans—*Cryofriganophyta*;

Coenotype: Kolyuchepodushechniki—*Cryotapeta*;

Formation: Acantholimone—*Acantholimoneta butkovi*.

Associations:

26) *Acantholimon butkovii*, *Festuca valesiaca*, *Cousinia verticillaris*

27) *Acantholimon butkovii*, *Cousinia verticillaris*, *Carex stenophylloides*). These associations occurred at 3000 - 3200 m above sea level. The soil is rocky, fine and gravelly.

In these acatnolimonics, the edificator is the *Acantholimon butkovii*—Cop². Subedifiers—*Festuca valesiaca*, Sp³-Sp². *Cousinia verticillaris* Sp³ *Artemisia lehmanniana* Sol, *Acanthophylum sp.* Sol. Vegetation cover is 40%.

4. Conclusions

During the expeditions, more than 110 herbarium leaves were collected in the surveyed territories and plant species were identified.

In conclusion, the region is currently under intense anthropogenic and man-made impact. The increasing impact on vegetation has caused significant changes in the composition and structure of communities in different zones of the foothill and mountainous areas. As a result, the diversity of vegetation and plant communities has decreased; their productivity and renewable capacity have decreased.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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