

**XALQARO QISHLOQ XO‘JALIGI UNIVERSITETI HUZURIDAGI ILMIY
DARAJALAR BERUVCHI PhD.08/2025.27.12.I.15.01 RAQAMLI ILMIY
KENGASH**

**OZIQ-OVQAT VA QISHLOQ XO‘JALIGI SOHASIDA STRATEGIK
RIVOJLANISH VA TADQIQOTLAR XALQARO MARKAZI**

MADIYEV SHAXZOD SHODMON O‘G‘LI

**QISHLOQ XO‘JALIGI TEXNIK SALOHIYATINING BUG‘DOY HOSILIGA
TA‘SIRINI IQTISODIY BAHOLASH**

08.00.04 – Qishloq xo‘jaligi iqtisodiyoti

**Iqtisodiyot fanlari bo‘yicha falsafa doktori (PhD) dissertatsiyasi
AVTOREFERATI**

Toshkent – 2026

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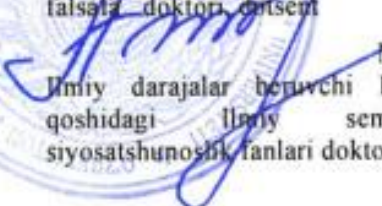
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KIRISH

Dissertatsiya mavzusining dolzarbligi va zarurati. Dunyo aholisi sonining o'sib borishi, iqtisodiy va ekologik inqirozlarning keskinlashishi sharoitida oziq-ovqatga talabning ortib borishi muammosi dolzarbligicha qolmoqda. Birlashgan Millatlar Tashkiloti (BMT)ning ma'lumotlariga ko'ra, 2050-yilga borib jahon aholisi soni 9,6 mlrd. kishiga yetishi, qishloq xo'jaligi mahsulotlarini yetishtirishni 60 foizga oshirish zaruratini keltirib chiqaradi¹. Jahon ekin maydonlarining 14 foizini don ekin maydonlari egallaydi². Bugungi kunda dunyo bo'yicha bug'doy yetishtirish yiliga 800 million tonnani tashkil etadi³. 2030-yilga kelib bu ko'rsatkich 850 million tonnaga oshishi kutilmoqda⁴. Oziq-ovqat savdosida don mahsulotlari qariyb 50 foizni tashkil qiladi⁵. Shunga ko'ra, jahon bozorida bug'doy mahsulotiga talab katta.

Jahonda o'rtacha global harorat sanoatdan oldingi davrga nisbatan 0,8 °C dan 1,2 °C gacha ko'tarildi⁶. Iqlim o'zgarishi bo'yicha hukumatlararo komissiya prognozlariga ko'ra, global o'rtacha harorat har o'n yil ichida 0,2 °C gacha ko'tarilishda davom etadi⁷. Bu esa qishloq xo'jaligi ekinlarining o'sish sharoitlariga salbiy ta'sir ko'rsatib, hosildorlikning kamayishi va ishlab chiqarish xavflari ortishiga sabab bo'lmoqda. Dunyodagi global iqlim o'zgarishlarining qishloq xo'jaligi ishlab chiqarishiga salbiy ta'sirlarini oldini olish va unga moslashishning samarali usullaridan biri qishloq xo'jaligida texnikalardan foydalanish darajasini oshirish orqali amalga oshiriladi.

Ma'lumki, mamlakatimiz oziq-ovqat xavfsizligini ta'minlashda donli ekinlar, xususan, bug'doyning o'rni yuqoridir. Bug'doy O'zbekistonda oziq-ovqat kaloriyasining 52 foizdan ortig'ini ta'minlaydi⁸. Shu bois, mustaqillikning dastlabki yillaridan ushbu tarmoqni barqaror rivojlantirish doirasida muhim tarkibiy islohotlar olib borildi va o'z ijobiy natijalarini bermoqda. Ammo, bir tomondan qishloq xo'jaligi ishlab chiqarishi asosan sug'orma dehqonchilikka asoslanganligi, ikkinchi tomondan esa suv tanqisligi keskinlashayotganligi, shuningdek "O'zbekistonning 70 foiz yerlari

¹ Food and Agriculture Organization of the United Nations (FAO). Sustainable agricultural mechanization: A framework for Africa [Elektron resurs]. – Rome: FAO, 2016. – URL: <http://www.fao.org/3/c-i6273r.pdf>

² Land statistics 2001–2023. Global, regional and country trends : FAOSTAT Analytical Brief No. 107 / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2025. — URL: <https://www.fao.org/statistics/highlights-archive/highlights-detail/land-statistics-2001-2023>

³ Statistical Yearbook. World Food and Agriculture 2023 / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2023. — URL: <https://openknowledge.fao.org/server/api/core/bitstreams/28cfd24e-81a9-4ebc-b2b5-4095fe5b1dab/content>

⁴ OECD-FAO Agricultural Outlook 2025–2034. Cereals / Organisation for Economic Co-operation and Development, Food and Agriculture Organization of the United Nations. — Paris : OECD Publishing, 2025. — URL: https://www.oecd.org/en/publications/2025/07/oecd-fao-agricultural-outlook-2025-2034_e173f332/full-report/cereals_251d1ece.html

⁵ Cereal Supply and Demand Brief / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2026. — URL: <https://www.fao.org/worldfoodsituation/csdb/en>

⁶ Masson-Delmotte, V. et al. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the IPCC. Cambridge University Press, 2021. URL: <https://www.ipcc.ch/report/ar6/wg1/>

⁷ IPCC. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. – Cambridge : Cambridge University Press, 2021. – 2391 p. – DOI: 10.1017/9781009157896.

⁸ Chabot P., Tondel F. A regional view of wheat markets and food security in Central Asia. – Washington, DC: United States Agency for International Development; Famine Early Warning Systems Network (FEWS NET); World Food Programme, 2011.

qurg'oqchil maydonlardan iborat"⁹ligi kelajakda qishloq xo'jaligi ishlab chiqarishining iqlim o'zgarishiga ta'sirchanligi yuqori ehtimollikda bo'lishligini ko'rsatadi. Shu bilan birga, hozirda respublikamiz qishloq xo'jalik ishlab chiqarishining barcha tarmoqlarini texnika vositalari bilan ta'minlanish darajasi nisbatan pastligicha qolmoqda. Bugungi kunda qishloq xo'jaligida mexanizatsiya darajasi 81 foizni tashkil etmoqda¹⁰. Bunday sharoitda, ishlab chiqarishda mavjud texnika vositalaridan samarali foydalanish mahsulot yetishtirish bo'yicha texnologik kartalarda ko'zda tutilgan barcha agrotexnik tadbirlarni o'z muddatida, sifatli bajarilishiga amaliy yordam ko'rsatadi. Shu bois, qishloq xo'jaligini texnik salohiyatidan foydalanishning nazariy, uslubiy va amaliy asoslarini takomillashtirish bo'yicha taklif va tavsiyalar ishlab chiqish hozirgi kunda dolzarb ahamiyatga ega.

O'zbekiston Respublikasi Prezidentining 2019-yil 23-oktabrdagi "O'zbekiston Respublikasi qishloq xo'jaligini rivojlantirishning 2020-2030-yillarga mo'ljallangan strategiyasini tasdiqlash to'g'risida"gi PF-5853-son Farmoni, 2023-yil 29-martdagi "Agrar sektorni zamonaviy qishloq xo'jaligi texnikalari bilan ta'minlashni rag'batlantirishning qo'shimcha chora-tadbirlari to'g'risida"gi PQ-103-sonli, 2024-yil 12-dekabrda "Qishloq xo'jaligini mexanizatsiyalash darajasini yanada oshirish chora-tadbirlari to'g'risida" PQ-431-sonli, 2026-yil 13-martdagi "Agrar sektorni zamonaviy qishloq xo'jaligi texnikalari bilan ta'minlashning navbatdagi chora-tadbirlari to'g'risida"gi PQ-97-sonli qarorlari va mazkur faoliyatga tegishli boshqa me'yoriy-huquqiy hujjatlarda belgilangan vazifalarni amalga oshirishga ushbu dissertatsiya ishi muayyan darajada xizmat qiladi.

Tadqiqotning respublika fan va texnologiyalari rivojlanishining ustuvor yo'nalishlariga mosligi. Dissertatsiya respublika ilm-fan va texnologiyalari rivojlanishining I. "Demokratik va huquqiy jamiyatni ma'naviy-axloqiy hamda madaniy rivojlantirish, innovatsion iqtisodiyotni shakllantirish" ustuvor yo'nalishiga muvofiq bajarilgan.

Muammoning o'rganilganlik darajasi. Qishloq xo'jaligida texnika vositalaridan samarali foydalanish, qishloq xo'jaligi texnik salohiyatining ekinlar yetishtirishga ta'sirini iqtisodiy baholash, ishlab chiqarish hajmlarini kengaytirish va rivojlantirishning metodologik jihatlar va amaliyoti ko'plab xorijlik olimlar tomonidan tadqiq etilgan. Agrar sektor texnik salohiyatini rivojlantirishning tashkiliy-iqtisodiy mexanizmlari A.K. Tmenova, G.A. Iovlev va N.A. Kreymer, texnik salohiyatdan foydalanish samaradorligi A.N. Stavtsev va A.N. Kortyaev, qishloq xo'jaligi ishlab chiqarishining texnik bazasini rivojlantirish va yangilash masalalari Yu.S. Tsen'ch hamda V.I. Dragaytsev¹¹ ilmiy ishlarida tadqiq etilgan bo'lsa, qishloq

⁹ Daryo.uz. – 2022. – URL: <https://daryo.uz/2022/06/10/ozbekistonning-70-foiz-yerlari-qurg'oqchil-maydonlardan-iborat-ormon-xo'jaligi-davlat-qomitasi>

¹⁰ Qishloq xo'jaligida texnikalar parki yangilanib, raqamli yechimlar keng joriy etiladi [Elektron resurs] // Prezident.uz. – 2026. – URL: <https://president.uz/oz/lists/view/8962>

¹¹ Тменова А.К. Организационно-экономический механизм развития технического потенциала аграрного сектора: дис. ... канд. экон. наук: 08.00.05. – Владикавказ, 2010. – 161 с.; Иовлев, Г.А. Технический потенциал аграрного сектора экономики: теоретические и практические аспекты // Аграрный вестник Урала. – 2016. – № 5 (147). – С. 72–78.; Креймер Н.А. Экономический механизм восстановления и развития технического потенциала сельскохозяйственных предприятий: по материалам Краснодарского края: дис. ... канд. экон. наук. – Краснодар, 2004. – 208 с.; Ставцев А.Н. Экономическая эффективность использования технического потенциала в молочном скотоводстве: дис. ... канд. экон. наук. – Орел, 2011. – 177 с.; Кортяев А.Н. Экономическая эффективность

xo'jaligi tashkilotlarining texnik salohiyatini optimallashtirish masalalari M.V. Lisenko va A.V. Nemchenko, tarmoqda texnik servisni tashkil etish hamda texnika vositalaridan foydalanishning iqtisodiy jihatlarida esa A.K. Subaeva¹² ilmiy ishlarida yoritilgan.

Shuningdek, ekonometrik modellar, xususan, SEM modeli asosida ishlab chiqarishda omillar ta'sirini baholash bo'yicha qator ishlar R.H. Hoyle, B.M. Byrne, J. Hair, G. Hult, C. Ringle, M. Sarstedt, J.M. Wooldridge¹³ kabi olimlarning ilmiy izlanishlarida tadqiq qilingan.

Mamlakatimizda ham bu sohani rivojlantirish va tubdan isloh qilish uchun O'zbekiston misolida bug'doy hosiliga omillar ta'sirini o'rganishda va iqtisodiy samaradorligini oshirishda agrar iqtisodchi olimlar tomonidan bir qator ilmiy izlanishlar olib borilgan. Xususan, agrar iqtisodchi olimlardan R.X.Xusanov, U.P.Umrzoqov, K.A.Chariyev, N.S.Xushmatov, Z.Z.Yusupov¹⁴ va boshqalarning ilmiy tadqiqot ishlarida o'z aksini topgan.

Mazkur olimlarning tadqiqot ishlarida ishlab chiqilgan taklif va tavsiyalar qishloq xo'jaligini barqaror rivojlantirishga qaratilganligini qayd qilgan holda shuni alohida ta'kidlash zarurki, qishloq xo'jaligi texnik salohiyati tushunchasi mohiyatini chuqurroq tahlil qilish hamda uning ishlab chiqarish jarayonida ta'sirlarini iqtisodiy baholash yetarli darajada tadqiq etilmagan. Shu boisdan, qishloq xo'jaligida texnik salohiyatning ishlab chiqarish hajmiga ta'sirini baholash kabi yuqorida qayd etilgan holatlar va ilmiy muammolar iqtisodiy adabiyotlarda yetarlicha tadqiq etilmaganligi, ilmiy va amaliy ahamiyatga ega ekanligi tadqiqot mavzusi sifatida tanlanishiga asos bo'ldi.

Dissertatsiya tadqiqotining dissertatsiya bajarilgan ilmiy-tadqiqot muassasasining ilmiy-tadqiqot ishlari rejasi bilan bog'liqligi. Dissertatsiya mavzusi

использования технического потенциала и пути ее повышения: на примере Республики Северная Осетия – Алания: дис. ... канд. экон. наук. – Москва, 2006. – 153 с.; Ценч, Ю.С. Научно-технический потенциал как главный фактор развития механизации сельского хозяйства // Сельскохозяйственные машины и технологии. – 2022. – Т. 16, № 2. – С. 4–13. – DOI: 10.22314/2073-7629-2022-16-2-4-13.; Драгайцев В.И. Организационно-экономический механизм обновления технической базы сельского хозяйства // Социально-экономические преобразования в аграрном секторе России: итоги и перспективы. – Москва: ГНУ ВНИИЭСХ, 2005.

¹² Лысенко М.В., Лысенко Ю.В., Мингалев В.Д. Технический потенциал сельскохозяйственных организаций и его оптимизация // Аграрный вестник Урала. – 2017. – № 12. – С. 24–31.; Немченко, А.В. Оценка технической оснащённости в сельском хозяйстве / А.В. Немченко, Т.А. Дугина, Е.А. Лихолетов // Международный научно-исследовательский журнал. – 2018. – № 9 (75), ч. 2. – С. 52–54. – DOI: 10.23670/IRJ.2018.75.9.034.; Субаева А.К. Экономика и организация технического сервиса (часть I). – Ульяновск: Ульяновская ГСХА, 2011. – 259 с.

¹³ Hoyle R.H. Handbook of structural equation modeling. – New York: Guilford Press, 2012. – 785 p.; Byrne B.M. Structural equation modeling with AMOS: Basic concepts, applications, and programming. – 3rd ed. – New York: Routledge, 2016. – 738 p.; Hair J.F., Hult G.T.M., Ringle C.M., Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). – Thousand Oaks, CA: Sage Publications, 2014. – 307 p.; Wooldridge J.M. Introductory Econometrics: A Modern Approach. – 6th ed. – Boston, MA: Cengage Learning, 2020. – 865 p.

¹⁴ Xusanov R.X., Xamdamov A.N., Rafikov I.E. Qishloq xo'jaligida servis xizmati. Mukobil mashina-traktor parklarini rivojlantirish muammolari.-T.: Yangi asr avlodi, 2001.-125 b.; Umrzoqov.U.P. Iqtisodiyot agrar sektorining resurs salohiyatidan foydalanish samaradorligini oshirish yo'llari (O'zbekiston Respublikasi materiallari asosida): diss... iqtisod fanlari doktori. Toshkent. 2003.-272 b.; Чариев К.А. Формирование и совершенствование механизма эффективного использования ресурсного потенциала сельского хозяйства. Диссертация на соискание ученой степени доктора экономических наук. Ташкент. 1992 г. 374 стр.; Xushmatov N.S., Rustamova I.B. Qishloq xo'jaligida innovatsion faoliyatni yo'lga qo'yishning asosiy yo'nalishlari. "Iqtisodiyot va innovatsion texnologiyalar" ilmiy elektron jurnali. № 3, may-iyun, 2019 yil 18-25 bet; Yusupov Z.Z. Qishloq xo'jaligini texnik modernizatsiyalashning tashkiliy-iqtisodiy mehanizmlarini takomillashtirish yollari. Iqtisodiyot fanlari falsafa doktori (PhD) ilmiy darajasini olish uchun tayyorlangan Dissertatsiya. Toshkent. 2021 y. 108 b.

bo'yicha tadqiqot ishlari Oziq-ovqat va qishloq xo'jaligi sohasida strategik rivojlanish va tadqiqotlar xalqaro markazining ilmiy-tadqiqot ishlari rejasi doirasida bajarilgan.

Tadqiqotning maqsadi qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini iqtisodiy baholash bo'yicha ilmiy asoslangan taklif va amaliy tavsiyalar ishlab chiqishdan iborat.

Tadqiqotning vazifalari quyidagilardan iborat:

- qishloq xo'jaligi ishlab chiqarishida texnik salohiyatdan foydalanishning mohiyati va nazariy asoslarini ilmiy jihatdan asoslash;

- qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini iqtisodiy baholash bo'yicha uslubiy yondashuvni ishlab chiqish;

- qishloq xo'jaligi texnik salohiyatini oshirish va texnik xizmat ko'rsatish bo'yicha xorijiy davlatlar tajribasi va ahamiyatga molik jihatlarini qo'llash;

- bug'doy yetishtirishning hozirgi holatini tahlil qilish va o'zgarishlar dinamikasi hamda rivojlanish tendensiyalarini aniqlash;

- qishloq xo'jaligini texnika vositalari bilan ta'minlanish darajasini tahlil qilish;

- qishloq xo'jaligida texnik salohiyatni oshirishning bug'doy hosiliga ta'sir etuvchi omillar tahlili va ekonometrik model asosida iqtisodiy baholash;

- ekonometrik modellar asosida qishloq xo'jaligida texnik salohiyatni ifodalovchi omillar asosida bug'doy hosilining prognoz ko'rsatkichlarini aniqlash.

Tadqiqot obyekti sifatida Jizzax viloyatida faoliyat ko'rsatayotgan qishloq xo'jaligi subyektlari tanlab olingan. Monografik tadqiqotlar uchun Jizzax viloyati Do'stlik va Arnasoy tumanlarining bug'doy yetishtiruvchi fermer xo'jaliklari tanlab olingan.

Tadqiqot predmetini qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini iqtisodiy baholash bilan bog'liq munosabatlar tashkil qiladi.

Tadqiqotning usullari. Tadqiqot jarayonida mantiqiy, taqqoslama tahlil, statistik va ekonometrik modellashtirish, SEM modeli, "KAP Survey" metodi asosidagi so'rovnoma va boshqa usullardan foydalanilgan.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat:

- qishloq xo'jaligi mahsulotlarini ishlab chiqarishda texnika vositalarining turlari, ularning soni, sifati, eskirish hamda texnika bilan ta'minlanganlik darajasi kabi ko'rsatkichlarni hisobga olgan holda texnika vositalaridan maksimal darajada foydalanish imkoniyatini ifodalovchi "texnik salohiyat" tushunchasining iqtisodiy mazmuni nazariy jihatdan takomillashtirilgan;

- SEM (Structural Equation Modeling) modeli asosida iqtisodiy baholash bo'yicha uslubiy yondashuvga ko'ra, fermer xo'jaliklarida bug'doy hosiliga texnik salohiyatning bevosita ta'siri (direct effect) hamda texnika vositalari bilan ta'minlanish va mehnat resurslaridan foydalanishni ifodalovchi omillarning bilvosita ta'siri (indirect effect) ustuvorligi ilmiy asoslangan;

- Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga ta'sir etuvchi texnik salohiyatni ifodalovchi omillarning ekonometrik modeli asosida bug'doy hosili o'zgarishining 2031-yilgacha bo'lgan prognoz ko'rsatkichlari ishlab chiqilgan;

- qishloq xo'jaligida texnika vositalarining uzluksiz ishlashini ta'minlash hamda texnik xizmat ko'rsatishni o'z vaqtida tashkil etish maqsadida texnik xizmat ko'rsatuvchi subyektlar hamda fermer xo'jaliklari o'rtasida moliyaviy majburiyatlarni

uchinchi tomon (bank) orqali kafolatli tarzda amalga oshirishga asoslangan eskrou (escrow) tizimini joriy etish taklif etilgan.

Tadqiqotning amaliy natijalari quyidagilardan iborat:

fermer xo'jaliklarida bug'doy hosiliga texnik salohiyatning ta'sirlarini iqtisodiy baholash bo'yicha uslubiy yondashuv ishlab chiqilgan. Natijada, Do'stlik va Arnasoy tumanlari fermer xo'jaliklarida texnik salohiyatning bug'doy hosiliga bevosita ta'siri 0,704 birlikni tashkil etib, hosildorlikka eng kuchli ta'sir ko'rsatuvchi omil ekanligi, texnika vositalari bilan ta'minlanganlik darajasining texnik salohiyatni ifodalashi 0,688 birlikga tengligi, mehnat resurslaridan foydalanish darajasining texnik salohiyatga ta'siri 0,319 birlikni tashkil etishi aniqlangan;

Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga ta'sir etuvchi texnik salohiyatni ifodalovchi omillarning ekonometrik modeli asosida bug'doy hosili o'zgarishining 2031-yilgacha prognoz ko'rsatkichlari aniqlangan. Natijada, hududda texnik salohiyat darajasining oshib borishi hisobiga bug'doy yalpi hosili hajmi 2024-yilda 479,8 ming tonnadan 2031-yilga kelib 565,2 ming tonnaga, ya'ni 17,8 foizga oshishi prognoz qilingan;

texnik xizmat ko'rsatuvchi subyektlar hamda fermer xo'jaliklari o'rtasida moliyaviy majburiyatlarni uchinchi tomon (bank) orqali kafolatli tarzda amalga oshirishga asoslangan eskrou (escrow) tizimini joriy etish taklif etilgan. Natijada, fermer xo'jaliklarida texnika vositalarining uzluksiz ishlashi ta'minlanadi, texnik xizmat ko'rsatish jarayonlari o'z vaqtida va sifatli amalga oshiriladi, moliyaviy majburiyatlarning bajarilishi kafolatlanib, xizmat ko'rsatuvchi subyektlar bilan o'zaro ishonch mustahkamlanadi hamda agrotexnik tadbirlarning kechikishi natijasida yuzaga keladigan iqtisodiy yo'qotishlar sezilarli darajada qisqaradi.

Tadqiqot natijalarining ishonchliligi. Olib borilgan tadqiqot natijalarining ishonchliligi shu sohadagi mamlakatimiz va dunyo olimlarining qishloq xo'jaligi texnik salohiyatini belgilovchi omillarning bug'doy hosiliga ta'sirlariga oid tadqiqot ishlaridagi ilmiy-uslubiy natijalarga tayanilganligi, ma'lumotlarning uzoq muddatlilikligi va rasmiy manbalardan olinganligi, hududlar kesimida to'plangan statistik ma'lumotlariga va fermer xo'jaliklaridan olingan so'rovnoma ma'lumotlariga asoslanganligi, taklif va tavsiyalarining amaliyotga joriy etilganligi, olingan natijalarning vakolatli tuzilmalar tomonidan tasdiqlanganligi bilan izohlanadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Tadqiqotning ilmiy-amaliy ahamiyati qishloq xo'jaligini texnik salohiyatini oshirish, fermer xo'jaliklarini o'zlari uchun zarur bo'lgan texnika vositalari hamda asbob-uskunalar sotib olish imkoniyatlarini kengaytirish bilan bog'liq iqtisodiy bilimlarni rivojlantirishga sharoit yaratib berishi bilan belgilanadi. Dissertatsiya ishida ishlab chiqilgan taklif va tavsiyalarni amaliyotga joriy etish fermer xo'jaliklarida ishlab chiqarish jarayonlarini texnik jihatdan yangilash, ularni moddiy-texnika bazasini mustahkamlash, iqtisodiy imkoniyatlarini oshirish yo'llarini ishlab chiqishda muhim ahamiyat kasb etadi. Tadqiqotning amaliy ahamiyati qishloq xo'jaligida mahsulot ishlab chiqarish jarayonida sarf-xarajatlarini kamaytirish va pirovard natijada qishloq xo'jaligi korxonalari iqtisodiy barqarorligini ta'minlashda o'z ifodasini topadi.

Dissertatsiya ishida olib borilgan ilmiy-tadqiqotlarning natijalaridan qishloq xo'jaligida texnik salohiyatdan foydalanish samaradorligini oshirishga qaratilgan

Davlat dasturlarini ishlab chiqish hamda oliy o'quv yurtlarida "Qishloq xo'jaligi iqtisodiyoti", "Qishloq xo'jalik ishlab chiqarish iqtisodiyoti" fanlarining o'quv dasturlarini takomillashtirish va o'qitishda keng foydalanilishi mumkin.

Tadqiqot natijalarning joriy qilinishi. Qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini iqtisodiy baholash bo'yicha olingan ilmiy natijalar asosida:

"texnik salohiyat" tushunchasining ta'rifida qishloq xo'jaligi mahsulotlarini ishlab chiqarishda texnika vositalarining turlari, ularning soni, sifati, eskirish hamda texnika bilan ta'minlanganlik darajasi kabi ko'rsatkichlarni hisobga olgan holda texnika vositalaridan maksimal darajada foydalanish imkoniyatini ifodalovchi iqtisodiy mazmuni asosida takomillashtirilgan taklifi oliy o'quv yurtlarining o'quv jarayonida, 61010400 – Turizm (agroturizm) ta'lim yo'nalishi talabalari uchun mo'ljallangan "Qishloq xo'jalik ishlab chiqarish iqtisodiyoti" darsligida foydalanilgan (Toshkent davlat agrar universitetining 2025-yil 4-iyundagi 1-9-6/139-son buyrug'i). Mazkur ilmiy yangilikning amaliyotga joriy etilishi natijasida talabalarning qishloq xo'jaligi texnik salohiyati tushunchasi mazmunini kengroq tushinishi orqali bilim va ko'nikmalarni oshirishga imkon beradi;

fermer xo'jaliklarida bug'doy hosiliga texnik salohiyatning ta'sirlarini iqtisodiy baholash bo'yicha uslubiy yondashuv viloyat tumanlarida Jizzax viloyati qishloq xo'jaligi boshqarmasi tomonidan amaliyotga joriy etilgan (Qishloq xo'jaligida bilim va innovatsiyalar milliy markazining 2026-yil 17-martdagi 05/04-04-280-son ma'lumotnomasi). Natijada, Do'stlik va Arnasoy tumanlari fermer xo'jaliklarida texnik salohiyatning bug'doy hosiliga bevosita ta'siri 0,704 birlikni tashkil etib, hosildorlikka eng kuchli ta'sir ko'rsatuvchi omil ekanligi, texnika vositalari bilan ta'minlanganlik darajasining texnik salohiyatni ifodalashi 0,688 birlikga tengligi, mehnat resurslaridan foydalanish darajasining texnik salohiyatga ta'siri 0,319 birlikni tashkil etishi aniqlangan;

Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga ta'sir etuvchi texnik salohiyatni ifodalovchi omillarning ekonometrik modeli asosida bug'doy hosili o'zgarishining 2031-yilgacha prognoz ko'rsatkichlarini aniqlash bo'yicha tavsiyalar Jizzax viloyati qishloq xo'jaligi boshqarmasi tomonidan amaliyotga joriy etilgan (Qishloq xo'jaligida bilim va innovatsiyalar milliy markazining 2026-yil 17-martdagi 05/04-04-280-son ma'lumotnomasi). Natijada, hududda texnik salohiyat darajasining oshib borishi hisobiga bug'doy yalpi hosili hajmi 2024-yilda 479,8 ming tonnadan 2031-yilga kelib 565,2 ming tonnaga, ya'ni 17,8 foizga oshishi prognoz qilingan;

texnik xizmat ko'rsatuvchi subyektlar hamda fermer xo'jaliklari o'rtasida moliyaviy majburiyatlarni uchinchi tomon (bank) orqali kafolatli tarzda amalga oshirishga asoslangan eskrou (escrow) tizimini joriy etish taklifi ATB "Xalq banki" Do'stlik tumani filiali faoliyatida foydalanilgan (Qishloq xo'jaligida bilim va innovatsiyalar milliy markazining 2026-yil 17-martdagi 05/04-04-280-son ma'lumotnomasi). Natijada, fermer xo'jaliklarida texnika vositalarining uzluksiz ishlashi ta'minlanadi, texnik xizmat ko'rsatish jarayonlari o'z vaqtida va sifatli amalga oshiriladi, moliyaviy majburiyatlarning bajarilishi kafolatlanib, xizmat ko'rsatuvchi subyektlar bilan o'zaro ishonch mustahkamlanadi hamda agrotexnik tadbirlarning kechikishi natijasida yuzaga keladigan iqtisodiy yo'qotishlar sezilarli darajada qisqaradi.

Tadqiqot natijalarining aprobatsiyasi. Tadqiqot natijalari 2 ta xorijiy va 2 ta respublika ilmiy-amaliy konferensiyalarida muhokama qilingan va ma'qullangan.

Tadqiqot natijalarining e'lon qilinganligi. Dissertatsiya ishi mavzusi bo'yicha jami 14 ta ilmiy ish, jumladan, O'zbekiston Respublikasi Oliy attestatsiya komissiyasining dissertatsiyalar asosiy ilmiy natijalarini chop etish bo'yicha tavsiya etilgan ilmiy nashrlarida 8 ta ilmiy maqola (5 ta respublika va 3 ta xorijiy jurnallarda), ilmiy-amaliy konferensiyalar to'plamlarida 4 ta ma'ruza tezislari chop etilgan. Shuningdek, hammualliflikda 1 ta darslik kitob va 1 ta elektron darsliklar chop etilgan.

Dissertatsiyaning tuzilishi va hajmi. Dissertatsiya ishi kirish, uchta bob, xulosa, foydalanilgan adabiyotlar ro'yxatidan iborat bo'lib, tarkibiga 37 ta statistik, tahliliy, hisob-kitob jadvallari va 23 ta rasm, 1 ta ilovani o'z ichiga olgan holda 121 sahifada bayon etilgan.

DISSERTATSIYANING ASOSIY MAZMUNI

Dissertatsiyaning **kirish** qismida tadqiqotning dolzarbligi va zarurati asoslangan, maqsadi, vazifalari, obyekti va predmeti shakllantirilgan, respublikada fan va texnologiyalar rivojlanishining ustuvor yo'nalishlariga bog'liqligi ko'rsatilgan, ilmiy yangiligi va amaliy natijalari bayon qilingan, olingan natijalarning nazariy va amaliy ahamiyati ochib berilgan, ularning amaliyotga joriy qilinishi, nashr etilgan ishlar va dissertatsiya tuzilishi bo'yicha ma'lumotlar keltirilgan.

Dissertatsiyaning **“Qishloq xo'jaligida texnik salohiyat va uni iqtisodiy baholashning nazariy-uslubiy asoslari”** deb nomlangan birinchi bobida qishloq xo'jaligi ishlab chiqarishida texnik salohiyatning mohiyati va nazariy asoslari, qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini iqtisodiy baholashning ilmiy-uslubiy asoslari uslubiy jihatlarini ilmiy asoslangan hamda xorijiy davlatlarda qishloq xo'jaligida texnik xizmat ko'rsatish bo'yicha ahamiyatga molik tajribalar va mamlakatimizda qo'llash imkoniyatlari yuzasidan ilmiy xulosalar ishlab chiqilgan.

Bugungi kunda mamlakatimiz agrar iqtisodiyotining raqobatbardoshligini oshirishda hal etuvchi ahamiyat kasb etadigan muhim ustuvor yo'nalishlardan biri – bu qishloq xo'jaligi mahsulotlari ishlab chiqaruvchi korxonalarda modernizatsiya, texnik va texnologik yangilash va resurstejamkor texnologiyalarni joriy etish masalalari muhim ahamiyat kasb qilmoqda.

Ishlab chiqarish jarayonlarini ilmiy asosda tushuntirishda iqtisodiyotning turli tarmoqlari miqyosida salohiyatni shakllantiruvchi asosiy omillar – bu resurslardir. Aynan ushbu resurslar ishlab chiqarishda yetakchi rol o'ynaydi va salohiyatni aniqlash masalasida ahamiyatlilik jihatlarini belgilashda jiddiy muammolar yuzaga kelishiga sabab bo'ladi. Bundan tashqari, agarda muayyan tarixiy bosqichda resurslarning asl mohiyati to'g'risida fikr yuritiladigan bo'linsa, ularning cheklanganligi va yashirin imkoniyatlari sharoitida “salohiyat” atamasini qo'llash zaruriyati paydo bo'ladi.

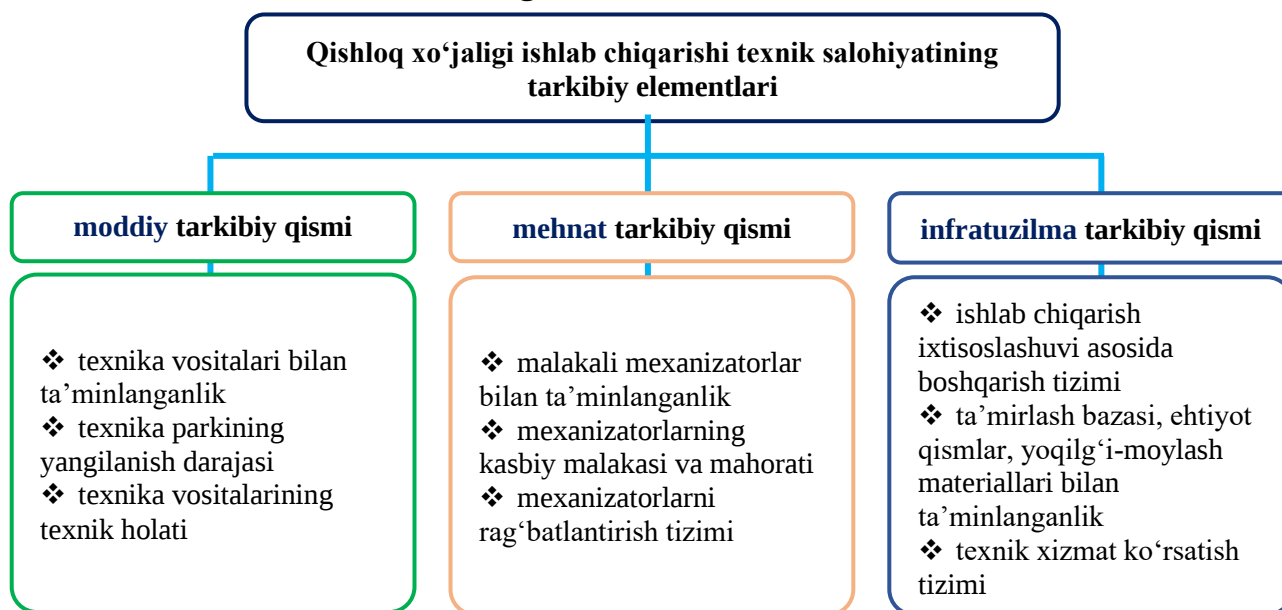
“Salohiyat” (lot. *“potentia”* – “kuch-qudrat”, “imkoniyat”) – muayyan maqsadga erishish uchun safarbar etilishi mumkin bo'lgan resurslar, vositalar va zaxiralar majmui bo'lib, shaxs, tashkilot yoki davlatning ma'lum bir sohadagi kuch-qudrati va imkoniyatlari darajasini ifodalaydi¹⁵.

¹⁵ Реанович Е.А. Смысловые значения понятия «потенциал» // Международный научно-исследовательский журнал. – 2019. – Т. 2. – № 7. – С. 14-15.

Agrar sohada “salohiyat” tushunchasi XX asrning 70-80-yillarida ilmiy tus olgan, iqtisodiy adabiyotlarda korxona resurs imkoniyatlarini ko‘tarish va amalga oshirish uslubi va amaliyotiga, ularning pirovard natijalarini baholashga, ya’ni salohiyat iqtisodiy mohiyatini bevosita yoki bilvosita ochib beradigan muammolarga katta e’tibor qaratilgan. Jumladan, “iqtisodiy salohiyat”, “sanoat salohiyati”, “agrar salohiyat”, “resurs salohiyati”, “texnik salohiyat” tushunchalari paydo bo‘lgan. Atamalarining bunday katta ro‘yxatining mavjudligi, ularning har biriga yanada batafsil yondashishga asos bo‘ladi.

Resurs salohiyati korxona yoki xo‘jalikning ixtiyorida bo‘lgan va ishlab chiqarish jarayonida iqtisodiy maqsadlarga erishish uchun foydalanilishi mumkin bo‘lgan barcha turdagi resurslarning o‘zaro bog‘liq majmuidir.

“Texnik salohiyat” tushunchasiga ta’rif berishda tadqiqotchi olimlarning qarashlari ham juda xilma-xil. Olimlarning bir qismi, texnik salohiyat – mahsulotning tegishli hajmini ishlab chiqarish, ishlarning muayyan hajmini bajarish qobiliyatiga ega bo‘lgan texnik vositalar yig‘indisidan iborat, deb hisoblasalar, boshqalarning fikricha, salohiyat bu resurslar emas, balki mahsulot ishlab chiqarish maqsadlariga erishish imkoniyatlaridir. Shu bilan birgalikda, qishloq xo‘jaligining texnik salohiyati tarkibida moddiy, mehnat va infratuzilma tarkibiy qismlari muhim rol o‘ynaydi (1-rasm). Uning tarkibidagi elementlar, o‘zaro yaqindan aloqada bo‘lgan holda, texnik, iqtisodiy va ijtimoiy natijaga asoslangan, ishlab chiqarishda texnik salohiyat rivojlanishi va amalga oshirilishi samarasini shakllanishiga imkon beradi.



1-rasm. Qishloq xo‘jaligi ishlab chiqarishi texnik salohiyatining tarkibiy qismlari va elementlari¹⁶

Bizningcha, yuqorida keltirilgan fikrlarni umumlashtirgan holda, bizningcha, “texnik salohiyat” tushunchasining mohiyatiga aniqlik kiritish maqsadga muvofiq. Tahlil natijalarini umumlashtirgan holda, shunday xulosaga kelish mumkinki, qishloq xo‘jaligining texnik salohiyati – bu ishlab chiqarish hajmi va ixtisoslashuvi bilan belgilangan texnik vositalar yig‘indisi bo‘lib, ular mehnat resurslarining ishlab

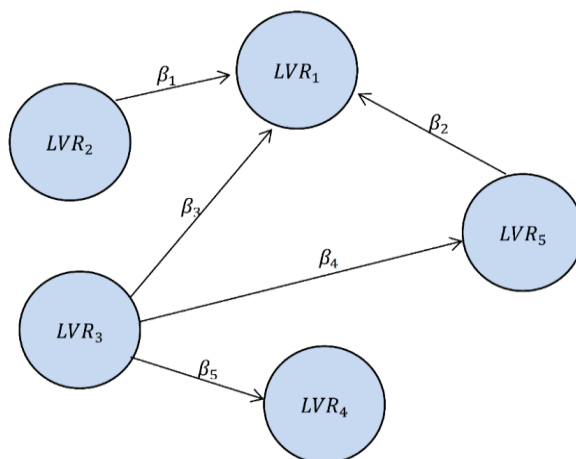
¹⁶ Muallif tomonidan adabiyotlar tahlili asosida ishlab chiqilgan.

chiqarish imkoniyatlari bilan texnologik bog‘langan hamda yer resurslaridan samarali foydalanish bilan bog‘liq texnologik jarayonlarni bajarish asosida mahsulotning muayyan miqdorini ishlab chiqarish imkoniyatini o‘z ichiga oladi.

Qishloq xo‘jaligining texnik salohiyati – bu mavjud texnika vositalari (traktorlar, kombaynlar, sug‘orish uskunalari, ekish, o‘rish va yig‘ish texnikalari, avtomatlashtirilgan yoki raqamli texnologiyalar) yordamida qishloq xo‘jaligi mahsulotlarini ishlab chiqarish hajmini maksimal darajada oshirish imkoniyatini ifodalaydigan salohiyat ko‘rsatkichidir. Ushbu tushuncha ishlab chiqarishda ishtirok etadigan texnika vositalarining turlari, ularning soni, sifati, eskirish hamda texnika bilan ta‘minlanganlik darajasi, ish unumdorligi va boshqa bir qator omillar bilan belgilanadi. Shuningdek, u qishloq xo‘jaligi ishlab chiqarishida mavjud texnika vositalari yordamida yetishtirilayotgan qishloq xo‘jaligi ekinlaridan hosil olishda maksimal ishlab chiqarish yoki ushbu resurslardan foydalanish imkoniyatlarini ifodalaydi. Texnik salohiyatni baholash qishloq xo‘jaligida samaradorlikni oshirish, resurslarni tejash va ishlab chiqarish barqarorligini ta‘minlash uchun zarur hisoblanadi.

Qishloq xo‘jaligi texnik salohiyati, xususan, texnika vositalaridan foydalanishning qishloq xo‘jaligi mahsulotlari yetishtirishga ta‘sirini baholash bo‘yicha bundan oldin qilingan ilmiy tadqiqot ishlari, odatda, turli yo‘nalishlarda bir qator usullar orqali bajarilgan. Ularga misol tariqasida, ishlab chiqarish funksiyasi (Kobb-Duglas usuli), DEA (Data Envelopment Analysis) – Ma‘lumotlarni qoplash tahlili usuli, SFA (Stochastic Frontier Analysis) – Stoxastik chegara tahlili usuli va statistik regressiya yo‘nalishidagi usullar orqali baholash mavjud. Agar tadqiqotda yashirin konstruktlar yoki ko‘p bosqichli sabab-oqibat bog‘lanishlari mavjud bo‘lsa, strukturaviy tenglamalar modeli (SEM) qo‘llaniladi.

Ushbu model omillarning bevosita va bilvosita ta‘sirini bir vaqtning o‘zida baholash imkonini beradi. SEM – bu regressiya, korrelyatsiya va faktor tahlillarini bir vaqtning o‘zida birlashtira oladigan keng qamrovli model hisoblanadi. Strukturaviy model yashirin o‘zgaruvchilar o‘rtasidagi bog‘liqlikni belgilaydi. Agar yashirin o‘zgaruvchi boshqa o‘zgaruvchilarga bog‘liq bo‘lsa, u bog‘liq (dependent), aks holda esa mustaqil (independent) o‘zgaruvchi deb ataladi. Strukturaviy modelda har bir mustaqil yashirin o‘zgaruvchi boshqa o‘zgaruvchilar bilan ko‘p omilli regressiya modeli orqali bog‘lanadi (2-rasm).



2-rasm. Beshta yashirin o‘zgaruvchiga ega strukturaviy modelning yo‘l diagrammasi

Masalan, LVR_1 , LVR_2 , LVR_3 , LVR_4 va LVR_5 uchun regressiya bog‘liqliklari quyidagicha bo‘ladi:

$$\begin{aligned} LVR_1 &= \beta_0 + \beta_1 LVR_2 + \beta_2 LVR_5 + \beta_3 LVR_3 + \varepsilon \\ LVR_5 &= \beta_0 + \beta_4 LVR_3 + \varepsilon \\ LVR_4 &= \beta_0 + \beta_5 LVR_3 + \varepsilon \end{aligned} \quad (1)$$

Shuningdek, omillar o‘rtasidagi sabab-oqibat bog‘lanishlari bevosita va bilvosita ta’sirlar orqali namoyon bo‘ladi. Bevosita ta’sir mustaqil yashirin o‘zgaruvchining natijaviy o‘zgaruvchiga to‘g‘ridan-to‘g‘ri “yo‘l koeffitsienti” orqali aniqlansa, bilvosita ta’sir oraliq (mediator) konstruktlar orqali yuzaga keladi.

1) Bevosita ta’sir (Direct effect) modeldagi yo‘l koeffitsienti bilan aniqlanadi:

$$DE = \beta_{XY} \quad (2)$$

bu yerda: β_{XY} – X konstrukting Y konstruktiga to‘g‘ridan-to‘g‘ri ta’sir koeffitsienti. Bevosita ta’sirning statistik ahamiyati quyidagicha aniqlanadi:

$$p = \frac{\beta}{SE} \quad (3)$$

Agar $p < 0.05$ bo‘lsa, ta’sir statistik jihatdan ahamiyatli deb qabul qilinadi.

2) Bilvosita ta’sir mediator o‘zgaruvchi orqali aniqlanadi. Masalan:

$$X \rightarrow M = \beta_1 \quad M \rightarrow Y = \beta_2 \quad (4)$$

bo‘lsa, unda bilvosita ta’sir quyidagicha hisoblanadi:

$$IE = \beta_1 \times \beta_2 \quad (5)$$

Agar zanjir ko‘p bosqichli bo‘lsa:

$$IE = \beta_1 \times \beta_2 \times \beta_3 \quad (6)$$

Bilvosita ta’sirning statistik ahamiyati ham bevosita ta’sirda bo‘lgani singari (3) formula yordamida tekshiriladi.

Ushbu uslubiy yondashuv strukturaviy tenglamalar modeli (SEM)ning variansga asoslangan PLS-SEM yondashuviga tayangan holda bevosita va bilvosita ta’sirlarni kompleks baholash imkonini beradi. Ushbu yondashuv o‘lchov va strukturaviy modelni bir vaqtning o‘zida baholash, latent konstruktlarni ko‘rsatkichlar asosida aniqlash hamda yo‘l koeffitsientlarining statistik ahamiyatini tekshirishni nazarda tutadi. Yana bir muhim jihati shundaki, u sabab-oqibat bog‘lanishlarini ko‘p bosqichli tarzda tahlil qilish va umumiy ta’sirni miqdoriy ifodalash imkonini beradi.

1-jadval

Xorijiy davlatlarda qishloq xo‘jaligida eskrou tizimi asosida texnik xizmat ko‘rsatish bo‘yicha modellar tavsifi

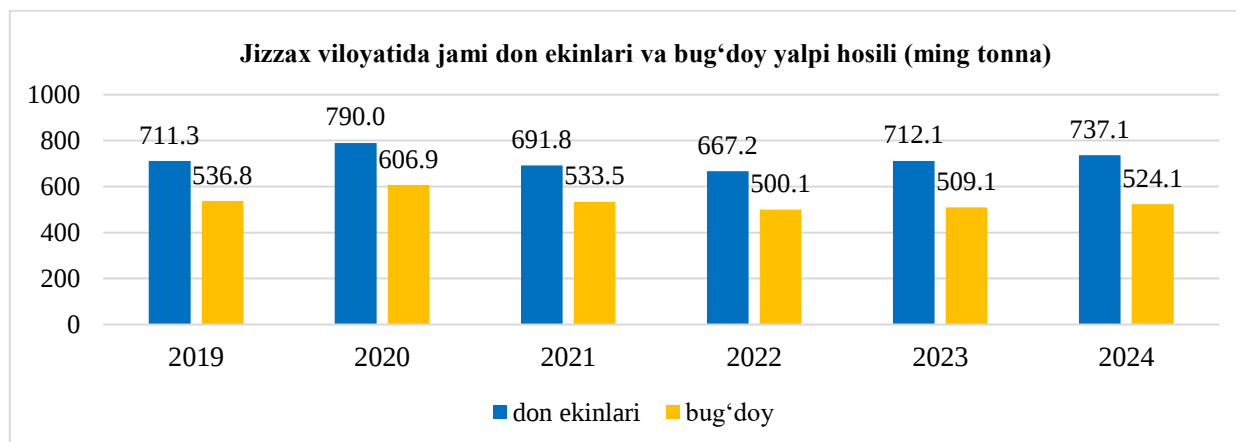
T/r	Model nomi	Davlat	Faoliyat turi	Qisqacha ishlash mexanizmi
1	Escrow.com platform	AQSh	klassik raqamli moliyaviy eskrou	Platforma xaridor mablag‘ini muzlatib turadi, texnika yetkazilib, uning sifati tasdiqlangach uni sotuvchiga o‘tkazadi.
2	“Hello Tractor”	Nigeriya	tranzaksion eskrou	Fermer SMS/ilova orqali texnik xizmatga buyurtma shakllantiradi; to‘lov masofadan amalga oshiriladi.
3	EM3 Agri Services	Hindiston	bosqichma-bosqich to‘lovli (Milestone)	Fermerlar markazlashgan shoxobchalar orqali texnika buyurtma qiladi va to‘lovlar hosil yig‘imiga moslangan tizim orqali yuritiladi.
4	JA Group Machinery Sharing System	Yaponiya	kooperativ ishonchli eskrou	Kooperativ texnikani sotib olib, fermerlar o‘rtasida reja asosida taqsimlaydi, texnik xizmat kooperativ zimmasida.
5	Machine Hire Centers (MHC)	Meksika	Institutional eskrou	FAO tomonidan qo‘llab-quvvatlangan model: xususiy mulkdorlar texnikalarni ijaraga berib, xizmat ko‘rsatadi. Yillik ijara asosiga moslashtirilgan tizim.

Bugungi kunda xorijiy davlatlarda fermerlarga va qishloq xo‘jaligida mahsulot yetishtiruvchi subyektlarga eskrou tizimi asosida texnik xizmat ko‘rsatish bo‘yicha bir qator modellar mavjud (1-jadval). Xorijiy mamlakatlar tajribasi shuni ko‘rsatadiki, texnik xizmat ko‘rsatishni samarali tashkil etish ishlab chiqarish uzluksizligini ta‘minlaydi hamda samaradorlikni oshirishga xizmat qiladi. Texnikalarni modernizatsiya qilish bilan bir qatorda texnik xizmat ko‘rsatishni samarali tashkil qilish qishloq xo‘jaligida samaradorlikni oshirishning asosiy sharti hisoblanadi.

Dissertatsiyaning **“Bug‘doy yetishtirish va texnika vositalari bilan ta‘minlanish darajasining tahlili va rivojlanish tendensiyalari”** deb nomlangan ikkinchi bobida bug‘doy yetishtirishning hozirgi holati va tendensiyalari, qishloq xo‘jaligining texnika vositalari bilan ta‘minlanish darajasi va qishloq xo‘jaligi texnik salohiyatining bug‘doy hosiliga ta‘siri etuvchi omillar tahlil qilingan holda ilmiy xulosalar shakllantirilgan.

Qishloq xo‘jaligida bug‘doy eng muhim oziq-ovqat ekinlari hisoblanadi. Dunyo aholisi ozuqa ratsionining asosiy qismini don va don mahsulotlari tashkil etadi. Jahon ekin maydonlarining 14 foizini don ekin maydonlari egallaydi. Dunyo bo‘yicha bug‘doy yetishtirish yiliga 760 million tonnani tashkil etadi. 2030-yilga kelib bu ko‘rsatkich 850 million tonnaga oshirish kutilmoqda. Oziq-ovqat savdosida don mahsulotlari 50 foizni tashkil qiladi. Shunga ko‘ra, jahon bozorida bug‘doy mahsulotiga talab katta. Shu bilan birgalikda, bug‘doy O‘zbekistonda oziq-ovqat kaloriyasining 52 foizdan ortig‘ini ta‘minlaydi.

Ushbu dissertatsiya ishida tadqiqot obyekti sifatida Jizzax viloyati tanlab olindi. Viloyat iqtisodiyotida qishloq xo‘jaligi, xususan, g‘allachilik va paxtachilik tarmoqlari yetakchi o‘rin egallaydi. Ayniqsa, sug‘oriladigan yerlar va lalmi hududlarning mavjudligi qishloq xo‘jaligi mahsulotlari yetishtirishda keng imkoniyatlar yaratadi. Jizzax viloyatida qishloq xo‘jaligida ishlatiladigan umumiy ekin maydoni 504,3 ming gektardan ortiqroq bo‘lib, shundan 259,9 mingdan ziyodroq gektari sug‘oriladigan ekin maydonlari hisobiga to‘g‘ri keladi. 3-rasmdan ko‘rish mumkinki, 2019-2024-yillarda viloyatda jami don ekinlari yalpi hosili 711,3 ming tonnadan 737,1 ming tonnagacha oshib, umumiy barqaror o‘sish tendensiyasini ko‘rsatdi. Bug‘doy yalpi hosili esa 536,8 ming tonnadan 524,1 ming tonnagacha biroz kamaygan.



3-rasm. 2019-2024-yillarda Jizzax viloyatida jami don ekinlari va bug‘doy yalpi hosili¹⁷

¹⁷ Jizzax viloyati Statistika boshqarmasi ma‘lumotlari asosida muallif ishlanmasi.

Yuqoridagi tahlillar shuni ko'rsatdiki, Jizzax viloyatida don va bug'doy ishlab chiqarish ko'rsatkichlari tumanlar kesimida sezilarli tafovutlarga ega. Xususan, Do'stlik tumani yalpi hosil hajmi bo'yicha yetakchi hududlardan biri bo'lib, 2024-yilda 97,6 ming tonna ko'rsatkichga erishgan va o'sish dinamikasi barqaror ijobiy tendensiyani namoyon etgan. Bu hudud intensiv ishlab chiqarish modeli shakllangan tuman sifatida tavsiflanadi. Arnasoy tumani esa tabiiy-iqlim sharoiti nisbatan murakkab bo'lishiga qaramay, yalpi hosil hajmini 79,0 ming tonnadan 83,5 ming tonnagacha oshirgan. Mazkur holat yer resurslaridan samarali foydalanish va texnik omillarning ta'sirini tahlil qilish uchun muhim empirik baza yaratadi. Shu bois, tadqiqot obyekti sifatida ishlab chiqarish hajmi yuqori va intensiv rivojlanish xususiyatiga ega Do'stlik tumani hamda nisbatan murakkab sharoitda faoliyat yurituvchi Arnasoy tumani tanlandi.

2-jadval

Jizzax viloyati qishloq xo'jaligining texnika vositalari bilan ta'minlanish dinamikasi (soni)¹⁸

T/r	Texnika vositalari nomi	2014	2018	2022	2023	2024	2024 yil 2014 yilga nisbatan, % da
1	Haydov traktorlari	243	260	335	431	435	179,01
2	Chopiq traktorlari	1341	1403	1410	1405	1383	103,13
3	Transport traktorlari	643	681	341	850	881	137,01
4	G'alla o'rish kombaynlari	281	294	339	308	322	114,59
5	Don seyalkalari	78	84	88	101	109	139,74
6	Omochlar (pluglar)	243	260	335	431	435	179,01
7	Traktor tirkamalari	1286	1362	1405	1422	1640	127,53
8	Mineral o'g'it sepish mashinalari	213	205	239	235	233	109,39
9	Organik o'g'it sepish mashinalari	259	298	319	317	324	125,09
10	Chizellar	288	338	362	364	366	127,08
11	Boronalar	6478	6863	7594	7593	7484	115,53

Jizzax viloyati qishloq xo'jaligida 2014-2024-yillar davomida texnika vositalari bilan ta'minlanganlik darajasi dinamikasi tahlili hududda agrar tarmoqning texnik salohiyati bosqichma-bosqich mustahkamlanib borayotganini ko'rsatadi (2-jadval). Mazkur davr mobaynida asosiy texnika turlarining aksariyatida o'sish tendensiyasi kuzatilgan. Avvalo, haydov traktorlari soni 2014-yildagi 243 donadan 2024-yilda 435 donaga yetib, 179,01 foizni tashkil etgan. Bu yerga asosiy ishlov berish jarayonlarining mexanizatsiyalash darajasi sezilarli oshganini anglatadi.

3-jadval ma'lumotlari asosida, Jizzax viloyatida 2025-yil holatiga qishloq xo'jaligi ishlab chiqarishining texnika vositalari bilan ta'minlanganlik darajasi me'yoriy talablar asosida tahlil qilindi.

Hisob-kitoblarga ko'ra, mavjud texnika vositalari soni ayrim yo'nalishlarda me'yoriy ehtiyojdan ortiq, ayrimlarida esa yetishmovchilik mavjudligini ko'rsatadi. Avvalo, haydov traktorlari bo'yicha me'yoriy talab 352 donani tashkil etgan bo'lsa, amalda 435 dona mavjud bo'lib, ta'minlanish darajasi 123,4 foizni tashkil etadi. Chopiq traktorlari (113,7 %) va transport traktorlari (108,6 %) bo'yicha ham me'yoriy ehtiyojdan yuqori ko'rsatkich qayd etilgan. G'alla o'rish kombaynlari bo'yicha

¹⁸ Muallif tomonidan Jizzax viloyati qishloq xo'jaligi boshqarmasi ma'lumotlari asosida tuzilgan.

ta'minlanish darajasi 146,2 foizni tashkil etib, donchilik tarmog'ida texnika vositalari bilan ta'minlanganlik yetarli darajada ekanganini ko'rsatadi. Shu bilan birga, don seyalkalari bo'yicha ham 211 dona talabga nisbatan 109 dona mavjud bo'lib, 102 dona yetishmovchilik qayd etilgan hamda ta'minlanish darajasi atigi 51,6 foizni tashkil etadi. Boshqa yo'nalishlarda esa sezilarli ortiqcha ta'minlanganlik kuzatiladi. Ayniqsa, boronalar (425,2 %) va chizellar (277,3 %) bo'yicha yuqori ko'rsatkich qayd etilgan bo'lib, bu mazkur texnika turlarining me'yoriy hisob-kitoblariga nisbatan ortiqcha hajmda mavjudligini anglatadi.

3-jadval

Jizzax viloyati qishloq xo'jaligi ishlab chiqarishining texnika vositalari bilan ta'minlanish darajasi¹⁹

T/r	Texnika vositalari nomi	Dolzarb davrdagi ish hajmlari, ga	1000 ga uchun talab, dona	Me'yor bo'yicha talab, dona	2025-yil holatiga mavjud, dona	Ta'minlanish darajasi, foiz
1	Haydov traktorlari	88100	4	352	435	123,4
2	Chopiq traktorlari	67600	18	1217	1383	113,7
3	Transport traktorlari	67600	12	811	881	108,6
4	G'alla kombaynlari	88100	2,5	220	322	146,2
5	Don seyalkalari	44000	4,8	211	109	51,6
6	Omochlar (pluglar)	88100	4	352	435	123,4
7	Traktor tirkamalari	67600	24	1622	1640	101,1
8	Mineral o'g'it sepish mashinalari	88100	2,1	185	233	125,9
9	Organik o'g'it sepish mashinalari	88100	4	352	324	92
10	Chizellar	44000	3	132	366	277,3
11	Boronalar	44000	40	1760	7484	425,2

Qishloq xo'jaligida texnika vositalari bilan ta'minlanganlik darajasi ishlab chiqarish jarayonining samaradorligiga bevosita ta'sir ko'rsatadi. Ayniqsa, zamonaviy texnika vositalaridan foydalanish mehnat va yoqilg'i resurslaridan foydalanish samaradorligini oshiradi. Shu sababli, bug'doy yetishtirish jarayonida eski va yangi texnika vositalaridan foydalanish natijasida yuzaga keladigan ish haqi va yoqilg'i xarajatlari farqi 10 ga maydon misolida tahlil qilindi. Hisob-kitoblarga ko'ra, 10 gektar maydonda bug'doy yetishtirish jarayonida eski va yangi texnika vositalaridan foydalanish natijasida mehnat va yoqilg'i resurslari sarfida sezilarli farqlar kuzatildi. Bunda ishlab chiqarish jarayonining asosiy bosqichlari – ekish davri, vegetatsiya davri va hosilni yig'ish davri bo'yicha ish haqi va yoqilg'i xarajatlari alohida hisoblab chiqildi (4-jadval).

Umumiy olganda, 10 gektar maydonda bug'doy yetishtirish jarayonining barcha bosqichlari bo'yicha jami ishlab chiqarish xarajatlari eski texnika vositalarida 27076,9 ming so'mni tashkil etgan bo'lsa, yangi texnika vositalarida 21519,1 ming so'mni tashkil etib, 5557,8 ming so'mga yoki 20,5 foizga kamaygan. Bu esa zamonaviy texnika vositalaridan foydalanish mehnat va yoqilg'i resurslaridan foydalanish samaradorligini oshirish orqali ishlab chiqarish xarajatlarini sezilarli darajada kamaytirishini ko'rsatadi.

¹⁹ Muallif tomonidan Jizzax viloyati qishloq xo'jaligi boshqarmasi ma'lumotlari asosida tuzilgan.

10 ga maydonda bug‘doy yetishtirish jarayonida eski va yangi texnika vositalaridan foydalanish bo‘yicha xarajatlar tahlili²⁰

T/r	Ko‘rsatkichlar	Eski texnika vositalari	Yangi texnika vositalari
<i>Ekish davri</i>			
1	Ish haqi, ming so‘m	2054,1	1064,2
2	Yoqilg‘i sarfi, litr	434,9	342,9
3	Yoqilg‘i sarfi, ming so‘m	4783,4	3771,9
Jami (ming so‘m)		6837,4	4836,1
<i>Vegetatsiya davri</i>			
1	Ish haqi, ming so‘m	2347,0	1516,3
2	Yoqilg‘i sarfi, litr	642,0	576,0
3	Yoqilg‘i sarfi, ming so‘m	7061,5	6335,9
Jami (ming so‘m)		9408,5	7852,2
<i>Hosilni yig‘ish davri</i>			
1	Ish haqi, ming so‘m	3543,3	2540,1
2	Yoqilg‘i sarfi, litr	662,5	571,9
3	Yoqilg‘i sarfi, ming so‘m	7287,7	6290,8
Jami (ming so‘m)		10831,0	8830,8
<i>Butun davr uchun</i>			
1	Ish haqi, ming so‘m	7944,4	5120,5
2	Yoqilg‘i sarfi, litr	1739,3	1490,8
3	Yoqilg‘i sarfi, ming so‘m	19132,5	16398,6
Jami (ming so‘m)		27076,9	21519,1

Fermer xo‘jaliklarida texnika vositalari bilan ta‘minlanganlik darajasi hamda ularning samarali foydalanilishi bug‘doy yetishtirish jarayonining iqtisodiy natijalariga sezilarli ta‘sir etishini ko‘rsatadi. Mazkur holatni yanada aniqroq tahlil qilish maqsadida Do‘stlik tumanidagi “Ko‘hna sirlar” va “Zafar” fermer xo‘jaliklari misolida taqqoslama tahlil amalga oshirildi. “Ko‘hna sirlar” fermer xo‘jaligida 1 ga maydonda bug‘doy yetishtirishda yoqilg‘i sarfi 203 litr, mehnat xarajatlari 2565 ming so‘m, hosildorlik 48 s/ga va sof foyda 1464,5 ming so‘mni tashkil etgan bo‘lsa, “Zafar” fermer xo‘jaligida esa zamonaviy texnikalar qo‘llanilishi natijasida yoqilg‘i sarfi 1 ga maydon uchun o‘rtacha 175 litr, mehnat xarajatlari 2333,2 ming so‘mga tushdi, hosildorlik 57 s/gaga yetgan va sof foyda 3888,8 ming so‘mni tashkil etgan. Bundan kelib chiqadiki, zamonaviy texnika vositalaridan foydalanish agrotexnik tadbirlarning samaradorligini oshirish bilan birga yoqilg‘i va mehnat resurslaridan foydalanishni ham optimallashtiradi. Umuman olganda, tadqiqot natijalari fermer xo‘jaliklarida texnik salohiyat mavjud ekanligini, ammo uning ayrim tarkibiy qismlarida nomutanosibliklar saqlanib qolayotganini ko‘rsatdi.

Dissertatsiyaning **“Bug‘doy yetishtirishda texnik salohiyatni oshirish yo‘nalishlari”** deb nomlangan uchinchi bobida qishloq xo‘jaligi texnik salohiyatining bug‘doy hosiliga ta‘siri ekonometrik model asosida iqtisodiy baholangan hamda qishloq xo‘jaligi texnikalariga xizmat ko‘rsatishda eskrou tizimini qo‘llash bo‘yicha taklif va tavsiyalar asoslangan. Ekonometrik modellashtirish asosida bug‘doy hosili o‘zgarishining 2031-yilgacha bo‘lgan prognoz ko‘rsatkichlari aniqlangan.

²⁰ Muallif hisob-kitoblari asosida tuzilgan.

Texnik salohiyatning bug'doy hosiliga ta'sirini baholash empirik hisoblash asosida aniqlanib, miqdoriy va statistik jihatdan asoslab berildi. Tahlillar dissertatsiya ishining 1.2-paragrafida bayon etilgan Strukturaliy tenglamalar modeli (SEM) asosida amalga oshirildi. 5-jadvalda modelda foydalaniladigan o'zgaruvchilarning statistik tavsiflari keltirilgan.

5-jadval

So'rovnoma natijalari asosida aniqlangan o'zgaruvchilarning statistik tavsiflari²¹

T/r	O'zgaruvchilar	O'lchov birligi	Kuz. soni	Statistika			
				O'rtacha	St. og'ish	Min.	Mak.
1	Fermerning ish tajribasi (X1)	Yil	230	12,226	6,798	2	27
2	Ta'lim ma'lumoti (X2)	kategoriyali	230	3,148	1,043	1	4
3	Fermerning jinsi (X3)	Ikkilik	230	0,839	0,368	0	1
4	Ixtisoslashuv darajasi (X4)	koefitsiyent	230	0,628	0,171	0,21	1
5	Xo'jalik moliyaviy barqarorligi (X5)	kategoriyali	230	1,935	0,776	1	3
6	Texnika vositalarining yangilanish darajasi (X6)	koefitsiyent	230	0,642	0,251	0	1
7	Mexanik ekish darajasi (X7)	koefitsiyent	230	0,452	0,214	0	0,8
8	Mexanik ishlar bajarish darajasi (X8)	koefitsiyent	230	0,674	0,279	0	1
9	Mexanik hosilni yig'ish darajasi (X9)	koefitsiyent	230	0,074	0,262	0	1
10	Mexanizator ishchilar bilan ta'minlanganlik darajasi (X10)	kategoriyali	230	2,270	0,865	1	3
11	Mexanizator ishchilarning malaka darajasi (X11)	kategoriyali	230	3,243	0,662	2	5
12	Zamonaviy texnikadan foydalanishda xabardorlik darajasi (X12)	kategoriyali	230	3,148	0,785	1	5
13	Texnika ijarasi/teknik servisdan foydalanish (X13)	Ikkilik	230	0,335	0,473	0	1
14	Sug'orishlar soni (X14)	kategoriyali	230	3,365	0,672	2	5
15	Mineral o'g'itlar berish (X15)	kategoriyali	230	3,178	1,065	1	5
16	Yer unumdorligi (bonitet balli) (X16)	Foizda	230	67,344	7,817	51,6	84
17	O'rtacha hosildorlik (X17)	Sentner	230	44,045	4,900	26,5	62,9

Shuningdek, omillar o'rtasidagi sabab-oqibat bog'lanishlari bevosita va bilvosita ta'sirlar orqali namoyon bo'ldi. Bevosita ta'sir mustaqil yashirin o'zgaruvchining natijaviy o'zgaruvchiga to'g'ridan to'g'ri "yo'l koefitsiyenti" orqali aniqlangan bo'lsa, bilvosita ta'sir oraliq (mediator) konstruktlar orqali aniqlandi (6-7-jadvallar).

6-jadval

Modeldagi bilvosita (specific indirect) ta'sir ko'rsatkichlari²²

Ta'sir yo'nalishlari ²³	Bilvosita ta'sir ko'rsatkichlari
TVTD -> TEX_POT -> HOSIL	0,485*
MRFD -> TVTD -> TEX_POT -> HOSIL	0,399**
MRFD -> TEX_POT -> HOSIL	0,225*
MRFD -> TVTD -> TEX_POT	0,567**

²¹ So'rovnoma ma'lumotlari asosida muallif tomonidan tayyorlangan.

²² Muallif tadqiqotlari asosida tayyorlangan.

²³ TEX_POT – Texnik salohiyat; UMUM – Umumiy omillar ; TIO – Tashkiliy-iqtisodiy omillar; TVTD – Texnika vositalari bilan ta'minlanishni ifodalovchi omillar; MRFD – Mehnat resurslaridan foydalanishni ifodalovchi omillar; HOSIL – Hosil yetishtirishga ta'sir qiluvchi omillar

Natijalar shuni ko'rsatdiki, texnik salohiyatning bug'doy hosiliga bevosita ta'siri 0,704 birlikni tashkil etib, hosildorlikka eng kuchli ta'sir ko'rsatuvchi omil sifatida namoyon bo'ldi.

7-jadval

Modeldagi bevosita ta'sirni ifodalovchi yo'l koeffitsientlari (Path coefficients)²⁴

Ta'sir yo'nalishlari	Yo'l koeffitsientlari
MRFD -> TEX_POT	0,319*
MRFD -> TVTD	0,823*
TEX_POT -> HOSIL	0,704***
TIO -> HOSIL	0,054*
TVTD -> TEX_POT	0,688***
UMUM -> HOSIL	0,113

Texnik salohiyatning shakllanishida texnika vositalari bilan ta'minlanganlik darajasi asosiy rol o'ynab, uning texnik salohiyatni ifodalashi 0,688 birlikga teng bo'ldi, bu esa texnika soni, sifati va foydalanish darajasi oshishi texnik salohiyatni sezilarli darajada kuchaytirishini ko'rsatadi. Shu bilan birga, mehnat resurslaridan foydalanish darajasining texnik salohiyatga ta'siri 0,319 birlikni tashkil etib, mehnat omilining ahamiyati mavjud bo'lsa-da, texnika omiliga nisbatan ikkilamchi ekanligini tasdiqlaydi. Bu esa SEM (Structural Equation Modeling) modeli asosida Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga omillar ta'sirlarini iqtisodiy baholashda texnik salohiyatning bevosita ta'siri (direct effect) hamda texnika vositalari bilan ta'minlanish va mehnat resurslaridan foydalanishni ifodalovchi omillarning bilvosita ta'siri (indirect effect) ustuvorligi ilmiy jihatdan asoslandi.

Tadqiqot ishimiz doirasida Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga ta'sir etuvchi texnik salohiyatni ifodalovchi omillarning ekonometrik modeli asosida bug'doy hosili o'zgarishining prognoz ko'rsatkichlarini aniqlashda ARIMA modelidan foydalanildi. Modelda viloyat fermer xo'jaliklarining yillar kesimida yetishtirgan yalpi bug'doy hajmi, ekin yer maydoni hamda asosiy turdagi texnika vositalari o'zgaruvchilar sifatida olindi.

ARIMA (Autoregressive Integrated Moving Average) modeli vaqt qatorlarini tahlil qilish va prognozlashda qo'llaniladigan statistik model bo'lib, u uchta asosiy parametr bilan ifodalanadi: p – avtoregressiya (AR) tartibi, d – qatorni statsionar holatga keltirish uchun olinadigan ayirma (differensiallash) tartibi hamda q – siljuvchi o'rtacha (MA) model tartibi. ARIMA modeli uzoq muddatli davriy ma'lumotlarni tahlil qilishda samarali hisoblanadi. Mazkur model avvalgi davrlardagi qiymatlar va xatoliklar asosida kelajakdagi ko'rsatkichlarni prognoz qilish imkonini beradi. Ya'ni, bazis yillardagi o'rtacha va dinamik o'zgarishlar hisobga olinib, kelgusi davrdagi tendensiyalarni aniqlash mumkin.

Modelni baholashdan oldin o'zgaruvchilarning statsionarlik darajasi Augmented Dickey-Fuller (ADF) hamda Phillips-Perron (P-P) testlari yordamida tekshirildi hamda barcha o'zgaruvchilar birinchi tartibli integratsiyalashgan, ya'ni I(1) jarayon ekanligi aniqlandi. Biz tuzilgan modellar orasidan mavjud kriteriyalardan foydalangan holda, ARIMA (1,1,0), ARIMA (0,1,0) va ARIMA (2,1,0) kabilarni tanlab oldik va

²⁴ Muallif tadqiqotlari asosida tayyorlangan.

oʻrnatilgan modellarning ishonchliligini baholashda AIC (*Akaike Information Criterion*) va BIC (*Bayesian Information Criterion*) mezonlari asosiy tanlov koʻrsatkichi sifatida qoʻllanildi hamda ular orasidan eng maqbulini aniqlashda aynan ushbu axborot mezonlari qiymatlari solishtirildi. Model tanlash qoidalariga muvofiq, AIC va BIC koʻrsatkichlari eng kichik qiymatga ega boʻlgan variant eng ishonchli va optimal model sifatida qabul qilindi. Baholash natijalariga koʻra, koʻrib chiqilgan modellar orasida ARIMA (2,1,0) varianti eng maqbul model sifatida tanlandi.

Modelning adekvatligini tekshirish maqsadida Ljung-Box, Jarque-Bera hamda ARCH testlari oʻtkazildi. Testlar natijalariga koʻra, qoldiqlar oq shovqin xususiyatiga ega, normal taqsimlangan va dispersiya barqaror ekanligi aniqlansa, model prognozlash uchun mos deb qabul qilindi.

Modelning adekvatligini baholash jarayonida determinatsiya koeffitsiyenti – R^2 qiymati 0,876 ga teng ekani aniqlandi. Bu esa tanlangan model maʼlumotlar toʻplamiga yuqori darajada mos kelishini bildiradi. Maʼlumki, R^2 koʻrsatkichi regressiya modelida mustaqil oʻzgaruvchilar tomonidan tushuntiriladigan bogʻliq oʻzgaruvchining umumiy dispersiya ulushini ifodalaydi. Yaʼni, R^2 ning 0,876 ga teng boʻlishi model tarkibidagi omillar natijaviy koʻrsatkich oʻzgarishining 87,6 foizini izohlashini anglatadi.

Olingan natijalar asosidagi 8-jadval maʼlumotlaridan koʻrinib turibdiki, 2026-2031-yillar davomida viloyat fermer xoʻjaliklarida bugʻdoy yalpi hosili barqaror oʻsish tendensiyasiga ega boʻlib, 2024-yildagi 479,8 ming tonnadan 565,2 ming tonnagacha, yaʼni 17,8 foizga ortishi prognoz qilindi. Umuman olganda, prognoz natijalari texnik salohiyatning mustahkamlanishi bugʻdoy hosildorligi oʻsishiga ijobiy taʼsir koʻrsatishini tasdiqlaydi va istiqbolda ishlab chiqarish hajmining barqaror kengayishini koʻrsatadi. Bu esa agrar sohada rivojlanish yoʻnalishlarini belgilash hamda strategiyalarni ishlab chiqish uchun amaliy asos yaratadi.

8-jadval

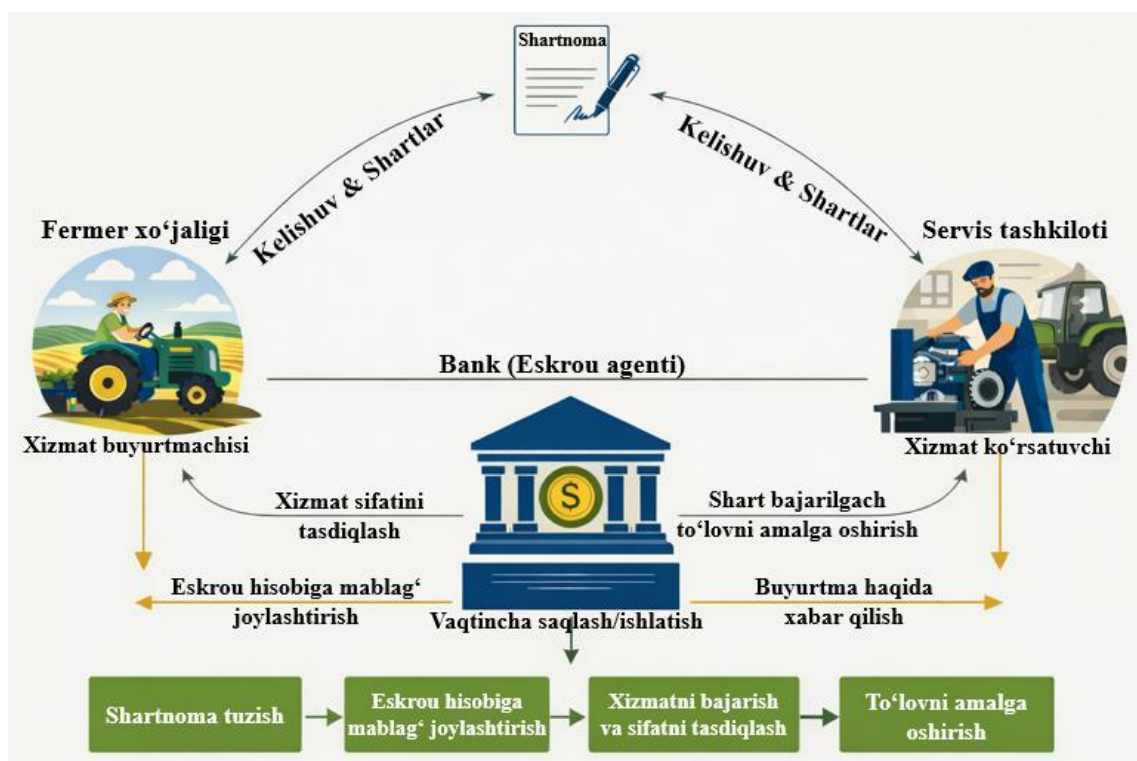
Viloyat fermer xoʻjaliklarida bugʻdoy yalpi hosili va unga taʼsir qiluvchi texnik salohiyat omillarining istiqboldagi oʻzgarish dinamikasi²⁵

Yillar	Yalpi hosil (ming tonna) Y	Yer maydoni (ming ga.) X1	Traktorlar soni (dona) X2	Don seyalkalari (dona) X3	Gʻalla kombaynlari (dona) X4	Oʻgʻit sepih mashinalari (dona) X5
2026	493,2	97,3	1411	117	337	581
2027	506,2	95,1	1420	115	339	594
2028	512,3	94,2	1432	112	344	598
2029	521,3	92,4	1449	118	342	609
2030	540,9	90,8	1458	123	349	615
2031	565,2	87,9	1472	133	357	623

Amaliyot shuni koʻrsatadiki, texnik xizmat koʻrsatish jarayonida muammolar faqat moddiy-texnik baza yoki servis infratuzilmasining yetarli darajada rivojlanmaganligi bilan cheklanmaydi. Koʻpincha xizmat sifati va toʻlovlar oʻrtasidagi nomutanosiblik, shartnomaviy majburiyatlarning toʻliq bajarilmasligi, shuningdek, tomonlar oʻrtasidagi oʻzaro ishonch darajasining pastligi kabi muammolar yuzaga

²⁵ STATA-17 dasturidan foydalangan holda muallif hisob-kitoblari.

keladi. Mazkur muammoni hal etish maqsadida qishloq xo‘jaligida texnik xizmat ko‘rsatish tizimiga moliyaviy majburiyatlarni uchinchi tomon orqali kafolatli amalga oshirishga asoslangan eskrou (escrow) mexanizmini joriy etish taklif etiladi. Ushbu mexanizm uch tomonlama institutsional munosabatga asoslanadi: fermer xo‘jaligi (buyurtmachi), texnik xizmat ko‘rsatuvchi subyekt (ijrochi) va bank yoki vakolatli moliyaviy institut (eskrou agenti).



Birinchi bosqichda fermer xo'jaligi va servis tashkiloti o'rtasida texnik xizmat hajmi, muddati, narxi va sifat ko'rsatkichlari aniq belgilangan shartnoma tuziladi. Shartnomada xizmat natijasini baholash mezonlari, qabul qilish tartibi hamda nizolarni hal etish mexanizmi ko'rsatiladi.

Uchinchi bosqichda servis tashkiloti belgilangan muddat va talablar asosida texnik xizmatni amalga oshiradi hamda bajarilgan ish tegishli hujjatlar bilan rasmiylashtiriladi.

²⁶ Muallif tadqiqotlari asosida tayyorlangan.

Natijada fermer xo'jaliklari uchun xizmat sifatiga kafolat yaratiladi, servis markazlari o'z majburiyatini vaqtida va to'liq bajarishga intiladi, texnika buzilganda "arzon, ammo sifatsiz" ta'mirlash muammosi kamayadi, davlat va xususiy sektor hamkorligida shaffof moliyaviy mexanizm yo'lga qo'yiladi.

XULOSA

1. Tahlil natijalarini umumlashtirgan holda, shunday xulosaga kelish mumkinki, qishloq xo'jaligining texnik salohiyati – bu ishlab chiqarish hajmi va ixtisoslashuvi bilan belgilangan texnik vositalar yig'indisi bo'lib, ular mehnat resurslarining ishlab chiqarish imkoniyatlari bilan texnologik bog'langan hamda yer resurslaridan samarali foydalanish bilan bog'liq texnologik jarayonlarni bajarish asosida mahsulotning muayyan miqdorini ishlab chiqarish imkoniyatini o'z ichiga oladi.

2. Tadqiqot ishida qishloq xo'jaligi texnik salohiyatining bug'doy hosiliga ta'sirini baholashda variansga asoslangan strukturaviy tenglamalar modeli – PLS-SEM (Partial Least Squares Structural Equation Modeling) yondashuvi qo'llanildi. Ushbu metod kovariatsiyani emas, balki endogen o'zgaruvchilarning dispersiyasini maksimal darajada tushuntirishga yo'naltirilgan iterativ (takroriy) hisoblash algoritmligiga asoslanadi. Ushbu yondashuv o'lchov va strukturaviy modelni bir vaqtning o'zida baholash, latent konstruktarni ko'rsatkichlar asosida aniqlash hamda yo'l koeffitsientlarining statistik ahamiyatini tekshirishni nazarda tutadi. Yana bir muhim jihati shundaki, u sabab-oqibat bog'lanishlarini ko'p bosqichli tarzda tahlil qilish va umumiy ta'sirni miqdoriy ifodalash imkonini beradi.

3. Bugungi kunda xorijiy davlatlarda fermerlarga va qishloq xo'jaligida mahsulot yetishtiruvchi subyektlarga texnik xizmat ko'rsatish bo'yicha agrotexnika xizmatlari modellari mavjud. Escrow.com platformasi AQShda, "Hello Tractor" Nigeriyada, Agricultural Machinery Service Centers Xitoyda, JA Group Machinery Sharing System Yaponiyada, EM3 Agri Services Hindistonda, Machine Hire Centers (MHC) Meksikada keng qo'llanilmoqda. Tadqiqot davomida xorijiy davlatlardagi qishloq xo'jaligi texnikalariga xizmat ko'rsatish faoliyatining muvaffaqiyatli tajribalari o'rganildi. Ularni O'zbekiston sharoitiga moslashtirish orqali qishloq xo'jaligi texnikalariga xizmat ko'rsatishni takomillashtirish bo'yicha takliflar ishlab chiqildi.

4. 2019-2024-yillar davomida Jizzax viloyatida jami don ekinlari maydoni nisbatan barqaror saqlangan bo'lib, 221,7 ming gektardan 221,8 ming gektarga deyarli o'zgarmagan. Bug'doy ekilgan maydon esa mazkur davrda qisqarish tendensiyasini namoyon etgan. Xususan, 2019-yildagi 143,2 ming gektardan 2024-yilda 117,9 ming gektarga kamaygan, ya'ni 25,3 ming gektarga yoki qariyb 17,7 foizga qisqargan. 2019-2024-yillarda viloyatda jami don ekinlari yalpi hosili 711,3 ming tonnadan 737,1 ming tonnagacha oshib, umumiy barqaror o'sish tendensiyasini ko'rsatdi. Bug'doy yalpi hosili esa 536,8 ming tonnadan 524,1 ming tonnagacha biroz kamaygan. Bu holat bug'doy maydonining qisqarishi bilan bog'liq bo'lib, ishlab chiqarish hajmi asosan hosildorlik va intensiv omillar hisobiga saqlab qolinganligini ko'rsatadi.

5. Tadqiqot doirasida Jizzax viloyatida asosiy turdagi qishloq xo'jaligi texnikalari ta'minoti hamda ularning foydalanish davomiyligi holatlari tahlil qilingan. Texnikalarning 1-5 yil davomida foydalanilganlari nisbatan kam ulushni tashkil etadi. Haydov traktorlari bo'yicha bu ko'rsatkich 23,4 foiz, chopiq traktorlari bo'yicha

22,6 foiz va purkagichlarda 20,1 foizni tashkil etmoqda. Eng yuqori ulush organik o'g'it sepish mashinalarida (32,8 %) kuzatilgan. Texnika vositalarining asosiy qismi 6-15 yil mobaynida foydalanilayotgan bo'lib, chopiq traktorlari 6-10 yil davomida ishlatilganlari 28,3 foiz, 11-15 yil davomida ishlatilganlari esa 24,8 foizni tashkil etadi. 20 yil va undan ortiq vaqt davomida foydalanilayotgan texnikalar umumiy tarkibda sezilarli o'rin tutadi. Umumiy qilib aytganda, texnikalar orasida 15 yildan ko'proq foydalanilganlari mavjud ta'minotning chorak qismidan ortiq ulushini tashkil etmoqda.

6. Monografik tadqiqotlar Jizzax viloyati Do'stlik va Arnasoy tumanlaridagi 230 ta fermer xo'jaliklari bilan "KAP Survey" so'rovnoma metodi yordamida texnika vositalarining yangilanish darajasi, ekish, agrotexnik ishlarni bajarish va hosilni yig'ib olish darajalari aniqlandi va ularning taqsimoti Stata dasturi asosida tahlil qilib chiqildi. Tahlil natijalariga ko'ra, texnika vositalarining yangilanish darajasi asosan 0,6-0,9 koeffitsient intervalida jamlangan. Jumladan, 0,8 koeffitsientga ega fermer xo'jaliklari 50 ta, 0,6 koeffitsientga ega 38 ta, 0,7 koeffitsient atrofida 13 ta xo'jalik qayd etilgan. Bu holat so'rovnomada ishtirok etgan fermerlarning salmoqli qismida texnik parkning kamida 60-80 foizi yangilanganini ko'rsatadi. Umuman olganda, tadqiqot natijalari fermer xo'jaliklarida texnik salohiyat mavjud ekanligini, ammo uning ayrim tarkibiy qismlarida nomutanositliklar saqlanib qolayotganini ko'rsatdi.

7. Strukturaviy tenglamalar modeli (SEM) asosida natijalar tahlili shuni ko'rsatadiki, texnik salohiyatning bug'doy hosiliga bevosita ta'siri 0,704 birlikni tashkil etib, hosildorlikka eng kuchli ta'sir ko'rsatuvchi omil sifatida namoyon bo'ldi. Texnik salohiyatning shakllanishida texnika vositalari bilan ta'minlanganlik darajasi asosiy rol o'ynab, uning texnik salohiyatni ifodalashi 0,688 birlikga teng bo'ldi, bu esa texnika soni, sifati va foydalanish darajasi oshishi texnik salohiyatni sezilarli darajada kuchaytirishini ko'rsatadi. Shu bilan birga, mehnat resurslaridan foydalanish darajasining texnik salohiyatga ta'siri 0,319 birlikni tashkil etib, mehnat omilining ahamiyati mavjud bo'lsa-da, texnika omiliga nisbatan ikkilamchi ekanligini tasdiqlaydi. Bu esa SEM (Structural Equation Modeling) modeli asosida Jizzax viloyati fermer xo'jaliklarida bug'doy hosiliga omillar ta'sirlarini iqtisodiy baholashda texnik salohiyatning bevosita ta'siri (direct effect) hamda texnika vositalari bilan ta'minlanish va mehnat resurslaridan foydalanishni ifodalovchi omillarning bilvosita ta'siri (indirect effect) ustuvorligi ilmiy jihatdan asoslandi.

8. 2026-2031-yillar davomida viloyat fermer xo'jaliklarida bug'doy yalpi hosilining o'sishi ilmiy asoslandi. Ya'ni, viloyat fermer xo'jaliklarida bug'doy yalpi hosilining prognoz hajmlari 2024-yildagi 479,8 ming tonnadan 2031-yilda 565,2 ming tonnaga, ya'ni 17,8 foizga ortishi ilmiy asoslandi.

9. Texnik xizmat ko'rsatuvchi subyektlar hamda fermer xo'jaliklari o'rtasida moliyaviy majburiyatlarni uchinchi tomon (bank) orqali kafolatli tarzda amalga oshirishga asoslangan eskrou (escrow) tizimi joriy etilishi natijasida, fermer xo'jaliklarida texnika vositalarining uzluksiz ishlashi ta'minlanadi, texnik xizmat ko'rsatish jarayonlari o'z vaqtida va sifatli amalga oshiriladi, moliyaviy majburiyatlarning bajarilishi kafolatlanib, xizmat ko'rsatuvchi subyektlar bilan o'zaro ishonch mustahkamlanadi hamda agrotexnik tadbirlarning kechikishi natijasida yuzaga keladigan iqtisodiy yo'qotishlar sezilarli darajada qisqaradi.

**SCIENTIFIC COUNCIL PHD.08/2025.27.12.I.15.01 FOR AWARDING OF
THE SCIENTIFIC DEGREES AT INTERNATIONAL AGRICULTURE
UNIVERSITY**

**INTERNATIONAL STRATEGIC CENTER FOR AGRI-FOOD
DEVELOPMENT**

MADIEV SHAKHZOD SHODMON UGLI

**ECONOMIC ASSESSMENT OF THE IMPACT OF AGRICULTURAL
TECHNICAL POTENTIAL ON WHEAT YIELD**

08.00.04 – Agricultural Economics

ABSTRACT

of the dissertation for the degree of Doctor of Philosophy (PhD) in Economics

Tashkent – 2026

The topic of the doctoral dissertation (PhD) was registered under No. B2025.4.PhD/Iqt5981 at the Supreme Attestation Commission of the Republic of Uzbekistan.

The dissertation was completed at the International Strategic Centre for Agri-Food Development.
The abstract of the dissertation is posted in three languages (Uzbek, Russian, English (resume)) on the website of the Scientific Council (www.iau.uz) and on the website of the "Ziyonet" informational and educational portal (www.ziyonet.uz).

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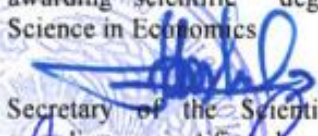
The defense of the dissertation will take place on « 6 » 10, 2026 at 15⁰⁰ at the meeting of Scientific council PhD.08/2025.27.12.1.15.01 at International Agriculture University. Address: 111200, Tashkent region, Kibray district, University Str., 2. Tel.: +998 55 517-00-71, e-mail: scientific_council@iau.uz.

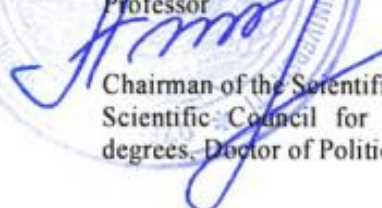
The doctoral dissertation (PhD) can be reviewed at the Information Resource Center of International Agriculture University (registered under No. 3). (Address: 111200, Tashkent region, Kibray district, University Str., 2. Tel.: +998 55 517-00-71, e-mail: scientific_council@iau.uz)

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INTRODUCTION

Relevance and necessity of the dissertation topic. The increasing demand for food remains urgent amid a growing world population and intensifying economic and environmental crises. According to the United Nations (UN), the world population is expected to reach 9.6 billion by 2050, requiring a 60 per cent increase in agricultural production²⁷. Grain crops occupy 14 per cent of the world's arable land²⁸. Today, global wheat production amounts to 800 million tons per year²⁹. By 2030, this indicator is expected to increase to 850 million tons³⁰. Grain products account for about 50 per cent of food sales³¹. Accordingly, demand for wheat products in the world market is high.

The average global temperature has increased by 0.8 °C to 1.2 °C compared to the pre-industrial age³². According to forecasts from the Intergovernmental Panel on Climate Change, global average temperatures will continue to rise by 0.2 °C every decade³³. This is negatively affecting crop growth, leading to reduced yields and increased production risks. One of the most effective ways to prevent and adapt to the negative impacts of global climate change on agricultural production is to increase the use of agricultural machinery.

Grain crops, particularly wheat, play a significant role in ensuring our country's food security. Wheat provides more than 52 per cent of Uzbekistan's food calories³⁴. Therefore, since the first years of independence, important structural reforms have been carried out within the framework of sustainable development in this sector and are yielding positive results. However, on the one hand, the fact that agricultural production is mainly based on irrigated agriculture, and on the other hand, the increasing water shortage, as well as the fact that "70 per cent of Uzbekistan's land consists of arid areas"³⁵, indicate that agricultural production is likely to be highly vulnerable to climate change in the future. At the same time, the level of provision of technical equipment across all sectors of agricultural production in the republic remains

²⁷ Food and Agriculture Organization of the United Nations (FAO). Sustainable agricultural mechanization: A framework for Africa [Elektron resurs]. – Rome: FAO, 2016. – URL: <http://www.fao.org/3/c-i6273r.pdf> (date of application: 2025.03.11).

²⁸ Land statistics 2001–2023. Global, regional and country trends : FAOSTAT Analytical Brief No. 107 / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2025. — URL: <https://www.fao.org/statistics/highlights-archive/highlights-detail/land-statistics-2001-2023>

²⁹ Statistical Yearbook. World Food and Agriculture 2023 / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2023. — URL: <https://openknowledge.fao.org/server/api/core/bitstreams/28cfd24e-81a9-4ebc-b2b5-4095fe5b1dab/content>

³⁰ OECD-FAO Agricultural Outlook 2025–2034. Cereals / Organisation for Economic Co-operation and Development, Food and Agriculture Organization of the United Nations. — Paris : OECD Publishing, 2025. — URL: https://www.oecd.org/en/publications/2025/07/oecd-fao-agricultural-outlook-2025-2034_e173f332/full-report/cereals_251d1ece.html

³¹ Cereal Supply and Demand Brief / Food and Agriculture Organization of the United Nations. — Rome : FAO, 2026. — URL: <https://www.fao.org/worldfoodsituation/csdb/en>

³² Masson-Delmotte, V. et al. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the IPCC. Cambridge University Press, 2021. URL: <https://www.ipcc.ch/report/ar6/wg1/>

³³ IPCC. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. – Cambridge : Cambridge University Press, 2021. – 2391 p. – DOI: 10.1017/9781009157896.

³⁴ Chabot P., Tondel F. A regional view of wheat markets and food security in Central Asia. – Washington, DC: United States Agency for International Development; Famine Early Warning Systems Network (FEWS NET); World Food Programme, 2011.

³⁵ Daryo.uz. – 2022. – URL: <https://daryo.uz/2022/06/10/ozbekistonning-70-foiz-yerlari-qurgoqchil-maydonlardan-iborat-ormon-xojaligi-davlat-qomitasi>

low. Today, mechanisation in agriculture stands at 81 per cent³⁶. The use of modern agricultural machinery provides practical assistance in the timely and high-quality implementation of all agrotechnical measures provided for in the technological charts for crop production. Therefore, developing proposals and recommendations to improve the theoretical, methodological, and practical foundations for using agriculture's technical potential remains highly relevant.

This dissertation research serves, to a certain extent, to fulfil the objectives outlined in the Decree of the President of the Republic of Uzbekistan No. DP-5853 dated October 23, 2019, “On the approval of the Strategy for the development of agriculture of the Republic of Uzbekistan for 2020-2030”, Resolutions of the President of the Republic of Uzbekistan No. RP-103 dated March 29, 2023, “On additional measures to stimulate the provision of the agricultural sector with modern agricultural machinery”, No. RP-431 dated December 12, 2024, “On measures to further enhance the level of agricultural mechanisation” and No. RP-97 dated March 13, 2026, “On further measures to provide the agrarian sector with modern agricultural machinery,” as well as other regulatory legal documents adopted in this field.

Compliance of the research with the priority directions of the development of science and technology of the republic. The dissertation was completed in accordance with the priority direction of the development of science and technology of the republic I. “Spiritual, moral and cultural development of a democratic and legal society, formation of an innovative economy”.

The degree of study of the problem. Many foreign scientists have studied the methodological aspects and practices of the effective use of machinery in agriculture, the economic assessment of the impact of agricultural technical potential on crop production, and the expansion and development of production volumes. The organisational and economic mechanisms for developing the technical potential of the agricultural sector were studied in the scientific works of A.K. Tmenova, G.A. Iovlev and N.A. Kreymmer, the efficiency of using technical potential was studied in the scientific works of A.N. Stavtsev and A.N. Kortyaev, the issues of developing and updating the technical base of agricultural production were studied in the scientific works of Yu.S. Tsen'ch and V.I. Dragaytsev³⁷, the issues of optimizing the technical potential of agricultural organizations were studied in the scientific works of M.V. Lysenko and A.V. Nemchenko, and the economic aspects of organizing a

³⁶ Qishloq xo‘jaligida texnikalar parki yangilanib, raqamli yechimlar keng joriy etiladi [Elektron resurs] // Prezident.uz. – 2026. – URL: <https://president.uz/oz/lists/view/8962>

³⁷ Тменова А.К. Организационно-экономический механизм развития технического потенциала аграрного сектора: дис. ... канд. экон. наук: 08.00.05. – Владикавказ, 2010. – 161 с.; Иовлев, Г.А. Технический потенциал аграрного сектора экономики: теоретические и практические аспекты // Аграрный вестник Урала. – 2016. – № 5 (147). – С. 72–78.; Креймер Н.А. Экономический механизм восстановления и развития технического потенциала сельскохозяйственных предприятий: по материалам Краснодарского края: дис. ... канд. экон. наук. – Краснодар, 2004. – 208 с.; Ставцев А.Н. Экономическая эффективность использования технического потенциала в молочном скотоводстве: дис. ... канд. экон. наук. – Орел, 2011. – 177 с.; Кортяев А.Н. Экономическая эффективность использования технического потенциала и пути ее повышения: на примере Республики Северная Осетия – Алания: дис. ... канд. экон. наук. – Москва, 2006. – 153 с.; Ценч, Ю.С. Научно-технический потенциал как главный фактор развития механизации сельского хозяйства // Сельскохозяйственные машины и технологии. – 2022. – Т. 16, № 2. – С. 4–13. – DOI: 10.22314/2073-7629-2022-16-2-4-13.; Драгайцев В.И. Организационно-экономический механизм обновления технической базы сельского хозяйства // Социально-экономические преобразования в аграрном секторе России: итоги и перспективы. – Москва: ГНУ ВНИИЭСХ, 2005.

technical service and using technical means in the agricultural sector were studied in the scientific works of A.K. Subaeva³⁸.

Also, a number of works on assessing the impact of factors in production based on econometric models, in particular the SEM model, have been studied in the scientific research of scientists such as R.H. Hoyle, B.M. Byrne, J. Hair, G. Hult, C. Ringle, M. Sarstedt and J.M. Wooldridge³⁹.

In our country, to develop and deeply reform this sector, agricultural economists have conducted several scientific studies, using Uzbekistan as an example, to examine how factors affect wheat yields and increase economic efficiency. In particular, this was reflected in the scientific research works of agricultural economists R.Kh. Khusanov, U.P. Umrzokov, K.A. Chariyev, N.S. Khushmatov, Z.Z. Yusupov⁴⁰ and others.

Although the proposals and recommendations developed in these scientists' research aim at the sustainable development of agriculture, a deeper analysis of the essence of the concept of agricultural technical potential and an economic assessment of its impact on the production process have not been sufficiently studied. Therefore, the aforementioned cases and scientific problems, such as assessing the impact of technical potential on agricultural production output, have not been sufficiently studied in the economic literature, and their scientific and practical significance served as the basis for choosing the research topic.

Connection of the dissertation research with the research plans of the scientific institution where the dissertation was completed. The research on the dissertation topic was conducted within the framework of the research plan of the International Strategic Centre for Agri-Food Development.

The aim of the research is to develop scientifically based proposals and practical recommendations for the economic assessment of the impact of agricultural technical potential on wheat yields.

The objectives of the research are as follows:

scientific substantiation of the essence and theoretical foundations of the use of technical potential in agricultural production;

³⁸ Лысенко М.В., Лысенко Ю.В., Мингалева В.Д. Технический потенциал сельскохозяйственных организаций и его оптимизация // Аграрный вестник Урала. – 2017. – № 12. – С. 24-31.; Немченко, А.В. Оценка технической оснащённости в сельском хозяйстве / А.В. Немченко, Т.А. Дугина, Е.А. Лихолетов // Международный научно-исследовательский журнал. – 2018. – № 9 (75), ч. 2. – С. 52–54. – DOI: 10.23670/IRJ.2018.75.9.034.; Субаева А.К. Экономика и организация технического сервиса (часть I). – Ульяновск: Ульяновская ГСХА, 2011. – 259 с.

³⁹ Hoyle R.H. Handbook of structural equation modeling. – New York: Guilford Press, 2012. – 785 p.; Byrne B.M. Structural equation modeling with AMOS: Basic concepts, applications, and programming. – 3rd ed. – New York: Routledge, 2016. – 738 p.; Hair J.F., Hult G.T.M., Ringle C.M., Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). – Thousand Oaks, CA: Sage Publications, 2014. – 307 p.; Wooldridge J.M. Introductory Econometrics: A Modern Approach. – 6th ed. – Boston, MA: Cengage Learning, 2020. – 865 p.

⁴⁰ Xusanov R.X., Xamdamov A.N., Rafikov I.E. Qishloq xo'jaligida servis xizmati. Mukobil mashina-traktor parklarini rivojlantirish muammolari.-T.: Yangi asr avlodi, 2001.-125 b.; Umrzokov.U.P. Iqtisodiyot agrar sektorining resurs salohiyatidan foydalanish samaradorligini oshirish yo'llari (O'zbekiston Respublikasi materiallari asosida): diss... iqtisod fanlari doktori. Toshkent. 2003.-272 b.; Чариев К.А. Формирование и совершенствование механизма эффективного использования ресурсного потенциала сельского хозяйства. Диссертация на соискание ученой степени доктора экономических наук. Ташкент. 1992 г. 374 стр.; Xushmatov N.S., Rustamova I.B. Qishloq xo'jaligida innovatsion faoliyatni yo'lga qo'yishning asosiy yo'nalishlari. "Iqtisodiyot va innovatsion texnologiyalar" ilmiy elektron jurnali. № 3, may-iyun, 2019 yil 18-25 bet; Yusupov Z.Z. Qishloq xo'jaligini texnik modernizatsiyalashning tashkiliy-iqtisodiy mexanizmlarini takomillashtirish yollari. Iqtisodiyot fanlari falsafa doktori (PhD) ilmiy darajasini olish uchun tayyorlangan Dissertatsiya. Toshkent. 2021 y. 108 b.

to develop a methodological approach to economically assessing the impact of agricultural technical potential on wheat yields;

applying the experience and relevant aspects of foreign countries in increasing the technical potential and technical maintenance of agriculture;

to analyse the current state of wheat production and identify the dynamics of changes and development tendencies;

to analyse the level of provision of agricultural machinery;

to analyse factors affecting wheat yield and conduct an economic assessment based on an econometric model for increasing technical potential in agriculture;

to determine forecast indicators for wheat yields based on factors reflecting technical potential in agriculture using econometric models.

Agricultural entities in the Jizzakh region were selected as **the research object**. For the monographic research, wheat-growing farms in the Dustlik and Arnasay districts of the Jizzakh region were selected.

The research examines the relationships associated with the economic assessment of the impact of agricultural technical potential on wheat yield.

Research methods. The research used logical and comparative analysis, statistical and econometric modelling, the SEM model, a questionnaire based on the “KAP Survey” method, and other methods.

The scientific novelty of the research is as follows:

economic content of the concept of “technical potential” has been theoretically improved, which expresses the possibility of maximum use of technical equipment in the production of agricultural products, taking into account such indicators as the types of machinery, their quantity, quality, depreciation and level of provision with machinery;

according to the methodological approach to economic assessment based on the SEM (Structural Equation Modelling) model, the priority of the direct effect of technical potential on wheat yields in farms, as well as the indirect effect of factors representing the provision of technical equipment and the use of labor resources, has been scientifically substantiated;

based on an econometric model of factors representing the technical potential affecting wheat yields in farms in the Jizzakh region, forecast indicators for wheat yield changes until 2031 have been developed;

in order to ensure the continuous work of agricultural machinery and the timely organization of technical servicing, it is proposed to implement an escrow system based on the guaranteed fulfillment of financial obligations through a third party (bank) between technical service entities and farms.

The practical results of the research are as follows:

a methodological approach has been developed for the economic assessment of the impact of technical potential on wheat yields in farms. As a result, it was found that the direct effect of technical potential on wheat yields in farms in the Dustlik and Arnasay districts is 0.704 units, which is the strongest factor affecting yields; the level of provision with technical equipment represents technical potential at 0.688 units, and the level of labor resource usage affects technical potential at 0.319 units;

based on an econometric model of factors representing the technical potential affecting wheat yields in farms in the Jizzakh region, forecast indicators for wheat yield changes until 2031 have been determined. As a result, due to the increase in the level of technical potential in the region, the volume of the gross wheat harvest is predicted to increase from 479.8 thousand tons in 2024 to 565.2 thousand tons by 2031, that is, by 17.8 per cent;

it is proposed to implement an escrow system based on the guaranteed fulfillment of financial obligations between technical service entities and farms through a third party (bank). As a result, the continuous work of technical equipment in farms is provided, service processes are carried out in a timely and high-quality manner, the fulfillment of financial obligations is guaranteed, mutual trust with service entities is strengthened, and economic losses resulting from delays in agrotechnical measures are significantly reduced.

The reliability of the research results. The reliability of the research results is explained by the fact that they are based on the scientific and methodological results of research works by our country's and world scientists in this field regarding the influence of factors determining the technical potential of agriculture on wheat yields, the long-term nature of the data and the fact that they are obtained from official sources, are based on statistical data collected by region and survey data obtained from farms, the implementation of proposals and recommendations into practice, and the confirmation of the results by authorised structures.

The scientific and practical significance of the research results. The scientific and practical significance of the research is that it creates conditions for developing economic knowledge to increase the technical potential of agriculture and expand farms' ability to purchase the necessary technical means and equipment. The practical implementation of the proposals and recommendations developed in the dissertation is important for the technical renewal of production processes on farms, strengthening their material and technical base, and developing ways to increase economic opportunities. The practical significance of the research lies in reducing agricultural production costs and, ultimately, in ensuring the economic stability of agricultural enterprises.

The results of the scientific research conducted in the dissertation work can be widely used in the development of state programs aimed at increasing the efficiency of using technical potential in agriculture, as well as in the improvement and teaching of curricula for the subjects "Agricultural Economics" and "Agricultural Production Economics" in higher educational institutions.

Implementation of research results. Based on the scientific results obtained on the economic assessment of the impact of agricultural technical potential on wheat yield:

in the definition of the concept of "technical potential," taking into account indicators such as the types of technical equipment in the production of agricultural products, their quantity, quality, depreciation, and the level of provision with machinery, the proposal improved on the basis of the economic content expressing the possibility of maximum use of technical equipment was used in the educational process of higher educational institutions, in the textbook "Agricultural Production

Economics” intended for students of the educational direction 61010400 – Tourism (agrotourism) (Order of Tashkent State Agrarian University No. 1-9-6/139 dated June 4, 2025). As a result of the implementation of this scientific novelty, it will be possible to increase the knowledge and skills of students through a deeper understanding of the concept of agricultural technical potential;

a methodological approach for the economic assessment of the impact of technical potential on wheat yields in farms has been implemented by the Department of Agriculture of the Jizzakh region in the districts of the region (Reference No. 05/04-04-280 dated March 17, 2026, from the National Center for Knowledge and Innovation in Agriculture). As a result, it was found that the direct effect of technical potential on wheat yields in farms in the Dustlik and Arnasay districts is 0.704 units, which is the strongest factor affecting yields; the level of provision with machinery represents technical potential at 0.688 units, and the level of labor resource usage affects technical potential at 0.319 units;

recommendations for determining forecast indicators of wheat yield changes until 2031 based on an econometric model of factors representing the technical potential affecting the wheat harvest in farms of the Jizzakh region were put into practice by the Department of Agriculture of the Jizzakh region (Reference No. 05/04-04-280 dated March 17, 2026, from the National Center for Knowledge and Innovation in Agriculture). As a result, due to the increase in the level of technical potential in the region, the volume of the gross wheat harvest is forecasted to increase from 479.8 thousand tons in 2024 to 565.2 thousand tons by 2031, that is, by 17.8 percent;

the proposal to implement an escrow system based on the guaranteed fulfillment of financial obligations between technical service entities and farms through a third party (bank) was used in the activities of the Dustlik district branch of JSC “Xalq Banki” (Reference No. 05/04-04-280 dated March 17, 2026, from the National Center for Knowledge and Innovation in Agriculture). As a result, the continuous work of technical equipment in farms is ensured, service processes are carried out in a timely and high-quality manner, the fulfillment of financial obligations is guaranteed, mutual trust with service entities is strengthened, and economic losses resulting from delays in agrotechnical measures are significantly reduced.

Approbation of the research results. The research results were discussed and approved at 2 international and 2 national scientific-practical conferences.

Publication of the research results. A total of 14 scientific papers have been published on the topic of the dissertation, including 8 scientific articles (5 in republican and 3 in foreign journals) in scientific publications recommended by the Supreme Attestation Commission of the Republic of Uzbekistan for the publication of the main scientific results of dissertations, and 4 lecture abstracts in collections of scientific and practical conferences. Also, 1 textbook and 1 electronic textbook were published in co-authorship.

The structure and size of the dissertation. The dissertation consists of an introduction, three chapters, a conclusion, and a list of references, and is 121 pages long, including 37 statistical, analytical, and calculation tables, 23 figures, and 1 appendix.

MAIN CONTENT OF THE DISSERTATION

The introduction of the dissertation substantiates the relevance and necessity of the research, formulates the goal, objectives, object, and subject of the research, defines its connection with the priority directions of science and technology development in the republic, outlines the scientific novelty and practical results, reveals the theoretical and practical significance of the results achieved, and provides information on their implementation into practice, published works, and the structure of the dissertation.

In the first chapter of the dissertation, titled “**Technical Potential in Agriculture and the Theoretical and Methodological Foundations of Its Economic Assessment**”, the essence and theoretical foundations of technical potential in agricultural production, the scientific and methodological foundations, and the methodological aspects of the economic assessment of the impact of agricultural technical potential on wheat yields are scientifically substantiated, and scientific conclusions are developed regarding significant experience in agricultural maintenance in foreign countries and the possibilities of its implementation in our country.

Today, one of the key priorities for increasing the competitiveness of our country's agrarian economy is modernisation, technical and technological renewal, and the implementation of resource-saving technologies at agricultural production enterprises.

When explaining production processes on a scientific basis, resources are the primary factors shaping potential across various sectors of the economy. These resources play a leading role in production and create serious problems when determining the key aspects of identifying potential. Furthermore, if the true essence of resources is discussed at a specific historical stage, it becomes necessary to use the term “potential” in the context of their limited and hidden capabilities.

“Potential” (Lat. “*potentia*” – “power”, “opportunity”) is a set of resources, instruments, and reserves that can be used to achieve a specific goal, expressing the level of power and capabilities of an individual, organisation, or state in a specific field⁴¹.

In the agricultural sector, the concept of “potential” acquired a scientific character in the 70s and 80s of the 20th century; in economic literature, great attention is paid to the methodology and practice of increasing and implementing the resource capabilities of enterprises, assessing their final results, and solving problems that directly or indirectly reveal the economic essence of potential. In particular, the concepts of “economic potential”, “industrial potential”, “agricultural potential”, “resource potential” and “technical potential” have appeared. The existence of such a large list of concepts provides grounds for a more detailed approach to each of them.

Resource potential is an interconnected set of all types of resources at the disposal of an enterprise or farm that can be used to achieve economic goals in the production process.

The views of researchers on defining the concept of “technical potential” are also very different. Some scientists believe technical potential consists of a set of technical

⁴¹ Реанович Е.А. Смысловые значения понятия «потенциал» // Международный научно-исследовательский журнал. – 2019. – Т. 2. – № 7. – С. 14-15.

equipment capable of producing a certain volume of products and performing a certain volume of work, while others believe potential is not resources but the possibilities of achieving production goals. At the same time, the material, labor and infrastructure components play an important role in the technical potential of agriculture (Fig. 1). Its constituent elements, being closely interconnected and based on technical, economic and social results, allow for the formation of the effectiveness of the development and implementation of technical potential in production.

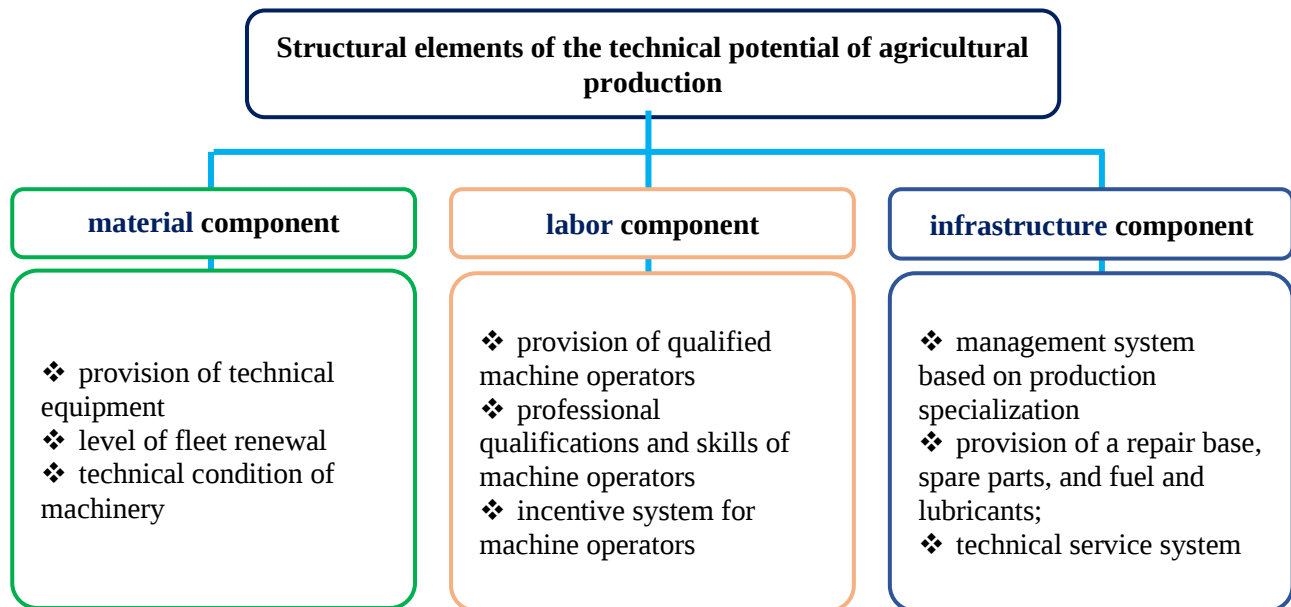


Figure 1. Components and elements of the technical potential of agricultural production⁴²

Summarising the above definitions, we believe it is advisable to clarify the essence of the concept of “technical potential”. Summarising the results of the analysis, it can be concluded that the technical potential of agriculture is a set of technical equipment defined by production volume and specialisation, which is technologically connected to the production capabilities of labor resources and includes the ability to produce a certain volume of products based on technological processes related to the efficient use of land resources.

Technical potential of agriculture is an indicator of the ability to maximise agricultural production using existing technical equipment (tractors, combines, irrigation equipment, sowing and harvesting machinery, automated or digital technologies). This concept is determined by factors such as the types of technical equipment involved in production, their quantity, quality, depreciation, and the level of provision of machinery, labour productivity, and energy efficiency. It also reflects the potential to maximise production or resource use in obtaining a harvest from agricultural crops grown with available machinery. Assessing technical potential is essential to increase efficiency in agriculture, save resources, and ensure production sustainability.

Previous scientific research on the technical potential of agriculture, particularly the impact of machinery use on agricultural production, has generally been conducted

⁴² Developed by the author based on a literature review.

in various directions using a number of methods. These include, for example, the production function (Cobb-Douglas method), DEA (Data Envelopment Analysis), SFA (Stochastic Frontier Analysis) and assessment using statistical regression methods. Regression analysis determines factor elasticities, marginal productivity, and statistical significance. If there are hidden constructs or multi-stage cause-and-effect relationships in the research, the structural equation model (SEM) is used.

This model allows for the simultaneous assessment of the direct and indirect effects of factors. SEM is a comprehensive model that can combine regression, correlation, and factor analysis simultaneously. The structural model determines the relationship between the hidden variables. If a hidden variable depends on other variables, it is called dependent; otherwise, it is called independent. In the structural model, each independent latent variable is connected to other variables through a multi-factor regression model (Fig. 2).

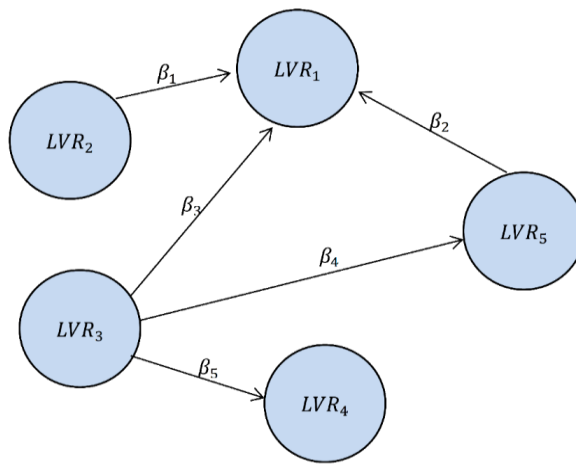


Figure 2. A path diagram of a structural model with five hidden variables

For example, the regression dependencies for LVR_1 , LVR_2 , LVR_3 , LVR_4 and LVR_5 are as follows:

$$\begin{aligned} LVR_1 &= \beta_0 + \beta_1 LVR_2 + \beta_2 LVR_5 + \beta_3 LVR_3 + \varepsilon \\ LVR_5 &= \beta_0 + \beta_4 LVR_3 + \varepsilon \\ LVR_4 &= \beta_0 + \beta_5 LVR_3 + \varepsilon \end{aligned} \quad (1)$$

Furthermore, cause-and-effect relationships between factors are manifested through direct and indirect effects. While the direct effect is determined by the direct “path coefficient” of the independent latent variable to the resulting variable, the indirect effect occurs through intermediate (mediator) constructs.

1) The direct effect is determined by the path coefficient in the structural model:

$$DE = \beta_{XY} \quad (2)$$

where: β_{XY} – the coefficient of the direct effect of construct X on construct Y.

The statistical significance of the direct effect is determined as follows:

$$p = \frac{\beta}{SE} \quad (3)$$

If $p < 0.05$, the effect is considered statistically significant.

2) The indirect effect is determined by the mediator variable. For example:

$$X \rightarrow M = \beta_1 \quad M \rightarrow Y = \beta_2 \quad (4)$$

then the indirect effect is calculated as follows:

$$IE = \beta_1 \times \beta_2 \quad (5)$$

If the chain is multi-stage:

$$IE = \beta_1 \times \beta_2 \times \beta_3 \quad (6)$$

The statistical significance of the indirect effect, as well as the direct effect, is checked using formula (3).

This methodological approach allows for a comprehensive assessment of direct and indirect effects, relying on the PLS-SEM variance-based approach of structural equation modelling (SEM). This approach involves simultaneous assessment of the measurement and structural model, identification of latent constructs based on indicators, and verification of the statistical significance of path coefficients. Another important aspect is that it allows for a multi-stage analysis of cause-and-effect relationships and the quantitative expression of the overall effect.

Table 1

Description of models for technical maintenance based on the escrow system in agriculture in foreign countries

No.	Name of model	Countries	Type of activity	Brief mechanism
1	Escrow.com platform	USA	classic digital financial escrow	The platform keeps the buyer's funds frozen and transfers them to the seller after the equipment is delivered and its quality is confirmed.
2	“Hello Tractor”	Nigeria	transactional escrow	Digital platform: the farmer forms an order for technical maintenance via SMS/app; payment is made remotely
3	EM3 Agri Services	India	milestone payment	Farmers order machinery through centralized distribution points, and payments are made through a system adapted to harvesting.
4	JA Group Machinery Sharing System	Japan	cooperative reliable escrow	The cooperative purchases machinery and distributes it among the farmers according to a plan; technical maintenance is the responsibility of the cooperative.
5	Machine Hire Centers (MHC)	Mexico	institutional escrow	A model supported by FAO: private owners provide equipment for lease and maintenance. A system adapted to an annual rental basis.

Today, a number of models exist in foreign countries for providing technical services to farmers and agricultural producers based on the escrow system (Table 1).

Foreign experience shows that effective technical maintenance ensures production continuity and increases efficiency. Along with machinery modernisation, effective organisation of technical maintenance is a key criterion for increasing agricultural efficiency.

In the second chapter of the dissertation, titled “Analysis and Development Tendencies of Wheat Production and the Level of Provision with Machinery”, scientific conclusions are formed based on an analysis of the current state and tendencies of wheat production, the level of provision with agricultural machinery, and the factors affecting the agricultural technical potential.

Wheat is considered the most important food crop in agriculture. The majority of the world’s population’s food rations consist of grain and cereal products. Grain crops occupy 14 per cent of the world’s arable land. Worldwide wheat production is 760 million tons per year. By 2030, this indicator is expected to increase to 850 million tons. In food trade, grain products account for 50 per cent. Accordingly, wheat products are in high demand on the world market. At the same time, wheat provides more than 52 per cent of Uzbekistan's food calories.

This dissertation selected the Jizzakh region as the object of research. Agriculture, particularly grain production and cotton growing, occupies a leading position in the region's economy. In particular, the mix of irrigated and rainfed lands creates significant opportunities for agricultural production. The cultivated area in the Jizzakh region exceeds 504.3 thousand hectares, of which more than 259.9 thousand hectares are irrigated sown areas.

Figure 3 shows that from 2019 to 2024, the gross harvest of grain crops in the region increased from 711.3 thousand tons to 737.1 thousand tons, showing a generally steady growth trend. The gross wheat harvest decreased slightly from 536.8 thousand tons to 524.1 thousand tons.

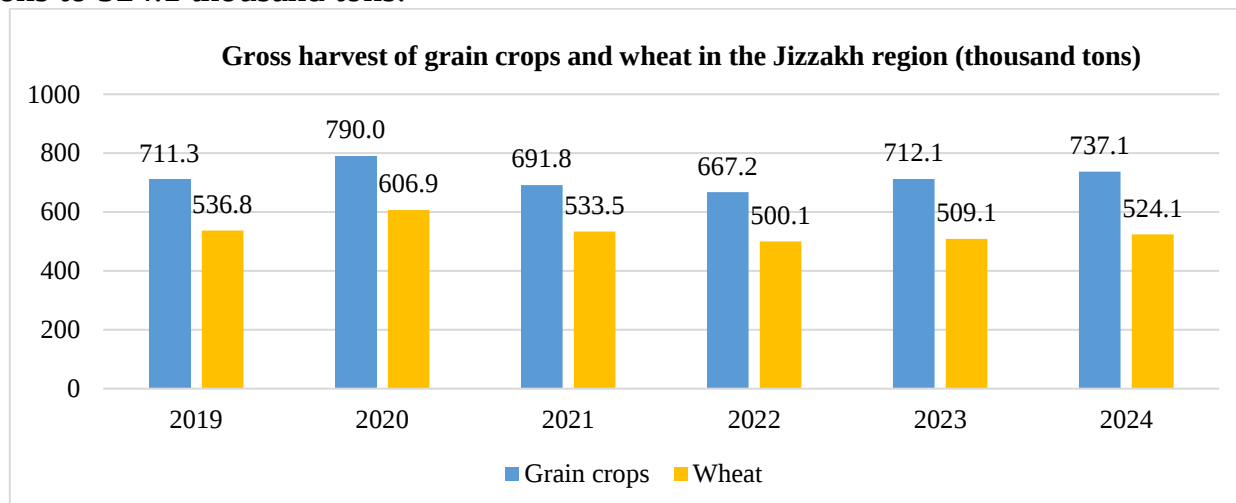


Figure 3. Gross harvest of grain crops and wheat in the Jizzakh region for 2019-2024⁴³

The analysis above shows significant differences in grain and wheat production indicators across districts in the Jizzakh region. In particular, Dustlik district is one of the leading regions in gross harvest volume, reaching 97.6 thousand tons in 2024, and its growth dynamics show a stable positive trend. This area is characterised by an intensive production model. In the Arnasay district, despite relatively difficult natural and climatic conditions, the gross harvest increased from 79.0 thousand tons to 83.5 thousand tons. This situation creates an important empirical basis for the effective use of land resources and the analysis of the impact of technical factors.

Therefore, the research focused on Dustlik district, with high production volumes and intensive development, and Arnasay district, with relatively difficult conditions.

Analysis of the dynamics of agricultural machinery provision in the Jizzakh region for 2014-2024 shows that the region's agricultural sector is gradually strengthening its technical potential (Table 2).

During this period, most main types of machinery showed an increasing trend. First, the number of ploughing tractors increased from 243 units in 2014 to 435 units in 2024, an increase of 179.01 per cent. This means the level of mechanisation of the main land cultivation processes has increased significantly.

⁴³ Developed by the author based on data from the Statistics Department of the Jizzakh region.

Table 2

**Dynamics of provision of agricultural machinery in the Jizzakh region
(in unit)⁴⁴**

No.	Name of machinery	2014	2018	2022	2023	2024	2024 compared to 2014, in %
1	Plowing tractors	243	260	335	431	435	179,01
2	Mowing tractors	1341	1403	1410	1405	1383	103,13
3	Transport tractors	643	681	341	850	881	137,01
4	Grain harvesters	281	294	339	308	322	114,59
5	Grain seeders	78	84	88	101	109	139,74
6	Plows	243	260	335	431	435	179,01
7	Tractor trailers	1286	1362	1405	1422	1640	127,53
8	Mineral fertilizer spread machines	213	205	239	235	233	109,39
9	Organic fertilizer spread machines	259	298	319	317	324	125,09
10	Chisels	288	338	362	364	366	127,08
11	Harrows	6478	6863	7594	7593	7484	115,53

According to the data in Table 3, the level of provision of agricultural production with machinery in the Jizzakh region as of 2025 was analyzed based on normative requirements.

Table 3

**Level of provision of agricultural production in the Jizzakh region with
machinery⁴⁵**

No.	Name of machinery	Volumes of work for the actual period, ha	Demand for 1000 ha, units	Normative demand, units	Available as of 2025, units	Level of provision, percent
1	Plowing tractors	88100	4	352	435	123,4
2	Mowing tractors	67600	18	1217	1383	113,7
3	Transport tractors	67600	12	811	881	108,6
4	Grain harvesters	88100	2,5	220	322	146,2
5	Grain seeders	44000	4,8	211	109	51,6
6	Plows	88100	4	352	435	123,4
7	Tractor trailers	67600	24	1622	1640	101,1
8	Mineral fertilizer spraying machines	88100	2,1	185	233	125,9
9	Organic fertilizer spreading machines	88100	4	352	324	92
10	Chisels	44000	3	132	366	277,3
11	Harrows	44000	40	1760	7484	425,2

According to calculations, the number of available machinery in some fields exceeds the normative requirement, while in others there is a shortage. First, while the normative requirement for ploughing tractors was 352 units, 435 units are in stock, and the provision level is 123.4 per cent. For mowing (113.7 %) and transport tractors (108.6 %), the indicator was higher than the normative requirement.

The provision level for grain harvesters is 146.2 per cent, indicating sufficient technical equipment in the grain production sector. At the same time, there are

⁴⁴ Compiled by the author based on data from the Jizzakh Regional Department of Agriculture.

⁴⁵ Compiled by the author based on data from the Jizzakh Regional Department of Agriculture.

109 units of grain seeders against a demand of 211; a shortage of 102 units was noted, and the provision level is only 51.6 per cent. Significant over-provision is seen in other fields. Especially high indicators were noted for harrows (425.2%) and chisels (277.3%), meaning these types of machinery are available in excess of normative calculations.

The level of machinery provision in agriculture directly affects production efficiency. In particular, the use of modern machinery increases the efficiency of using labor and fuel resources. Therefore, we analysed the difference between wages and fuel costs arising from the use of old and new machinery in the wheat production process using a 10-hectare area as an example. According to calculations, significant differences in labor and fuel resource costs were found due to the use of old and new machinery during the wheat production process on 10 hectares. At the same time, wages and fuel costs were calculated separately for the main stages of the production process: the sowing stage, the growing stage and the harvesting stage (Table 4).

Table 4

Analysis of costs for using old and new machinery in the process of growing wheat on an area of 10 hectares⁴⁶

No.	Indicators	Old machinery	New machinery
<i>Sowing stage</i>			
1	Wage, thousand soums	2054,1	1064,2
2	Fuel consumption, litres	434,9	342,9
3	Fuel consumption, thousand soums	4783,4	3771,9
Total (thousand soums)		6837,4	4836,1
<i>Growing stage</i>			
1	Wage, thousand soums	2347,0	1516,3
2	Fuel consumption, litres	642,0	576,0
3	Fuel consumption, thousand soums	7061,5	6335,9
Total (thousand soums)		9408,5	7852,2
<i>Harvesting stage</i>			
1	Wage, thousand soums	3543,3	2540,1
2	Fuel consumption, litres	662,5	571,9
3	Fuel consumption, thousand soums	7287,7	6290,8
Total (thousand soums)		10831,0	8830,8
<i>For all stages</i>			
1	Wage, thousand soums	7944,4	5120,5
2	Fuel consumption, litres	1739,3	1490,8
3	Fuel consumption, thousand soums	19132,5	16398,6
Total (thousand soums)		27076,9	21519,1

Overall, the total production costs for all stages of the wheat production process on an area of 10 hectares amounted to 27,076.9 thousand soums using old machinery and 21,519.1 thousand soums using new machinery, representing a decrease of 5,557.8 thousand soums or 20.5 per cent. It indicates that the use of modern machinery reduces production costs by increasing the efficiency of labor and fuel resources.

The level of provision of machinery in farms and its effective use demonstrates a significant impact on the economic results of the wheat production process. In order to

⁴⁶ Based on the author's calculations.

analyse this situation, a comparative analysis was conducted using the examples of the “Kuhna Sirlar” and “Zafar” farms in the Dustlik district. In the “Kuhna Sirlar” farm, when growing wheat on 1 hectare area, fuel consumption was 203 liters, labor costs were 2,565 thousand soums, yield was 48 qt/ha, and net profit was 1,464.5 thousand soums; in the “Zafar” farm, as a result of using modern machinery, fuel consumption averaged 175 liters per 1 hectare, labor costs were 2,333.2 thousand soums, yield reached 57 qt/ha, and net profit was 3,888.8 thousand soums. It follows that the use of modern machinery not only increases the efficiency of agrotechnical measures but also optimizes the use of fuel and labor resources. Overall, the research results showed that farms have technical potential, but imbalances persist in some components.

The third chapter of the dissertation, titled “**Directions for Increasing Technical Potential in Wheat Production**”, provides an economic assessment of the impact of agricultural technical potential on wheat yields based on an econometric model and substantiates proposals and recommendations for applying the escrow system in servicing agricultural machinery. Based on econometric modeling, forecast indicators for changes in wheat yields until 2031 have been determined.

Table 5

Statistical descriptions of variables determined based on survey results⁴⁷

No.	Variables	Measure- ment unit	No. obs.	Statistics			
				Mean	St. Dev.	Min.	Max.
1	Farmer’s work experience (X1)	year	230	12,226	6,798	2	27
2	Education level (X2)	categoric	230	3,148	1,043	1	4
3	Farmer’s gender (X3)	binary	230	0,839	0,368	0	1
4	Specialization level (X4)	coef.	230	0,628	0,171	0,21	1
5	Financial stability of the farm (X5)	categoric	230	1,935	0,776	1	3
6	Machinery modernization level (X6)	coef.	230	0,642	0,251	0	1
7	Mechanical sowing level (X7)	coef.	230	0,452	0,214	0	0,8
8	Mechanical work level (X8)	coef.	230	0,674	0,279	0	1
9	Mechanical harvesting level (X9)	coef.	230	0,074	0,262	0	1
10	Level of provision of machine operator personnel (X10)	categoric	230	2,270	0,865	1	3
11	Qualification level of machine operators (X11)	categoric	230	3,243	0,662	2	5
12	Level of awareness regarding the use of modern technology (X12)	categoric	230	3,148	0,785	1	5
13	Equipment rental/service use (X13)	binary	230	0,335	0,473	0	1
14	Number of watering (X14)	categoric	230	3,365	0,672	2	5
15	Mineral fertilization (X15)	categoric	230	3,178	1,065	1	5
16	Soil fertility (bonitet score) (X16)	in percent	230	67,344	7,817	51,6	84
17	Average yield (X17)	in quintal	230	44,045	4,900	26,5	62,9

The assessment of the impact of technical potential on wheat yields was based on empirical calculations and supported by quantitative and statistical analyses. The analyses were conducted based on the Structural Equation Modeling (SEM) described in Section 1.2 of the dissertation work. Table 5 presents the statistical descriptions of the variables used in the model.

⁴⁷ Prepared by the author based on survey data.

In the SmartPLS software, the sequence of operations for the model is as follows: model formation, measurement model validation, mediation analysis, assessment of structural results and general model quality assessment.

Furthermore, cause-and-effect relationships between factors are manifested through direct and indirect effects. While the direct effect is determined by the direct “path coefficient” of the independent latent variable to the resulting variable, the indirect effect is determined by intermediate (mediator) constructs (Tables 6-7).

The results showed that the direct effect of technical potential on wheat yield was 0.704 units, the factor with the strongest impact on yield.

Table 6

Specific indirect effect indicators in the model

Directions ⁴⁸	Indirect effect indicators
TVTD -> TEX_POT -> HOSIL	0,485*
MRFD -> TVTD -> TEX_POT -> HOSIL	0,399**
MRFD -> TEX_POT -> HOSIL	0,225*
MRFD -> TVTD -> TEX_POT	0,567**

The level of provision with machinery plays a key role in the formation of technical potential, and its expression of technical potential is 0.688 units, which indicates that increasing the number, quality, and level of use of machinery significantly strengthens technical potential.

Table 7

Path coefficients representing direct effect in the model

Directions	Path coefficients
MRFD -> TEX_POT	0,319*
MRFD -> TVTD	0,823*
TEX_POT -> HOSIL	0,704***
TIO -> HOSIL	0,054*
TVTD -> TEX_POT	0,688***
UMUM -> HOSIL	0,113

At the same time, the effect of the level of labor resource usage on technical potential is 0.319 units, confirming that although the labor factor is significant, it is secondary to the technical factor.

Based on the SEM (Structural Equation Modeling) model, the priority of the direct effect of technical potential and the indirect effect of factors representing the provision of machinery and the usage of labor resources in the economic assessment of factors affecting wheat yields in farms in the Jizzakh region has been scientifically substantiated.

Within the framework of our research, we used the ARIMA model to forecast wheat yield changes based on an econometric model of factors representing the

⁴⁸ TEX_POT – Technical potential; UMUM – General factors; TIO – Organizational-economic factors; TVTD – Factors expressing the provision of machinery; MRFD – Factors expressing the usage of labor resources; HOSIL – Factors affecting crop yield

technical potential affecting wheat yields on farms in the Jizzakh region. In the model, we used the gross volume of wheat grown by farms in the region over the years, the sown area, and the main types of machinery as variables.

The ARIMA (Autoregressive Integrated Moving Average) model is a statistical model used in the analysis and forecasting of time series, represented by three main parameters: p – the autoregression (AR) order, d – the difference (differentiation) order obtained to bring the series to a stationary state, and q – the moving average (MA) model order.

The ARIMA model is effective in analyzing long-term periodic data. This model allows for the forecasting of future indicators based on values and errors from previous periods. That is, by accounting for average and dynamic changes in the base years, it is possible to determine trends in the coming period. Before assessing the model, the level of stability of the variables was checked using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (P-P) tests, and it was determined that all variables are first-order integrated, i.e., $I(1)$ process.

We selected ARIMA (1,1,0), ARIMA (0,1,0), and ARIMA (2,1,0) from the created models using existing criteria, and we used AIC and BIC as the main selection indicators when assessing the reliability of the established models. In the process of determining the most optimal among several variants of ARIMA models, the values of these information criteria were compared.

According to the model selection rules, the variant with the lowest AIC and BIC values was accepted as the most reliable and optimal model. Based on the assessment results, the variant ARIMA (2, 1, 0) was selected as the most optimal model among the reviewed models.

Ljung-Box, Jarque-Bera and ARCH tests were conducted to check the adequacy of the model. Based on the test results, the model was deemed suitable for prediction if the residuals exhibited white-noise properties, were normally distributed, and had stable dispersion.

During the assessment of the model's adequacy, it was determined that the coefficient of determination (R^2) is equal to 0.876. This means that the selected model is highly compatible with the data set. It is known that the R^2 indicator represents the share of the total variance of the dependent variable explained by the independent variables in the regression model. In other words, R^2 equals 0.876, meaning the factors in the model account for 87.6 per cent of the variation in the dependent variable.

Based on the results in Table 8, gross wheat yield on the region's farms is forecast to grow steadily from 479.8 thousand tons in 2024 to 565.2 thousand tons by 2031, a 17.8 per cent increase.

Overall, the forecast results confirm that strengthening technical potential will positively affect wheat yield growth and indicate steady expansion of production volumes in the future. This creates a practical basis for determining development directions and strategies in the agricultural sector.

Table 8

Dynamics of future changes in the gross wheat yield and technical potential factors affecting it in the region's farms⁴⁹

Years	Gross harvest (thsd. tons) Y	Land area (thsd. ha) X1	Number of tractors (units) X2	Grain seeders (units) X3	Grain harvesters (units) X4	Fertilizer spreading machines (units) X5
2026	493,2	97,3	1411	117	337	581
2027	506,2	95,1	1420	115	339	594
2028	512,3	94,2	1432	112	344	598
2029	521,3	92,4	1449	118	342	609
2030	540,9	90,8	1458	123	349	615
2031	565,2	87,9	1472	133	357	623

As practice shows, problems in the technical maintenance process are not limited to the insufficient development of the material and technical base or service infrastructure. Often, problems arise such as an imbalance between service quality and payments, incomplete fulfilment of contractual obligations, as well as a low level of mutual trust between the parties. In order to solve this problem, it is proposed to implement an escrow mechanism based on the guaranteed fulfilment of financial obligations through a third party in the agricultural technical maintenance system.

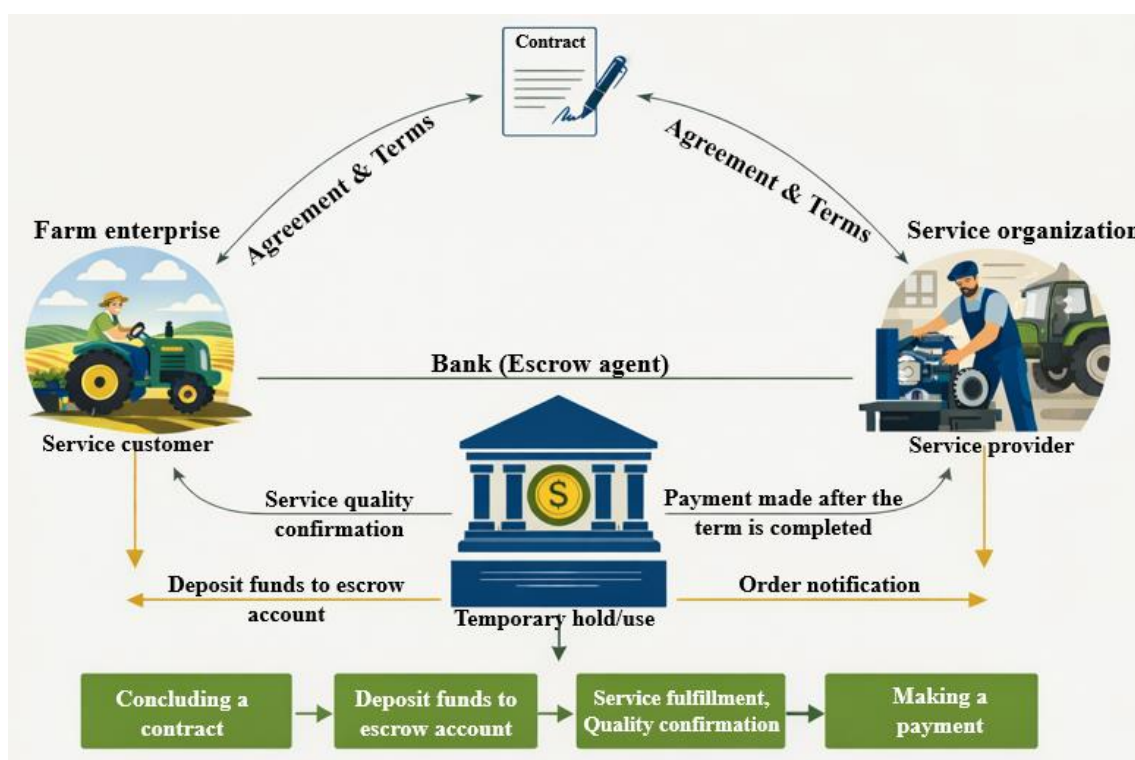


Figure 4. Operational mechanism of the escrow system in technical maintenance in agriculture⁵⁰

⁴⁹ The author's estimates using the STATA-17 software.

⁵⁰ Prepared based on the author's research.

This mechanism is based on a tripartite institutional relationship: the farm (customer), the technical service entity (executor) and the bank or authorised financial institution (escrow agent).

The proposed mechanism is implemented in 4 stages (Fig. 4).

In the first stage, the farm and the service organisation sign a contract that clearly defines the scope, duration, price, and quality indicators of the technical services. The contract specifies the criteria for evaluating service results, the acceptance procedure and the dispute resolution mechanism.

In the second stage, the farmer transfers the funds to a bank account, not directly to the service organisation, and the funds remain in the account until the service is completed.

In the third stage, the service organisation performs technical maintenance based on the established deadlines and requirements, and documents the completed work with the relevant documents.

At the fourth stage, after the quality of service is found to be in accordance with the terms of the contract, the bank transfers the funds to the service organisation. If the service quality is not up to standard, the funds will be refunded or reviewed in accordance with the procedures specified in the contract.

As a result, a guarantee of service quality will be created for farms, service centres will strive to fulfil their obligations in a timely and complete manner, the problem of “cheap but low-quality” repairs will be reduced, and a transparent financial mechanism for public-private partnership will be established.

CONCLUSION

1. Summarising the results of the analysis, it can be concluded that the technical potential of agriculture is a set of technical equipment defined by production volume and specialisation, which is technologically connected to the production capabilities of labor resources and includes the ability to produce a certain volume of products based on technological processes related to the efficient use of land resources.

2. In the research work, the PLS-SEM (Partial Least Squares Structural Equation Modeling) approach – a model of variance-based structural equations – was applied to assess the impact of agricultural technical potential on wheat yields. This method is based on an iterative (repetitive) computational algorithm aimed at maximizing the explanation of the variance of endogenous variables rather than covariance. This approach involves simultaneous evaluation of the measurement and structural model, identification of latent constructs based on indicators, and verification of the statistical significance of path coefficients. Another important aspect is that it allows for a multi-stage analysis of cause-and-effect relationships and the quantitative expression of the total effect.

3. Today, foreign countries use models of agrotechnical services for the technical maintenance of farmers and agricultural entities. Escrow.com platform is widely used in the USA, “Hello Tractor” in Nigeria, Agricultural Machinery Service Centers in China, JA Group Machinery Sharing System in Japan, EM3 Agri Services in India, Machine Hire Centers (MHC) in Mexico. The research examined successful experience in agricultural machinery maintenance in foreign countries. The authors

developed proposals to improve agricultural machinery maintenance by adapting this experience to Uzbekistan's conditions.

4. From 2019 to 2024, the total area of grain crops in the Jizzakh region remained relatively stable, changing only slightly from 221.7 thousand hectares to 221.8 thousand hectares. Wheat sown area declined during this period. Specifically, it decreased from 143.2 thousand hectares in 2019 to 117.9 thousand hectares in 2024, representing a decrease of 25.3 thousand hectares, or nearly 17.7 per cent. From 2019 to 2024, the region's gross grain harvest increased from 711.3 thousand tons to 737.1 thousand tons, showing a steady overall growth trend. The gross harvest of wheat decreased slightly from 536.8 thousand tons to 524.1 thousand tons. This is linked to reduced wheat cultivation areas, indicating that production volumes were maintained mainly through productivity and intensive factors.

5. Within the framework of the research, we analysed the provision of the main types of agricultural machinery in the Jizzakh region and the duration of their use. The share of equipment used for 1-5 years is relatively low. For ploughing tractors, this figure is 23.4 per cent, for mowing tractors – 22.6 per cent, and for sprayers – 20.1 per cent. The highest share was observed in organic fertiliser spreading machines (32.8 %). Most machinery has been in operation for 6-15 years; mowing tractors have a service life of 6-10 years, accounting for 28.3 per cent, while those with a service life of 11-15 years account for 24.8 per cent. Machinery that has been in use for 20 years or more occupies a significant place in the total structure. Overall, machinery older than 15 years accounts for more than a quarter of the available equipment. In such conditions, along with machinery modernisation, the primary condition for increasing efficiency in agriculture is effective organisation of technical maintenance based on the aforementioned situation.

6. Monographic research was conducted with 230 farms in the Dustlik and Arnasay districts of the third region of the Jizzakh region; using the “KAP Survey” questionnaire method, the level of technical equipment renewal, mechanical sowing, mechanical works, and mechanical harvesting was determined, and their distribution was analyzed using the Stata software. According to the results, technical equipment renewal is primarily concentrated in the 0.6-0.9 coefficient range. Specifically, 50 farms had a coefficient of 0.8, 38 had 0.6, and 13 had 0.7. This situation indicates that a significant portion of the surveyed farmers have updated at least 60-80 per cent of the technical park. Overall, the results show that farms have technical potential, but imbalances persist in some structural components.

7. Analysis of the results based on the structural equation model (SEM) shows that the direct effect of technical potential on wheat yield was 0.704 units, the factor with the strongest impact on yield. The level of provision with machinery plays a key role in the formation of technical potential, and its expression of technical potential is 0.688 units, which indicates that increasing the number, quality, and level of use of machinery significantly strengthens technical potential. At the same time, the impact of the level of labor resource usage on technical potential is 0.319 units, confirming that although the labor factor is significant, it is secondary to the technical factor. Based on the SEM (Structural Equation Modeling) model, the priority of the direct effect of technical potential and the indirect effect of factors representing the provision with

machinery and the use of labor resources in the economic assessment of factors affecting wheat yields in farms in the Jizzakh region has been scientifically substantiated.

8. The growth of the gross wheat harvest in the region's farms during 2026-2031 has been scientifically substantiated. That is, it is scientifically substantiated that the forecast volumes of the gross wheat harvest in the region's farms will increase from 479.8 thousand tons in 2024 to 565.2 thousand tons in 2031, i.e., by 17.8 per cent.

9. As a result of the implementation of an escrow system based on the guaranteed fulfilment of financial obligations between technical service entities and farms through a third party (bank), the continuous work of machinery in farms is ensured, maintenance processes are carried out in a timely and high-quality manner, the fulfilment of financial obligations is guaranteed, mutual trust with service entities is strengthened, and economic losses resulting from delays in agrotechnical measures are significantly reduced.

**НАУЧНЫЙ СОВЕТ PhD.08/2025.27.12.I.15.01 ПО ПРИСУЖДЕНИЮ
УЧЕНЫХ СТЕПЕНЕЙ ПРИ МЕЖДУНАРОДНОМ
СЕЛЬСКОХОЗЯЙСТВЕННОМ УНИВЕРСИТЕТЕ**

**МЕЖДУНАРОДНЫЙ ЦЕНТР СТРАТЕГИЧЕСКОГО РАЗВИТИЯ И
ИССЛЕДОВАНИЙ В СФЕРЕ ПРОДОВОЛЬСТВИЯ И СЕЛЬСКОГО
ХОЗЯЙСТВА**

МАДИЕВ ШАХЗОД ШОДМОН УГЛИ

**ЭКОНОМИЧЕСКАЯ ОЦЕНКА ВЛИЯНИЯ ТЕХНИЧЕСКОГО
ПОТЕНЦИАЛА СЕЛЬСКОГО ХОЗЯЙСТВА НА УРОЖАЙ ПШЕНИЦЫ**

08.00.04 – Экономика сельского хозяйства

АВТОРЕФЕРАТ

**диссертации на соискание ученой степени
доктора философии (PhD) по экономическим наукам**

Ташкент – 2026

Тема диссертации доктора философии (PhD) зарегистрирована в Высшей аттестационной комиссии Республики Узбекистан под номером B2025.4.PhD/Iqt5981.

Диссертация выполнена в Международном центре стратегического развития и исследований в сфере продовольствия и сельского хозяйства.

Автореферат диссертации на трёх языках (узбекском, русском и английском (резюме)) размещён на веб-сайте Учёного совета (www.iau.uz) и на информационно-образовательном портале «Ziynet» (www.ziynet.uz).

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Самаркандский институт агроинноваций и исследований

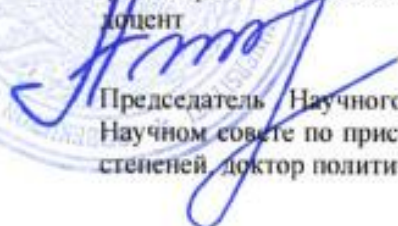
Защита диссертации состоится «6» 10 2026 года в 15⁰⁰ часов на заседании Научного совета PhD.08/2025.27.12.1.15.01 по присуждению ученых степеней при Международном сельскохозяйственном университете (Адрес: 111200, Ташкентская область, Кибрайский район, улица Университетская, дом 2. Тел.: +998 55 517-00-71, e-mail: scientificcouncil@iau.uz).

С диссертацией можно ознакомиться в Информационно-ресурсном центре Международного сельскохозяйственного университета (зарегистрирован под номером 3). (Адрес: 111200, Ташкентская область, Кибрайский район, улица Университетская, 2. Тел.: +998 55 517-00-71, e-mail: scientificcouncil@iau.uz).

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ВВЕДЕНИЕ (аннотация диссертации доктора философии (PhD))

Целью исследования является разработка научно обоснованных предложений и практических рекомендаций по экономической оценке влияния технического потенциала сельского хозяйства на урожай пшеницы.

В качестве **объекта исследования** были выбраны субъекты сельского хозяйства, осуществляющие деятельность в Джизакской области. Для монографических исследований были отобраны фермерские хозяйства, выращивающие пшеницу в Дустликском и Арнасайском районах Джизакской области.

Научная новизна исследования заключается в следующем:

с теоретической точки зрения усовершенствовано экономическое содержание понятия «технический потенциал», выражающего возможность максимального использования технических средств в производстве сельскохозяйственной продукции с учётом таких показателей, как виды технических средств, их количество, качество, износ, а также уровень обеспеченности техникой;

согласно методологическому подходу к экономической оценке на основе модели SEM (Structural Equation Modeling), научно обоснована приоритетность прямого влияния (direct effect) технического потенциала на урожай пшеницы в фермерских хозяйствах, а также косвенного влияния (indirect effect) факторов, выражающих обеспеченность техническими средствами и использование трудовых ресурсов;

разработаны прогнозные показатели изменения урожая пшеницы до 2031 года на основе эконометрической модели факторов, отражающих технический потенциал, влияющий на урожай пшеницы в фермерских хозяйствах Джизакской области;

в целях обеспечения непрерывной работы технических средств в сельском хозяйстве, а также своевременной организации технического обслуживания предложено внедрение системы эскроу (escrow), основанной на гарантированном осуществлении финансовых обязательств между субъектами технического обслуживания и фермерскими хозяйствами через третье лицо (банк).

Внедрение результатов исследования. На основе полученных научных результатов, по экономической оценке, влияния технического потенциала сельского хозяйства на урожай пшеницы:

предложение по совершенствованию определения понятия «технический потенциал» на основе его экономического содержания, выражающего возможность максимального использования технических средств при производстве сельскохозяйственной продукции с учётом таких показателей, как виды технических средств, их количество, качество, износ, а также уровень обеспеченности техникой, было использовано в учебном процессе высших учебных заведений, в учебнике «Экономика сельскохозяйственного производства», предназначенном для студентов направления образования 61010400 – Туризм (агротуризм) (приказ Ташкентского государственного

аграрного университета № 1-9-6/139 от 4 июня 2025 года). В результате внедрения данной научной новизны в практику создаётся возможность повышения знаний и навыков студентов посредством более широкого понимания содержания понятия технического потенциала сельского хозяйства;

методический подход к экономической оценке влияния технического потенциала на урожай пшеницы в фермерских хозяйствах был внедрён в практику Управлением сельского хозяйства Джизакской области в районах области (справка Национального центра знаний и инноваций в сельском хозяйстве № 05/04-04–280 от 17 марта 2026 года). В результате установлено, что в фермерских хозяйствах Дустликского и Арнасайского районов прямое влияние технического потенциала на урожай пшеницы составило 0,704 единицы, определяя его как фактор, оказывающий самое сильное влияние на урожайность, отражение технического потенциала уровнем обеспеченности техническими средствами составило 0,688 единицы, а влияние уровня использования трудовых ресурсов на технический потенциал составило 0,319 единицы;

рекомендации по определению прогнозных показателей изменения урожая пшеницы до 2031 года на основе эконометрической модели факторов, характеризующих технический потенциал, влияющий на урожай пшеницы в фермерских хозяйствах Джизакской области, были внедрены в практику Управлением сельского хозяйства Джизакской области (справка Национального центра знаний и инноваций в сельском хозяйстве № 05/04-04–280 от 17 марта 2026 года). В результате за счет повышения уровня технического потенциала в регионе прогнозируется увеличение валового сбора пшеницы с 479,8 тыс. тонн в 2024 году до 565,2 тыс. тонн к 2031 году, то есть на 17,8 процента;

предложение по внедрению системы эскроу (escrow), основанной на гарантированном осуществлении финансовых обязательств между субъектами, оказывающими техническое обслуживание, и фермерскими хозяйствами через третье лицо (банк), было использовано в деятельности Дустликского районного филиала АКБ «Xalq bank» (справка Национального центра знаний и инноваций в сельском хозяйстве № 05/04-04-280 от 17 марта 2026 года). В результате обеспечивается непрерывная работа технических средств в фермерских хозяйствах, процессы технического обслуживания осуществляются своевременно и качественно, гарантируется выполнение финансовых обязательств, укрепляется взаимное доверие с субъектами, оказывающими услуги, а также значительно сокращаются экономические потери, возникающие в результате задержки агротехнических мероприятий.

Структура и объем диссертации. Диссертационная работа состоит из введения, трёх глав, заключения и списка использованной литературы. Работа изложена на 121 странице, включая 37 статистических, аналитических и расчётных таблиц, 23 рисунка и 1 приложение.

E'LON QILINGAN ISHLAR RO'YXATI
СПИСОК ОПУБЛИКОВАННЫХ РАБОТ
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Avtoreferat “O‘zbekiston agrar fani xabarnomasi”
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