SAMARQAND AGROINNOVATSIYALAR VA TADQIQOTLAR INSTITUTI HUZURIDAGI ILMIY DARAJALAR BERUVCHI DSc.08/2025.27.12.I.07.02 RAQAMLI ILMIY KENGASH

SAMARQAND AGROINNOVATSIYALAR VA TADQIQOTLAR INSTITUTI

ILASHOV BAXTINUR SHERALI O‘G‘LI

BARQAROR QISHLOQ XO‘JALIGI AMALIYOTLARINING ISHLAB CHIQARISH SAMARADORLIGIGA TA’SIRINI IQTISODIY BAHOLASH (SAMARQAND VILOYATI MISOLIDA)

08.00.04 – Qishloq xo‘jaligi iqtisodiyoti

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Contents of dissertation abstract of doctor of philosophy (PhD) on economic sciences

Ilashov Baxtinur Sherali o‘g‘li

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KIRISH (Falsafa doktori (PhD) dissertatsiyasi annotatsiyasi)

Dissertatsiya mavzusining dolzarbligi va zaruriyati. Qishloq xo‘jaligi global miqyosda murakkab va ziddiyatli vazifani bajaradi. Bir tomondan, u aholi soni ortib borayotgan sharoitda oziq-ovqat xavfsizligini ta’minlashi kerak. Ikkinchi tomondan, agrar ishlab chiqarish yer, suv, energiya va biologik resurslarga kuchli bosim o‘tkazadi. Yer unumdorligining pasayishi, suv tanqisligi, iqlim o‘zgarishi, biologik xilma-xillikning qisqarishi va oziq-ovqat yetkazib berish tizimlarining beqarorlashuvi ushbu ziddiyatni yanada kuchaytirmoqda. Natijada agrar sektor oldida faqat ishlab chiqarish hajmini oshirish emas, balki resurslardan tejamkor foydalanish va ekologik barqarorlikni saqlash vazifasi ham turibdi.

Markaziy Osiyo bu muammolar keskin namoyon bo‘ladigan mintaqalardan biridir. Mintaqa qishloq xo‘jaligi asosan sug‘oriladigan dehqonchilikka tayanadi, mavjud suv resurslari esa transchegaraviy xarakterga ega. Qurg‘oqchil iqlim, sug‘orish tizimlarining eskirganligi, yerlarning sho‘rlanishga moyilligi va suvdan foydalanish samaradorligining pastligi ishlab chiqarish barqarorligini cheklaydi. Bunday sharoitda suv tanqisligi nafaqat ekologik, balki iqtisodiy va ijtimoiy muammo sifatida ham namoyon bo‘ladi. Chunki agrar sektor mintaqada qishloq aholisi bandligi va daromadining muhim manbalaridan biri bo‘lib qolmoqda.

Shunga qaramay, agrar siyosat va amaliy islohotlarda ko‘pincha ishlab chiqarish hajmini saqlash, eksport salohiyatini kengaytirish va qisqa muddatli iqtisodiy natijalarga erishish ustuvor yo‘nalish sifatida qaraladi. Bu esa tabiiy resurslarning uzoq muddatli holati, tuproq unumdorligi va ekotizim barqarorligini yetarli darajada hisobga olmaslik xavfini kuchaytiradi. Shu nuqtai nazardan, barqaror qishloq xo‘jaligi amaliyotlarini iqtisodiy samaradorlik bilan bog‘liq holda o‘rganish Markaziy Osiyo sharoitida alohida ahamiyat kasb etadi. Mazkur tadqiqot aynan shu muammo — ekologik barqarorlik va iqtisodiy samaradorlik o‘rtasidagi bog‘liqlikni fermer xo‘jaliklari darajasida baholash zaruratidan kelib chiqadi.

O‘zbekistonda oxirgi yillarda qishloq xo‘jaligini modernizatsiya qilish, resurslarni tejovchi texnologiyalarni joriy etish va barqaror ishlab chiqarish tizimlariga o‘tish bo‘yicha keng ko‘lamli islohotlar amalga oshirilmoqda. O‘zbekiston Respublikasi Prezidenti Sh.M.Mirziyoyev Oliy Majlis va O‘zbekiston xalqiga yo‘llagan murojaatnomasida shunday deydi “... Hozirgi vaqtda butun dunyoda bo‘lgani kabi O‘zbekistonda ham jiddiy ekologik muammolar paydo bo‘lmoqda. Aksariyat hudularimizda tuproq tarkibi buzilib, unumdor yerlar qisqarib borayotgani, cho‘llanish, suv yetishmasligi, qurg‘oqchilik, aholini toza ichimlik suvi bilan ta’minlash shular jumlasidandir.” Amaliyot shuni ko‘rsatmoqdaki, hukumat tomonidan barqaror qishloq xo‘jaligi sohasidagi izchil islohotlarga qaramasdan, fermerlar yangi texnologiya va amaliyotlarni joriy etishda ekologik foydadan ko‘ra iqtisodiy natijalarga ko‘proq e’tibor qaratadi. Shu sababli barqaror amaliyotlarning ishlab chiqarish samaradorligiga ta’sirini ilmiy asosda baholash va aniq hududiy sharoitda dalillarga tayangan tavsiyalar ishlab chiqish zarurati mavjud.

Mazkur dissertatsiya ishi O‘zbekiston Respublikasida agrar sohaning rivojlanishiga oid bir qator strategik hujjatlarda belgilab berilgan vazifalarni bajarishga muayyan hissa qo‘shadi. Jumladan, O‘zbekiston Respublikasi

Prezidentining 2019-yil 23-oktabrdagi PF-5853-sonli “O‘zbekiston Respublikasi qishloq xo‘jaligini rivojlantirishning 2020-2030-yillarga mo‘ljallangan strategiyasini tasdiqlash to‘g‘risida”gi Farmoni, 2021-yil 3-fevraldagi PF-615-sonli “Qishloq xo‘jaligida bilim va innovatsiyalar tizimi hamda zamonaviy xizmatlar ko‘rsatishni yanada rivojlantirish to‘g‘risida”gi Farmoni, “Iqlim o‘zgarishiga nisbatan barqaror agroekotizimni yaratish hamda qishloq xo‘jaligi mahsulotlari yetishtiruvchilarning iqlim o‘zgarishi bilan bog‘liq xavflarga moslashuvchanligini oshirish chora-tadbirlari to‘g‘risida”gi PQ-233-sonli Qarori, shuningdek 2025-yil 8-sentabrdagi PQ-269-sonli “Respublikada kartoshka yetishtirishni ko‘paytirish va urug‘chiligini yanada rivojlantirishga doir qo‘shimcha chora-tadbirlar to‘g‘risida”gi Qarori, hamda ushbu yo‘nalishga aloqador boshqa me’yoriy-huquqiy hujjatlarda nazarda tutilgan maqsadlarga erishishda ilmiy asos sifatida xizmat qiladi.

Tadqiqotning respublika fan va texnologiyalari rivojlanishining asosiy ustuvor yo‘nalishlariga mosligi.

Dissertatsiya respublika fan va texnologiyalari rivojlanishining I.“Demokratik va huquqiy jamiyatni ma’naviy axloqiy hamda madaniy-ma’rifiy rivojlantirish, innovatsion iqtisodiyotni shakllantirish” ustuvor yo‘nalishiga muvofiq bajarilgan.

Muammoning o‘rganilganlik darajasi. Qishloq xo‘jaligi tarmog‘ini barqaror rivojlantirish, iqlim o‘zgaruvchanligi, yer resurslarining sifat jihatidan yomonlashuvi va suv tanqisligi kabi dolzarb masalalarni zamonaviy texnologiyalar yordamida hal etish hamda ishlab chiqaruvchilarning iqtisodiy natijadorligini yaxshilash yo‘nalishida D.Rigby, F.Benitez-Altuna, F.Zahm, J.Pretty, M.Farrel, C.Cobb, T.Coelli, J.Jondrow, L.Latruffe, M.Girardin[1] kabi xorij olimlari tadqiqotlar olib borganlar.

Yurtimizda qishloq xo‘jaligi ishlab chiqarishining atrof-muhitga ta’siri va barqaror dehqonchilik tamoyillarining tatbiq etilishi yo‘nalishidagi izlanishlar Sh.Babaxolov, F.Ahrorov A.Tadjiyev, N.Djanibekov, I.Bobojonov va I.Rustamovalar ilmiy ishlarida o‘z aksini topgan bo‘lsa, qishloq xo‘jaligida resurslardan optimal foydalanish, ishlab chiqarishda iqtisodiy samaradorlik ko‘rsatkichlariga omillar ta’sirini O.Murtazayev, Sh.Hasanov, K.Akramov, G‘.Sanayev, M.Djurayeva, A.Karimovlar empirik tahlil qilishgan[2]. Mavjud ilmiy

[1] Rigby, D., Woodhouse, P., Young, T., & Burton, M. (2001). Constructing a farm level indicator of sustainable agricultural practice. *Ecological economics*, *39*(3), 463-478; Benitez-Altuna, F., Trienekens, J., Materia, V. C., & Bijman, J. (2021). Factors affecting the adoption of ecological intensification practices: A case study in vegetable production in Chile. *Agricultural Systems*, *194*, 103283; Zahm, F., Viaux, P., Vilain, L., Girardin, P., & Mouchet, C. (2004). The IDEA method (Farm Sustainability Indicators): A diagnostic assessment method to make the transition from the concept of sustainability to its assessment using indicators; Pretty, J., Toulmin, C., and Williams, S. (2011). Sustainable intensification in African agriculture. Int. J. Agric. Sustain. 9, 5–24; Farrell, M. J. (1957). "The Measurement of Productive Efficiency". *Journal of the Royal Statistical Society*, Series A, 120(3), 253-290; Cobb, C.W., & Douglas, P.H. (1928). "A Theory of Production." *American Economic Review*, 18(1), 139-165; Jondrow J, Lovell CAK, Materov IS, Schmidt P (1982) On the estimation of technical efficiency in the stochastic frontier production function model. J Econom 19(2–3):233–238; Latruffe, L., Diazabakana, A., Bockstaller, C., Desjeux, Y., Finn, J. A., Kelly, E., Ryan, M., & Uthes, S. (2016). Measurement of sustainability in agriculture: a review of indicators. Studies in Agricultural Economics, 118(3), 123–130; Girardin, M. (2022). Organic Dairy Production (pp. 830–835). Elsevier eBooks

[2] Babakholov, S., & Hasanov, S. (2024). Perceptions towards climate change, water scarcity and adaptation strategies: Case of the Zerafshan River Basin in Uzbekistan. *Italian Review of Agricultural Economics (REA)*, *79*(2), 19-33; Ahrorov, F. (2024). Барқарор қишлоқ хўжалигини ривожлантириш: Ўзбекистонда экологик деҳқончилик ва

adabiyotda barqaror qishloq xo‘jaligi amaliyotlari, ularning qo‘llanilishiga ta’sir ko‘rsatuvchi omillar hamda ishlab chiqarish faoliyatining iqtisodiy samaradorligini baholash masalalari bo‘yicha bir qator izlanishlar amalga oshirilgan. Shunga qaramay, barqaror qishloq xo‘jaligi amaliyotlari va ishlab chiqarishning iqtisodiy samaradorligi o‘rtasidagi bevosita sabab-oqibat munosabatlarini aniqlashga qaratilgan tadqiqotlar hozircha yetarli darajada emas. Ushbu ilmiy bo‘shliqni to‘ldirish uchun mazkur yo‘nalishda empirik tahlillarga asoslangan tadqiqotlar o‘tkazish va ilmiy-amaliy asoslangan tavsiya va takliflar ishlab chiqish muhim hisoblanadi.

Tadqiqotning maqsadi fermer xo‘jaliklarida barqaror qishloq xo‘jaligi amaliyotlarini qo‘llash orqali ekologik barqarorlik hamda iqtisodiy samaradorlik ko‘rsatkichlarini oshirishga qaratilgan, ilmiy asoslangan taklif va amaliy tavsiyalar ishlab chiqishdan iborat.

Tadqiqotning vazifalari:

fermer xo‘jaliklari faoliyatini rivojlantirishda barqaror qishloq xo‘jaligi amaliyotlarini qo‘llashning iqtisodiy-ijtimoiy zaruriyatini nazariy asoslash;

qishloq xo‘jaligida ishlab chiqarish barqarorligini baholashga doir xorij tajribalarini o‘rganish;

fermer xo‘jaliklarining iqtisodiy samaradorlik hamda ekologik barqarorlik ko‘rsatkichlarini baholashga oid zamonaviy uslubiyotlar yondashuvlar va tajribalarni o‘rganish;

qishloq xo‘jaligida ekologik barqarorlik indeksini hisoblash uslubiyotini takomillashtirish;

Samarqand viloyatida fermer xo‘jaliklarining qo‘llayotgan barqaror qishloq xo‘jaligi amaliyotlari asosida ekologik barqarorlik darajasini baholash yuzasidan so‘rovnoma o‘tkazish va ekonometrik tahlillarni amalga oshirish;

respublikamiz qishloq xo‘jaligi tizimida Samarqand viloyati misolida Respublikamiz qishloq xo‘jaligi tizimida Samarqand viloyati misolida ekologik barqarorlik va iqtisodiy samaradorlik ko‘rsatkichlarini oshirishga qaratilgan ijtimoiy-iqtisodiy mexanizmning amaliy xaritasini ishlab chiqish;

Samarqand viloyatida kartoshka va bug‘doy yetishtirish yalpi hajmining 2030-yilgacha bo‘lgan rivojlanish tendensiyasining prognoz parametrlarini ishlab chiqish.

Tadqiqotning obyekti sifatida Samarqand viloyatidagi qishloq xo‘jalik mahsulotlari yetishtiruvchi fermer xo‘jaliklari tanlab olingan.

Tadqiqotning predmetini mamlakatimiz qishloq xo‘jaligi tizimida ishlab chiqarish ekologik barqarorlik darajasini aniqlash va iqtisodiy samaradorlik ko‘rsatkichiga ta’sirini baholash jarayonida vujudga keladigan ijtimoiy-iqtisodiy munosabatlar majmui tashkil etadi.

органик маҳсулотлар етиштиришга ўтиш. *Economics and Innovative Technologies*, *12*(1), 111-118; Tadjiev, A., Djanibekov, N., Soviadan, M. K., & Herzfeld, T. (2025). Participation in informal cooperation in water management and adoption of sustainable agricultural practices: Empirical evidence from Uzbekistan. *Australian Journal of Agricultural and Resource Economics*; Kienzler, K. M., Djanibekov, N., & Lamers, J. P. (2011). An agronomic, economic and behavioral analysis of N application to cotton and wheat in post-Soviet Uzbekistan. *Agricultural Systems*, *104*(5), 411-418; Rustamova, I., Primov, A., Karimov, A., Khaitov, B., & Karimov, A. (2023). Crop diversification in the Aral sea region: long-term situation analysis. *Sustainability*, *15*(13), 10221.

Tadqiqotning usullari. Tadqiqot jarayonida mantiqiy, taqqoslama tahlil, so‘rovnoma o‘tkazish, deskriptiv statistik tahlil, ekonometrik modellashtirish, Stoxastik chegaraviy tahlil (Stochastic frontier analysis) modeli, Tobit modeli hamda ARIMA (o‘rtachaga intiluvchi integratsiyalashgan avtoregressiya) modeli usullaridan foydalanilgan.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat:

fermer xo‘jaliklarida qo‘llanilayotgan qishloq xo‘jaligi amaliyotlari asosida ishlab chiqarish faoliyati ekologik barqarorlik indeksi hisoblangan va uning “past” ($0 \le EBI < 0,3$), “o‘rta” ($0,3 \le EBI < 0,6$) va “yuqori” ($0,6 \le EBI \le 1$) guruhlarga ajratish mezonlari ishlab chiqilgan;

fermer xo‘jaliklari ishlab chiqarish samaradorligini baholash bo‘yicha uslubiy yondashuv “barqarorlik indikatori” hamda “davlat imtiyozli kreditlaridan foydalanish” kabi omillarni qo‘llash asosida takomillashtirilgan;

qishloq xo‘jaligida davlat (State)–ilmiy tadqiqot (Science)–amaliyot (Practice) integratsiyasiga asoslangan uch tomonlama kompleks tizimli yondashuv ishlab chiqilgan hamda ushbu yondashuv doirasida fermer xo‘jaliklarining ekologik barqarorlik darajasi va iqtisodiy samaradorligini oshirish imkoniyatlari “TOBIT” modeli asosida ilmiy asoslangan;

Samarqand viloyatida fermer xo‘jaliklarining joriy barqarorlik darajasida kartoshka va bug‘doy yetishtirish hajmlarining 2030-yilgacha bo‘lgan prognoz parametrlari ishlab chiqilgan.

Tadqiqotning amaliy natijalari quyidagilardan iborat:

Samarqand viloyatidagi fermer xo‘jaliklarida kartoshka va bug‘doy yetishtirishda qo‘llanilayotgan qishloq xo‘jaligi amaliyotlari asosida barqarorlik indeksi hisoblangan va barqarorlik darajasining “past” ($0 \le EBI < 0,3$), “o‘rta” ($0,3 \le EBI < 0,6$) va “yuqori” ($0,6 \le EBI \le 1$) mezonlari ishlab chiqilgan. Natijada jami o‘rganilgan 121 nafar kartoshka yetishtiruvchi fermer xo‘jaliklarining 42 tasi yoki 35 foizi “past” darajadagi, 39 tasi yoki 32 foizi “o‘rta” darajadagi, 40 tasi yoki 33 foizi “yuqori” ekologik barqarorlik darajasida ekanligi, bug‘doy yetishtirishda esa jami 196 ta fermer xo‘jaliklarning 137 tasi yoki 70 foizi “past”, 29 tasi yoki 15 foizi “o‘rta”, 30 tasi yoki 15 foizi “yuqori” darajadagi ekologik barqarorlikka erishgani aniqlangan. Natijada fermer xo‘jaliklarining ishlab chiqarish ekologik barqarorlik darajasi kartoshka yetishtirishda bug‘doy yetishtirishga nisbatan yuqori darajada ekanligi aniqlangan;

Fermer xo‘jaliklari misolida ishlab chiqarish samaradorligiga ta’sir etuvchi omillarni baholashda “barqarorlik indikatori” hamda “davlat imtiyozli kreditlaridan foydalanish” kabi omillardan foydalanish iqtisodiy samaradorlikka yuqori statistik aniqlikda ijobiy ta’sir etuvchi omil ekanligi aniqlangan va shu asosda xo‘jaliklarning ishlab chiqarish samaradorligi va ekologik barqarorlik darajasini oshirishga doir strategik tavsiyalar ishlab chiqilgan;

qishloq xo‘jaligida davlat (State) – ilmiy tadqiqot (Science) – amaliyot (Practice) uch tomonlama kompleks tizimli yondashuv asosida fermer xo‘jaliklarining ishlab chiqarishdagi ekologik barqarorlik darajasi va iqtisodiy samaradorligini oshirishga qaratilgan istiqbolli amaliy xaritasi ishlab chiqilgan va

tavsiya etilgan. Natijada fermer xo‘jaliklarida ishlab chiqarish samaradorligini 7,6 foizga oshishi Tobit modeli yordamida asoslab berilgan;

Samarqand viloyatidagi kartoshka va bug‘doy yetishtirish hajmlarining joriy barqarorlik darajasida 2030-yilgacha bo‘lgan prognoz parametrlari ARIMA modeli asosida ishlab chiqilgan.

Tadqiqot natijalarining ishonchliligi tadqiqot davomida mahalliy va xorijiy iqtisodchi olimlarning barqaror qishloq xo‘jaligi amaliyotlari hamda ularning agrar sohadagi iqtisodiy samaradorlikka ta’siri masalalariga oid ilmiy-uslubiy yondashuvlaridan foydalanilganligi; tahlilga jalb qilingan ma’lumotlarning uzoq vaqt davomida to‘planganligi va rasmiy manbalardan olinganligi; empirik bazaning Samarqand viloyati tumanlari bo‘yicha fermer xo‘jaliklari o‘rtasida o‘tkazilgan so‘rovnoma natijalariga tayanishi; ishlab chiqilgan taklif va tavsiyalarning amaliyotda qo‘llanilganligi; shuningdek, erishilgan natijalarning vakolatli organlar tomonidan rasman e’tirof etilganligi bilan izohlanadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Tadqiqot natijalarining ilmiy ahamiyati fermer xo‘jaliklari darajasida ekologik barqarorlik va iqtisodiy samaradorlikni birgalikda baholashga qaratilgan metodik yondashuvni asoslash bilan belgilanadi. Tadqiqotda ekologik barqarorlik indikatorlari shakllantirilib, ularning ishlab chiqarish samaradorligi bilan bog‘liqligi empirik ma’lumotlar asosida tahlil qilindi. Bu yondashuv barqaror qishloq xo‘jaligi amaliyotlarini faqat ekologik nuqtai nazardan emas, balki ularning iqtisodiy natijalarga ta’siri bilan bog‘liq holda o‘rganish imkonini beradi.

Tadqiqotning amaliy ahamiyati olingan natijalar asosida fermer xo‘jaliklarida barqaror ishlab chiqarish amaliyotlarini kengaytirish, trening va maslahat xizmatlarini kuchaytirish, shuningdek, moliyaviy resurslardan foydalanish imkoniyatlarini yaxshilash bo‘yicha tavsiyalar ishlab chiqish bilan izohlanadi. Ushbu natijalar davlat boshqaruv organlari, qishloq xo‘jaligi bo‘yicha maslahat xizmatlari, moliyaviy institutlar va fermer xo‘jaliklari uchun amaliy qarorlar qabul qilishda foydalanilishi mumkin. Bundan tashqari, dissertatsiya materiallari oliy ta’lim muassasalarida “Qishloq xo‘jaligi iqtisodiyoti” va “Atrof-muhit va resurslar iqtisodiyoti” fanlarini o‘qitishda qo‘shimcha ilmiy-uslubiy manba sifatida qo‘llanilishi mumkin.

Tadqiqot natijalarining joriy qilinishi. Barqaror qishloq xo‘jaligi amaliyotlarining ishlab chiqarish samaradorligiga ta’sirini iqtisodiy baholash bo‘yicha olingan ilmiy taklif va amaliy tavsiyalar asosida: fermer xo‘jaliklarining ishlab chiqarish faoliyati yekologik barqarorlik darajasini “past”, “o‘rta” va “yuqori” darajali mezonlar asosida baholash bo‘yicha ishlab chiqilgan indeks Samarqand viloyati qishloq xo‘jaligi boshqarmasining fermer xo‘jaliklari faoliyatini rivojlantirish bo‘yicha ishlab chiqilgan chora-tadbirlar rejasi asosida fermer xo‘jaliklarida amaliyotga joriy etilgan (2026-yil 2-fevral) hamda O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligi tomonidan tasdiqlangan (O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligining 2026-yil 13-fevraldagi 06/26-2-10-05/18-sonli ma’lumotnomasi). Qishloq xo‘jaligi vazirligi, Statistik tahlil va prognozlashtirish departamenti tomonidan amaliyotga qabul qilingan hamda

Samarqand viloyati qishloq xo‘jaligi tizim tashkilotlarida fermer xo‘jaliklarining ishlab chiqarish faoliyati ekologik barqarorlik darajasini baholash bo‘yicha amaliyotga joriy etilgan. Natijada, jami o‘rganilgan 121 nafar kartoshka yetishtiruvchi fermer xo‘jaliklarining 42 tasi yoki 35 foizi “past” darajadagi, 39 tasi yoki 32 foizi “o‘rta” darajadagi, 40 tasi yoki 33 foizi “yuqori” ekologik barqarorlik darajasida ekanligi, bug‘doy yetishtirishda esa jami 196 ta fermer xo‘jaliklarning 137 tasi yoki 70 foizi “past”, 29 tasi yoki 15 foizi “o‘rta”, 30 tasi yoki 15 foizi “yuqori” barqarorlik darajasida ekanligi aniqlangan;

fermer xo‘jaliklarining ishlab chiqarish samaradorligini oshirishida “barqarorlik indikatori” hamda “davlat imtiyozli kreditlaridan foydalanish” kabi omillar asosida baholash bo‘yicha berilgan taklif Samarqand viloyati qishloq xo‘jaligi boshqarmasining fermer xo‘jaliklari faoliyatini rivojlantirish bo‘yicha ishlab chiqilgan chora-tadbirlar rejasi asosida fermer xo‘jaliklarida amaliyotga joriy etilgan (2026-yil 2-fevral) hamda O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligi tomonidan tasdiqlangan (O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligining 2026-yil 13-fevraldagi 06/26-2-10-05/18-sonli ma’lumotnomasi). Ushbu uslubiy yondashuv Qishloq xo‘jaligi vazirligi, Agrar sohani iqtisodiy rivojlantirish va moliyalashtirish departamenti tomonidan Samarqand viloyati qishloq xo‘jaligi tizim tashkilotlarida amaliyotga joriy etilgan. Tadqiqot natijalariga ko‘ra, fermer xo‘jaliklarida barqaror amaliyotlar va davlat imityozli kreditlaridan foydalanish asosida ishlab chiqarish samaradorligini 7,1 foizga oshirish imkoniyati mavjudligi asoslangan;

qishloq xo‘jaligida davlat (State)–ilmiy tadqiqot (Science)–amaliyot (Practice) integratsiyasiga asoslangan uch tomonlama kompleks tizimli ishlab chiqilgan yondashuv doirasida fermer xo‘jaliklarining ekologik barqarorlik darajasi va iqtisodiy samaradorligini oshirish imkoniyatlari bo‘yicha berilgan takliflar Samarqand viloyati qishloq xo‘jaligi boshqarmasining fermer xo‘jaliklari faoliyatini rivojlantirish bo‘yicha ishlab chiqilgan chora-tadbirlar rejasi asosida fermer xo‘jaliklarida amaliyotga joriy etilgan (2026-yil 2-fevral) hamda O‘zbekiston Respublikasi Qishloq xo‘jaligi tomonidan tasdiqlangan (O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligining 2026-yil 13-fevraldagi 06/26-2-10-05/18-sonli ma’lumotnomasi). Qishloq xo‘jaligi vazirligi, Agrar sohani rivojlantirish va oziq-ovqat xavfsizligi departamenti tomonidan Samarqand viloyati qishloq xo‘jaligi tizim tashkilotlarida amaliyotga joriy etilgan. Natijada, Samarqand viloyatining Bulung‘ur, Toyloq va Jomboy tumanlaridagi fermer xo‘jaliklarida berilgan taklif asosida ishlab chiqarish samaradorlik ko‘rsatkichini 7,6 foizga oshirishga erishilgan;

Samarqand viloyatida barqaror qishloq xo‘jaligi amaliyotlarini samarali joriy etish orqali kartoshka va bug‘doy yetishtirish qiymati o‘sishining 2030-yilgacha bo‘lgan prognozi bo‘yicha takliflar O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligi tomonidan amaliyotga qabul qilingan (O‘zbekiston Respublikasi Qishloq xo‘jaligi vazirligining 2026-yil 13-fevraldagi 06/26-2-10-05/18-sonli ma’lumotnomasi). Qishloq xo‘jaligi vazirligi, Statistik tahlil va prognozlashtirish bo‘limi tomonidan Samarqand viloyati qishloq xo‘jaligi tizim tashkilotlarida amaliyotga joriy etilgan. Natijada, 2030-yilga borib kartoshka yetishtirish hajmining

prognoz qiymati 1049 ming tonnani va bug‘doy yetishtirish hajmining prognoz qiymati 868,5 ming tonnani tashkil etishi asoslangan.

Tadqiqot natijalarining aprobatsiyasi. Tadqiqot natijalari 2 ta xalqaro va 4 ta respublika doirasidagi ilmiy-amaliy anjumanlarda muhokamadan o‘tkazilgan va ijobiy baholangan.

Tadqiqot natijalarining e’lon qilinishi. Dissertatsiya mavzusi bo‘yicha O‘zbekiston Respublikasi Oliy attestatsiya komissiyasi tomonidan tavsiya etilgan jurnallarda jami 4 ta ilmiy maqola, jumladan, 3 ta mahalliy nashlarda va 1 ta xalqaro jurnalda maqolalar chop etilgan.

Dissertatsiyaning tuzilishi va hajmi. Dissertatsiya ishi tarkibi kirish, uchta bob, xulosa, foydalanilgan adabiyotlar ro‘yxati va ilovalardan tarkib topgan bo‘lib, jami 143 sahifada bayon etilgan.

DISSERTATSIYANING ASOSIY MAZMUNI

Dissertatsiyaning kirish qismida mavzuning dolzarbligi, muammoning o‘rganilganlik darajasi, uning maqsadi va vazifalari, ilmiy yangiligi, amaliy ahamiyati bayon etilgan, tadqiqot natijalarining ishonchliligi, tadbiq etilganligi, aprobatsiyasi, e’lon qilinganligi hamda uning tarkibiy tuzilishi va hajmi bo‘yicha ma’lumotlar keltirilgan.

Dissertatsiyaning **“Qishloq xo‘jaligida barqarorlik va samaradorlik konsepsiyalari va ularning nazariy-uslubiy asoslari”** deb nomlangan birinchi bobida qishloq xo‘jaligini barqaror rivojlantirishning nazariy asoslanishi va barqaror qishloq xo‘jaligi amaliyotlarining o‘rni, iqtisodiy samaradorlik ko‘rsatkichlarini baholashning usullari, ilmiy-uslubiy asoslari, barqarorlik va samaradorlikni bog‘lovchi konsepsiyalar ochib berilgan. Shuningdek, jahonda barqaror qishloq xo‘jaligi amaliyotlarini qo‘llanilishining hozirgi holati tahlili, rivojlangan va rivojlanayotgan davlatlarning barqaror qishloq xo‘jaligini rivojlantirish borasidagi amalga oshirayotgan islohotlarining xususiyatlari o‘rganilgan hamda ushbu tajribalarni O‘zbekistonda joriy qilish imkoniyatlari tahlil qilinib, ular asosida ishlab chiqilgan xulosa va takliflarning mazmun-mohiyati nazariy jihatdan asoslangan.

Olimlar o‘z tadqiqotlarida barqaror qishloq xo‘jaligini “hozirgi avlodning oziq-ovqat va bioresurs ehtiyojlarini qondira oladigan, shu bilan birga kelajak avlodlar ehtiyojlarini xavf ostiga qo‘ymaydigan tizim” deb ta’riflaydi[3]. Bu yondashuvda uchta asosiy o‘lchov mavjud:

1. Ekologik barqarorlik – tuproq unumdorligini saqlash, suv resurslarini muhofaza qilish, pestitsid va o‘g‘itlardan oqilona foydalanish;
2. Iqtisodiy barqarorlik – foydalilik, rentabellik, bozor barqarorligi;
3. Ijtimoiy barqarorlik – fermerlarning daromad barqarorligi, qishloqdagi bandlik, gender tenglik, ta’lim va sog‘liqni saqlashga kirish imkoniyati.

Barqaror qishloq xo‘jaligini joriy etish natijasida qishloq xo‘jaligi ishlab chiqaruvchilarining iqtisodiy va ijtimoiy farovonligini agroekotizimga zarar yetkazmasdan ta’minlash imkoniyati mavjud. Bu jarayonda barqaror qishloq xo‘jaligi amaliyotlarini (almashlab ekish, aralash ekin ekish, organik o‘g‘itlardan foydalanish, ekinlarni deiversifikatsiya qilish, shudgorlamasdan ekin ekish) ishlab chiqarishda qo‘llash asosiy rol o‘ynaydi.

Qishloq xo‘jaligini barqaror rivojlantirishda qishloq xo‘jaligi mahsulotlarini ishlab chiqaruvchilarning barqarorlik holatini doimiy baholab borish hamda ushbu jarayonda ularni rag‘batlantirishga qaratilgan qishloq xo‘jaligi islohotlarini izchil ravishda joriy etib borilishi, shuningdek, mazkur jarayondagi yuzaga kelayotgan muammolarni hal qilish uchun tadqiqotlarni empirik tadqiqotlarni uzluksiz amalga oshirilib borishi o‘ta dolzarb vazifa hisoblanadi.

Barqaror qishloq xo‘jaligini baholash bo‘yicha indikatorlarni qo‘llashda xorij tajribasi o‘rganilib taqqoslama tahlil qilingan (1-jadval).

[3] WCED (World Commission on Environment and Development), 1987. Our Common Future. Oxford University Press, New York, 383 pp.

1-jadval

Barqaror qishloq xo‘jaligini baholash bo‘yicha indikatorlarni qo‘llashda dunyo tajribasi[4].

Qit’a	Barqarorlikni baholashdagi asosiy metodlar	Asosiy foydalanilayotgan barqarorlik amaliyotlari	Erishilgan yutuqlar	Barqarorlikka erishishdagi asosiy to‘siqlar
Yevropa	RISE 3.0, SOSTARE, ISAP, AFI, IDEA, SAFE, MOTIFS, SIRIUS, LCA, MCDA	Aralash ekin ekish, organik o‘g‘itlar, almashlab ekish,	Hosildorlik va bioxilma-xillik o‘rtasida muvozanat, subsidiyalar bilan bog‘langan barqarorlik	Sharqiy va G‘arbiy Yevropa o‘rtasidagi islohotlardagi tafovutlar, texnik bilim yetishmasligi
Shimoliy Amerika	RISE, MESMIS, USDA ASI, AEIs, LCA, SAFA	Shudgorlamasdan ekin ekish, dehqonchilik va chorvachilikni integratsiyalash, qoplama ekinlar ekish	Ekologik muhofaza va ishlab chiqarish integratsiyasi, hosildorlikning oshishi	Bozorlarga kirishdagi to‘siqlar, agrar islohotlar ishlab chiqishda muvofiqlik muammolari
Janubiy Amerika	SIRIUS, MESMIS, SIAS, ISAP, ASI, SAFA, LSI, MCDA	Agroekologik innovatsiyalar, ekinlar diversifikatsiyasi, mulchalash	Mahalliy innovatsiyalar orqali agrodiversifikatsiya, daromadlar oshishi	Dastlabki xarajatlar yuqoriligi, tashqi resurslarga bog‘liqlik
Osiyo	SAFA, RISE, PSDCIFASA, CSI, MCDA, ASI	Konservatsion dehqonchilik, aralash ekin ekish, organik dehqonchilik	Suv samaradorligi, issiqxona gazlari kamayishi, iqtisodiy foydalilik	Ma’lumot yetishmovchiligi, institutsional qo‘llab-quvvatlash pastligi
Afrika	RISE, IDEA, SIRIUS, MESMIS, SAFE, SLF, API	Shudgorlamasdan ekin ekish, tabiiy o‘g‘itlar, aralash ekin ekish,	Oziq-ovqat xavfsizligi va fermer daromadining yaxshilanishi	Yerga egalik huquqining noaniqligi, moliyaviy resurslar cheklanganligi
Avstraliya	AFSA, LCI, TBL, AEIs	Ekin qoldiqlarini qoldirish, nazoratli texnika harakati asosidagi dehqonchilik	Tuproq eroziyasi kamayishi, hosildorlikning barqarorligi	Iqlim sharoitiga bog‘liqlik, iqtisodiy barqarorlikning zaifligi

[4] O‘rganilgan adabiyotlar asosida muallif ishlanmasi

Dissertatsiyaning “**Respublika qishloq xo‘jaligi ishlab chiqarishida barqarorlik va samaradorlik ko‘rsatkichlarining holati va mavjud muammolar**” deb nomlangan ikkinchi bobida tadqiqotning ilmiy-uslubiy, amaliy ishlanma hamda natijalari asosida Samarqand viloyatida qishloq xo‘jaligi sohasidagi asosiy ko‘rsatkichlari dinamikasi tahlil qilingan, viloyatdagi Zarafshon daryosi yuqori oqimida joylashgan tumanlarda faoliyat yuritayotgan fermer xo‘jaliklarining ekologik barqarorlik darajasi va ishlab chiqarish samaradorlik ko‘rsatkichlari, shunindek, ishlab chiqarish samaradorligiga omillarning marjinal ta’siri empirik tahlillar asosida ishlab chiqilgan xulosa va takliflarning mazmun-mohiyati yoritilgan.

Statistika ma’lumotlariga ko‘ra Samarqand viloyatida so‘nggi yillarda qishloq xo‘jaligi mahsulotlari hajmi o‘sib borayotganiga qaramasdan, qishloq xo‘jaligi ekin maydonlari miqdori yildan-yilga kamayib bormoqda.

2-jadval

Samarqand viloyatidagi qishloq xo‘jaligi ekin maydoni va mahsulotlari hajmi ko‘rsatkichlari, 2018-2024-yillar[5]

Yillar	2018	2019	2020	2021	2022	2023	2024
Qishloq xo‘jaligi ekin maydonlari, ming gektar	351833	328107	340750	359283	336799.7	320047	320041
Qishloq xo‘jaligi mahsulotlari, mlrd. so‘m	25658	28379.5	33759.4	41206.1	42088.9	49025.9	57452

Respublikada qishloq xo‘jalik mahsulotlari hajm va sifat jihatdan oshib borishiga qaramasdan, oxirgi 10 yillikda qishloq xo‘jaligi uchun mo‘ljallangan yerlarning kamayib borishi, suv tanqisligi muammosining tobora jiddiylashishi va iqlim o‘zgarishi salbiy ta’sirlarining oshib borishi natijasida ushbu sohada faoliyat yuritish qiyinlashmoqda. Shu bilan birga muttasil ko‘payib borayotgan aholi soni qishloq xo‘jaligi mahsulotlariga bo‘lgan talabning keskin oshishiga olib kelmoqda. Natijada fermer va dehqonlar ishlab chiqarish hajmlarini oshirish uchun mineral o‘g‘itlar, shuningdek, kasalliklar va hasharotlarga qarshi kurashishda kimyoviy vositalardan me’yoridan ortiq foydalanishmoqda.

Dunyo tajribasida olimlar fermer xo‘jaliklarining fermer xo‘jaliklarining ishlab chiqarish jarayonida nafaqat hosildorlikni oshirib yuqori hosil olish, balki tabiatga tashqi ta’sirlarni kamaytirgan holda sog‘lom qishloq xo‘jaligi ekotizimini asrab qolish uchun qishloq xo‘jaligida ekologik barqarorlik konsepsiyasidan foydalanishmoqda. Mazkur tadqiqotda fermer xo‘jaliklarining ekologik barqarorlik indeksi ko‘rsatkichini baholash uslubiyoti takomillashtirildi. Buning uchun Dan Rigby va hammualiflar tomonidan taklif etilgan uslubiyot asos qilib olindi[6].

[5] Samarqand viloyati statistikasi boshqarmasi ma’lumotlari asosida muallif ishlanmasi.

[6] Rigby, D., Woodhouse, P., Young, T., & Burton, M. (2001). Constructing a farm level indicator of sustainable agricultural practice. *Ecological economics*, *39*(3), 463-478.

3-jadval

Barqarorlik o‘lchovlari bo‘yicha har bir ishlab chiqarish bosqichining baholanishi[7].

Ishlab chiqarish bosqichlarida qo‘llanilgan amaliyotlar	Tashqi resurslardan foydalanishni kamaytirish	Qayta tiklanmaydigan resurslardan foydalanishni kamaytirish	Tabiiy-biologik jarayonlarni rag‘batlantirish	Mahalliy bioxilma-xillikni rag‘batlantirish	Jami
Urug‘ manbasi					
Sotib olingan urug‘	0	0	0	0	0
Xo‘jalikning o‘z urug‘i	1	0	0	0	1
Tuproq unumdorligini boshqarish					
Ko‘proq mineral, kamroq organik o‘g‘it qo‘llash	-1	-1	-1	0	-3
Ikkala o‘g‘itdan vaziyatdan kelib chiqib unumli foydalanish	0	0	0	0	0
Kamroq mineral, ko‘proq organik o‘g‘itdan foydalanish	0	1	1	0	2
Kasallik va zararkunandalarni nazorat qilish					
Kimyoviy vositalardan foydalanish	-1	-1	-3	-3	-8
Kimyoviy vositalarsiz profilaktik amaliyotlar	2	2	2	2	8
Begona o‘tlarni nazorat qilish					
Kimyoviy gerbitsidlar	-1	-1	-1	-1	-4
Kimyoviy vositalarsiz profilaktik amaliyotlar	1	1	1	1	4
Ekinlarni boshqarish amaliyotlari					
Kartoshkani takroriy ekish	0	0	-1	0	-1
Almashlab ekish (boshoqlilar bilan)	0.5	0.5	1	0	2
Almashlab ekish (dukkaklilar bilan)	1	1	1	0	3

Biz fermer xo‘jaliklarining ekologik barqarorlik indeksini hisoblash uchun xo‘jalikdagi ishlab chiqarish jarayonining besh bosqichini qamrab olganmiz. Bular: 1) urug‘ manbasi; 2) yerni o‘g‘itlashdagi organik va mineral o‘g‘itlarning hajmi; 3) kasallik va zararkunandalarni nazorat qilish amaliyotlari; 4) begona o‘tlarni nazorat qilish amaliyotlari va 5) ekinlarni boshqarish amaliyotlari (3-jadvalga qarang). Har bir ishlab chiqarish bosqichi bo‘yicha xo‘jaliklarning ekologik barqarorlik ko‘rsatkichlari hisoblangandan so‘ng quyidagi formula asosida yagona indeksga jamlandi:

$$EBI_i = (0{,}05*urug‘\_manba_i) + (0{,}26*tuproq\_unum_i) + (0{,}23*kasallik\_kurash_i) + (0{,}23*begona\_o‘t\_kurash_i) + (0{,}23*ekinlar\_boshqarish_i) \quad (1)$$

[7] O‘rganilgan adabiyotlar asosida muallif ishlanmasi

Bu yerda:

EBI_i = *i*-fermerning ekologik barqarorlik indeksi;

$urug'\_manba_i$ = *i*-fermerning urug‘ manbasi bo‘yicha barqarorlik ko‘rsatkichi;

$tuproq\_unum_i$ = *i*-fermerning tuproq unumdorligini boshqarish bo‘yicha barqarorlik ko‘rsatkichi;

$kasallik\_nazorat_i$ = *i*-fermerning kasallik va zararkunandalarni nazorat qilish bo‘yicha barqarorlik ko‘rsatkichi;

$begona\_o't\_nazorat_i$ = *i*-fermerning begona o‘tlarni nazorat qilish bo‘yicha barqarorlik ko‘rsatkichi;

$ekinlar\_boshqarish_i$ = *i*-fermerning ekinlarni boshqarish bo‘yicha barqarorlik ko‘rsatkichi.

Mazkur formulada keltirilgan indikatorlar va ularga biriktirilgan vaznlar ekologik barqarorlikni ta’minlashdagi nisbiy ahamiyatiga ko‘ra aniqlangan. Indeks tuzishda vaznlarni belgilash jarayoni tasodifiy emas, balki ilmiy adabiyotlar, mantiqiy-normativ yondashuv hamda tadqiqot obyekti xususiyatlarini hisobga olgan holda amalga oshirildi.

4-jadval

Fermer xo‘jaliklarining ekologik barqarorlik indeksi ko‘rsatkichlari (kartoshka yetishtirishda)[8]

Tumanlar nomi	Kuzatuvlar soni	O‘rtacha ekologik barqarorlik indeksi	Stan. og‘ish	Min.	Mak.
Bulung‘ur	44	0.38	0.28	0	0.94
Toyloq	52	0.56	0.3	0.09	1
Jomboy	25	0.45	0.24	0.08	1
Jami	121	0.47	0.29	0	1

Tahlil natijalariga ko‘ra kartoshka yetishtirishda Toyloq tumanidagi fermer xo‘jaliklarida o‘rtacha ekologik barqarorlik darajasi (0,56) Bulung‘ur tumanidagi ko‘rsatkichdan 0,19 koeffitsiyent yoki 19 foizga hamda Jomboy tumanidagi ko‘rsatkichdan 11 foizga yuqori ekanligi ma’lum bo‘ldi. Bunda Toyloq tumanidagi fermer xo‘jaliklarining organik o‘g‘itlardan nisbatan ko‘proq foydalanishi hamda kasallik va begona o‘tlarga qarshi kimyoviy vositalardan kamroq foydalanishi muhim omillar bo‘ldi.

Fermer xo‘jaliklarining bug‘doy yetishtirishda hisoblangan ekologik barqarorlik darajalarini tumanlar bo‘yicha ma’lumoti tahlil qilinganda tumanlar bo‘yicha ishlab chiqarish ekologik barqarorlik darajalari bir-biriga nisbatan yaqinligini ko‘rish mumkin. O‘rtacha ekologik barqarorlik darajasi eng baland Bulung‘ur tumani (0,3 koeffitsiyent) va eng past Jomboy tumani (0,24 koeffitsiyent) o‘rtasida 0,06 koeffitsiyent yoki 6 foiz farq borligini ko‘rish mumkin (5-jadvalga qarang).

[8] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

5-jadval

Ekologik barqarorlik indeksi natijalari (bug‘doy yetishtirishda)[9]

Tumanlar nomi	Kuzatuvlar soni	O‘rtacha ekologik barqarorlik indeksi	Stan. og‘ish	Min.	Mak.
Bulung‘ur	72	0.3	0.23	0	1
Toyloq	63	0.27	0.22	0	0.89
Jomboy	61	0.24	0.21	0	0.74
Jami	196	0.27	0.22	0	1

Shuningdek, o‘rtacha ekologik barqarorlik darajalari kartoshka yetishtirishga nisbatan bug‘doy yetishtirishda deyarli 2 barobar past ekanligini kuzatish mumkin. Bu esa, albatta, ekinlarni yetishtirish jarayonidagi qo‘llanilayotgan amaliyotlar bilan bog‘liq. Ya’ni bug‘doy yetishtirishda kasallik va begona o‘tlarni nazorat qilish tadbirlarida kimyoviy vositalardan ko‘proq foydalanishi hamda almashlab ekish amaliyotidan juda kam foydalanilishi kartoshka yetishitirishga nisbatan ekologik barqarorlik darajasining 2 barobar pastroq chiqishiga sabab bo‘lmoqda.

6-jadval

Kartoshka yetishtiruvchi fermer xo‘jaliklarining ekologik barqarorlik indeksi ko‘rsatkichlari asosida guruhlanishi[10]

Barqarorlik bo‘yicha guruhlar	Fermer xo‘jaliklari soni	O‘rtacha ekologik barqarorlik indeksi	Min.	Mak.
Past	42	0.161	0	0.281
O‘rta	39	0.436	0.302	0.586
Yuqori	40	0.835	0.677	1
Jami	121	0.472	0	1

Shundan so‘ng fermer xo‘jaliklarini ekologik barqarorlik darajalari bo‘yicha guruhlash mezonlari ishlab chiqildi. Buning uchun uch kvantil[11] usulidan foydalanildi. Ushbu yondashuv fermer xo‘jaliklari ekologik barqarorlik indeksi qiymatlarining tabiiy taqsimotini hisobga olib, ularni uchta nisbatan teng qismlarga ajratishga imkon beradi. Ushbu usul statistik tahlilda keng qo‘llaniladigan taqsimotga asoslangan guruhlash yondashuvidir. Uning mohiyati shundan iboratki, mavjud indeks qiymatlari o‘sish tartibida joylashtiriladi va butun tanlanma quyidagi 3 ta guruhga bo‘linadi:

- 1-guruh (past darajadagi ekologik barqarorlik) = $[min(ESI); Q1)$
- 2-guruh (o‘rta darajadagi ekologik barqarorlik) = $[Q1; Q2)$
- 3-guruh (yuqori darajadagi ekologik barqarorlik) = $(Q_2;\ max(ESI)]$

[9] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

[10] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

[11] Kvantil - bu ma’lumotlar to‘plamidagi kuzatuvlarning ma’lum foizi undan kichik yoki unga teng bo‘lgan chegaraviy qiymatni ifodalovchi statistik ko‘rsatkichdir.

Bu yerda:

- $Q1 = 33.3$ foizli kvantil
- $Q2 = 66.6$ foizli kvantil

Mazkur tahlil asosida fermer xo‘jaliklarini ekologik barqarorlik indeksi ko‘rsatkichlari bo‘yicha guruhlash mezonlari ishlab chiqildi. Natijalarga ko‘ra, ekologik barqarorlik indeksi 0,3 koeffitsiyentdan kam bo‘lganda past barqarorlik, 0,3 dan 0,6 koeffetisyentgacha bo‘lganda o‘rta barqarorlik va 0,6 dan 1 koeffitsiyentgacha bo‘lganda yuqori barqarorlikka ega deb topildi.

7-jadval

Bug‘doy yetishtiruvchi fermer xo‘jaliklarining ekologik barqarorlik indeksi ko‘rsatkichlari asosida guruhlanishi[12]

Barqarorlik bo‘yicha guruhlar	Fermer xo‘jaliklari soni	O‘rtacha ekologik barqarorlik indeksi	Min.	Mak.
Past	137	0.15	0	0.281
O‘rta	29	0.4	0.307	0.57
Yuqori	30	0.71	0.605	1
Jami	196	0.27	0	1

Tahlilning navbatdagi bosqichida yuqorida ishlab chiqilgan mezonlar asosida xo‘jaliklarnig bug‘doy yetishtirishda qayd etgan ekologik barqarorlik indeksi ko‘rsatkichlari asosida guruhlarga bo‘lindi. Natijalarni tahlil qiladigan bo‘lsak, fermer xo‘jaliklarining 70 foiz qismi past darajadagi barqarorlik guruhiga mansub va o‘rta va yuqori barqarorlik ko‘rsatkichiga erishgan xo‘jaliklar jami xo‘jaliklarning mos ravishda 14,8 foiz va 15,3 foiz qismini tashkil etadi. O‘rtacha ekologik barqarorlik ko‘rsatkichi esa 0,27 koeffitsiyent yoki 27 foizni tashkil etadi (7-jadvalga qarang).

Fermer xo‘jaliklarining texnik samaradorlik ko‘rsatkichlari Stoxastik chegaraviy tahlil modelining Kobb-Duglas ishlab chiqarish funskiyasi asosida hisoblandi va samaradorlikka ishlab chiqarish resurslarining ta’siri baholandi.

Stoxastik chegaraviy model natijalariga razm solinganda, ishchi kuchi sarfidan tashqari barcha omillar kartoshka yalpi hosiliga ijobiy ta’sir qilganini ko‘rish mumkin. Xususan, tahlil natijalariga ko‘ra urug‘ sarfining 1 foizga oshishi hosildorlikni 0,76 foizga oshiradi. Bu natija urug‘ resursi tadqiq etilgan xo‘jaliklarda eng muhim ishlab chiqarish omili ekanini ko‘rsatadi. Urug‘ resursi sarfi bug‘doy yetishtirishda ham hosildorlikka ijobiy ta’sir qilmoqda va urug‘ sarfining 1 foizga oshishi hosildorlikni 0,77 foizga oshirishi aniqlangan. Sifatli va tuproq-iqlim sharoitiga mos urug‘ navini tanlash orqali xo‘jaliklari hosildorlikni yuqori oshirish imkoniyati mavjud. Bundan tashqari organik o‘g‘itlar sarfi ham hosildorlikka ijobiy ta’sir etishi aniqlangan (β=0.047, p=0.03). Organik o‘g‘itlash tuproqning strukturasini yaxshilashi, nam saqlash va mikrobiologik faoliyatni oshirish orqali hosildorlikka o‘z ijobiy ta’sirini ko‘rsatadi. Kartoshka yetishtirishdan farqli ravishda

[12] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

bug‘doy yetishtirishda kimyoviy o‘g‘itlar sarfining hosildorlikka ta’siri sezilarli yuqori ekanligini ko‘rish mumkin. Ya’ni mineral o‘g‘itlarning sarfini 1 foizga oshishi bug‘doy hosildorligini 0,16 foizga oshirishi mumkinligi tahlil natijalaridan aniqlangan.

8-jadval

Stoxastik chegaraviy tahlil modeli orqali aniqlangan ishlab chiqarish omillarning bug‘doy va kartoshka hosildorligiga ta’siri natijalari[13]

Omillar	Bug‘doy yetishtirishda	Kartoshka yetishtirishda
	Koeffitsiyentlar	Koeffitsiyentlar
Urug‘	0.77*** (0.061)	0.76*** (0.061)
Organik o‘g‘it	0.047** (0.021)	0.088* (0.05)
Mineral o‘g‘it	0.16*** (0.052)	0.034 (0.048)
Ishchi kuchi	0.067 (0.059)	-0.31** (0.132)
O‘zgarmas qiymat	2.5*** (0.432)	3.79*** (0.73)
Dispersiya parametrlari		
σ_v	0.14	0.11
σ_u	0.18	0.31
σ^2	0.05	0.11
λ	1.29	2.75
Wald chi²(4) = 1420.45	(p = 0.000)	(p = 0.000)
Kuzatuvlar soni	196	121

***, **, * mos ravishda 1%, 5% va 10% aniqlikda statistik muhimlikni ifodalaydi, qavs ichida standard xatoliklar berilgan.

Bug‘doy yetishtiruvchi xo‘jaliklarning o‘rtacha samaradorlik ko‘rsatkichi 0,82 koeffitsiyent yoki 82 foizni tashkil qilgan bo‘lsa, ushbu ko‘rsatkich kartoshka yetishtirgan fermer xo‘jaliklarida 0,84 koeffitsiyent yoki 84 foizni tashkil etdi. Bu shuni anglatadiki, fermer xo‘jaliklari joriy resurs sarfida omillardan optimal foydalangan holda bug‘doy yetishtirishda samaradorlikni 18 foizga va kartoshka yetishtirishda 16 foizga yaxshilash imkoniyati mavjud.

Dissertatsiyaning “**Qishloq xo‘jaligida fermer xo‘jaliklarining barqarorligini va samaradorligini oshirish istiqbollari**” deb nomlangan uchinchi bobida qishloq xo‘jaligi ishlab chiqaruvchilari ekologik barqarorlik darajasi va iqtisodiy samaradorlik ko‘rsatkichlarini oshirishning ijtimoiy-iqtisodiy mexanizmi tadqiqot natijalariga asoslanib topilgan, shuningdek, Samarqand viloyatida kartoshka va bug‘doy yetishtirish hajmlarining 2030-yilgacha bo‘lgan ko‘rsatkichlarining prognoz parametrlari ishlab chiqilgan.

Tadqiqot davomida fermer xo‘jaliklarining texnik samaradorlik ko‘rsatkichlariga omillar ta’sirini baholash uchun Bulung‘ur, Toyloq va Jomboy tumanlaridagi fermer xo‘jaliklaridan O‘zbekiston-Koreya xalqaro hamkorlik loyihasi bo‘lmish “O‘zbekistonda kartoshka urug‘chiligini rivojlantirish va kadrlar salohiyatini oshirish” loyihasi doirasida 2024-yil fevral-mart oylarida olingan so‘rovnoma ma’lumotlaridan foydalanildi.

[13] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

Jadvalda keltirilgan ma’lumotlar tavsifi uchun xulosa qilib aytganda, kartoshka o‘rtacha hosildorligi 28,5 t/ga ni tashkil etgan va o‘rtacha texnik samaradorlik ko‘rsatkichi 0,84 koeffitsiyentni tashkil etgan (9-jadvalga qarang).Mazkur fermer xo‘jaliklarining o‘rtacha ekologik barqarorlik indeksi ko‘rsatkichi 47 foizni tashkil etgan hamda fermerlarning o‘rtacha yoshi 44,7 yil bo‘lgan. Shuningdek, so‘rovnomada qatnashgan fermerlarning 50 foizi klasterlar a’zolari va 53 foiz qismi kartoshka yetishtirish to‘g‘risidagi o‘quv treninglar va seminarlarda qatnashganliklarini bildirishgan.

9-jadval

Empirik tahlillarda qo‘llanilgan ma’lumotlarning statistik tavsifi[14]

Omillar nomi	O‘lchov birligi	O‘rtacha	St.og‘ish	Min.	Mak.
Texnik samaradorlik	Koeffitsiyent	0.84	0.1	0.2	0.95
Kartoshka hosili	Kg/ga	28544.4	8107.6	6000	50000
Ekin maydoni	Gektar	3.54	3.285	0.1	18
Ekologik barqarorlik indeksi	Koeffitsiyent	0.47	0.29	0	1
Yosh	Yil	44.7	10.3	23	75
Klasterga a’zolik	Ikkilik	0.5	0.5	0	1
O‘quv treninglari	Ikkilik	0.53	0.5	0	1
Kredit	Ikkilik	0.49	0.5	0	1
Bozorgacha masofa	Kategorik	0.87	0.8	0	2
Respondentlar soni		121			

Mazkur tadqiqotda fermer xo‘jaliklarining ishlab chiqarish samaradorligini oshirish mexanizmlarini empirik baholashda Tobit regressiya modeli qo‘llanildi. Buning asosiy sababi shundaki, tadqiqotda bog‘liq o‘zgaruvchi sifatida foydalanilgan ishlab chiqarish samaradorligi ko‘rsatkichi chegaralangan xarakterga ega bo‘lib, ularning qiymatlari 0 va 1 oralig‘ida aniqlanadi.

Tobit modelining matematik formulasi quyidagicha ifodalanadi:

$y_i^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \varepsilon_i$ (2)

Bu yerda:

y_i^* = latent bog‘liq o‘zgaruvchi;

β_0 = ozod had;

$\beta_1, \beta_2, \dots, \beta_5$ = mustaqil o‘zgaruvchilarning baholanadigan koeffitsiyentlari;

x_1 = fermer xo‘jaligining ekologik barqarorlik indeksi;

x_2 = fermer xo‘jaligi boshlig‘ining yoshi;

x_3 = fermer xo‘jaligining klasterga a’zoligi;

x_4 = fermer xo‘jaligi boshlig‘ining o‘quv treninglarda ishtiroki;

x_5 = fermer xo‘jaligining kredit xizmatidan foydalanganligi;

x_6 = fermer xo‘jaligi yer maydonidan bozorgacha masofa;

$\varepsilon_i = N(0, \delta^2)$ normal taqsimlangan tasodifiy xatolik.

[14] To‘plangan so‘rovnoma ma’lumotlari asosida muallif hisob-kitobi

Tahlil natijalariga ko‘ra, ekologik barqarorlik indeksi ishlab chiqarish samaradorligiga ijobiy va statistik jihatdan ahamiyatli ta’sir ko‘rsatmoqda. Ushbu natija fermer xo‘jaliklarida ekologik jihatdan barqaror amaliyotlarni joriy etish iqtisodiy samaradorlikni ko‘rsatkichini oshirishini ko‘rsatadi. Ishlab chiqarish jarayonida almashlab ekish amaliyotini qo‘llash, kimyoviy o‘g‘itlardan foydalanishni kamaytirish yoki kimyoviy pestitsidlardan foydalanishni cheklash orqali birinchidan, ishlab chiqarish xarajatlarini qisqartirish mumkin, shuningdek, yerning va ekotizimning uzoq muddatli salomatligini ta’minlanishi natijasida hosildorlikni oshirish imkoniyatini ham oshirish mumkinligi jahon tajribasida o‘z isbotini topgan.

10-jadval

Tobit regressiya modeli natijalari[15]

Omillar	Koeffitsiyentlar
Ekologik barqarorlik indeksi	0.086* (0.046)
Yosh	0.002 (0.0012)
Klasterga a’zolik	-0.08*** (0.027)
Treninglarda qatnashish	0.076*** (0.028)
Kredit	0.071** (0.027)
Bozorgacha masofa	0.03* (0.017)
O‘zgarmas qiymat	0.58*** (0.065)
var(e.tex_sam)	0.02 (0.003)
Pseudo R2	0.58
LR chi²(4) = 47.47	(p = 0.000)
Kuzatuvlar soni	121

***, **, * mos ravishda 1%, 5% va 10% aniqlikda statistik muhimlikni ifodalaydi, qavs ichida standard xatoliklar berilgan.

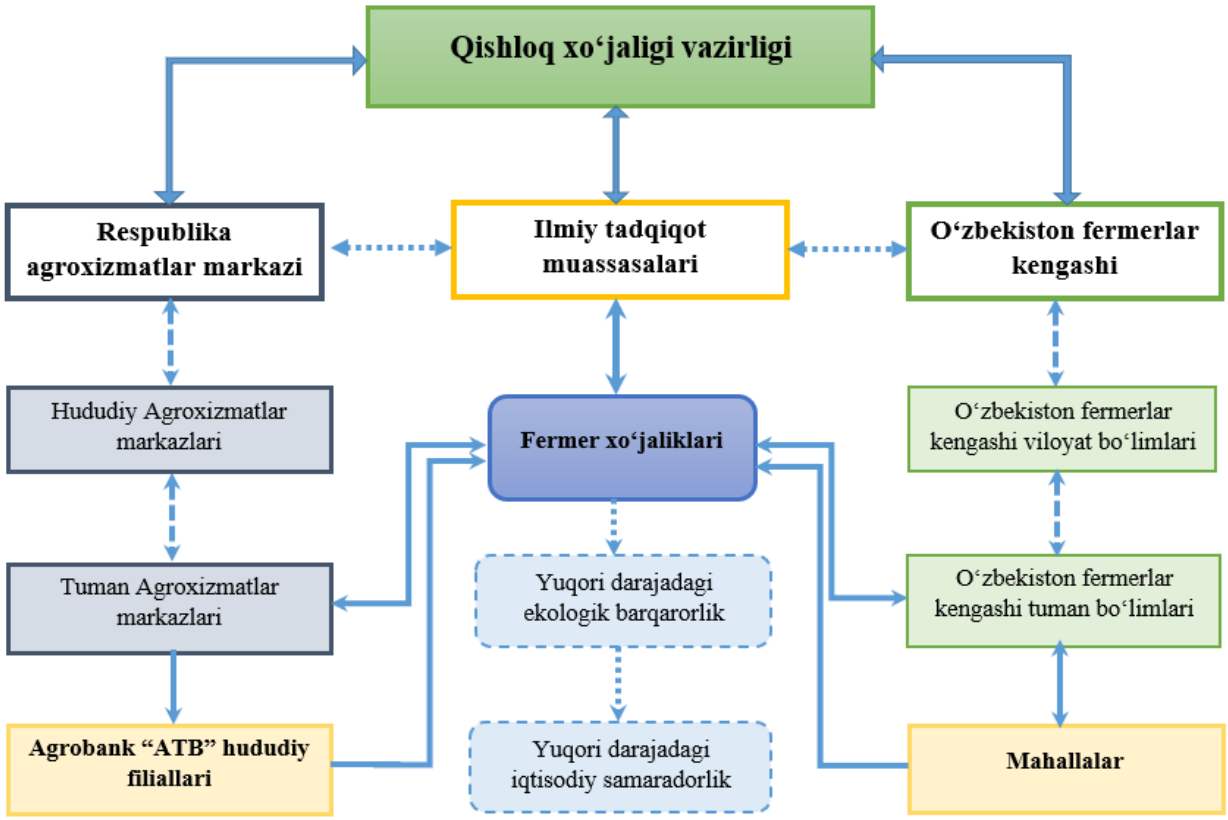
Kredit resurslaridan foydalanish o‘zgaruvchisi ham ishlab chiqarish samaradorligiga ijobiy va statistik jihatdan ahamiyatli ta’sir ko‘rsatgan Bu holat moliyaviy resurslardan foydalanish imkoniyatining kengayishi barqaror qishloq xo‘jaligi amaliyotlarini qo‘llash va samaradorlikni oshirishda muhim omil ekanligini ko‘rsatadi.

Tadqiqot natijalarida eng muhim omillardan biri sifatida fermerlarning o‘quv-treninglarda qatnashishi ajralib turadi. Treninglarda qatnashish o‘zgaruvchisining koeffitsiyenti 0,076 ga teng bo‘lib, 1 foizlik ishonchlilik darajasida statistik jihatdan ahamiyatli ekanligi aniqlandi. Ushbu natijaga ko‘ra kartoshka ishlab chiqarish

[15] To‘plangan ma’lumotlar asosida muallif hisob-kitobi

jarayoni va ekologik barqarorlik to‘g‘risidagi o‘quv treninglarida ishtirok etgan fermer xo‘jaliklarining ishlab chiqarish samaradorligi ishtirok etmagan xo‘jaliklarga nisbatan 7,6 foizga yuqori bo‘lganligini tavsiflaydi.

Tobit modeli natijalariga ko‘ra, aynan mana shu bilim uzatish zanjiri fermer xo‘jaliklarining ishlab chiqarish samaradorligini oshirishda muhim rol o‘ynaydi. Treninglarda qatnashgan fermerlar zamonaviy agrotexnologiyalarni qo‘llash, resurslardan tejamkor foydalanish, ekologik barqaror bo‘lgan ishlab chiqarish usullarini joriy etish bo‘yicha ko‘proq bilimga ega bo‘ladi. Bu esa ularning ishlab chiqarish jarayonlarini yanada samarali tashkil etishiga olib keladi. Shuningdek, treninglar fermerlarning qaror qabul qilish salohiyatini oshirib, risklarni kamaytirishga xizmat qiladi.



1-rasm. Qishloq xo‘jaligida “Davlat - Ilmiy tadqiqot - Amaliyot” uch tomonlama komleks tizimli yondashuv asosida fermer xo‘jaliklarining ekologik barqarorlik darajasi va iqtisodiy samaradorligini oshirishga qaratilgan istiqbolli amaliy xaritasi.

Amaliy xaritada Qishloq xo‘jaligi vazirligi umumiy islohotlar yo‘nalishlarini belgilovchi va barcha institutlar faoliyatini muvofiqlashtiruvchi markaziy organ sifatida ishtirok etadi (1-rasmga qarang). Ilmiy tadqiqot muassasalari barqaror qishloq xo‘jaligi amaliyotlari bo‘yicha metodologiyalar, indikatorlar va baholash mezonlarini ishlab chiqib, trening jarayonining ilmiy asoslanganligini ta’minlaydi. Respublika agroxizmatlar markazi va uning viloyat hamda tuman bo‘limlari ushbu ilmiy ishlanmalarni amaliyotga tatbiq etish, fermer xo‘jaliklari bilan bevosita ishlash, trening va maslahat xizmatlarini ko‘rsatish hamda monitoring jarayonini amalga oshiruvchi asosiy ijrochi institut hisoblanadi.

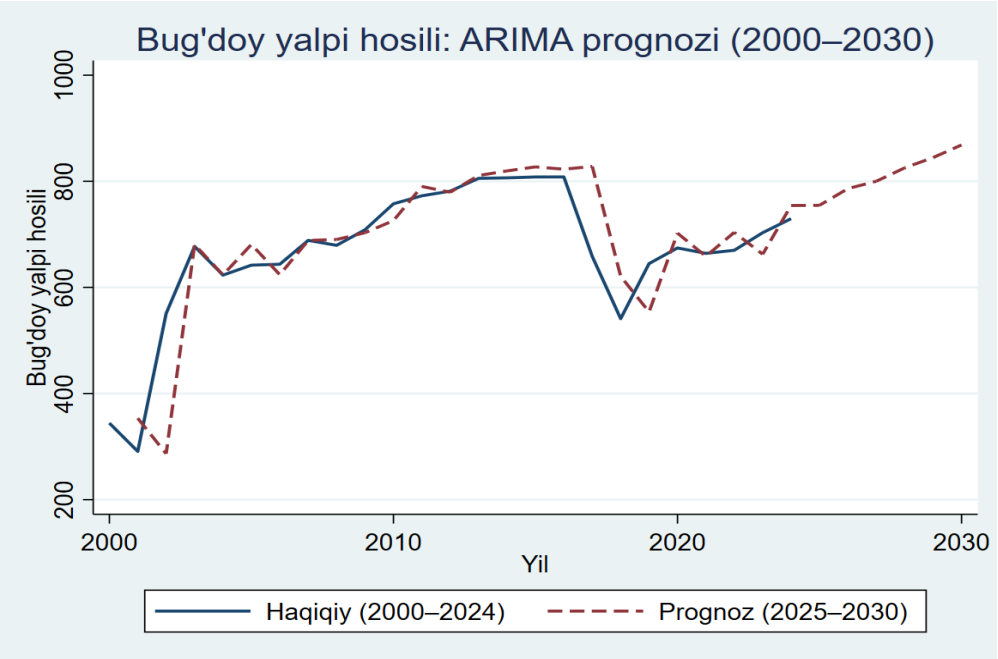
Mazkur amaliy xaritaning muhim jihatlaridan biri Agrobank “ATB” hududiy filiallarining trening va monitoring tizimi bilan integratsiyalashgan holda ishtirok etishidir. Treninglar davomida fermer xo‘jaliklarining ekologik barqarorlik va iqtisodiy samaradorlik ko‘rsatkichlari asosida reyting natijalari shakllantiriladi. Ushbu reyting natijalari agroxizmatlar markazi va ilmiy muassasalar ishtirokida baholanib, keyinchalik Agrobank hududiy filiallariga uzatiladi. Natijada, imtiyozli kreditlar ajratish jarayoni subyektiv qarorlar asosida emas, balki fermer xo‘jaliklarining real ekologik va iqtisodiy natijalariga tayangan holda amalga oshiriladi.

Shuningdek, O‘zbekiston fermerlar kengashi va uning viloyat hamda tuman bo‘limlari mazkur amaliy xaritada muhim institutsional rol o‘ynaydi. Fermerlar kengashi trening va moliyaviy dasturlarda ishtirok etuvchi fermer xo‘jaliklarini hududiy sharoitlar, ishlab chiqarish yo‘nalishlari va mavjud muammolarni inobatga olgan holda maqsadli tanlashga ko‘maklashadi. Bu jarayon trening va kredit dasturlarining manzilliligini oshirishga, shuningdek, fermerlar o‘rtasida mexanizmga nisbatan ishonch va qabul qilish darajasini kuchaytirishga xizmat qiladi. Fermerlar kengashi orqali fermerlarning ehtiyojlari va muammolari yuqori darajadagi institutlarga yetkazilib, teskari aloqa mexanizmi shakllanadi.

Amaliy xaritada ko‘rsatilgan teskari aloqalar tizimi Tobit modeli natijalarini yanada mustahkamlaydi. Fermer xo‘jaliklari tomonidan treninglar natijasida yuzaga kelgan amaliy muammolar, taklif va ehtiyojlar trening markazlari hamda ilmiy-tadqiqot institutlariga yetkaziladi. Ushbu teskari aloqa asosida trening mazmuni va uslublari takomillashtirilib, keyingi bosqichlarda yanada samarali bilim uzatish imkoniyati yaratiladi. Natijada treninglar bir martalik tadbir sifatida emas, balki uzluksiz bilim almashinuvi jarayoni sifatida shakllanadi.

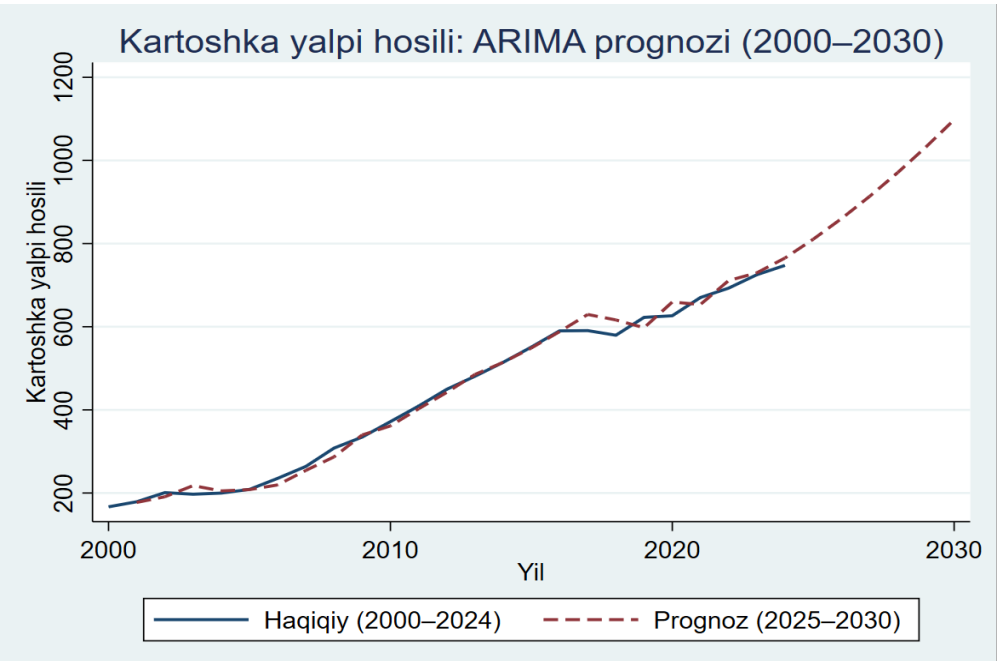
Fermer xo‘jaliklarining ishlab chiqarish samaradorligi va ekologik barqarorligini oshirish jarayoni faqat alohida iqtisodiy omillar ta’siri bilan emas, balki ushbu omillarni uyg‘unlashtiruvchi institutsional mexanizmlarning samarali ishlashi bilan belgilanadi. Mazkur tadqiqotda Tobit regressiya modeli natijalari shuni ko‘rsatdiki, bilim va malakani oshirishga qaratilgan o‘quv-treninglar fermer xo‘jaliklari samaradorligiga ijobiy va statistik jihatdan yuqori darajada ahamiyatli ta’sir ko‘rsatmoqda. Ushbu empirik natija treninglarni qishloq xo‘jaligida samaradorlik va barqarorlikni ta’minlash istiqbolli amaliy xaritasining markaziy institutsional bo‘g‘ini sifatida qarash zarurligini asoslaydi.

Samarqand viloyatida kartoshka va bug‘doy yetishtirish hajmlarini barqaror oshirish va ishlab chiqarish faoliyatini rivojlantirishning 2030-yilgacha bo‘lgan istiqbol parametrlarini baholash maqsadida ARIMA modelidan foydalanildi. Tahlil uchun O‘zbekiston Respublikasi Milliy statistika agentligining Samarqand viloyatidagi 2000-2024-yillarda kartoshka va bug‘doy yalpi hosili ma’lumotlaridan foydalanildi.



2-rasm. Samarqand viloyatida bug‘doy yetishtirish yalpi hajmi dinamikasi prognozi natijalari.

Prognoz natijalariga asosan, Samarqand viloyatida bug‘doy yetishtirish yalpi 2030-yilgacha bo‘lgan muddatda barqaror o‘sish tendensiyasini namoyon etadi. Jumladan, 2025-yilda bug‘doy yalpi hosili 2024-yilga nisbatan 25,1 ming tonnaga yoki 3,5 foizga oshishi tahlillar natijasida asoslandi. Shuningdek, bug‘doy yalpi hosili 2030-yilga borib 868,5 ming tonnaga yetishi ARIMA modeli prognoz natijalari asosida aniqlandi (2 va 3-rasmlarga qarang).



3-rasm. Samarqand viloyatida kartoshka yetishtirish yalpi hajmi dinamikasi prognozi natijalari.

Xulosa

1. Dissertatsiyada barqaror qishloq xo‘jaligi konsepsiyasining ijtimoiy-iqtisodiy ahamiyati, barqaror qishloq xo‘jaligi amaliyotlarini qo‘llanilishi bo‘yicha dunyo tajribasi, qishloq xo‘jaligi ishlab chiqaruvchilari ekologik barqarorlik darajasi va iqtisodiy samaradorlik ko‘rsatkichlarini baholashning nazariy asoslari va uslubiy yondashuvlar o‘rganildi.

2. Empirik tahlillar asosida ishlab chiqarish iqtisodiy samaradorlik ko‘rsatkichlariga ta’sir etuvchi omillar baholanib, Stoxastik chegaraviy tahlil modeli, Tobit modeli, chiziqli regressiya modeli va ARIMA modeli kabi ilg‘or ilmiy-uslubiy yondashuvlardan foydalanildi. Tadqiqot natijalari asosida barqaror qishloq xo‘jaligi amaliyotlarini qo‘llash fermer xo‘jaliklarining ishlab chiqarish iqtisodiy samaradorligini oshishiga ijobiy ta’sir qilishi aniqlandi.

3. Fermer xo‘jaliklari ekologik barqarorlik ko‘rsatkichi xo‘jaliklarda ishlab chiqarish jarayonida qo‘llanilayotgan qishloq xo‘jaligi amaliyotlari asosida baholangan holda xo‘jaliklarni ekologik barqarorlik darajasiga ko‘ra “quyi” ($0 \le EBI < 0,3$), “o‘rta” ($0,3 \le EBI < 0,6$) va “yuqori” ($0,6 \le EBI \le 1$) guruhlarga bo‘lish mezonlari hisoblandi.

4. Tadqiqotda kartoshka va bug‘doy yetishtiruvchi fermer xo‘jaliklarining ishlab chiqarish iqtisodiy samaradorlik ko‘rsatkichlariga omillar ta’siri Kobb-Duglas ishlab chiqarish funksiyasi asosidagi Stoxastik chegaraviy tahlil modeli yordamida baholandi. Jumladan, kartoshka yetishtirishda urug‘ sarfi, organik o‘g‘it sarfi va ishchi kuchi omillari yuqori statistik aniqlikda ta’sir etishi aniqlandi. Bug‘doy yetishtirishda esa iqtisodiy samaradorlik ko‘rsatkichiga urug‘ sarfi, organik va mineral o‘g‘itlar sarfi omillari yuqori statistik aniqlikda ijobiy ta’sir qiluvchi omillar ekanligi anilandi.

5. Tadqiqotda fermer xo‘jaliklarining kartoshka va bug‘doy yetishtirish iqtisodiy samaradorlik ko‘rsatkichlariga omillar ta’siri sifat va midoriy ko‘rsatkichli yondashuv asosida Tobit modeli yordamida baholangan. Natijada, fermer xo‘jaliklarining ishlab chiqarish iqtisodiy samaradorlik ko‘rsatkichiga ekologik barqarorlik darajasi, kreditlardan foydalanish, treninglarda qatnashish kabi omillar yuqori statistik aniqlikda ijobiy ta’sirga egaligi aniqlangan. Ushbu natijalar asosida fermer xo‘jaliklarining iqtisodiy samaradorlik ko‘rsatkichini oshirishga doir taklif va tavsiyalar ishlab chiqildi.

6. Tadqiqotda fermer xo‘jaliklaridan olingan so‘rovnoma ma’lumotlari asosidagi empirik tahlillar asosida “Davlat – ilmiy tadqiqot – amaliyot” uch tomonlama kompleks tizimli yondashuv asosida xo‘jaliklarning iqtisodiy samaradorlik va ekologik barqarorlik darajasini oshirishga qaratilgan istiqbolli amaliy xaritasi asoslandi.

7. Samarqand viloyatida kartoshka va bug‘doy yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari ARIMA modeli yordamida statistik davriy qatorlar ma’lumotlari asosida asoslandi. Prognoz natijalariga ko‘ra kartoshka va bug‘doy yetishtirish hajmlari o‘sish tendensiyasiga egaligi hamda viloyatda kartoshka yetishtirish hajmi 2030-yilg borib 1049 ming tonnaga yetishi va bug‘doy yetishtirish hajmi 868,5 ming tonnaga yetishi prognoz qilindi.

SCIENTIFIC COUNCIL № DSc.08/2025.27.12.I.07.02 FOR AWARDING OF THE SCIENTIFIC DEGREES AT SAMARKAND AGROINNOVATIONS AND RESEARCH UNIVERSITY

SAMARKAND AGROINNOVATIONS AND RESEARCH UNIVERSITY

ILASHOV BAKHTINUR SHERALI UGLI

ECONOMIC EVALUATION OF THE IMPACT OF SUSTAINABLE AGRICULTURAL PRACTICES ON PRODUCTION EFFICIENCY (IN CASE OF SAMARKAND REGION)

08.00.04 – Agricultural economics

ABSTRACT
of the Dissertation of Doctor of Philosophy (PhD) in Economic Sciences

Samarkand – 2026

The theme of the doctoral dissertation (PhD) was registered at the Supreme Attestation Commission under Ministry of higher education, science and innovations of the Republic of Uzbekistan under the number B2025.4.PhD/Iqt3700.

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INTRODUCTION (Doctor of Philosophy (PhD) dissertation abstract)

Relevance and actuality of the dissertation theme. In recent years, agricultural systems worldwide have been increasingly exposed to several profound crisis factors simultaneously. Climate change, the depletion of water resources, land degradation, biodiversity loss, and the destabilization of food supply chains pose serious threats to the sustainability and long-term efficiency of global agricultural production. On the one hand, agriculture is expected to ensure food security under conditions of rapid population growth; on the other hand, it has become one of the major sources of environmental pressure. Therefore, the transition towards a new production model that combines sustainability and efficiency in agricultural development has become a strategic necessity at the international level.

Climate change and water scarcity are becoming particularly acute challenges for the Central Asian region. Agriculture in the region is mainly based on irrigated farming and is characterized by the transboundary nature of water resources, an arid climate, and a high susceptibility of land to salinization. Increasing water shortages, outdated irrigation systems, and the low efficiency of resource use have a negative impact on the sustainability of agricultural production. At the same time, the share of the rural population remains high in the countries of the region, where the agricultural sector plays a decisive role in ensuring social stability as a source of employment and income. The agrarian reforms implemented in recent years have mainly focused on maintaining existing production volumes and increasing export potential, while in many cases issues of environmental sustainability and the long-term efficient use of resources have remained secondary. Therefore, under the conditions of the region, the introduction of sustainable agricultural practices and an in-depth analysis of their economic efficiency are of both scientific and practical relevance.

In recent years, Uzbekistan has been implementing large-scale reforms aimed at modernizing agriculture, introducing resource-saving technologies, and transitioning towards sustainable production systems. In his Address to the Oliy Majlis and the people of Uzbekistan, President of the Republic of Uzbekistan Sh. M. Mirziyoyev stated: "...At present, as throughout the world, serious environmental problems are also emerging in Uzbekistan. These include the deterioration of soil composition in most of our regions, the reduction of fertile lands, desertification, water shortages, drought, and the provision of the population with clean drinking water."[16]. Practical experience shows that, despite consistent government reforms in the field of sustainable agriculture, farmers tend to pay greater attention to economic outcomes than to environmental benefits when adopting new technologies and practices. Therefore, there is a need to scientifically assess the impact of sustainable practices on production efficiency and to develop evidence-based recommendations adapted to specific regional conditions.

[16] O'zbekiston Respublikasi Prezidenti Shavkat Mirziyoyevning Oliy Majlis va O'zbekiston xalqiga Murojaatnomasi. 20.12.2022 www.president.uz

This dissertation research contributes, to a certain extent, to the implementation of the tasks set out in the Decree of the President of the Republic of Uzbekistan No. PF-5853 dated October 23, 2019, "On Approval of the Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020–2030"; the Presidential Decree No. PF-615 dated February 3, 2021, "On Further Development of the System of Knowledge and Innovation in Agriculture and the Provision of Modern Services"; the Resolution No. PQ-233 "On Measures to Create a Climate-Resilient Agroecosystem and Improve the Adaptability of Agricultural Producers to Risks Associated with Climate Change"; the Resolution No. PQ-269 dated September 8, 2025, "On Additional Measures to Increase Potato Production and Further Develop Seed Production in the Republic"; as well as other relevant regulatory and legal documents related to this field.

Compliance of the research with the priority areas of national science and technology development. The dissertation has been conducted in accordance with Priority Area I of the national framework for the development of science and technology, namely "The development of a democratic and legal society, its moral, ethical, cultural, and educational advancement, and the formation of an innovative economy."

The extent of the study of the research problem. Issues related to the adoption of sustainable agricultural practices in the agricultural sector, addressing challenges such as climate change, land degradation, and water scarcity through the application of innovative production practices, as well as improving the economic efficiency of producers, have been extensively examined by foreign scholars, including D. Rigby, F. Benítez-Altuna, F. Zahm, J. Pretty, M. Farrell, C. Cobb, T. Coelli, J. Jondrow, L. Latruffe, and M. Girardin[17].

In Uzbekistan, the application of sustainable agricultural practices and the environmental impacts of agricultural production activities have been studied by Sh. Babakholov, F.Ahrorov, A. Tadjiev, N. Djanibekov, I. Bobojonov and I. Rustamova. Furthermore, issues of optimal resource use in agriculture and the effects of various factors on indicators of economic efficiency in production have been empirically analyzed by O. Murtazaev, Sh. Hasanov, K. Akramov, G. Sanaev, M. Djuraeva, and

[17] Rigby, D., Woodhouse, P., Young, T., & Burton, M. (2001). Constructing a farm level indicator of sustainable agricultural practice. *Ecological economics*, *39*(3), 463-478; Benitez-Altuna, F., Trienekens, J., Materia, V. C., & Bijman, J. (2021). Factors affecting the adoption of ecological intensification practices: A case study in vegetable production in Chile. *Agricultural Systems*, *194*, 103283; Zahm, F., Viaux, P., Vilain, L., Girardin, P., & Mouchet, C. (2004). The IDEA method (Farm Sustainability Indicators): A diagnostic assessment method to make the transition from the concept of sustainability to its assessment using indicators; Pretty, J., Toulmin, C., and Williams, S. (2011). Sustainable intensification in African agriculture. Int. J. Agric. Sustain. 9, 5–24; Farrell, M. J. (1957). "The Measurement of Productive Efficiency". *Journal of the Royal Statistical Society*, Series A, 120(3), 253-290; Cobb, C.W., & Douglas, P.H. (1928). "A Theory of Production." *American Economic Review*, 18(1), 139-165; Jondrow J, Lovell CAK, Materov IS, Schmidt P (1982) On the estimation of technical efficiency in the stochastic frontier production function model. J Econom 19(2–3):233–238; Latruffe, L., Diazabakana, A., Bockstaller, C., Desjeux, Y., Finn, J. A., Kelly, E., Ryan, M., & Uthes, S. (2016). Measurement of sustainability in agriculture: a review of indicators. Studies in Agricultural Economics, 118(3), 123–130; Girardin, M. (2022). Organic Dairy Production (pp. 830–835). Elsevier eBooks

A. Karimov[18]. Although a number of studies have addressed sustainable agricultural practices, the determinants of their adoption, and the assessment of economic efficiency in agricultural production, there remains a notable research gap concerning the empirical identification and rigorous evaluation of the relationship between sustainable agricultural practices and economic efficiency. Consequently, conducting in-depth, methodologically sound analyses in this area and developing scientifically and practically grounded recommendations and policy proposals remains highly relevant.

The aim of the research is to develop scientifically grounded proposals and practical recommendations for improving the level of ecological sustainability and economic efficiency indicators of farms through the implementation of sustainable agricultural practices.

Research objectives. The specific objectives of the research are as follows:

to provide a theoretical justification for the socio-economic necessity of adopting sustainable agricultural practices in the development of farm activities;

to examine international experience in assessing the sustainability of agricultural production;

to review and systematize contemporary methodological approaches and best practices for evaluating the economic efficiency and ecological sustainability of farms;

to improve the methodology for calculating an ecological sustainability index in agriculture;

to conduct a farm-level survey in Samarkand region to assess the level of ecological sustainability based on the sustainable agricultural practices applied by farms, and to perform corresponding econometric analyses;

to develop a practical roadmap of a socio-economic mechanism aimed at enhancing ecological sustainability and economic efficiency within the national agricultural system, using Samarkand region as a case study;

to develop forecast parameters for the development trends of gross potato and wheat production in Samarkand region up to 2030.

Object of the research. The object of the research comprises agricultural farms engaged in agricultural production in Samarkand region.

Subject of the research. The subject of the research consists of the system of socio-economic relations that arise in the process of determining the level of ecological sustainability of agricultural production and assessing its impact on economic efficiency indicators within the national agricultural system.

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[18] Babakholov, S., & Hasanov, S. (2024). Perceptions towards climate change, water scarcity and adaptation strategies: Case of the Zerafshan River Basin in Uzbekistan. *Italian Review of Agricultural Economics (REA)*, *79*(2), 19-33; Ahrorov, F. (2024). Барқарор қишлоқ хўжалигини ривожлантириш: Ўзбекистонда экологик деҳқончилик ва органик маҳсулотлар етиштиришга ўтиш. *Economics and Innovative Technologies*, *12*(1), 111-118 Tadjiev, A., Djanibekov, N., Soviadan, M. K., & Herzfeld, T. (2025). Participation in informal cooperation in water management and adoption of sustainable agricultural practices: Empirical evidence from Uzbekistan. *Australian Journal of Agricultural and Resource Economics*; Kienzler, K. M., Djanibekov, N., & Lamers, J. P. (2011). An agronomic, economic and behavioral analysis of N application to cotton and wheat in post-Soviet Uzbekistan. *Agricultural Systems*, *104*(5), 411-418; Rustamova, I., Primov, A., Karimov, A., Khaitov, B., & Karimov, A. (2023). Crop diversification in the Aral sea region: long-term situation analysis. *Sustainability*, *15*(13), 10221.

Research methods. The study employs a range of qualitative and quantitative methods, including logical reasoning, comparative analysis, farm-level surveys, descriptive statistical analysis, econometric modeling, the Stochastic Frontier Analysis (SFA) model, the Tobit model, and the ARIMA model.

Scientific novelty of the research. The scientific novelty of the dissertation is reflected in the following contributions:

an ecological sustainability index of production activity was calculated based on the agricultural practices applied by farms, and criteria were developed for classifying this index into "low" ($0 \leq ESI < 0,3$), "medium" ($0,3 \leq ESI < 0,6$), and "high" ($0,6 \leq ESI \leq 1$) levels;

the methodological approach to assessing the production efficiency of farms was improved through the inclusion of factors such as the "sustainability indicator" and "access to state concessional loans";

a tripartite integrated framework based on the interaction of the State, Science, and Practice in agriculture was developed, and within this framework the potential for enhancing the ecological sustainability and economic efficiency of farms was scientifically justified using the Tobit model;

forecast parameters for potato and wheat production volumes in Samarkand region up to 2030 were developed under the current level of sustainability of farms.

Practical results of the research. The practical outcomes of the research are as follows:

on the basis of agricultural practices applied in potato and wheat production by farms in Samarkand region, a sustainability index was calculated, and criteria were developed to classify farms into low ($0 \leq ESI < 0,3$), medium ($0,3 \leq ESI < 0.6$), and high ($0,6 \leq ESI \leq 1$) sustainability levels. The findings revealed that, among the 121 potato-producing farms surveyed, 42 farms, or 35 percent, were classified as having a low level of ecological sustainability, 39 farms, or 32 percent, as having a medium level, and 40 farms, or 33 percent, as having a high level. In contrast, among the 196 wheat-producing farms surveyed, 137 farms, or 70 percent, were classified as having a low level of ecological sustainability, 29 farms, or 15 percent, as having a medium level, and 30 farms, or 15 percent, as having a high level. These results indicate that the ecological sustainability level of farm production is relatively higher in potato production than in wheat production.

in evaluating the factors influencing production efficiency in farms, the inclusion of the sustainability indicator and access to state concessional credit was found to have a statistically significant positive effect on economic efficiency. Based on these findings, strategic recommendations were developed to enhance both production efficiency and ecological sustainability at the farm level.

a prospective practical roadmap aimed at improving the ecological sustainability and economic efficiency of farm production was developed and recommended within the framework of a tripartite integrated systems approach based on the interaction between State – Science - Practice in agriculture. The Tobit model results substantiated that the implementation of this approach could increase farm production efficiency by 7,6 percent.

forecast parameters for potato and wheat production volumes in Samarkand region up to 2030 were developed using the ARIMA model, taking into account the current level of sustainability.

Reliability of the research results. The reliability of the research findings is ensured by their consistency with established scientific and methodological results reported in studies by national and international economists on sustainable agricultural practices and their impacts on economic efficiency in agriculture; the use of long-term data obtained from official sources; the reliance on primary survey data collected from farms across the districts of Samarkand region; the practical implementation of the proposed recommendations; and the validation of the results by authorized institutions.

Scientific and practical significance of the research results. The scientific significance of the research results lies in the development of methodological approaches for assessing the level of ecological sustainability of agricultural production; in the empirical economic evaluation of the effects of various factors on the economic efficiency of farms; and in the formulation of methods for assessing how improvements in agricultural producers' knowledge levels and access to financial resources influence both economic efficiency and ecological sustainability. These contributions expand the analytical framework for evaluating sustainability–efficiency linkages in agriculture based on empirical evidence.

The practical significance of the research results is reflected in their applicability to enhancing knowledge on ecological sustainability and economic efficiency, as well as their potential use in the educational process of higher education institutions within courses such as "Agricultural Economics" and "Environmental and Resource Economics."

Implementation of the research results. Based on the scientific findings and practical recommendations obtained from the economic assessment of the impact of sustainable agricultural practices on production efficiency, the following outcomes have been achieved:

the index developed for assessing the ecological sustainability level of farm production activity according to "low", "medium", and "high" criteria was introduced into practice in farms on the basis of the action plan developed by the Samarkand Regional Department of Agriculture for the development of farm activities (February 2, 2026), and was approved by the Ministry of Agriculture of the Republic of Uzbekistan (Reference No. 06/26-2-10-05/18, February 13, 2026). The index was accepted for practical application by the Department of statistical analysis and forecasting of the Ministry of Agriculture and introduced into practice in the agricultural system organizations of Samarkand region for assessing the ecological sustainability level of farm production activity. As a result, it was determined that among the 121 potato-producing farms studied, 42 farms, or 35 percent, had a low level of ecological sustainability, 39 farms, or 32 percent, had a medium level, and 40 farms, or 33 percent, had a high level. In wheat production, among the 196 farms studied, 137 farms, or 70 percent, had a low level of

sustainability, 29 farms, or 15 percent, had a medium level, and 30 farms, or 15 percent, had a high level;

The proposal to improve the assessment of farm production efficiency by incorporating the “sustainability indicator” and “access to state concessional loans” was introduced into practice under the action plan of the Samarkand Regional Department of Agriculture for developing farm activities (February 2, 2026), and was approved by the Ministry of Agriculture of the Republic of (Reference No. 06/26-2-10-05/18, February 13, 2026). This methodological approach was implemented in the agricultural system organizations of Samarkand region by the Department for Economic Development and Financing of the Agrarian Sector. The research results substantiate that the use of sustainable practices and state concessional loans can increase farm production efficiency by 7.1 percent;

the proposals on improving the ecological sustainability level and economic efficiency of farms within the framework of the developed tripartite integrated systems approach based on the integration of the State, Science, and Practice in agriculture were introduced into practice in farms under the action plan prepared by the Samarkand Regional Department of Agriculture for the development of farm activities (February 2, 2026), and were approved by the Ministry of Agriculture of the Republic of Uzbekistan (Reference No. 06/26-2-10-05/18, February 13, 2026). These proposals were implemented in the agricultural system organizations of Samarkand region by the Department for Agrarian Sector Development and Food Security of the Ministry of Agriculture. As a result, on the basis of the proposed recommendations, a 7,6 percent increase in production efficiency indicators was achieved in farms located in Bulungur, Taylak, and Jambay districts of Samarkand region;

the proposals on forecasting the growth in the value of potato and wheat production through the effective implementation of sustainable agricultural practices in Samarkand region up to 2030 were accepted for practical application by the Ministry of Agriculture of the Republic of Uzbekistan (Reference No. 06/26-2-10-05/18, February 13, 2026). These proposals were implemented in the agricultural system organizations of Samarkand region by the Department of Statistical Analysis and Forecasting of the Ministry of Agriculture. As a result, it was substantiated that by 2030 the forecast volume of potato production would reach 1,049 thousand tons, while the forecast volume of wheat production would amount to 868,5 thousand tons.

Approbation of the research results. The research findings were discussed and positively evaluated at 2 international and 4 national conferences.

Publication of the research results. A total of 4 scientific articles related to the dissertation topic have been published in journals recommended by the Higher Attestation Commission of the Republic of Uzbekistan, including 3 articles in national journals and 1 article in an international journal.

Structure and volume of the dissertation. The dissertation consists of introduction, 3 chapters, conclusion, list of references, and appendices, and is presented in a total of 143 pages.[i]

MAIN CONTENT OF THE DISSERTATION

The **introduction** of the dissertation outlines the relevance of the research topic, the degree to which the problem has been studied, the aim and objectives of the study, its scientific novelty and practical significance. It also presents information on the reliability, implementation, approbation, and publication of the research results, as well as the structure and overall volume of the dissertation.

The first chapter of the dissertation, entitled **"Concepts of sustainability and efficiency in agriculture and their theoretical and methodological foundations,"** elaborates on the theoretical justification of sustainable agricultural development and the role of sustainable agricultural practices. It examines the methods and scientific–methodological foundations for assessing economic efficiency indicators and reveals the conceptual linkages between sustainability and efficiency. In addition, the current global state of the application of sustainable agricultural practices is analyzed, and the specific features of reforms undertaken by developed and developing countries to promote sustainable agriculture are examined. The possibilities for adapting and implementing these international experiences in Uzbekistan are analyzed, and the theoretical foundations of the conclusions and recommendations derived from this analysis are substantiated.

In the scientific literature, sustainable agriculture is commonly defined as a system that is capable of meeting the food and bioresource needs of the present generation without compromising the ability of future generations to meet their own needs. Within this framework, three core dimensions are distinguished:

1. Ecological sustainability – preservation of soil fertility, protection of water resources, and the rational use of pesticides and fertilizers;
2. Economic sustainability – profitability, cost efficiency, and market stability;
3. Social sustainability – income stability of farmers, rural employment, gender equality, and access to education and healthcare services.

The implementation of sustainable agriculture makes it possible to enhance the economic and social well-being of agricultural producers without causing harm to agroecosystems. In this context, the adoption of sustainable agricultural practices such as crop rotation, intercropping, the use of organic fertilizers, crop diversification, and conservation tillage plays a decisive role in agricultural production.

Ensuring sustainable agricultural development requires the continuous assessment of the sustainability status of agricultural producers, the consistent implementation of agricultural reforms aimed at incentivizing sustainability, and the ongoing conduct of empirical research to address emerging challenges within this process. These tasks represent a critically important priority.

Finally, international experience in the application of indicators for assessing sustainable agriculture has been examined and subjected to comparative analysis (See table 1).

In the second chapter of the dissertation, entitled "**The state of sustainability and efficiency indicators in agricultural production of the republic and existing challenges**" an analysis of the dynamics of key agricultural indicators in Samarkand

region is carried out based on the scientific and methodological approach, applied developments, and empirical results of the research.

Table 1

Global experience in the application of indicators for assessing sustainable agriculture[19]

Continent	Main methods for assessing sustainability	Mainly used sustainable agricultural practices	Achieved results	Main barriers to achieving sustainability
Europe	RISE 3.0, SOSTARE, ISAP, AFI, IDEA, SAFE, MOTIFS, SIRIUS, LCA, MCDA	Intercropping, application of organic fertilizers, crop rotation	A balance between productivity and biodiversity, sustainability linked to subsidies	Differences in reforms between Eastern and Western Europe, lack of technical knowledge
North America	RISE, MESMIS, USDA ASI, AEIs, LCA, SAFA	Zero tillage farming, integration of crop and livestock production, cover cropping	Integration of environmental protection and production, increased productivity	Barriers to market access, coordination problems in the design of agrarian reforms
South America	SIRIUS, MESMIS, SIAS, ISAP, ASI, SAFA, LSI, MCDA	Agroecological innovations, crop diversification, mulching	Agrodiversification through local innovations, increased incomes	High initial costs, dependence on external resources
Asia	SAFA, RISE, PSDCIFASA, CSI, MCDA, ASI	Conservation agriculture, intercropping, organic farming	Water-use efficiency, reduced greenhouse gas emissions, economic profitability	Lack of data, weak institutional support, lack of knowledge
Africa	RISE, IDEA, SIRIUS, MESMIS, SAFE, SLF, API	No-tillage farming, natural fertilizers, intercropping	Improved food security and farm incomes	Uncertainty in land tenure rights, limited financial resources
Australia	AFSA, LCI, TBL, AEIs	Retention of crop residues, controlled traffic farming	Reduced soil erosion, stable yields	Dependence on climatic conditions, weak economic stability

The chapter examines the levels of ecological sustainability and production efficiency of farms operating in the districts located in the upper reaches of the Zarafshan River within the region, as well as the marginal effects of various factors

[19] Author's framework based on the reviewed literature

on production efficiency. Based on empirical analyses, the essence and significance of the resulting conclusions and recommendations are presented.

According to statistical data, despite the steady growth in the volume of agricultural production in Samarkand region in recent years, the total area of agricultural land under cultivation has been declining year by year (See table 2).

Table 2

Indicators of agricultural cropland area and production volume in Samarkand region, 2018–2024 [20]

Years	2018	2019	2020	2021	2022	2023	2024
Agricultural cropland area, thousand hectares	351833	328107	340750	359283	336799.7	320047	320041
Agricultural output, billion UZS	25658	28379.5	33759.4	41206.1	42088.9	49025.9	57452

Despite the quantitative and qualitative growth of agricultural production in the Republic, agricultural activity has become increasingly challenging over the past decade due to a continuous reduction in land allocated for agriculture, the escalating problem of water scarcity, and the intensifying negative impacts of climate change. At the same time, the steadily growing population has led to a sharp increase in demand for agricultural products. As a result, farmers and smallholders have increasingly relied on excessive use of mineral fertilizers and chemical inputs to combat pests and diseases in order to raise production volumes.

In international practice, scholars emphasize that farm production should aim not only at increasing yields and achieving higher output, but also at preserving healthy agricultural ecosystems by minimizing adverse environmental externalities. In this context, the concept of ecological sustainability in agriculture has been widely applied. Within the framework of the present study, the methodology for assessing the ecological sustainability index of farms has been refined. For this purpose, the methodological approach proposed by Dan Rigby and co-authors was taken as the analytical basis.

To calculate the ecological sustainability index of farms, the production process at the farm level was assessed across five integrated stages. These stages include the seed source, the application of organic and mineral fertilizers, practices for disease and pest control, practices for weed control, and crop management practices (see Table 3). After the ecological sustainability indicators for each stage were calculated, they were aggregated into a single composite index using the following formula:

$$EBI_i = (0{,}05*seed\_source_i) + (0{,}26*soil\_fertility_i) + (0{,}23*pest\_control_i) + (0{,}23*weed\_control_i) + (0{,}23*crop\_managment_i) \quad (1)$$

Where:

EBI_i denotes the ecological sustainability index of the i-th farm;

[20] Author's elaboration based on data from Samarkand regional Statistics Department.

seed_source$_i$ represents the sustainability indicator of the *i*-th farm with respect to seed sources;

soil_fertility$_i$ denotes the sustainability indicator of the *i*-th farm related to soil fertility management;

pest_control$_i$ represents the sustainability indicator of the *i*-th farm with respect to disease and pest control practices;

weed_control$_i$ denotes the sustainability indicator of the *i*-th farm related to weed control practices;

crop_managment$_i$ represents the sustainability indicator of the *i*-th farm with respect to crop management practices.

Table 3

Assessment of each production stage according to sustainability dimensions[21].

Practices applied at the production stages	Minimizing off-farm inputs	Minimizing non-renewable inputs	Maximizing natural biological processes	Promoting local biodiversity	Total
Seed source					
Purchased seed	0	0	0	0	0
Own	1	0	0	0	1
Soil fertility management					
Greater use of mineral fertilizers and lower use of organic fertilizers	-1	-1	-1	0	-3
Efficient use of both types of fertilizers depending on conditions	0	0	0	0	0
Lower use of mineral fertilizers and greater use of organic fertilizers	0	1	1	0	2
Pest/disease control					
Chemical pesticides	-1	-1	-3	-3	-8
Preventive practices without chemicals	2	2	2	2	8
Weed control					
Chemical herbicides	-1	-1	-1	-1	-4
Preventive practices without chemicals	1	1	1	1	4
Crop management					
Repeated cultivation of the same crop	0	0	-1	0	-1
Crop rotation (with cereals)	0.5	0.5	1	0	2
Crop rotation (with legumes)	1	1	1	0	3

[21] Author's framework based on the reviewed literature

In the presented formula, the indicators and the weights assigned to them were determined according to their relative importance in ensuring ecological sustainability. The process of assigning weights in the construction of the index was not arbitrary; rather, it was carried out on the basis of the scientific literature, a logical–normative approach, and the specific characteristics of the research object.

According to the results of the analysis, in potato production the average level of ecological sustainability among farms in Toyloq district (0,56) was higher by 0,19 points, or 19 percent, compared to Bulungur district, and by 11 percent compared to Jomboy district. This outcome is primarily explained by the relatively higher use of organic fertilizers and the lower reliance on chemical inputs for disease and weed control among farms in Toyloq district.

Table 4

Ecological sustainability index indicators of farms (in potato production)[22]

Districts	Number of observations	Mean EBI index	St. deviation	Min.	Max.
Bulungur	44	0.38	0.28	0	0.94
Toyloq	52	0.56	0.3	0.09	1
Jomboy	25	0.45	0.24	0.08	1
Total	121	0.47	0.29	0	1

When analyzing district-level data on the ecological sustainability levels calculated for wheat-producing farms, it can be observed that the levels of ecological sustainability across districts are relatively close to each other. The difference between the district with the highest average ecological sustainability level - Bulungur district (0,30) and the district with the lowest level - Jomboy district (0,24) amounts to 0,06 points, or 6 percent.

In addition, the average levels of ecological sustainability in wheat production are observed to be nearly two times lower than those in potato production. This difference is primarily associated with the production practices applied in crop cultivation. Specifically, in wheat production, the more intensive use of chemical inputs for disease and weed control, along with the very limited application of crop rotation practices, results in ecological sustainability levels that are approximately two times lower compared to potato production.

Table 5

Ecological sustainability index indicators of farms (in wheat production)[23]

Districts	Number of observations	Mean ecological sustainability index	St. dev.	Min.	Max.
Bulungur	72	0.3	0.23	0	1
Toyloq	63	0.27	0.22	0	0.89
Jomboy	61	0.24	0.21	0	0.74
Total	196	0.27	0.22	0	1

[22] Author's calculations based on the survey data

[23] Author's calculations based on the survey data

Subsequently, criteria for grouping farms according to their levels of ecological sustainability were developed. For this purpose, the tercile (three-quantile) method was applied. This approach allows the distribution of farms into three relatively equal groups by taking into account the natural distribution of ecological sustainability index values. It is a distribution-based grouping method that is widely used in statistical analysis. The essence of this approach is that the observed index values are arranged in ascending order, and the entire sample is divided into the following three groups:

- Group 1 (low sustainability) = [min(ESI); Q1)
- Group 2 (medium sustainability) = [Q1; Q2)
- Group 3 (high sustainability) = (Q2; max(ESI)]

Where:

- Q1 denotes the 33.3rd percentile (first tertile);
- Q2 denotes the 66.6th percentile (second tertile).

Table 6

Grouping of potato-producing farms based on ecological sustainability index indicators[24]

Sustainability groups	Number of farms	Mean ecological sustainability index	Min.	Max.
Low	42	0.161	0	0.281
Medium	39	0.436	0.302	0.586
High	40	0.835	0.677	1
Total	121	0.472	0	1

Based on this analysis, criteria for grouping farms according to their ecological sustainability index values were developed. According to the results, farms with an ecological sustainability index of less than 0,3 were classified as having a low level of sustainability, those with values from 0,3 to 0,6 as having a medium level of and those with values from 0.6 to 1 as having a high level of sustainability.

Table 7

Grouping of wheat-producing farms based on ecological sustainability index indicators [25]

Sustainability groups	Number of farms	Mean ecological sustainability index	Min.	Max.
Low	137	0.15	0	0.281
Medium	29	0.4	0.307	0.57
High	30	0.71	0.605	1
Total	196	0.27	0	1

[24] Author's calculations based on the survey data

[25] Author's calculations based on the survey data

At the next stage of the analysis, farms were grouped based on the ecological sustainability index values recorded in wheat production, using the criteria developed above. The results show that 70 percent of farms belong to the low sustainability group, while farms achieving medium and high levels of sustainability account for 14,8 percent and 15,3 percent of the total number of farms, respectively. The average ecological sustainability index is 0.27, or 27 percent (see Table 7).

The technical efficiency indicators of farms were calculated using the Stochastic Frontier Analysis model based on the Cobb–Douglas production function, and the effects of production resources on efficiency were assessed.

An examination of the stochastic frontier model results indicates that, with the exception of labor input, all factors exert a positive effect on gross potato output. In particular, the results show that a 1 percent increase in seed input leads to a 0.76 percent increase in yield, indicating that seed input is the most important production factor in the surveyed farms. Seed input also has a positive effect on wheat production, with a 1 percent increase in seed use raising wheat yields by 0,77 percent. This suggests that selecting high-quality seed varieties adapted to local soil and climatic conditions offers substantial potential for increasing farm productivity. In addition, organic fertilizer use was found to have a positive effect on yields (β = 0,047, p = 0,03). Organic fertilization improves soil structure, enhances moisture retention, and increases microbiological activity, thereby contributing positively to crop yields. In contrast to potato production, the effect of chemical fertilizer use on yields is significantly stronger in wheat production. Specifically, the analysis shows that a 1 percent increase in mineral fertilizer use can increase wheat yields by 0,16 percent.

Table 8

Results of the effects of production factors on wheat and potato yields identified using the stochastic frontier analysis model[26]

Variables	Wheat production	Potato production
	Coefficients	Coefficients
Seed	0.77*** (0.061)	0.76*** (0.061)
Organic fertilizers	0.047** (0.021)	0.088* (0.05)
Chemical fertilizers	0.16*** (0.052)	0.034 (0.048)
Labour	0.067 (0.059)	-0.31** (0.132)
Constant	2.5*** (0.432)	3.79*** (0.734)
Dispersion parametrs		
σ_v	0.14	0.11
σ_u	0.18	0.31
σ^2	0.05	0.11
λ	1.29	2.75
Wald chi²(4) = 1420.45	(p = 0.000)	(p = 0.000)
Number of observations	196	121

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

[26] Author's calculations based on the survey data

The average technical efficiency score of wheat-producing farms was 0,82, or 82 percent, while this indicator amounted to 0,84, or 84 percent, for potato-producing farms. This implies that, given the current level of resource use, farms have the potential to improve efficiency by 18 percent in wheat production and by 16 percent in potato production through more optimal utilization of production inputs.

In the third chapter of the dissertation, entitled **"Prospects for enhancing the sustainability and efficiency of farms in agriculture",** a socio-economic mechanism for increasing the ecological sustainability level and economic efficiency of agricultural producers is developed based on the research findings. In addition, forecast parameters for potato and wheat production volumes in Samarkand region up to 2030 are formulated.

During the research, to assess the effects of various factors on the technical efficiency of farms, survey data collected from farms in Bulungur, Toyloq, and Jomboy districts during February–March 2024 were used. These data were obtained within the framework of the Uzbekistan–Korea international cooperation project "Development of potato seed production and enhancement of human capacity in Uzbekistan".

In summary of the data presented in the table, the average potato yield amounted to 28,5 t/ha, while the average technical efficiency score was 0,84 (see Table 9). The average ecological sustainability index of the surveyed farms was 47 percent, and the average age of farmers was 44,7 years. In addition, 50 percent of the surveyed farmers were members of agricultural clusters, 53 percent reported having participated in training courses and seminars on potato production.

Table 9

Statistical description of the data used in the empirical analysis[27]

Variables	**Unit**	**Mean**	**St. dev.**	**Min.**	**Max.**
Technical efficiency	Coefficient	0.84	0.1	0.2	0.95
Potato yield	Kg/ga	28544.4	8107.6	6000	50000
Land	Hectar	3.54	3.285	0.1	18
Ecological sustainability index	Coefficient	0.47	0.29	0	1
Age	Year	44.7	10.3	23	75
Cluster member	Binary	0.5	0.5	0	1
Training	Binary	0.53	0.5	0	1
Credit	Binary	0.49	0.5	0	1
Distance to market	Categorical	0.87	0.8	0	2
Number of respondents		121			

In this study, the Tobit regression model was applied to empirically assess the mechanisms for improving the production efficiency of farms. The main reason for this choice is that the production efficiency indicator used as the dependent variable in the analysis has a censored nature, with values bounded between 0 and 1.

[27] Author's calculations based on the survey data

The mathematical specification of the Tobit model is expressed as follows:

$y_i^* = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \varepsilon_i$ (2)

Where:

y_i^* denotes the latent dependent variable;

β_0 epresents the intercept term;

$\beta_1, \beta_2, \ldots, \beta_5$ are the coefficients to be estimated for the independent variables;

x_1 denotes the ecological sustainability index of the farm;

x_2 represents the age of the farm manager;

x_3 indicates the farm's membership in an agricultural cluster;

x_4 represents the farm manager's participation in training courses;

x_5 indicates the farm's use of credit services;

x_6 denotes the distance from the farm's land to the market;

ε_i is a normally distributed random error term with mean zero and variance δ^2 $i.e. \varepsilon_i \sim N(0, \delta^2)$.

Table 10

Results of Tobit regression model[28]

Variables	Coefficients
Ecological sustainability index	0.086* (0.046)
Age	0.002 (0.0012)
Cluster member	-0.08*** (0.027)
Training	0.076*** (0.028)
Credit	0.071** (0.027)
Distance to market	0.03* (0.017)
Constant	0.58*** (0.065)
var(e.tech. eff.)	0.02 (0.003)
Pseudo R2	0.58
LR chi²(4) = 47.47	(p = 0.000)
Number of observations	121

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively

According to the analysis results, the ecological sustainability index has a positive and statistically significant effect on production efficiency. This finding indicates that the adoption of ecologically sustainable practices on farms contributes to an increase in economic efficiency. The application of crop rotation practices in the production process, the reduction in the use of chemical fertilizers, or the reduction of chemical pesticide use make it possible, first, to reduce production

[28] Author's calculations based on the survey data

costs, and second, to enhance productivity by ensuring the long-term health of land and agroecosystems — an outcome that has been widely confirmed by international experience.

The variable representing the use of credit resources also has a positive and statistically significant effect on production efficiency, with a coefficient of 0,071. This result indicates that improved access to financial resources is an important factor in enabling technological upgrading, the adoption of sustainable agricultural practices, and efficiency enhancement at the farm level.

Among the most influential factors identified in the study, farmers' participation in training programs stands out. The coefficient of the training participation variable is 0,076 and is statistically significant at the 1 percent confidence level. According to this result, the production efficiency of farms whose managers participated in training courses on potato production and ecological sustainability is 7,6 percent higher than that of farms that did not participate in such training programs.

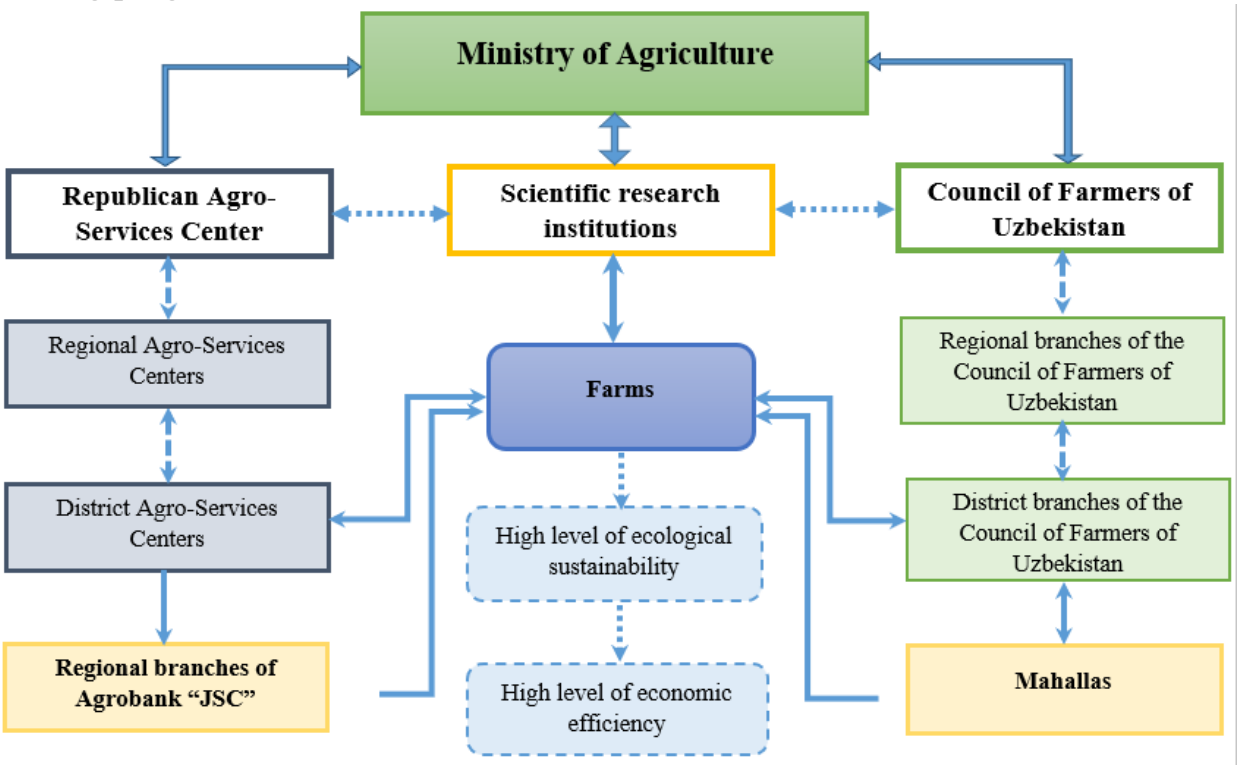

Figure 1. Prospective practical roadmap aimed at enhancing the ecological sustainability level and economic efficiency of farms in agriculture, based on an integrated tripartite "State – Scientific Research – Practice" systemic approach.

According to the results of the Tobit model, this very knowledge transfer chain plays a crucial role in improving the production efficiency of farms. Farmers who participate in training programs acquire greater knowledge on the application of modern agrotechnologies, efficient use of resources, and the introduction of environmentally sustainable production methods. This, in turn, enables them to organize production processes more efficiently. Moreover, training enhances farmers' decision-making capacity and contributes to risk reduction.

Within the proposed practical roadmap, the Ministry of Agriculture acts as the central coordinating body responsible for defining the overall directions of reforms and harmonizing the activities of all involved institutions (see Figure 1). Scientific research institutions develop methodologies, indicators, and assessment criteria for sustainable agricultural practices, thereby ensuring the scientific soundness of the training process. The Republican Agro-Services Center and its regional and district branches serve as the main implementing institutions responsible for transferring these scientific developments into practice, working directly with farms, providing training and advisory services, and conducting monitoring activities.

One of the key features of this practical roadmap is the integrated participation of regional branches of Agrobank "JSC" within the training and monitoring system. During training programs, rating results are formed based on farms' ecological sustainability and economic efficiency indicators. These ratings are evaluated with the participation of agro-services centers and scientific institutions and subsequently communicated to the regional branches of Agrobank. As a result, the allocation of preferential credit is carried out not on the basis of subjective decisions, but rather on the basis of the actual ecological and economic performance of farms.

In addition, the Council of Farmers of Uzbekistan and its regional and district branches play an important institutional role within this mechanism. The Farmers' Council facilitates the targeted selection of farms participating in training and financial programs, taking into account regional conditions, production specializations, and existing challenges. This process enhances the targeting of training and credit programs and strengthens farmers' trust in and acceptance of the mechanism. Through the Farmers' Council, farmers' needs and challenges are communicated to higher-level institutions, thereby forming an effective feedback mechanism.

The feedback system incorporated into the practical roadmap further reinforces the results of the Tobit model. Practical problems, suggestions, and needs identified by farms as a result of training activities are transmitted to training centers and research institutions. Based on this feedback, the content and methods of training are refined, creating opportunities for more effective knowledge transfer in subsequent stages. As a result, training programs are transformed from one-off events into a continuous process of knowledge exchange.

The process of improving production efficiency and ecological sustainability of farms is determined not only by the influence of individual economic factors, but also by the effective functioning of institutional mechanisms that integrate these factors. The results of the Tobit regression model in this study indicate that training programs aimed at enhancing knowledge and skills have a positive and highly statistically significant effect on farm efficiency. This empirical finding substantiates the need to consider training as the central institutional component of the practical roadmap for ensuring efficiency and sustainability in agriculture.

To assess the medium- and long-term prospects for sustainably increasing potato and wheat production volumes and developing agricultural production activities in Samarkand region up to 2030, the ARIMA model was applied. The

analysis was based on data on gross potato and wheat production in Samarkand region for the period 2000 – 2024 obtained from the National Statistics Agency of the Republic of Uzbekistan.

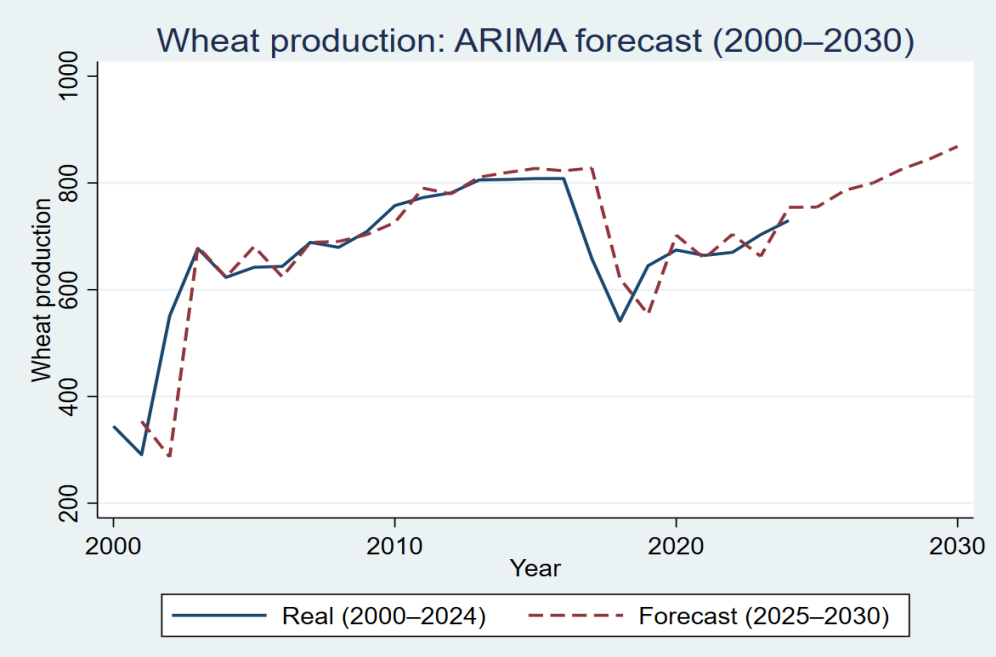

Figure 2. Forecast results of the dynamics of gross wheat production in Samarkand region.

Based on the forecast results, gross wheat production in Samarkand region is expected to exhibit a stable growth trend up to 2030. In particular, the analysis shows that in 2025 gross wheat output will increase by 25,1 thousand tons, or 3,5 percent, compared to 2024. Furthermore, according to the ARIMA model forecasts, gross wheat production is projected to reach 868,5 thousand tons by 2030 (see Figures 2 and 3).

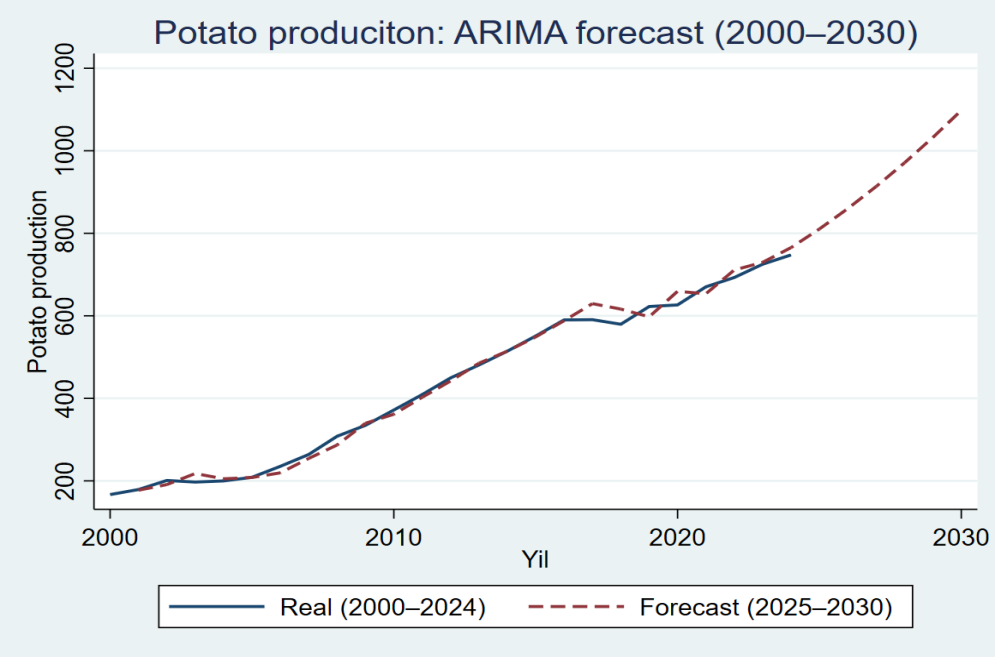

Figure 3. Forecast results of the dynamics of gross potato production in Samarkand region.

Conclusion

1. The dissertation examines the socio-economic significance of the sustainable agriculture concept, global experience in the application of sustainable agricultural practices, as well as the theoretical foundations and methodological approaches to assessing the environmental sustainability level and economic efficiency indicators of agricultural producers.

2. Based on empirical analyses, the factors affecting economic efficiency of agricultural production were evaluated using advanced scientific and methodological approaches, including the Stochastic Frontier Analysis (SFA) model, Tobit model, linear regression model, and ARIMA model. The results indicate that the adoption of sustainable agricultural practices has a positive effect on improving the economic efficiency of farm enterprises.

3. The environmental sustainability index of farms was assessed based on agricultural practices applied in the production process. Accordingly, farms were classified into low ($0 \leq ESI < 0,3$), medium ($0,3 \leq ESI < 0,6$), and high ($0,6 \leq ESI \leq 1$) environmental sustainability levels, providing a structured framework for sustainability assessment.

4. In the study, the impact of various factors on the economic efficiency of potato- and wheat-producing farms was evaluated using a Stochastic Frontier Analysis model based on the Cobb–Douglas production function. Specifically, in potato production, seed input, organic fertilizer use, and labor were identified as factors with high statistical significance. In wheat production, seed input as well as organic and mineral fertilizer use were found to have a statistically significant positive effect on economic efficiency.

5. The impact of factors on the economic efficiency of potato and wheat production was further assessed using the Tobit model, incorporating both qualitative and quantitative variables. The results reveal that environmental sustainability level, access to credit, and participation in training programs have a statistically significant positive effect on farm-level economic efficiency. Based on these findings, policy-oriented recommendations were developed to enhance the economic efficiency of farm enterprises.

6. Based on empirical analyses of survey data collected from farm enterprises, a prospective practical roadmap aimed at improving economic efficiency and environmental sustainability was substantiated using an integrated “State – Scientific Research – Practice” tripartite systemic approach.

7. Forecast indicators of potato and wheat production volumes in the Samarkand region up to 2030 were developed using the ARIMA model based on statistical time series data. According to the forecast results, potato and wheat production volumes are expected to follow an upward trend, with potato production projected to reach 1049 thousand tons and wheat production 868,5 thousand tons by 2030.

НАУЧНЫЙ СОВЕТ DSc.08/2025.27.12.I.07.02 ПО ПРИСУЖДЕНИЮ УЧЕНОЙ СТЕПЕНИ ПРИ САМАРКАНДСКОМ ИНСТИТУТЕ АГРОИННОВАЦИЙ И ИССЛЕДОВАНИЙ

САМАРКАНДСКИЙ ИНСТИТУТ АГРОИННОВАЦИЙ И ИССЛЕДОВАНИЙ

ИЛАШОВ БАХТИНУР ШЕРАЛИ УГЛИ

ЭКОНОМИЧЕСКАЯ ОЦЕНКА ВЛИЯНИЯ УСТОЙЧИВЫХ МЕТОДОВ ВЕДЕНИЯ СЕЛЬСКОГО ХОЗЯЙСТВА НА ЭФФЕКТИВНОСТЬ ПРОИЗВОДСТВА (НА ПРИМЕРЕ САМАРКАНДСКОЙ ОБЛАСТИ)

08.00.04 – Экономика сельского хозяйства

АВТОРЕФЕРАТ
диссертации доктора философии (PhD) по экономическим наукам

Самарканд – 2026

Тема диссертации (PhD) зарегистрирована Высшей аттестационной комиссией при Кабинете Министров Республики Узбекистан за B2025.4.PhD/Iqt3700.

Диссертация выполнена в Самаркандском институте агроинноваций и исследований.

Автореферат диссертации размещен на трех языках (на узбекском, английском, русском (резюме)) на сайте (www.iau.uz) Ученого совета и на информационно-образовательном портале «ZiyoNet» (www.ziyonet.uz).

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Ведущая организация:	**Международный сельскохозяйственный университет**

Защита диссертации состоится «___» _____ 2026 года в ____ часов на заседании научного совета DSc.08/2025.27.12.I.07.02 по присуждению учёной степени при Самаркандском институте агроинноваций и исследований. Адрес: Самаркандская область, Акдарьинский район, Дахбет Курган, ул. А.Темура, 7. Телефон: (998 66) 492-81-16, электронная почта: info@samaguni.uz

С диссертацией можно ознакомиться в информационно-ресурсном центре Самаркандского института агроинноваций и исследований (зарегистрирован под номером _____). Адрес: Самаркандская область, Акдарьинский район, Дахбет Курган, ул. А.Темура, 7. Телефон: (998 66) 492-81-16, электронная почта: info@samaguni.uz.

Автореферат диссертации разослан «____» _____2026 года.
(протокол реестр №____ от «____» _____ 2026 года).

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ВВЕДЕНИЕ (аннотация докторской диссертации (PhD))

Цель исследования заключается в разработке научно обоснованных предложений и практических рекомендаций по повышению уровня экологической устойчивости и показателей экономической эффективности фермерских хозяйств на основе устойчивых сельскохозяйственных практик.

Задачи исследования:

теоретически обосновать экономическую и социальную необходимость применения устойчивых сельскохозяйственных практик в развитии деятельности фермерских хозяйств;

изучить зарубежный опыт оценки устойчивости сельскохозяйственного производства;

проанализировать современные методологические подходы и практики оценки показателей экономической эффективности и экологической устойчивости фермерских хозяйств;

усовершенствовать методику расчёта индекса экологической устойчивости в сельском хозяйстве;

провести социологический опрос и осуществить эконометрический анализ для оценки уровня экологической устойчивости фермерских хозяйств Самаркандской области на основе применяемых ими устойчивых сельскохозяйственных практик;

разработать практическую дорожную карту социально-экономического механизма, направленного на повышение показателей экологической устойчивости и экономической эффективности в системе сельского хозяйства Республики Узбекистан на примере Самаркандской области;

разработать прогнозные параметры тенденций развития валового объёма производства картофеля и пшеницы в Самаркандской области до 2030 года.

Объектом исследования выбраны фермерские хозяйства, осуществляющие производство сельскохозяйственной продукции в Самаркандской области.

Предмет исследования представляет собой совокупность социально-экономических отношений, возникающих в процессе определения уровня экологической устойчивости производства в системе сельского хозяйства страны и оценки её влияния на показатели экономической эффективности.

Научная новизна исследования заключается в следующем:

на основе сельскохозяйственных практик, применяемых в фермерских хозяйствах, рассчитан индекс экологической устойчивости производственной деятельности и разработаны критерии его классификации по группам: «низкий» ($0 \leq ИЭУ < 0,3$), «средний» ($0,3 \leq ИЭУ < 0,6$) и «высокий» ($0,6 \leq ИЭУ \leq 1$);

усовершенствован методический подход к оценке производственной эффективности фермерских хозяйств на основе применения таких факторов, как «индикатор устойчивости» и «использование государственных льготных кредитов»;

разработан трехсторонний комплексный системный подход, основанный на интеграции государства (State), научных исследований (Science) и практики

(Practice) в сельском хозяйстве, а также в рамках данного подхода научно обоснованы возможности повышения уровня экологической устойчивости и экономической эффективности фермерских хозяйств на основе модели «TOBIT»;

разработаны прогнозные параметры объемов производства картофеля и пшеницы в Самаркандской области до 2030 года при текущем уровне устойчивости фермерских хозяйств.

Практические результаты исследования заключаются в следующем:

на основе сельскохозяйственных практик, применяемых при выращивании картофеля и пшеницы в фермерских хозяйствах Самаркандской области, рассчитан индекс устойчивости и разработаны критерии оценки уровня устойчивости: «низкий» ($0 \leq EBI < 0,3$), «средний» ($0,3 \leq EBI < 0,6$) и «высокий» ($0,6 \leq EBI \leq 1$). В результате установлено, что из 121 обследованного фермерского хозяйства, занимающегося выращиванием картофеля, 42 хозяйства, или 35 процентов, имеют «низкий» уровень экологической устойчивости, 39 хозяйств, или 32 процента, «средний» уровень, а 40 хозяйств, или 33 процента, «высокий» уровень экологической устойчивости. При выращивании пшеницы из 196 обследованных фермерских хозяйств 137 хозяйств, или 70 процентов, имеют «низкий» уровень экологической устойчивости, 29 хозяйств, или 15 процентов, «средний» уровень, а 30 хозяйств, или 15 процентов, «высокий» уровень экологической устойчивости. В результате выявлено, что уровень экологической устойчивости производственной деятельности фермерских хозяйств при выращивании картофеля выше по сравнению с выращиванием пшеницы;

при оценке факторов, влияющих на производственную эффективность на примере фермерских хозяйств, установлено, что использование таких факторов, как «индикатор устойчивости» и «использование государственных льготных кредитов», оказывает положительное влияние на экономическую эффективность с высокой статистической значимостью. На этой основе разработаны стратегические рекомендации по повышению производственной эффективности и уровня экологической устойчивости фермерских хозяйств;

на основе трехстороннего комплексного системного подхода, включающего взаимодействие государства (State), научных исследований (Science) и практики (Practice) в сельском хозяйстве, разработана и рекомендована перспективная практическая дорожная карта, направленная на повышение уровня экологической устойчивости производственной деятельности и экономической эффективности фермерских хозяйств. В результате с помощью модели Tobit обосновано повышение производственной эффективности фермерских хозяйств на 7,6 процента;

на основе модели ARIMA разработаны прогнозные параметры объемов производства картофеля и пшеницы в Самаркандской области до 2030 года при текущем уровне устойчивости.

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