UDC 349.6

IMPROVING THE INSTITUTIONAL AND LEGAL FRAMEWORK FOR MEDICINAL PLANT CONSERVATION AND SUSTAINABLE USE IN UZBEKISTAN UNDER GLOBAL CLIMATE CHANGE

Rustamov Mukhammadrizo Rustam ogli
Master's Student, Green University of Uzbekistan
ORCID ID: https://orcid.org/0009-0007-0644-0786
e-mail: rustamovmm2003@gmail.com

Abdullaev Fayzulla Khabibullaevich
Researcher, «Center for Innovation and Technology Implementation» LLC, PhD
ORCID ID: https://orcid.org/0000-0003-0013-2348
e-mail: f_abdullaev@yahoo.com
Doi: https://doi.org/10.5281/zenodo.20265946

Annotasiya. Tadqiqot O‘zbekistonda dorivor o‘simliklarni saqlash va barqaror foydalanishning institutsional-huquqiy asoslarini o‘rganadi. Qiyosiy va normativ-huquqiy tahlil, institutsional baholash hamda statistik metodlar qo‘llanildi. O‘zbekiston normativ hujjatlari WHO GACP, ISO 17025, Yevropa Farmakopeyasi va Nagoya protokoli bilan solishtirildi. Yettita tizimli kamchilik aniqlandi: xalqaro akkreditatsiyalangan laboratoriyaning yo‘qligi va Nagoya protokoliga qo‘shilmaslik. Kvota hisoblash modeli ($Q = P \times R \times S - C$) va «Dorivor o‘simlik resurslari to‘g‘risida»gi qonun loyihasi ishlab chiqildi.
Kalit so‘zlar: dorivor o‘simliklar, institutsional asoslar, huquqiy islohot, GACP, Nagoya protokoli, kvota tizimi, iqlim o‘zgarishi, barqaror rivojlanish.

Аннотация. Проанализированы институциональные и правовые основы сохранения лекарственных растений в Узбекистане. Применены сравнительно-правовой, институциональный и логико-статистический методы. Нормативные документы оценены на соответствие стандартам ВОЗ GACP, ISO 17025, Европейской фармакопее и Нагойскому протоколу. Выявлено семь структурных пробелов, включая два критических: отсутствие аккредитованной лаборатории и неприсоединение к Нагойскому протоколу. Разработаны модель расчёта квот ($Q = P \times R \times S - C$) и проект профильного закона.
Ключевые слова: лекарственные растения, институциональная основа, правовая реформа, GACP, Нагойский протокол, квотная система, изменение климата, устойчивое развитие.

Abstract. We examine Uzbekistan's institutional and legal framework for medicinal plant conservation. Combining comparative legal analysis, institutional assessment, and statistical methods, we evaluate national regulations against WHO GACP, ISO 17025, European Pharmacopoeia, and Nagoya Protocol standards. Seven governance gaps emerge. Two are critical: no internationally accredited laboratory and non-accession to the Nagoya Protocol. We develop a quota calculation model ($Q = P \times R \times S - C$) and propose a Law «On Medicinal Plant Resources».
Keywords: medicinal plants, institutional framework, legal reform, GACP, Nagoya Protocol, quota system, climate change, sustainable development.

Introduction. Global climate change poses a major challenge to biodiversity conservation and sustainable resource management. The Intergovernmental Panel on Climate Change (*IPCC*) has documented those rising temperatures, altered precipitation patterns, and increased frequency of extreme weather events directly affect plant phenology, distribution, and population viability [1]. Medicinal and aromatic plants (*MAPs*) are particularly vulnerable [2].

The global market for plant-derived pharmaceuticals has expanded substantially over the past decade. Exports under HS Code 1211 grew from USD 2.1 billion (2010) to over USD 4.1 billion (2023). Countries with advanced certification infrastructure capture up to 60% of final product value. Raw material suppliers- including most biodiversity-rich developing states- remain confined to low-margin extractive segments [3].

Uzbekistan holds natural advantages. The country's phytogeographic diversity supports over 4,500 higher plant species; approximately 750 possess recognized medicinal properties. Key commercial species include *Glycyrrhiza glabra*, *Ephedra intermedia*, *Ferula assa-foetida*, and *Rosa canina*. Many shows genetic adaptations to arid conditions- valuable resources for climate-resilient conservation.

Yet institutional fragmentation, regulatory incoherence, and infrastructure deficits constrain sustainable value capture. Industrial processing covers only 15-20% of production; over 70% of exports are unprocessed raw materials. Central Asia faces 1.5-3.0°C warming by 2050, which will directly impact wild MAP populations [1].

Reforms began in 2020. Presidential Decree PP-4901 created a cluster-based cultivation model and established the Scientific-Production Centre for Medicinal Plants [4]. Later reforms (*PF-14, PF-149*) transferred the Centre to the Ministry of Ecology (MoECC).

No comprehensive legal-institutional analysis of these reforms against international standards has been published. We address this gap. Drawing on primary regulatory documents and comparative analysis, we identify governance failures and develop a reform agenda for Uzbekistan under climate change.

Materials and Methods. We employ five methods: comparative legal analysis, normative-legal analysis, institutional assessment, logical-statistical analysis, and the system approach. Comparative legal analysis evaluates Uzbekistan's regulatory framework (*PP-4901, PP-251, PF-14, PF-149*) against WHO GACP, ISO 17025, European Pharmacopoeia, and Nagoya Protocol standards, plus five comparator jurisdictions (*China, Germany/EU, India, Russia/EAEU, Turkey*). Normative-legal analysis identifies gaps and contradictions within national legislation. Institutional assessment examines mandates and coordination among MoECC, PIDA, Ministry of Agriculture, Forestry Agency, and Institute of Botany. Logical-statistical analysis quantifies quota allocation versus market demand and develops the formula $Q = P \times R \times S - C$. The system approach evaluates the framework as an integrated architecture. Primary data include official legal acts, quota orders, and statistical reports.

Results and Discussion. We find three governance failures. Below we detail each, interpret it theoretically, and compare with international standards and five jurisdictions (*China, Germany/EU, India, Russia/EAEU, Turkey*).

Institutional Fragmentation. Uzbekistan's medicinal plant governance suffers from structural fragmentation. Before 2020, four state bodies shared responsibility without coordination. PP-4901 created the Scientific-Production Centre [4]. But the 2023-2024 reforms (*PF-14, PF-149*) transferred the Centre to MoECC without any inter-ministerial protocol. The result: a competence vacuum. No single agency controls the full chain from conservation to pharmaceutical export. The data are clear. This aligns with institutional

economics on transaction costs and agency fragmentation [3]. Divided jurisdiction raises costs and weakens enforcement. MoECC prioritizes environmental protection. PIDA focuses on market access. Agriculture oversees cultivation. Yet no legal mechanism compels their coordination. This fragmentation cripples climate adaptation.

Quota System Failure. Quota data reveal that allocated volumes cover only 40-63% of documented market demand. This under-allocation creates perverse incentives. Harvesters face a choice: legal collection (*insufficient*) or unregulated illegal harvesting. GPS traceability and post-harvest verification are absent. The quota ceiling is unenforceable. Consider *Ferula assa-foetida*. We apply a Maximum Sustainable Yield-based formula ($Q = P \times R \times S - C$) to 120,000 hectares. The calculation yields a sustainable quota of approximately 3,000 tons. The approved quota exceeds this ecological ceiling by a factor of 2.25. Hardin's tragedy of the commons explains why: when property rights are ill-defined (*res nullius*) and enforcement weak, rational harvesters ignore sustainability. Our formula anchors quotas in ecological data and creates a structural incentive- increased cultivation (C) automatically reduces wild harvest allowances, progressively internalizing the externality.

International Standards Compliance. Two critical deficiencies emerge. First, no internationally accredited ISO 17025 laboratory exists. Uzbek exporters cannot certify raw materials to European or EAEU Pharmacopoeia standards. Uzbekistan remains in low-margin uncertified supply chains, capturing only 15-20% of potential value [3]. Second, non-accession to the Nagoya Protocol leaves endemic medicinal flora unprotected. Foreign entities can commercialize genetic resources without benefit-sharing. These gaps converge on value chain marginalization. The laboratory gap is a supply-side constraint. The Nagoya gap is a sovereignty failure. China, India, and Turkey addressed analogous gaps through national accreditation and Nagoya ratification with domestic ABS legislation [5].

Theoretical Contribution. Our quota formula ($Q = P \times R \times S - C$) extends Maximum Sustainable Yield (*MSY*) theory- extensively applied in fisheries law (*UNCLOS Article 119*)- to terrestrial plant management. The formula offers three innovations: species-specific recovery coefficients (R) calibrated to Central Asian arid-zone conditions; ecological safety coefficients (S) with precautionary buffers; and subtraction of cultivated supply (C), creating a dynamic incentive to shift from wild collection to cultivation. The *Ferula* calculation shows policy relevance. Without recalibration, warming of 1.5-3.0°C by 2050 [1] will worsen pressure on drought-sensitive populations.

Comparative Lessons. Uzbekistan's trajectory resembles India and Turkey before their sectoral consolidations. India's National Medicinal Plants Board annual demand-supply survey is replicable. Turkey achieved dual EU/EAEU market access through TÜRKAK ISO 17025 accreditation, pharmacopoeial harmonization, and Nagoya ratification (*2014*). China's Traditional Chinese Medicine Law (*2017*) made cultivation standards mandatory and linked wild quotas to certified volumes- exactly the mechanism in our formula's C term. These comparators share three features absent in Uzbekistan: a sector-specific primary law; mandatory GACP/GAP compliance with a designated certification authority; and at least one internationally accredited laboratory. Their absence explains why Uzbekistan's exceptional floristic wealth has not translated into commercial value.

Conclusion. We present the first comprehensive legal-institutional analysis of Uzbekistan's post-2020 medicinal plant governance. Seven structural gaps emerge. Two are critical: no accredited ISO 17025 laboratory and non-accession to the Nagoya Protocol. Uzbekistan's rich flora remains trapped in low-margin uncertified supply chains, capturing only 15-20% of potential value. Our quota formula ($Q = P \times R \times S - C$), adapted from MSY theory, addresses conservation risk and demand failure. Hardin's commons explains persistent over-harvesting. Near-term measures- mandatory GACP, inter-agency protocol,

GPS traceability, and Nagoya accession- need no primary legislation. Evidence from India, Turkey, and China suggests that legislative consolidation would lock in gains and provide legal certainty for climate-resilient investment.

References

1. IPCC. (2023). *Climate change 2023: Synthesis report*. Geneva: IPCC. https://doi.org/10.59327/IPCC/AR6-9789291691647
2. Hamilton, A. C. (2004). Medicinal plants, conservation and livelihoods. *Biodiversity and Conservation*, 13(8), 1477-1517. https://doi.org/10.1023/B:BIOC.0000021333.23413.42
3. Schippmann, U., Leaman, D., & Cunningham, A. B. (2006). A comparison of cultivation and wild collection of medicinal and aromatic plants. In R. J. Bogers et al. (Eds.), *Medicinal and aromatic plants* (pp. 75-95). Springer. https://link.springer.com/book/9781402054471
4. Government of Uzbekistan. (2020, November 26). Presidential Decree No. PP-4901. LEX.UZ. https://lex.uz/ru/docs/5125731
5. World Health Organization. (2003). *WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants*. Geneva: WHO Press. https://www.who.int/publications/i/item/9241546271

6. About the authors

7. Rustamov Mukhammadrizo Rustam ogli- Master's Student, Green University of Uzbekistan, Sustainable Development and Environmental Law. ORCID ID: https://orcid.org/0009-0007-0644-0786. Phone. (*mob.*): (+998-99)-111-01-60, e-mail: rustamovmm2003@gmail.com
8. Abdullaev Fayzulla Khabibullaevich- Researcher, «Center for Innovation and Technology Implementation» LLC, PhD. ORCID ID: https://orcid.org/0000-0003-0013-2348. Phone (*mob.*): (+998-97)-767-04-55, e-mail: f_abdullaev@yahoo.com.