UNIVERSITY OF CENTRAL ASIA
GRADUATE SCHOOL OF DEVELOPMENT
MOUNTAIN SOCIETIES RESEARCH INSTITUTE

Impacts of Climate Change on Food Security and Health: Medicinal and Aromatic Plants (MAPs) in the Pamir Region of Tajik and Afghan Badakhshans

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Impacts of Climate Change on Food Security and Health:
Medicinal and Aromatic Plants (MAPs) in the Pamir Region of Tajik and Afghan Badakhshan

Objectives: There are two major objectives of this study:

- *Investigate how mountain communities use and depend on MAPs for **sustenance and healthcare** in the study areas; and*
- *Explore and document the **impacts of climate change** on medicinal and aromatic plants (MAPs) and therefore the **food security** of mountain communities in the Pamirs.*

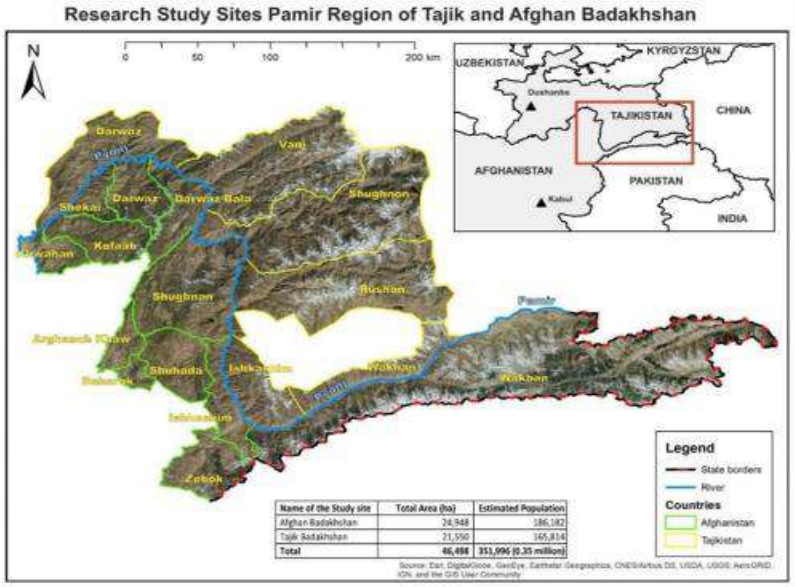
Methods adopted

Research design: *Multistage random sampling technique was adopted; Sample size was kept 20%*

Data collection: *Structured questionnaire was developed to collect the required data from 8 border districts (4 districts of Tajik and 4 districts of Afghan Badakhshans); 56% female respondents*

Focus group discussion: *FGDs were held with key informants and knowledgeable people*

Research Study Area



Results of the Research Study

MAPs contribution to Food Security

Preliminary findings show:

- Field investigation of 200 respondents both Afghan and Tajik Pamirs revealed that the population heavily rely on plants to meet their daily livelihood needs, particularly for herbal remedies and food.
- The result of the study shows that 128 different plant species belonging to 63 families and 81 genera are used for food/ nourishment and health-related purposes.
- Rapidly changing climatic conditions impacting plant populations in their natural habitats makes mountain communities more vulnerable to different ailments and food insecurity.

Evidence shows climate change is triggering visible effects on plant populations as well as their distribution in certain geographies.

Contribution of MAPs to Food Security

Contribution of MAPs to Livelihoods

- The livelihoods of many poor mountain dwellers depend heavily on the collection and selling of various medicinal plants both at local, Cross Border and national markets in Tajik/Afghan Badakhshans
- 89 medicinal plant species traded in local and national markets

Afghan-Badakhshan	Gorno-Badakhshan
Jambilak (*Ziziphora pamiroalaica*)	Jambilak (*Ziziphora pamiroalaica*)
Liquorice (*Glycerrhiza glabra*)	Liquorice (*Glycerrhiza glabra*)
Barberry (*Barberis vulgaris*)	Barberry (*Barberis vulgaris*)
Espand /Harmal (*Peganum harmala*)	Espand/Harmal (*Peganum harmala*)
Black currant (*Ribes nigrum*)	Golden root (*Rhodiola rosea*)
Caper (*Capparis spinosa*)	Caper (*Capparis spinosa*)
Stinking gum / hing (*Ferula asafoetida*)	Blackwood (*Cotoneaster sp.*)
Black cumin (*Bunium persicum*)	Chicory/Endive (*Cichorium intybus*)
Krishk (*Artimisia sp.*)	St. John's wort (*Hypericum perforatum*)
Saffron (*Crocus sativus*)	Chamomile (*Matricaria chamomilla*)
Russian olive (*Elaeagnus angustifolia*)	Buck wheat (*Fagopyrum esculentum*)

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Contribution of MAPs to Livelihoods

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Contribution of MAPs to Health

- **Amidst extreme climatic and geographic conditions, the high-quality medicinal and aromatic plant species have thrived and adapted in Pamir region**
- **The local population possesses valuable Indigenous knowledge on the medicinal use of local plants to promote health.**
- **Our study revealed that over 30 different human ailments/diseases are treated traditionally by 128 different medicinal plant species**

The eight most common human ailments treated by different MAPs are here:

Common human ailments/Diseases	No. of plants used	Current status
Cardio-vascular diseases	8	Decreasing ⬇
High blood pressure (Hypertension)	8	Most of the plants ⬇
Gastrointestinal problems	8	Most of the plants ⬇
Cough /Bronchitis	6	Decreasing ⬇
UTI, kidney stones and pain	9	Most of the plants ⬇
Arthritis, Joint pain, inflammation	4	Most of the plants ⬇
Jaundice, Liver diseases	3	Most of the plants ⬇
Gynecological diseases/ problems	3	Most of the plants ⬇

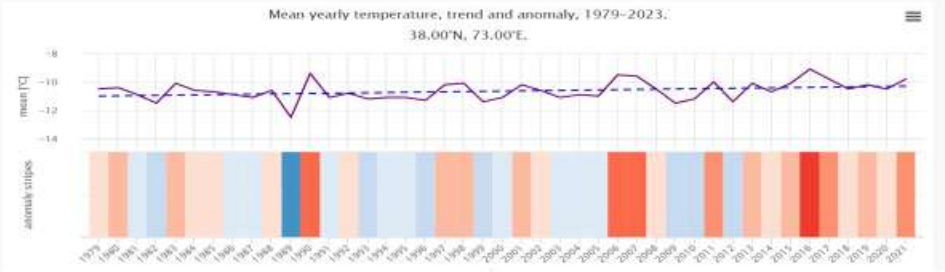
Impact of climate change on medicinal and aromatic plants (MAPs) in Pamir region

- The study reveals that climate change is causing visible effects on plant population size and distribution.
- MAP population is declining rapidly and shifting from lower to higher elevations
- Medicinal plant resources were abundant in the study area 15 to 20 years ago, these resources are rapidly depleting due to anthropogenic and climatic factors.
- Indigenous knowledge of medicinal plants is rapidly declining.
- MAPs were regularly found around villages 15-20 years ago are now sporadically found in lower and higher mountains
- 50 to 60 MAP species are now becoming rare in the area

Effect of Climate change on Food Security

Climate change is not globally uniform and affects some regions more than others. On the following diagrams, you can see how climate change has already affected the region of Pamir Mountains during the past 40 years.

Yearly Temperature Change Pamir Mountains

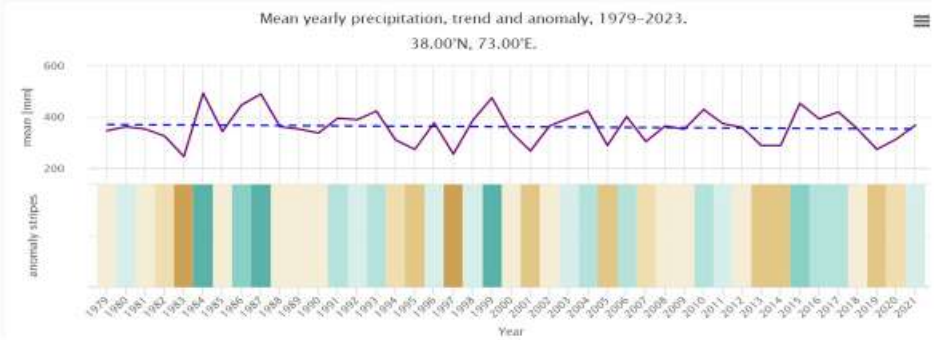


The top graph shows an estimate of the mean annual temperature .The dashed blue line is the linear climate change trend. The trend line is going up from left to right, the temperature trend is positive, and it is getting warmer in Pamir Mountains due to climate change. (-11.0 degree C 1979 to -10.3 Degree C in 2021)

Below graph shows the so-called warming stripes. Each colored stripe represents the average temperature for a year - blue for colder and red for warmer years. (The data source used is ERA5, the fifth generation ECMWF atmospheric reanalysis of the global climate, covering the time range from 1979 to 2021, with a spatial resolution of 30 km. https://www.meteoblue.com/en/climate-change/pamir-mountains_tajikistan_1131187

Impact of climate change on fruit plants in Pamir region

Yearly Precipitation Change - Pamir Mountains



The top graph shows an estimate of mean total precipitation for the larger region of Pamir Mountains. The dashed blue line is the linear climate change trend. The trend line is going down; conditions are becoming drier in Pamir Mountains over time. (370.4 mm1979 to 353.3 mm 2021)

In the lower part the graph shows the so-called precipitation stripes. Each colored stripe represents the total precipitation of a year - green for wetter and brown for drier years.

https://www.meteoblue.com/en/climate-change/pamir-mountains_tajikistan_1131187

Climate Change impact

Argu district Landslide Afghan Badakhshan 2014, over 400 souls buried alive

Flash flood and avalanche in Northern Afghanistan 2015

Flash flood in Baghlan 2014

Avalanche in Northern Afghanistan 2015

Barsim Flood near Khorog July 2015

-July 2015 heavy mud flow due to high temp and melting of glacier

-6 people were died and more than 100 hhs destroyed

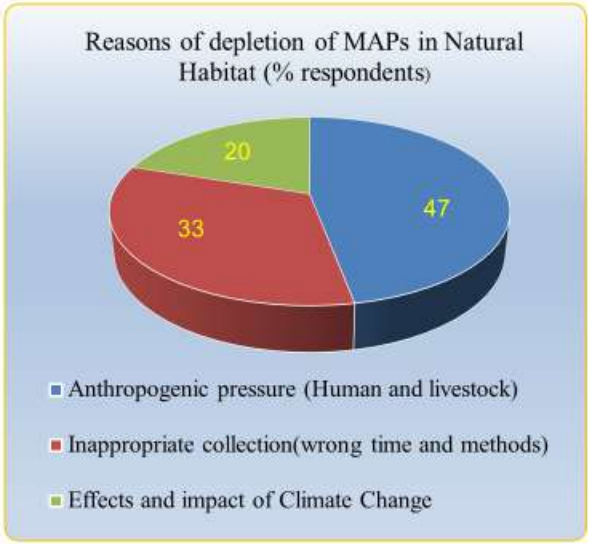
-An artificial lake created in Gund River

-Affected population are relocated to the tent camp in Shugnan District;

-Govt has allocated land for construction of the houses for 83 affected families in Shugnan District.

Reasons of MAPs depletion in the natural habitats

Respondents, including herbalists/tabibs, perceived this to be due to increasing biotic pressure and over-harvesting by local villagers. However, recent studies in neighboring countries such as India and China illustrate many of the local medicinal plant species have shifted to adjust to global warming in search of more suitable temperature regimes



Human induced environmental degradation in Pamir region Afghan Badakhshan

Conclusion

- In addition to the concerns raised about the depletion of MAPs, we should also consider climate change. Although this perspective was less prominent among respondents as a whole, it was emphasized by the scholars and professionals.
- Residents shared their experiences and observations, describing less rainfall and snow in recent years compared to 15 to 20 years ago. This has resulted in drought, poor forage in pastures, water scarcity in streams and channels.
- Untimely rains damaging crops, an unaligned agricultural calendar due to changing weather patterns, and the appearance of new crop diseases and insect pests. These challenges, all of which are related to weather disturbances, are triggered by climate change.
- Given these findings, Pamir communities should be informed about the Indigenous knowledge of MAPs as well as the consequences of MAP disappearance on traditional health and food systems in mountain communities.

Suggestion and recommendations

Few suggestions/recommendations are here under:

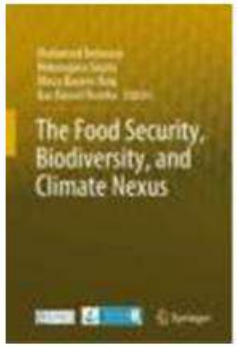
- *Increase community awareness regarding the importance of conserving medicinal plants through trainings, conferences, and developing promotional materials in local languages/dialects.*
- *Devise a government policy focused on the conservation and management of medicinal plants and other non-timber forest products.*
- *Control overexploitation of medicinal plants by residents as well as by nomads/graziers. This includes offering a pre- and post-harvest management training for the people involved in medicinal plants collection and processing.*
- *Examine forest conversion and uprooting of shrubs from mountains.*

Suggestion and recommendations Contd…

- *Identify MAPs vulnerable to climate change and cultivate them on-farm to reduce the risk of depletion or local extinction.*
- *Establish protected areas for MAP/biodiversity hot spots to maintain genetic diversity in the natural ecosystem.*
- *Practice sustainable agricultural and rangeland management to reverse land degradation in problematic areas.*
- *Provide training on climate-smart agriculture practices for farmers.*
- *Form community-based natural resource management committees and provide basic trainings on conservation and sustainable management of natural resources including MAPs at village level.*

Book Chapter

The Food Security, Biodiversity, and Climate Nexus



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Thanks a lot!

Any question?