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OROL DENGIZI MINTAQASIDA CHO'LLANISHNI BARTARAF ETISHNING BARQAROR USULI: TABIIY OFAT TURIZMI PLATFORMASIDAN FOYDALANISH

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Annotatsiya: O'zbekistonning g'arbiy hududlari va qo'shni mamlakatlar aholisining turmush darajasi Orol dengizining qurishi hamda tuproqning ikkilamchi sho'rlanishi oqibatida yuzaga kelgan cho'llanish jarayonidan jiddiy zarar ko'rmoqda. Sho'rlanish nafaqat mahalliy aholining dehqonchilik imkoniyatlarini cheklamoqda, balki atrof-muhit iflosligi va havo sifati yomonlashuvi sil kasalligi, yuqori nafas yo'llari infeksiyalari, oshqozon-ichak kasalliklari va saraton kabi kasalliklarning tarqalishiga sabab bo'lmoqda. Shu kungacha olib borilgan tadqiqotlar cho'llanishning sabablari va salbiy ta'sirini aniqlashga yo'naltirilgan bo'lib, muqobil hamda potentsial bozor imkoniyatlarini yetarli darajada inobatga olmagan. Ushbu tadqiqotda MCDM yondashuvi asosida muqobil variantlarning afzalliklari AHP va PROMETHEE modellari yordamida tahlil qilinib, ularni tartiblash orqali baholandi. Tadqiqot cho'llanishni kamaytirish vositasi sifatida tabiiy ofat turizmi platformasini ilgari suradi. Taklif etilayotgan yondashuv cho'llanishga qarshi barqaror strategiyalarni ishlab chiqish va cho'llashgan hududlarda aholi farovonligini oshirishga xizmat qilishi mumkin.

Kalit so'zlar: MCDM; AHP; PROMETHEE; Orol dengizi; cho'llanish; innovatsion platforma; "Qora tarix"; ofat turizmi.

Abstract: The living standards of the population in the western regions of Uzbekistan and neighboring countries have been severely affected by the drying up of the Aral Sea and the secondary salinization of soil, which have caused a rapid desertification process. Soil salinization not only limits the agricultural opportunities of local communities but also contributes to environmental pollution and air quality degradation, leading to increased cases of tuberculosis, upper respiratory tract infections, gastrointestinal diseases, and cancers. Previous studies have primarily focused on identifying the causes and impacts of desertification without adequately considering alternative and potential market-based solutions. This study uses the MCDM approach to rank the advantages of alternative strategies through AHP and PROMETHEE models. It proposes the development of a natural disaster tourism platform as a sustainable solution to mitigate desertification. The proposed model is considered beneficial in developing mechanisms to combat desertification and improve the well-being of populations living in arid zones.

Key words: MCDM; AHP; PROMETHEE; Aral Sea; desertification; innovative platform; "Dark history"; disaster tourism.

Аннотация: Уровень жизни населения западных регионов Узбекистана и сопредельных государств серьезно пострадал из-за высыхания Аральского моря и вторичного засоления почв, вызвавших процесс опустынивания. Засоление ограничивает не только сельскохозяйственные возможности местных жителей, но и способствует ухудшению экологической обстановки, что, в свою очередь, приводит к росту заболеваемости туберкулезом, инфекциями верхних дыхательных путей, желудочно-кишечными расстройствами и онкологическими заболеваниями. Проведённые до настоящего времени исследования были направлены на выявление причин и последствий опустынивания, не учитывая альтернативные и потенциальные рыночные возможности. В данной работе с использованием метода MCDM проведена ранжировка преимуществ альтернативных решений на основе моделей AHP и PROMETHEE. Исследование предлагает использовать платформу стихийного туризма как устойчивое решение проблемы опустынивания. Разработанный подход может стать полезным механизмом для улучшения условий жизни населения в засушливых регионах.

Ключевые слова: MCDM; AHP; PROMETHEE; Аральское море; опустынивание; инновационная платформа; "Черная история"; стихийный туризм.



KIRISH

So'nggi 50 yil ichida global isish insoniyat uchun asosiy muammoga aylandi (Society – 2020). Toshqinlar, yashash muhitining buzilishi va yuqumli kasalliklarning tarqalishi kabi jiddiy oqibatlar natijasida global isish yashil taraqqiyot va barqaror rivojlanishni keskin izdan chiqarmoqda (Indicators – 2019). Bu salbiy oqibatlarga qo'shimcha ravishda, global isish dunyo bo'ylab yog'in miqdoriga ta'sir ko'rsatib, cho'llanish jarayonini tezlashtirmoqda. Cho'llanish, o'z navbatida, tuproqdan karbonat angidrid ajralishini kuchaytirib, global isish jarayoniga hissa qo'shadi. Iqlim o'zgarishi tufayli cho'llanish xavfining ortishi kutilmoqda va bu holat hosildorlikning kamayishiga, qishloq xo'jaligi hamda chorvachilik faoliyatining qisqarishiga olib kelishi mumkin (Mirzabaev et al. – 2019). Yer yuzasining 20–25 foizi va butun dunyo bo'ylab 250 million kishining hayotiga (Bezerra et al. – 2020) bevosita ta'sir ko'rsatishi, o'simlik va hayvonot dunyosi hamda insoniyat salomatligiga tobora ko'proq xavf tug'dirayotganligi tufayli, cho'llanish muammosi BMT Konvensiyasi, Kioto protokoli va Parij bitimlarida muhim siyosiy chora-tadbirlar doirasiga kiritilgan.

MAVZUGA OID ADABIYOTLAR SHARHI

Cho'llanish — ekologik omillar va inson faoliyati natijasida yuzaga keladigan, turli salbiy ekologik hamda ijtimoiy-iqtisodiy oqibatlarga olib keluvchi tabiiy tahdid hisoblanadi (Akbari et al. – 2020). Birlashgan Millatlar Tashkilotining Atrof-muhit dasturi (UNEP) cho'llanishni quruq, yarim quruq va nam-quruq hududlarda inson faoliyatining salbiy ta'siri natijasida yuzaga keladigan yer va tuproq degradatsiyasi deb ta'riflaydi (UNEP – 1997). Cho'llanish, odatda, yer va suv resurslaridan foydalanish belgilangan ekologik chegaralardan ortiq bo'lgan holatlarda yuzaga keladi (Karavitis et al. – 2020).

Birlashgan Millatlar Tashkilotining Barqaror Rivojlanish Maqsadlari (BRM) 6.4 va 15.3 bandlari hamda UNCCD tomonidan 2018–2030-yillarga mo'ljallangan strategik dastur doirasida 1,3 milliarddan ortiq odam hayotiga bevosita va bilvosita ta'sir ko'rsatishi mumkin bo'lgan cho'llanish jarayonini oldini olish maqsadida Yerlarning Degradatsiyasi Neytralligi (LDN) tamoyili ilgari surilgan (Jiang et al. – 2020; UNCCD – n.d.).

Yerlarning degradatsiyasi — murakkab ijtimoiy, iqtisodiy, biofizik va institutsional omillar, shuningdek, siyosiy harakatsizlik hamda resurslardan nobarqaror foydalanish bilan bog'liq (L. Salvati et al. – 2016; L. Salvati – 2014).

Cho'llanishga sabab bo'luvchi omillar ikki asosiy guruhga bo'linadi: inson omillari va tabiiy-iqlimiy omillar. Inson omillariga — past hosildorlikdagi yerlarning kengaytirilishi, aholi sonining o'sishi, migratsiya, yer resurslaridan noto'g'ri foydalanish kiradi. Iqlimiy omillarga esa — qurg'oqchilik, sho'rlanish, eroziya, yer osti suvlari muvozanatining buzilishi, ularning sifati pasayishi va o'simlik qoplamasining degradatsiyasi kiradi (Akbari et al. – 2020; Benassi et al. – 2020; Jiang, Jiapaer et al. – 2019).

Shuningdek, suv va shudgor eroziyasi, yaylovlardan noto'g'ri foydalanish, yong'inlar, tuproqning sho'rlanishi va suv tanqisligi cho'llanishning asosiy sabablaridan hisoblanadi (Karavitis et al. – 2020). Tadqiqotlar cho'llanishning asosiy sababi sifatida keng ko'lamli inson aralashuvini (antropogen ta'sir) ta'kidlaydi; iqlim va geografik omillar esa ikkilamchi omillar sifatida qayd etiladi (Hu et al. – 2020; C. Zhang et al. – 2020; Sarparast et al. – 2020).

Cho'llanish ekologik omillar yoki inson faoliyati natijasida ko'llar, daryolar va dengizlarning suv yo'qotishi orqali ham yuzaga kelishi mumkin. Afrikada 85 % mamlakatlar cho'llanish xavfi ostida bo'lib, Nil (42 %), Niger (50 %), Senegal (51 %), Volta (67 %), Limpopo (66 %) va Chad ko'li (26 %) kabi daryo havzalarida o'rta va yuqori darajadagi degradatsiya aniqlangan (Mirzabaev et al. – 2019). Chad ko'lining qisqarishi 20 million kishining hayoti va faoliyatiga salbiy ta'sir ko'rsatgan (Gadzama & Ayuba – 2016). 1963–2007-yillar oralig'ida Chad ko'li maydoni 25 000 km² dan 3 000 km² gacha qisqargan (Musa et al. – 2008), natijada 1984–2016-yillar oralig'ida 45 945,08 km² o'simlik qoplamasi butunlay yo'qolgan (Nwilo et al. – 2020).

Orol dengizi misolida cho'llanish oqibatlari yanada yaqqol namoyon bo'lmoqda. Akademik Askokskiy tomonidan ogohlantirilgan "Orol dengizining o'limi" ssenariysi 70 yildan so'ng haqiqatga aylandi. Orol 90 % suvini yo'qotgan, bu esa 60 milliondan ortiq aholi, flora va fauna hayotiga jiddiy xavf tug'dirmoqda (Activities et al. – n.d.). Dengizning qurishi natijasida O'zbekiston va Qozog'iston hududlarida iqtisodiy, ekologik va ijtimoiy muammolar yuzaga kelgan (Opp – 2005; Jiang, Bao et al. – 2019).

UNEP hisob-kitoblariga ko'ra, cho'llanish tufayli dunyo miqyosida har yili taxminan 42 milliard AQSH dollari miqdorida iqtisodiy yo'qotishlar qayd etiladi (JSST – 2025). JSST ma'lumotlariga ko'ra, global kasalliklarning 23 % va saraton holatlarining 25 % atrof-muhit bilan bog'liq (JSST – 2025).

Orolbo'yi hududida sil kasalligidan o'lim darajasi O'zbekiston bo'yicha o'rtacha ko'rsatkichdan uch baravar yuqori (Task et al. – 2019). PM2.5 va PM10 zarrachalari (2,5 va 10 mikrometrdan kichik) tarkibidagi chang, ifloslantiruvchi moddalar, patogenlar, allergenlar va biologik agentlar (bakteriyalar, qo'ziqorinlar, viruslar) chang bo'ronlari orqali havoga ko'tarilib, yurak-qon tomir, nafas va ruhiy tizimlarga jiddiy zarar yetkazadi (Lee et al. – 2019; Micklin – 2016; Mirzabaev et al. – 2019).



PM zarrachalari global o'lim holatlarining 1,4 % ga, chang bo'ronlari esa o'lim darajasining 1,7 % ga oshishiga sabab bo'lmoqda (Ardon-Dryer et al. – 2019; Goudarzi et al. – 2019). Sayed.el tomonidan olib borilgan tadqiqotda esa, Burkina-Fasoda besh yoshgacha bo'lgan bolalarda PM10 va PM2.5 miqdori yuqori bo'lgan (70–150 va 40–70 mg/m³) kunlarda neonatal o'lim darajasi keskin oshgani aniqlangan.

Cho'llanishning namoyon bo'lishi (Goudie, 2019) the spread of desert-like conditions as a result of a combination of climatic fluctuations and human impacts, is a form of land degradation that occurs in and around the world's drylands. Considerable debate surrounds the speed, nature, and causes of desertification, but it undoubtedly has a series of health implications. One group of these is associated with indirect human impacts of the phenomenon, including mass migrations, poverty, food and water shortages, and conflict over land and water resources. Another group of health problems is associated with reductions in water quality, whether in terms of availability, or, more importantly, in terms of salt and particulate loadings. Possibly the most pervasive health consequences of desertification are reductions in air quality caused by the build-up of dust particles in the air. Among the human health considerations associated with dust (mineral aerosol

Biologik xilma-xillikning yo'qolishi;
O'simlik qatlamining kamayishi;
Iste'molga yaroqsiz o'simliklarning tarqalishi;
Butalashish;
Yuza buzilishlar;
Tuproqning shamol eroziyasi;
Chang bo'ronlari;
Qumlar faollashuvi;
Ko'llarning qurishi;
Suv yo'qotilishi natijasida yer osti suvlarining kamayishi;
Tuproqning suv eroziyasi;
Jarliklarning hosil bo'lishi;
Sho'rlanish;
Yer osti suvlari kamayishi.

Bundan tashqari, cho'l va cho'l zonasida chang bo'ronlari tufayli yuzaga keladigan past ko'rish darajasi har yili bir qancha avtohalokatlarga, shu jumladan, avtomobil va hatto samolyot halokatlariga olib kelmoqda, natijada bir nechta insonlar halok bo'lmoqda. Masalan, 2019–yilda 50 ta avtohalokatda 8 kishi halok bo'lgan va 20 dan ortiq kishi jarohatlangan (Goudie – 2019).

Muammoni bartaraf etish choralari va mos loyihalar

O'zbekiston va Qozog'iston hukumatlari xalqaro hamjamiyat bilan hamkorlikda Orol dengizining qurish jarayonini to'xtatish maqsadida to'g'on qurish, G'arbiy, Sharqiy va Shimoliy Orol dengizini tiklash, suv yo'nalishlarini o'zgartirish, suv o'tkazish va sug'orishga doir loyihalarni amalga oshirmoqda. Orol dengiziga doir loyihalardan tashqari, qurib qolgan dengiz hududining insonlar va tabiatga salbiy ta'sirini yumshatish maqsadida ijtimoiy-iqtisodiy yo'nalishdagi bir qator tashabbuslar boshlangan.

1993–yilda tashkil etilgan Orol dengizini saqlash bo'yicha xalqaro jamg'arma (IFAS) 1998–2019–yillar oralig'ida Orol dengizi havzasini tiklash dasturining (ASBP–1, 2, 3, 4, 5) besh bosqichini amalga oshirdi. Loyiha umumiy qiymati 65 million AQSH dollarini tashkil etgan (IFAS – 2019). Ushbu dastur asosan suv resurslarini boshqarish, botqoqliklarni tiklash, to'g'onlar va suv omborlarini qurish, qurib qolgan yerlarni boshqarish kabi yo'nalishlarga moliyaviy ko'mak ko'rsatdi.

Sovet Rossiyasi parchalanib ketganidan so'ng boshlangan dastlabki loyihalar Orol dengizini tiklash va qurish jarayonini sekinlashtirishga yo'naltirilgan bo'lsa, keyingi davr loyihalari ekologik va ijtimoiy-iqtisodiy oqibatlarni yumshatishga qaratildi. Masalan, BMTning 2016–2020–yillarga mo'ljallangan rivojlanish dasturi (UNDAF) mahalliy aholining ekologik, iqtisodiy va sog'liqni saqlash xavfsizligini mustahkamlashni asosiy maqsad qilib oldi. 2012–yildan boshlab BMTning Inson xavfsizligi bo'yicha ishonch fondi doirasida suv, elektr energiyasi, sog'liqni saqlash, maktab va maktabgacha ta'lim muassasalari qurish, asalarichilik, tikuvchilik, hunarmandchilik, oziq-ovqat va sutni qayta ishlash, nonvoyxona hamda boshqa biznes loyihalari amalga oshirildi. Shuningdek, sog'liqni saqlash xodimlari uchun malaka oshirish tadbirlari o'tkazildi (Programme – n.d.).

Xuddi shu tarzda, 2017–2021–yillarga mo'ljallangan Orolbo'yi mintaqasi bo'yicha Prezident davlat dasturi aholining iqtisodiy, oziq-ovqat, sog'liqni saqlash va ekologik xavfsizligini ustuvor yo'nalish sifatida belgiladi. "Qoraqalpog'iston Respublikasining Mo'ynoq tumanini kompleks rivojlantirish dasturi 2019–2021" doirasida 451 600 gektar maydonda maxsus samolyot, deltaflan va qishloq xo'jaligi texnikasi yordamida 1 532 tonna saxaul va 73 tonna qoraqurak urug'i ekildi (IFAS – 2019).

Orol dengizi muammosi bilan kurashishda innovatsion platforma



Orol dengizini tiklash bo'yicha bir nechta g'oyalari mavjud. Biroq bu g'oyalarning ayrimlari katta miqdorda moliyaviy mablag'larni talab etsa, boshqalari uzoq vaqt oralig'ida amalga oshirilishi mumkin. Masalan, Krapivin tomonidan taklif etilgan tiklash modeli senariylariga ko'ra, bu jarayon 90–240 yilgacha cho'zilishi mumkin (Krapivin et al. – 2019). Sibirdan suv haydash sxemalari kabi yirik muhandislik loyihalari esa ulkan xarajatlari va ehtimoliy ekologik zararlar sababli amalga oshirilmay qoldi (Micklin & Aladin – 2008).

Shu sababli Orol dengizi muammosini innovatsion yondashuv – ya'ni "qora tarix" va cho'l ekoturizmi manzili sifatida rivojlantirish orqali hal etish taklif etiladi. "Qora tarix" va ofat turizmi bugungi kunda jadal rivojlanayotgan xalqaro turizm yo'nalishlaridan biridir. Ushbu turizm yirik halokat, ofat yoki travmatik voqealar bilan bog'liq hududlarga sayohatni tashkil etishni anglatadi (Gotham – 2015; Skinner – 2018). 2016–yil dekabr holatiga ko'ra, "qora tarix" va ofat turizmi sohasida internetda 4 milliondan ortiq qidiruvlar amalga oshirilgan (Sharma & Nayak – 2019).

Ukrainadagi Chernobil zonasi, Nyu-Yorkdagi Jahon savdo markazi, Yevropadagi Holokost konslagerlari singari, Orol havzasi ham to'g'ri targ'ib qilinsa, global miqyosda sayyohlar uchun jozibador "qora tarix" va ekoturizm manziliga aylanishi mumkin. Allaqachon Mo'ynoq shahri bo'ylab tashkil etilgan "Stixia" elektron musiqa festivali o'z brendini shakllantirib, ushbu ekologik fojiga xalqaro auditoriya e'tiborini qaratishga erishgan (Vielmini & Khurana – 2020). Bundan tashqari, Orol dengizining qurigan havzasida joylashgan Vozrojdeniye oroli – SSSR davrida yashirin biologik qurol sinov maydonchasi sifatida ishlatilgan – turistlar uchun qiziqarli va o'ziga xos manzil bo'lishi mumkin (Gorvett – 2017; Page – 2005).

Cho'llanishga qarshi kurashish harakatlari

Tadqiqotlar cho'llanish tahdidi ostidagi hududlarni tiklashdan ko'ra ularni himoya qilish, oldini olish va barqaror foydalanishga e'tibor qaratish muhimligini ta'kidlamoqda (Karavitis et al. – 2020). Bugungi kunda dunyoning ko'plab hududlarida cho'llanishning kuchli ta'siri sezilmoqda. Shunday ekan, cho'llanishga qarshi kurashish global darajadagi dolzarb ehtiyojga aylangan. Ijoby tomoni shundaki, ekologik tiklanish choralari samara bergan bir qator amaliy tajribalar mavjud (Qingfu Liu et al. – 2020; Lingbeek et al. – 2017).

Cho'llanishga qarshi samarali usullar sifatida quyidagilar taklif etiladi: terraslash, yaylovlarni nazorat qilish (Byrne et al. – 2020), barqaror dehqonchilik, cho'kindi to'siqlari, tomchilab sug'orish, tuproq qatlamini boyitish (Shrestha – 2015), yong'inlardan himoyalangan hududlar tashkil etish va cho'l ekoturizmini rivojlantirish.

Shrestha (2015) o'z tadqiqotida Nepal tog' va tepaliklarida unumdor tuproqni saqlab qolish uchun hayvonlarni bog'lab boqish, biomassa ishlab chiqarish, tuproq va suvni saqlovchi biomuhandislik yechimlarining ahamiyatini ta'kidlagan.

Adabiyotlar	Yechim	Cho'llanishga qarshi kurashish uchun taklif etilgan texnikalar
(Li et al., 2020)it cannot suppress floating sands, nor hold large amounts of water, and it cannot fix the vegetation in place to ensure it has adequate lodging resistance. In recent years, microbially induced carbonate precipitation (MICP	Cho'kindi to'siqlar	Somonli shaxmat taxtasi to'sig'i (SCB) va Mikroorganizmlar tomonidan karbonat hosil bo'lishi (MICP) texnologiyalari
(Longjun, 2019)social, and environmental concern to the international communities. It is seriously constraining the global food security, ecosecurity, socioeconomic stability, as well as sustainable development. The United Nations Convention to Combat Desertification (UNCCD		Ba'zi maxsus zonalarda katta maydonlarda tabiiy va sun'iy qum yoyilishini chegaralash to'siqlari
(Deng et al., 2020; Guan et al., 2018; Rossi et al., 2017)namely, cyanobacterial, lichen and moss, are well-accepted as the main succession phases and are hypothesized to represent a continuous process. Herein, natural BSCs (NBSCs	Tuproqning yuqori qatlamini boyitish	Induksiyalangan biologik tuproq qobiqlari (IBSCs - ya'ni, tsianobakteriyalar, liken va mox) ning qayta tiklanishi cho'llanishga qarshi kurashning samarali strategiyasi hisoblanadi.
(Mihi et al., 2019)	Ekologik barqaror dehqonchilik	Issiq va quruq hududlarda cho'lga qarshi kurash va uni yumshatishda xurma bog'lari tashkil qilish
(Mirhashemi et al., 2018)	O'simliklar dunyosini qayta tiklash	Moringa oleifera (M. oleifera) tez o'sadigan, qurg'oqchilikka chidamli daraxt bo'lib, cho'lga qarshi kurashda muhim rol o'ynashi mumkin



(Sarparast et al., 2020)	O'simliklar dunyosini qayta tiklash	Haloxylon persicum va Tamarix spp. kabi chidamli o'simlik turlari orqali boshqa o'simliklarni tiklash rejalarini ishlab chiqish
(Sun et al., 2019)	Hayvonlarning yaylovlarda boqilishini boshqarish	O'tloqlarni muhofaza qilish siyosatini amalga oshirish
(Peng et al., 2020)	Hayvonlarning yaylovlarda boqilishini boshqarish	Yoriqlar ko'p bo'lgan hududlarda, karst toshli cho'l hududlarida o'simliklarni tiklash loyihalarini rivojlantirish uchun tuproq sharoitlarini yaxshilashda turli o'tlarni o'stirish
(Z. Zhang & Huisingh, 2018)we assessed the mechanisms of land desertification and the key strategies to monitor, control and mitigate land desertification in China, which will provide unique experiences and schemes to support academics and industrialists in other developing countries to reverse desertification. In aspect of monitoring desertification, satellite remote sensing can detect and characterize large-scale desertification, and in-situ field work can measure changes of soil physical & chemical properties induced by desertification. In aspect of desertification control and mitigation, the implementation of sustainable cultivation/ grazing practices and wind-shelter forests are the key measures in Northeast China, while water use quotas and sustainable water management are the key measures in Northwest China. Finally, we suggested big-data-based water resource management, regional-climate-model-based agricultural planning, CO2 storage with deep saline water recovery and desert geoengineering as possible solutions to future, large-scale reversal of deserts and desertification regions in China and other developing countries.»»author»:»{«dropping-particle»:»»,»family»:»Zhang»,»given»:»Z hihua»,»non-dropping-particle»:»»,»parse-names»:false,»suffix»:»»,»{«dropping-particle»:»»,»family»:»Huisingh»,»given»:»Donald»,»non-dropping-particle»:»»,»parse-names»:false,»suffix»:»»,»},»container-title»:»Journal of Cleaner Production»,»id»:»ITEM-1»,»issued»:»{«date-parts»:»[[«2018»]]»,»page»:»765-775»,»publisher»:»Elsevier Ltd»,»title»:»Combating desertification in China: Monitoring, control, management and revegetation»,»type»:»article-journal»,»volume»:»182»,»uris»:»[«http://www.mendeley.com/documents/?uuid=678e3756-458b-403d-944d-eb2687e31490»]»,»mendeley»:»{«formattedCitation»:»(Z. Zhang & Huisingh, 2018	Hayvonlarning yaylovlarda boqilishini boshqarish /suv menejmenti	Cho'lga qarshi kurashning asosiy chorasii sifatida barqaror dehqonchilik/o'tlatish amaliyoti va barqaror suv boshqaruvi yechimlari



(Qiang Liu et al., 2018) a self-watering system has been developed. This self-watering system, designed to collect and store rainwater, dew and groundwater, reliably provides water to the surface vegetation. The system consists of two parts: one is the original soil and the other is soil which is replaced by finer soils. The results of laboratory model tests and numerical simulations showed that the system continuously raises the ground water to a level higher than the maximum capillary height of sandy ground without the requirement for any extra energy input. The stable operation of the system mainly depends on unsaturated hydraulic conductivity, the soil water retention curve and the shape and the size of the area of replaced soil. Because the original top soil reduces evaporation, soil salinization is minimal. The evaporation rate is negatively and exponentially correlated to the thickness of the covered original soil. Both the T-type system and suspension-type system have been shown to have a larger net capillary storage capacity than the original sandy ground, with a specific value dependent on the soil water retention curve. The rate of water movement in the T-type system is five to six times higher than that in the suspension-type system. The water content of coarser soil near the finer soil is larger than that of homogeneous coarser soil. The numerical simulation results were in good agreement with the model test, and a case study with various potential transpiration rates was conducted to evaluate the dynamic performance of the system.»»author»: {«dropping-particle»:»», «family»:»Liu», «given»:»Qiang», «non-dropping-particle»:»», «parse-names»:false, «suffix»:»», {«dropping-particle»:»», «family»:»Yasufuku», «given»:»Noriyuki», «non-dropping-particle»:»», «parse-names»:false, «suffix»:»», {«dropping-particle»:»», «family»:»Omine», «given»:»Kiyoshi», «non-dropping-particle»:»», «parse-names»:false, «suffix»:»»}], «container-title»:»Soils and Foundations», «id»:»ITEM-1», «issue»:»4», «issued»: {«date-parts»: [[«2018»]], «page»:»838-852», «publisher»:»Japanese Geotechnical Society», «title»:»Self-watering system for arid area: A method to combat desertification», «type»:»article-journal», «volume»:»58», «uris»: [«http://www.mendeley.com/documents/?uuid=f5cf750b-733c-4ea0-9436-ea83eaa319ee»]], «mendeley»: {«formattedCitation»:»(Qiang Liu et al., 2018	Suv menejmenti (O'z-o'zini sug'orish tizimi)	Yomg'ir suvi, shudring va yer osti suvlarini yig'ish va saqlash uchun mo'ljallangan o'z-o'zini boshqaruvchi sug'orish tizimlari va hokazo.
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TADQIQOT METODOLOGIYASI

Tadqiqot so'rovnoma strategiyasi orqali amalga oshirildi. Yakuniy tahlil uchun 121 ta yaroqli so'rovnoma tanlab olindi. Ushbu tadqiqotda Orol dengizida cho'llanishga qarshi kurash strategiyalarini baholash va eng ustuvor strategiyani aniqlash uchun ko'p mezonli qaror qabul qilish (MCDM) usuli qo'llanildi. Metodologiya ikki bosqichdan iborat:



1–bosqich: Analitik iyerarxik jarayon (AHP) metodi yordamida mezonlar ahamiyatligini aniqlash. AHP usuli mezonlarning nisbiy ahamiyatini baholashda qo'llanildi. Juftlikdagi taqqoslashlar orqali har bir mezon uchun ahamiyatlilik darajasi hisoblab chiqildi.

2–bosqich: PROMETHEE usuli yordamida muqobil variantlarni darajalash (reytinglash). Muqobil variantlar AHP orqali aniqlangan og'irliklarga asoslangan holda PROMETHEE metodi yordamida baholandi. Ushbu ustunlik usuli bir nechta mezonlar va ularning nisbiy ahamiyatini hisobga olib, har bir variantning umumiy samaradorligini aniqlash imkonini berdi.

To'plangan ma'lumotlar AHP va PROMETHEE metodlari asosida tahlil qilinib, mezonlar va variantlarning ustuvorlik darajalari aniqlandi. Natijalar cho'llanishga qarshi kurashda eng samarali strategiyani tanlab olish imkonini yaratdi.

Instrument va texnik yechimlar

Tadqiqot doirasida hisob-kitoblar va tahlillarni amalga oshirish uchun AHP va PROMETHEE dasturiy ta'minotidan foydalanildi. Natijalar asosida qaror qabul qilish jarayoni va cho'llanishga qarshi amaliy yechimlar ishlab chiqildi. Qo'llanilgan metodologiya variantlarni baholashning tizimli yondashuvini ta'minlab, ilmiy asosda qarorlar qabul qilish imkonini berdi.

AHP tahlili natijalari: Mezonlar ustuvorligi

Mezon	Ahamiyatlilik (og'irlik)
Daromad potentsiali	0.4825
Suv sarfi	0.2823
Malaka talabi	0.1216
Ekin (o'simlik)	0.0703
Tuproq sifati	0.0433

Tahlil natijalariga ko'ra, "Daromad potentsiali" eng muhim mezon hisoblanadi. Undan keyingi o'rinda "Suv sarfi" turadi. Qolgan mezonlar nisbatan kamroq og'irlikka ega bo'lsa-da, umumiy baholashda muhim rol o'ynaydi.

TAHLIL VA NATIJALAR

Mutaxassis fikrlari asosidagi muqobil variantlar ballari

Muqobil variantlar		Daromad potentsiali	Suv sarfi	Malaka talabi	Ekin	Tuproq sifati
Turizm	A1	7	3	3	3	1
Tomchilab sug'orish	A2	5	5	5	5	5
Barqaror dehqonchilik	A3	7	5	7	5	5
O'tloqlar nazorati	A4	1	1	1	7	7
Tuproq yuzasini boyitish	A5	3	5	9	7	9
Teraslash	A6	3	1	5	3	5
Yong'indan himoyalangan hudud	A7	3	3	1	7	3
Cho'kindi to'siqlar	A8	3	3	7	3	5

PROMETHEE reyting natijalari tahlili:

PROMETHEE usuli asosida olingan natijalar Orol dengizi cho'llanishini bartaraf etish uchun muqobil variantlarni quyidagicha darajalashtiradi:

Turizm (A1) – 1–o'rin: eng samarali va ustuvor variant sifatida baholanadi.

Barqaror dehqonchilik (A3) – 2–o'rin: hududga ijobiy ekologik va iqtisodiy ta'sir ko'rsatish potensialiga ega.

Yong'inlardan himoyalangan hudud (A7) – 3–o'rin: muhofaza va ekologik xavfsizlik masalalarida ahamiyatli.

Teraslash (A6) – 4–o'rin: yer resurslarini samarali boshqarish jihatidan muhim.

O'tloqlar nazorati (A4) – 5–o'rin: ekotizim muvozanatini tiklash va saqlashda foydali.

Tomchilab sug'orish (A2) – 6–o'rin: samarali bo'lsa-da, boshqa variantlarga nisbatan kamroq ustunlikka ega.



Cho'kindi to'siqlar (A8) – 7-o'rin: biroz foydali bo'lishi mumkin, ammo samaradorligi nisbatan pastroq.

Tuproq yuzasini boyitish (A5) – 8-o'rin: amalga oshirish qiyin va nisbatan past samaradorlikka ega variant sifatida baholangan.

Mazkur reyting natijalari Orol dengizi atrofidagi cho'llanish oqibatlarini kamaytirish bo'yicha eng ijobiy natijalar beradigan yechimlarni aniqlashda yo'l-yo'riq bo'lib xizmat qiladi. Bu yondashuv ekologik, iqtisodiy va ijtimoiy omillarni kompleks baholashga asoslangan qaror qabul qilishni ta'minlaydi.

XULOSA VA TAKLIFLAR

Ushbu tadqiqot Orol dengizi cho'llanishi oqibatlarini bartaraf etish bo'yicha muqobil strategiyalarni baholash va reyting asosida darajalashda PROMETHEE usulidan foydalanish orqali muammoga ko'p qirrali yondashuvning ahamiyatini namoyon etdi. Xususan, Turizm, barqaror dehqonchilik va yong'inlardan himoyalangan hudud kabi variantlar ustuvor yo'nalishlar sifatida ajralib chiqdi. Ushbu natijalar cho'llanishning ekologik hamda ijtimoiy-iqtisodiy ta'sirini kamaytirish uchun resurslarni boshqarishda qaror qabul qiluvchi subyektlar uchun muhim yo'l-yo'riq bo'lib xizmat qiladi.

Tadqiqot natijalari yer resurslarini boshqarishda barqaror amaliyotlarni joriy etish, atrof-muhitni muhofaza qilish hamda cho'llanishga qarshi kurashishda jamoatchilik ishtirokini ta'minlash zarurligini ko'rsatadi. Samarali strategiyalar va global hamkorlikni o'z ichiga olgan yaxlit yondashuv orqali ekologik buzilgan yerlarni tiklash, bioxilma-xillikni rag'batlantirish va barqaror kelajakni ta'minlashga erishish mumkin.

Tadqiqot natijalari cho'llanishdan jiddiy zarar ko'rgan hududlar aholisi, manfaatdor tomonlar va siyosatchilar uchun muhim ahamiyat kasb etadi. Eng samarali muqobil variantlarga ustuvorlik berish va yer resurslarini barqaror boshqarish amaliyotlarini yo'lga qo'yish orqali cho'llanishning salbiy ta'sirlarini kamaytirish va barqaror rivojlanishni rag'batlantirish imkoniyati mavjud.

Xulosa qilib aytganda, ushbu tadqiqot cho'llanish va yer resurslarini barqaror boshqarish sohasidagi ortib borayotgan ilmiy izlanishlarga o'z hissasini qo'shadi va bu dolzarb global muammoni hal etishda integratsiyalashgan yondashuvlarning ahamiyatini yana bir bor tasdiqlaydi.

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