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

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

AHATQULOV BAHRIDDIN MATLABOVICH

ZAMONAVIY BIOTEXNOLOGIYALAR ASOSIDA KARTOSHKA URUG‘CHILIGINING IQTISODIY SAMARADORLIGINI OSHIRISH

08.00.04 – Qishloq xo‘jaligi iqtisodiyoti

IQTISODIYOT FANLARI BO‘YICHA FALSAFA DOKTORI (PHD) DISSERTATSIYASI AVTOREFERATI

Samarqand – 2026

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Оглавление авторефарата диссертасии доктора философии (PhD) по экономическим наукам

Contents of the Dissertation Abstract of Doctor of Philosophy (PhD) in Economics Sciences

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Falsafa doktori (PhD) dissertatsiyasi mavzusi O‘zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi huzuridagi Oliy attestatsiya komissiyasida B2025.3.PhD/Iqt5660 raqam bilan ro‘yxatga olingan.

Dissertatsiya Oziq-ovqat va qishloq xo‘jaligi sohasida strategik rivojlanish va tadqiqotlar xalqaro markazida bajarilgan.

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KIRISH (Falsafa doktori (PhD) dissertatsiyasi annotatsiyasi)

Dissertatsiya mavzusining dolzarbligi va zarurati. Kartoshka dunyo aholisi iste'molida muhim ahamiyatga ega. U iste'mol bozorining barqarorligini ta'minlaydigan, oziq-ovqat xavfsizligini mustahkamlaydigan strategik mahsulotdir. Ma'lumotlarga ko'ra, oxirgi yillarda kartoshka ekini maydonlari Afrikada 382 %, Markaziy Osiyoda 162 % kengaygan, Yevropada 69 % qisqargan.[1] Shu sababli kartoshka yetishtiradigan barcha davlatlarda, shu jumladan respublikamizda ham zamonaviy biotexnologiyalar asosida kartoshka urug'chiligining iqtisodiy samaradorligini oshirishga qaratilgan ilmiy tadqiqotlarga ehtiyoj mavjud.

Jahonda qator yo'nalishlarda yangi innovatsion yondashuvlar orqali yuqori hosildor kartoshka navlarini yaratish va sifatli kartoshka tugunaklarini yetishtirish orqali samaradorlikni oshirishga qaratilgan ilmiy-tadqiqotlar olib borilmoqda. Kartoshkachilikda yuqori hosildor, sifatli kartoshka to'qimalaridan mikro va mini tuganaklarni ko'paytirish hamda mahalliy urug'chilikni rivojlantirish tadqiqiotchilar oldiga dolzarb masalalarni qo'yadi. Bugungi kunda O'zbekistonda kartoshka yetishtirishdan olingan hosil iste'mol va urug'likka bo'lgan talabni qoplamaydi. Бу, o'z navbatida, talab tufayli narxlarning oshishiga, import hajmini kengayishiga sabab bo'lmoqda, yetishtirishda xarajatlari yuqori bo'lgani uchun sotishdan kam daromad olinmoqda.

Respublikamizning turli tuproq-iqlim sharoitlarida sifatli hamda mo'l kartoshka hosilini yetishtirish uchun intensiv usul hisoblangan in vitro ko'paytirish asosida kartoshka urug'chiligini yo'lga qo'yish, virus va kasalliklardan xoli kartoshka tugunaklarini ekish orqali an'anaviy usulga nisbatan yuqori hosildorlikka erishish hamda samaradorlikni oshirish bo'yicha muayyan natijalarga erishilmoqda. "O'zbekiston – 2030" strategiyasi"da mahalliy sabzavot, poliz va kartoshka urug'liги ta'minotini 50 %га yetkazish (54-maqsad) va oziq-ovqat mahsulotlarini yetishtirishni nazarda tutuvchi mexanizmlar qishloq xo'jaligini rivojlantirishning 2020-2030-yilgacha mo'ljallangan strategiyasida ustuvor yo'nalish sifatida belgilangan.[2]

Mazkur dissertatsiya иши O'zbekiston Respublikasi Prezidentining "O'zbekiston Respublikasi qishloq xo'jaligini rivojlantirishning 2020-2030-yillarga mo'ljallangan strategiyasini tasdiqlash to'g'risida" 2019-yil 23-oktabrdagi PF-5853-son, "Tomorqa yer egalari va dehqon xo'jaliklari faoliyatida zamonaviy tashkiliy tizimni joriy qilish va moliyaviy qo'llab-quvvatlashning qo'shimcha chora-tadbirlari to'g'risida" 2025-yil 14-fevraldagi PF-22-son Farmonlari, "Respublikada kartoshka yetishtirishni ko'paytirish va urug'chiligini yanada rivojlantirishga doir qo'shimcha chora-tadbirlar to'g'risida" 2025-yil 8-sentabrdagi PQ-269-son, "Respublikada kartoshka yetishtirishni kengaytirish va urug'chiligini yanada rivojlantirish chora-tadbirlari to'g'risida" 2020-yil 6-maydagi PQ-4704-son qarorlari hamda mazkur sohaga tegishli boshqa me'yoriy-huquqiy hujjatlarda belgilangan vazifalarni amalga oshirishga muayyan darajada xizmat qiladi.

Tadqiqotning respublika fan va texnologiyalari rivojlanishining ustuvor yo'nalishlariga bog'liqligi. Dissertatsiya tadqiqoti respublika fan va texnologiyalar rivojlanishning II. "Demokratik va huquqiy jamiyatni ma'naviy, axloqiy hamda madaniy-

[1] Хамидреза Вадждани. 2022. "Применение картофеля в прикладных науках". https://pem.areeo.ac.ir/article_128058_a9bb42c14a2d7c8705f67a7b32b25344.

[2] O'zbekiston Respublikasi Prezidentining "O'zbekiston-2030" strategiyasi to'g'risida" 2023-yil 11-sentyabrdagi PF-158-son Farmoni.

ma’rifiy rivojlantirish, innovatsion iqtisodiyotni shakllantirish”, shu bilan birga, V. “Qishloq xo‘jaligi, biotexnologiya, ekologiya va atrof-muhit muhofazasi” bo‘yicha ustuvor yo‘nalishlar doirasida bajarilgan.

Muammoning o‘rganilganlik darajasi. Serhosil kartoshka navlarida zamonaviy usullarni takomillashtirish va hosilni ko‘paytirish, parvarishlash usullarini iqtisodiy tahlil qilish, kartoshka yetishtirishning iqtisodiy samaradorligini oshirishda ishlab chiqarish xarajatlarini kamaytirish, kartoshka navlarining urug‘ berish xususiyatlarini o‘rganish, iqtisodiy foydani ko‘paytirishga mo‘ljallangan strategiyalarni takomillashtirish, organik o‘g‘itlarning hosildorlikni oshirishdagi iqtisodiy samaradorligini baholash, kartoshka urug‘chiligida in-vitro ko‘paytirish orqali boshlang‘ich materiallarni olish, shuningdek iqtisodiy samaradorlikka erishish imkoniyatlarini asoslashga qaratilgan ilmiy-tadqiqotlar xorijlik olimlardan Vishegurov S.X.[3], Belova M.V.[4], Chagin V.V.[5], Naser M.[6], Oves Y.V.[7] hamda boshqalar tomonidan olib borilgan.

Respublikamizda Sherkabilov Sh.A., Dilmurodov O.G., Iskandarov S.T., Alimov U.Z., Saidjonov S.J. va Hasanov B.T.[8] kabi yetakchi olimlar tomonidan kartoshka urug‘chiligida iqtisodiy samaradorlikni oshirish, agrosanoat majmuida qo‘shimcha qiymat zanjirini yaratish bo‘yicha ilmiy-tadqiqotlar bajarilgan. Lekin respublikamiz sharoitida zamonaviy biotexnologiyalar asosida kartoshka urug‘chiligining iqtisodiy samaradorligini oshirishga qaratilgan ilmiy-tadqiqotlar yetarlicha amalga oshirilmagan.

Dissertatsiya mavzusining dissertatsiya bajarilgan ilmiy-tadqiqot ishlari rejasi bilan bog‘liqligi. Dissertatsiya tadqiqoti Oziq-ovqat va qishloq xo‘jaligi sohasida strategik rivojlanish va tadqiqotlar xalqaro markazining ilmiy-tadqiqotlar uchun ish rejasining 6-bandiga asosan oziq-ovqat tarmog‘ini rivojlantirishni qo‘llab-quvvatlash, amaldagi loyiha va dasturlarning iqtisodiy tahlillari doirasida bajarilgan.

Tadqiqotning maqsadi biotexnologik usul hisoblangan in vitro ko‘paytirish asosida kartoshka urug‘chiligining samaradorligini oshirish bo‘yicha nazariy va ilmiy taklif hamda tavsiyalar ishlab chiqishdan iborat.

Tadqiqotning vazifalari:

kartoshkaning virus va turli kasalliklarga chidamliligi, vegetatsiya davrining optimallashuvi, shuningdek birlik maydondan olinadigan sof foydani ekstensiv usullarga nisbatan multiplikativ o‘sishini asoslash;

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[3] Вишегуров С.Х. “Совершенствование агротехнических приемов выращивания разных сортов оздоровленного семенного картофеля в лесостепи приобья” (2000 г).

[4] Белова М.В. “Повышение экономической эффективности производства и реализации картофеля” (2004).

[5] Чагин В.В. “Сортовой потенсиал и семенная продуктивност картофеля в степной зоне Рес. Хакасия” (2011 г).

[6] Naser M. “Effect of Fish Amino Acid on Potato Growth and Yield under Natural Science Farming” (2018-y).

[7] Овес Й.В. “Биотехнологические основы совершенствования процесса получения и размножения исходного материала в оригинальном семеноводстве картофеля” (2021 г).

[8] Sherkabilov Sh.A. Kartoshkachilikni barqaror rivojlantirishning iqtisodiy asoslarini takomillashtirish avt. T. 2025-y. 57-b.; Dilmurodov O.G. Iqtisodiyotni erkinlashtirish sharoitida meva-sabzavotchilik majmuida mahsulot sotishning logistik zanjirini takomillashtirish: diss. i.f.n.-T.: 2010-y.-152 b.; Iskandarov S.T. Himoyalangan yer sabzavotchiligini rivojlantirishning iqtisodiy asoslarini takomillashtirish: avt. diss. i.f.n.-T. 2018-y-46 b.; Alimov U.Z. Poliz mahsulotlarini yetishtirishning iqtisodiy samaradorligini oshirish yo‘llari: avt. diss. i.f.f.d.-T.: 2023-y. -52 b., Saidjonov S.J. Kartoshkachilikning rivojlanishi va uni iqtisodiy samaradorligini oshirish: avt. diss. i.f.n. – T.: 2009-y.; Hasanov B.T. Oziq-ovqat ta’minotida kartoshka yetishtirish qiymat zanjiri subyektlari faoliyatini takomillashtirish (Samarqand viloyati misolida): avt. i.f.f.d. – T.: Qarshi, 2024-y.

urug‘lik kartoshka yetishtirish bosqichlarida energiya, mehnat, muhit, material va boshqa xarajatlarni hisoblash va ularni xarajatlarga ta’sirini o‘rganish, iqtisodiy tahlillar asosida yangi mexanizm ishlab chiqish;

kartoshka hajmini oshirishga qaratilgan hamda yetishtirish jarayonlarini takomillashtiruvchi tizimni iqtisodiy va huquqiy qo‘llab-quvvatlash;

kartoshkaning iste’mol ratsionidagi ahamiyatini hisobga olib, davlat-xususiy sheriklik (DXSh) tamoyiliga asosan urug‘lik yetishtirish, saqlash hamda sotishda samaradorlikni ta’minlash bo‘yicha tavsiyalar ishlab chiqish;

kartoshka urug‘chiligining samaradorligini baholashda “Samaradorlik indeksi” orqali kartoshka urug‘chiligining samaradorligini baholash;

in vitro ko‘paytirishning samaradorligi yuqori bo‘lgan yangi mexanizmlari asosida O‘zbekiston Respublikasi uchun kartoshka urug‘chiligining 2030-yilgacha prognoz ko‘rsatkichlarini ishlab chiqish.

Tadqiqotning obyekti sifatida urug‘lik kartoshka yetishtiruvchi xo‘jaliklar hamda monografik tadqiqotlar uchun Sabzavot, poliz ekinlari va kartoshkachilik ilmiy-tadqiqot institutining Toyloq tumanidagi ilmiy-tadqiqot stansiyasi tanlab olingan.

Tadqiqotning predmeti in vitro ko‘paytirish usuli bilan kartoshka urug‘chiligini rivojlantirish, hosildorlik, sifat va urug‘ samaradorligini oshirish bo‘yicha fanlararo iqtisodiy munosabatlar tizimini tashkil qiladi.

Tadqiqot usullari. Tadqiqot jarayonida qiyosiy va iqtisodiy tahlil, ilmiy mantiqiy mushohada, monografik kuzatish, sintez, ekspert baholash, iqtisodiy-matematik modellashtirish hamda prognozlashdan foydalanilgan.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat**:**

kartoshka urug‘chiligida an’anaviy usullardan farqli ravishda in vitro ko‘paytirish usulini qo‘llash orqali mahsulot hajmining bosqichma-bosqich multiplikativ o‘sishi aniqlangan va iqtisodiy samaradorligi asoslangan;

kartoshka urug‘chiligining iqtisodiy samaradorligini baholashda “Samaradorlik indeksi” takomillashtirilib, samaradorlik darajalari juda samarasiz [1.0–1.4], samarasiz [1.5–2.4], qisman samarali [2.5–3.4], samarali [3.4–4.4], juda samarali [4.5–5.0] kabi mezonlar orqali baholanishi ilmiy asoslangan;

Samarqand viloyati misolida DXSh negizida urug‘lik kartoshka hajmini oshirish hamda yetishtirish jarayonlarini tizimli yondashuvlar asosida optimallashtirishga qaratilgan tashkiliy-iqtisodiy mexanizm ishlab chiqilgan va takomillashtirilgan;

O‘zbekiston Respublikasida zamonaviy biotexnologiyalarga asoslangan hamda iqtisodiy parametrlarga mos urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari ishlab chiqilgan.

Tadqiqotning amaliy natijalari quyidagilardan iborat**:**

kartoshka urug‘chiligida in vitro ko‘paytirish usuli asosida joriy etilgan 3 bosqichli yondashuv natijasida maydondan olinadigan sof foyda ekstensiv usullarga nisbatan multiplikativ o‘sish hisobiga 30 % gacha oshishi aniqlangan;

kartoshka urug‘chiligining iqtisodiy samaradorligi “Samaradorlik indeksi” uslubi asosida (juda samarasiz, samarasiz, qisman samarali, samarali, juda samarali) mezonlar bo‘yicha

baholanib, urug‘ yo‘qotishlari 5 % gacha, ortiqcha xarajatlar esa 20 % gacha kamayishi isbotlangan;

Samarqand viloyati misolida davlat-xususiy sheriklik asosida 3 yilga mo‘ljallangan, yetishtirish jarayonlarini takomillashtirish va qo‘llab-quvvatlash mexanizmlari natijasida 93 ming tonna yalpi hosil olish imkoniyati prognoz qilingan;

O‘zbekiston Respublikasida zamonaviy biotexnologiyalarga asoslangan hamda iqtisodiy parametrlarga mos urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari ishlab chiqilgan.

Tadqiqot natijalarining ishonchliligi. Kartoshka urug‘chiligida xarajatlarni maqbullashtirish, iqtisodiy samaradorlikni oshirish va resurslardan oqilona foydalanishga doir ma’lumotlarga statistik ishlov berilganligi, so‘rovnoma, monografik kuzatish, prognoz va eksperiment usullaridan foydalanilganligi, nazariy va amaliy natijalarning o‘zaro muvofiqligi, ularning amaliyotga joriy etilganligi, shuningdek tadqiqot natijalarining respublika va xalqaro miqyosdagi ilmiy-amaliy konferensiyalarda muhokama qilinganligi hamda O‘zbekiston Respublikasi Oliy attestatsiya komissiyasi tomonidan tavsiya etilgan ilmiy nashrlarda e’lon qilinganligi bilan asoslanadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Urug‘lik kartoshka yetishtirishda qo‘shimcha qiymat yaratish va ishlab chiqarishning texnologik bosqichlarini qisqartirish bo‘yicha ilmiy yondashuvlar ishlab chiqilganligi, kartoshka urug‘chiligida ortiqcha xarajatlarni kamaytirish va zamonaviy iqtisodiy mexanizmlarni joriy qilish imkoniyatlari asoslanganligi, hosilni muvofiqlashtirishga qaratilgan monitoring tizimi ishlab chiqilganligi, Samarqand viloyati misolida DXSh asosida urug‘lik kartoshka yetishtirish mexanizmi takomillashtirilganligi hamda respublikada zamonaviy biotexnologiyalarga asoslangan urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari ishlab chiqilganligi bilan belgilanadi.

Urug‘lik kartoshka yetishtirishda in vitro ko‘paytirish usuli kabi zamonaviy biotexnologiyalarni joriy etish, viruslardan xoli boshlang‘ich materiallardan foydalanish orqali qo‘shimcha qiymatni oshirish, ishlab chiqarish jarayonlarini soddalashtirish imkoniyati yaratilganligi, ishlab chiqilgan ilmiy taklif hamda tavsiyalar asosida fermer xo‘jaliklarida yuqori hosildorlik hamda daromadga erishish mumkinligi, shuningdek tadqiqot natijalaridan kartoshkachilikda iqtisodiy munosabatlarni takomillashtirish va “Qishloq xo‘jaligi iqtisodiyoti” fanini rivojlantirishda foydalanish imkoniyati mavjudligi bilan ifodalanadi.

Tadqiqot natijalarining joriy qilinishi. Kartoshka urug‘chiligining iqtisodiy samaradorligini oshirish bo‘yicha olingan ilmiy va amaliy natijalar asosida:

kartoshka urug‘chiligida in vitro ko‘paytirish asosida mahsulot hajmining bosqichma-bosqich multiplikativ o‘sishga va iqtisodiy samaradorlikni oshirishga qaratilgan yondashuv Qishloq xo‘jaligi vazirligi tizimida 17 ga maydonda joriy qilinib, hosildorlik 48 s/ga oshirilgan (Qishloq xo‘jaligi vazirligining 2025-yil 14-avgustdagi 05/05/4953-son ma’lumotnomasi, Qishloq xo‘jaligi vazirligining 2026-yil 10-martdagi 01/27-4-51-son 13 ta banddan iborat “Aholini kartoshkaga bo‘lgan ehtiyojini kafolatli ta’minlash, kartoshka yetishtirish hajmini oshirish hamda bozorlarda narxlar barqarorligini ta’minlash bo‘yicha chora-tadbirlar dasturi”).

kartoshka urug‘chiligida “Samaradorlik indeksi”ni takomillashtirish hamda “Yetishtirish-saqlash-sotish”ni avtomatlashtirish hisobiga samaradorlikni oshirishga qaratilgan yondashuv

respublika bo‘ylab ijrosini ta’minlashga qaratilgan (Qishloq xo‘jaligi vazirining “O‘zbekiston Respublikasi Vazirlar Mahkamasining 2025-yil 18-martdagi 166-son qarori ijrosini ta’minlash chora-tadbirlari to‘g‘risida” 2025-yil 11-sentabrdagi 218-son buyrug‘i, vazirlikning 2025-yil 14-avgustdagi 05/05/4953-son ma’lumotnomasi). Shuningdek, kompaniya misolida ortiqcha xarajatlar 10 % ga, urug‘ yo‘qotishlari 5 % ga kamaytirilib, iqtisodiy samaradorlik 76,67 % ga oshishi asoslangan;

Samarqand viloyati misolida DXSh asosida urug‘lik kartoshka yetishtirishni tashkiliy-iqtisodiy mexanizmi, 3 yilda 93 ming tonna urug‘lik kartoshka yetishtirish prognozi asosida Samarqand agroinnovatsiyalar va tadqiqotlar instituti qoshidagi “O‘zbekiston-Koreya kartoshka urug‘chiligi markazi” faoliyatiga joriy qilingan (Samarqand agroinnovatsiyalar va tadqiqotlar instituti Kuzatuv kengashining 2024-yil 14-iyundagi 2-son, 2025-yil 4-dekabrdagi 3-son yig‘ilishi bayonlari, Qishloq xo‘jaligi vazirligining 2026-yil 13-fevraldagi 06/26-2-10-05/16-son ma’lumotnomasi);

zamonaviy biotexnologiyalarga asoslangan va iqtisodiy parametrlarga mos urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari bo‘yicha ishlab chiqilgan takliflar O‘zbekiston Respublikasi Prezidentining 2025-yil 8-sentabrdagi PQ-269-son qarorida inobatga olingan, unga ko‘ra, 2030-yilgacha 617 ming tonna yuqori sifatli urug‘lik kartoshka yetishtirish orqali iqtisodiy samaradorlikka erishish prognoz qilingan (Qishloq xo‘jaligi vazirining 2025-yil 11-sentabrdagi 218-son buyrug‘i bilan tasdiqlangan 16 ta banddan iborat chora-tadbirlar rejasi hamda vazirlikni 2026-yil 13-fevraldagi 06/26-2-10-05/16-son ma’lumotnomasi).

Tadqiqot natijalarining aprobatsiyasi. Xorijiy hamda mahalliy anjumanlarda, Oziq-ovqat va qishloq xo‘jaligi sohasida strategik rivojlanish va tadqiqotlar xalqaro markazi Ilmiy kengashi muhokamasida ma’qullangan. 2 ta xalqaro, 4 ta mahalliy ilmiy konferensiyada aprobatsiyadan o‘tkazilgan.

Tadqiqot natijalarining e’lon qilinganligi. O‘zbekiston Respublikasi Oliy attestatsiyasi komissiyasi tomonidan tavsiya etilgan ilmiy nashrlarda 3 ta maqola (2 tasi mahalliy va 1 tasi xorijiy ilmiy jurnallarda) nashr qilingan.

Dissertatsiyaning hajmi va tuzilishi. Dissertatsiya kirish, 3 ta bob, xulosa hamda takliflar, foydalanilgan adabiyotlar ro‘yxati, shuningdek ilovalarni qamrab olgan holda jami 113 betda bayon etilgan.

DISSERTATSIYANING ASOSIY MAZMUNI

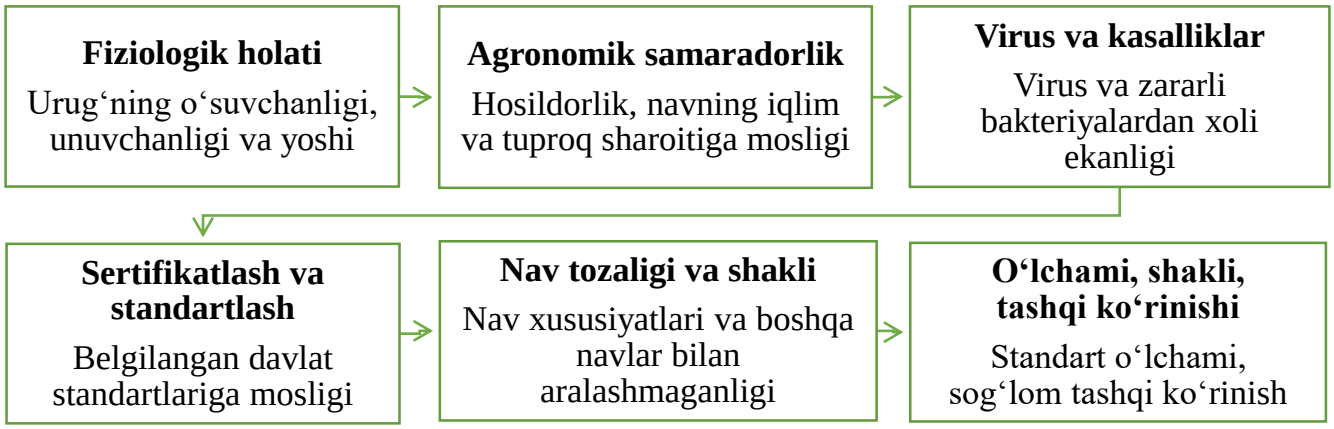
Kirish qismida o‘tkazilgan tadqiqotning dolzarbligi va zarurati asoslangan. Tadqiqotning maqsadi, vazifalari, obyekti hamda predmetlari tavsiflangan; respublika fan va texnologiyalari rivojlanishining ustuvor yo‘nalishlariga mosligi ko‘rsatilgan; tadqiqotning ilmiy yangiligi va amaliy natijalari bayon qilingan; olingan natijalarini amaliyotga joriy qilish, nashr etilgan, ishlar shu bilan birga dissertatsiyaning tuzilishi bo‘yicha ma’lumotlar keltirilgan.

Dissertatsiyaning “**Zamonaviy biotexnologiyalar asosida kartoshka urug‘chiligi iqtisodiy samaradorligining nazariy asoslari”** deb nomlangan I bobida zamonaviy biotexnologiyalar asosida urug‘lik kartoshka yetishtirishning nazariy-uslubiy asoslari,

samaradorlikni oshirish yo‘llari va xorij tajribasining tashkiliy-iqtisodiy mexanizmlari yoritilgan. Kartoshka ozuqaviy qiymati yuqori mahsulotlardan biridir. Uning kimyoviy tarkibi, 62-82 % suv hamda 23-34 % quruq moddalardan iborat bo‘lib, 16 % kraxmal, 1,2-3 % oqsil, 0,9 % qand va boshqa biologik moddalar uchraydi.

Hisob-kitoblarga ko‘ra, 1 mlrd nafardan ortiq aholi kundalik iste’molida kartoshka iste’mol qiladi.[9] Bugungi kunda 50 dan ziyod davlatlarda kartoshka genlari ustida tadqiqotlar o‘tkazilib, intensiv va yuqori hosil beradigan navlar yaratilmoqda. E’tiborlisi shundaki, biologik o‘zgartirishlar natijasida kartoshka navlarining biometrik ma’lumotlarini shakllantirish va seleksiya jarayonida genetik belgilarni aniqlash[10] hamda iqtisodiy barqaror yangi xususiyatli nav duragaylarini yaratish mumkinligi ilmiy asoslangan.

Kartoshka urug‘chiligining tashkiliy asosiga tayanib, in vitro ko‘paytirish, mutagenez va genetik usullar orqali yangi, intensiv hamda yuqori hosildor navlar yaratiladi. Masalan, germaniyalik olim Otto Appel kartoshka kasalliklarini aniqlash va virusli infeksiyalarga qarshi kurashish bo‘yicha sertifikatlash metodikasini ishlab chiqqan. Ushbu metodika sifat va sanitariya standartlarga rioya qilish orqali sifatli urug‘ ko‘paytirishga qaratilgan (1-rasm).



1-rasm. Urug‘ samaradorligini baholash bo‘yicha Otto Appel metodikasi[11]

Metodika nav tozaligi va hosil sifati barqarorligini ta’minlashga qaratilgan bo‘lib, seleksiya xarajatlarini qisqartiradi. Masalan, potensial hosildorlik, N-1 gektarda (dona), B-1 o‘simlikda tuganak soni (dona), M-1 ta tuganakni o‘rtacha massasi (g).

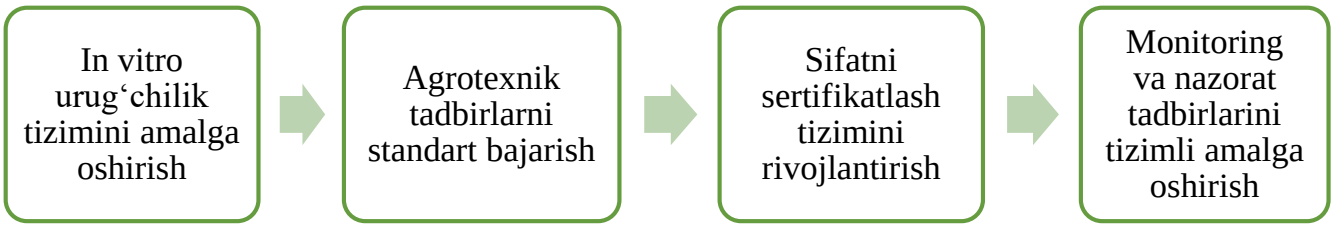
Kasallik ta’siridagi yalpi hosil: $\mathbf{Y_h=(N-N_k)B\times M+N_kB\times M(1-P_k)}$ (1).

Bunda, hosil kamayish miqdori: $\mathbf{\Delta Y=Y_p-Y_h}$ (2).

Y_h-yalpi hosil, N_k-kasallangan o‘simliklar, P_k-kasallangan o‘simliklarda hosil kamayishi (0-1 oraliq). Foizda $\mathbf{K=Y_p-Y_h/Y_p\times 100\ \%}$. Misol sifati, 10 mln dona mini tuganak hisobiga ko‘ra, $N_k=N\times C=10$ mln×0,1=100 ming dona, potensial hosil $Y_p=10$ mln×8×60=4 mlrd 800 t/ga,

[9] Rahimov G., Massino I., Qurbonov G., Alimov A. “O‘simlikshunoslik”. Kartoshka. -T.: 2006. 55-203-b.
[10] Борис К.В., Рижова Н.Н., Кочиева Й.З. “Изучение внутривидового полиморфизма фрагмента гена сахарозосинтазы сус4 картофеля (Solanum tuberosum) // Genetika, 2011, t.47, 190-198 стр.
[11] www.openagrar.de/receive/openagrar_mods_00036264, Virus and Virus-like Diseases of Potatoes and Production of Seed-Potatoes, Die Pflanzkartoffel (1918; 2-nashr 1920).

Y_h=(9 mln×8×60)+(1 mln×8×60×0,6)=4608 t/ga, kamayish K=4 %. Empirik jihatdan esa kartoshkaga bo‘lgan talab, aholi soni ortishi hamda mahsulotning ahamiyati hisobga olinadi. Ushbu tadqiqotda kartoshka urug‘chiligining metodik tasnifi ishlab chiqilgan (2-rasm).



2-rasm. Zamonaviy biotexnologiyalarga asoslangan kartoshka urug‘chiligining metodik tasnifi[12]

2-rasmda birinchi bosqich sifatida in vitro texnologiyasini qisqa muddatda ko‘payish koeffitsiyenti yuqori prognoz qilingan; ikkinchi bosqichda aeroponik, gidroponik yoki dala sharoitiga mos agrotexnik tadbirlarni amalga oshirish nazarda tutilgan; uchinchi bosqichda nav tozaligi, virusdan xoliligi, laboratoriya diagnostikasi, molekulyar markerlar bilan identifikatsiya qilish kabi nazorat tartiblarini joriy qilishga asoslangan. Shuningdek, to‘rtinchi bosqichda laboratoriyadan dalagacha monitoring, vegetatsiya davrida fitosanitar kuzatuv tahlillari amalga oshiriladi. Bularning natijasida yo‘qotishlar 15 % gacha kamayadi, hosil sifati oshadi, ishlab chiqarishning umumiy samaradorligi ko‘payadi. Yerdan foydalanishning umumiy iqtisodiy samaradorligini quyidagi formula asosida aniqlash mumkin:

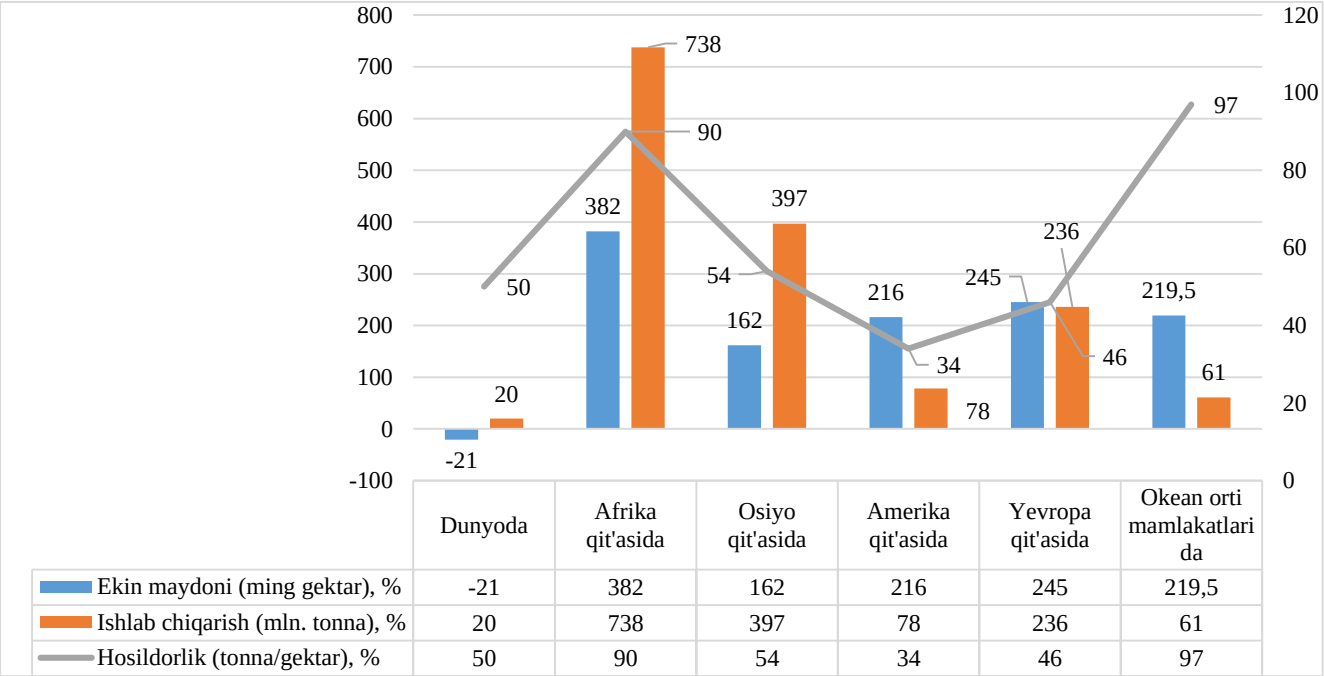
$$\mathbf{I=SD/(L+M+E)} \quad (3).$$

Bunda, I – yerdan foydalanishning iqtisodiy samaradorlik ko‘rsatkichi, SD – yerning tegishli turi bir gektari hisobiga olingan sof daromad, so‘m. I – yerdan foydalanishning iqtisodiy samaradorligi (birliksiz koeffitsiyent), SD – yer turi bo‘yicha 1 gektarga olingan sof daromad, so‘m, L – mehnat (ishchi kuchi) xarajatlari, so‘m/ga, M – moddiy resurslar xarajati, so‘m/ga, E – yer resurslari (energiya xarajatlari) so‘m/ga. Hisob-kitoblarga ko‘ra, SD = o‘rtacha 10 mln so‘m/ga, L=2 mln so‘m/ga, M=1,5 mln so‘m/ga, E=700 ming so‘m/ga bo‘lsin.

Natija I=(10 mln)/(2 mln+1,5 mln+700 ming)=(10 mln)/(4,2 mln)=2,38.

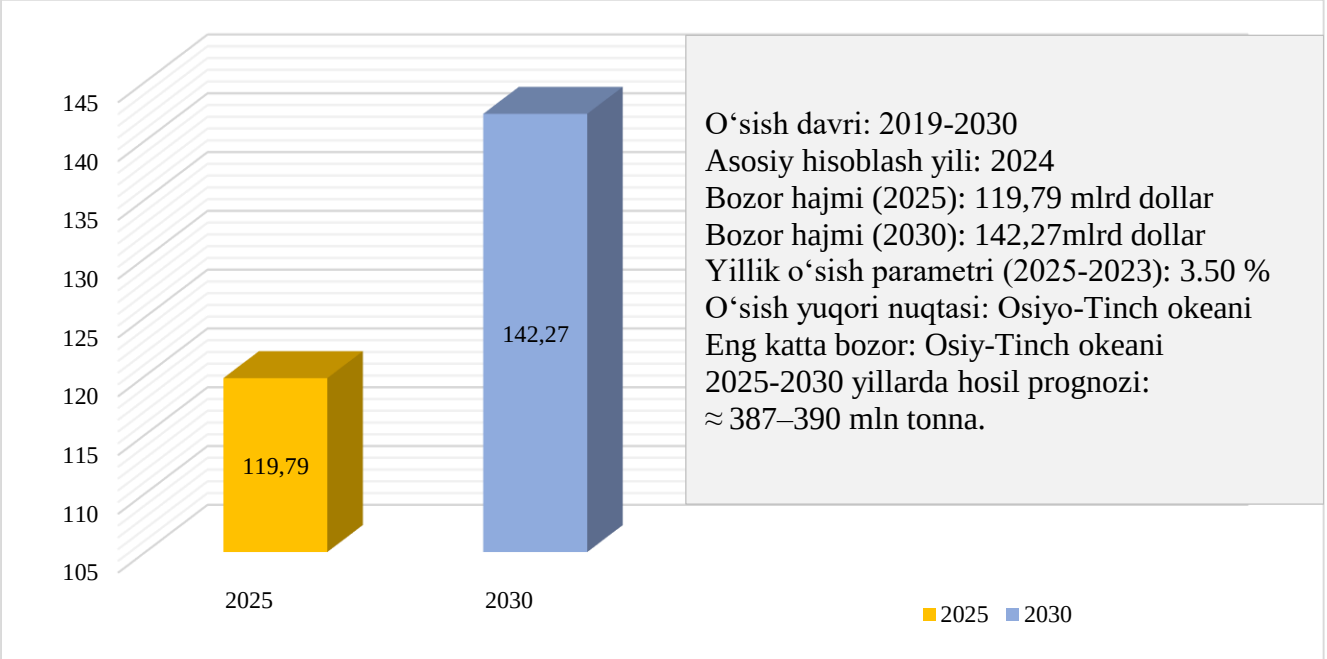
Xulosa shuki, yerdan foydalanishning iqtisodiy samaradorligi koeffitsiyenti 2,38 ni tashkil qildi. 1 gektar uchun qilingan 1 so‘m xarajatdan 2,38 so‘m daromad olindi. Dunyo miqyosida kartoshka yetishtirish hajmi va hosildorlik ko‘rsatkichlariga ko‘ra 2025-yilda bozor hajmi 119,79 mlrd AQSh dollarini tashkil qilgan hamda 2030-yilga kelib 142,27 mlrd dollarga yetishi kutilmoqda. Bu Osiyo-Tinch okeani mintaqasida iste’mol hajmi va yetishtirish kengayishi bilan izohlanadi (3- va 4-rasmlar).

[12] Tadqiqotga asoslangan muallif ishlanmasi.



	Dunyoda	Afrika qit'asida	Osiyo qit'asida	Amerika qit'asida	Yevropa qit'asida	Okean orti mamlakatlarida
Ekin maydoni (ming gektar), %	-21	382	162	216	245	219,5
Ishlab chiqarish (mln. tonna), %	20	738	397	78	236	61
Hosildorlik (tonna/gektar), %	50	90	54	34	46	97

3-rasm. Dunyo miqyosida kartoshka yetishtirish va hosildorlik tahlillari[13]



4-rasm. 2025-2030-yillarda jahon kartoshka bozoridagi o‘sish prognozi[14]

O‘zbekistonda kartoshka importini kamaytirish va aholiga sifatli kartoshka yetkazib berish uchun urug‘chilik tizimini takomillashtirish zarur. Buning uchun mahsulot yetishtiruvchilarga sifatli urug‘larni bosqichma-bosqich beg‘araz yetkazib berishni nazarda tutuvchi boshqaruv tizimi juda muhim. Kartoshka urug‘chiligi iqtisodiy jihatdan zarur, chunki ichki hosildorlik jahon

[13] https://pem.areeo.ac.ir/article_128058_a9bb42c14a2d7c8705f67a7b32b25344.
[14] https://www.mordorintelligence.com/industry-reports/potato-market.

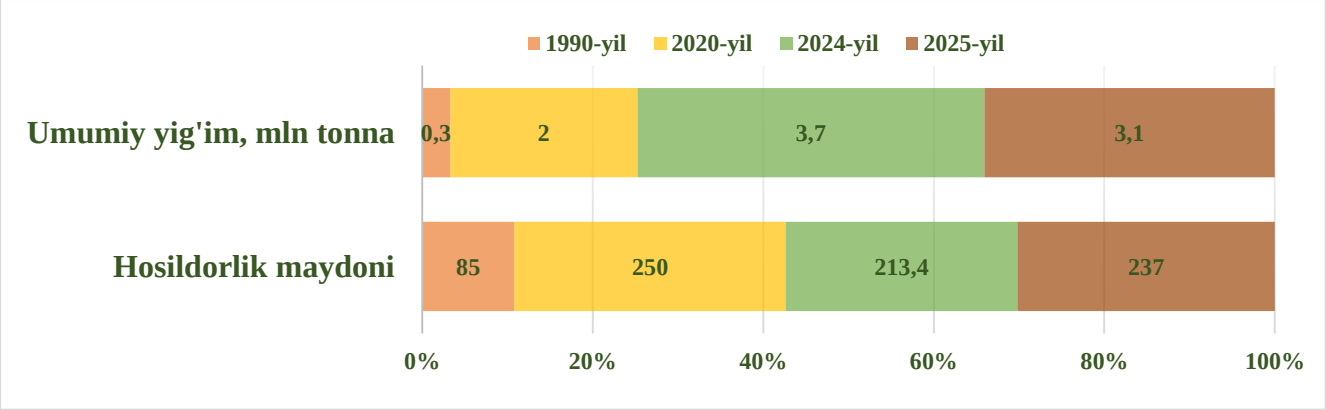
standartlariga nisbatan past, import 2025-yilda 490,8 ming tonnaga yetgan (9,1 % oshgan). Urug‘lik importi yil sayin oshmoqda, bu esa mahalliy urug‘chilik tizimi yetarli darajada rivojlanmaganini ko‘rsatadi. Zamonaviy biotexnologik usullar yordamida hosildorlikni 100 % gacha oshirishni bunga yechim sifatida qarash mumkin (1-jadval).

1-jadval

Kartoshka urug‘chiligida samaradorlikning iqtisodiy zarurati[15]

Yo‘nalishlar	Ko‘rsatkichlar
Import hajmi (2025)	490,8 ming tonna kartoshka
Import o‘sishi	9,1 % ga oshgan
Urug‘lik importi (2025)	4 ming tonna
Ichki hosildorlik	163 sentner/ga
Jahon hosildorligi	16 t/ga (tajribalarda 40-80 t/ga)
Ilg‘or texnologiyalar samaradorligi	hosilni 50-100 %ga oshirishi mumkin

Xulosa shuki, kartoshka urug‘chiligida import navlarga bo‘lgan qaramlik tufayli O‘zbekistonda so‘nggi yillarda kartoshka hosildorligida o‘zgaruvchan natijalarga erishildi. Umumiy yig‘im sezilarli darajada oshgan bo‘lsa-da, oxirgi yillarda biroz pasayish kuzatilgan. Hosildorlik maydoni dastlab o‘sish tendensiyasiga ega bo‘lgan va ma’lum darajada kamaygan. Bu o‘zgarishlar kartoshka yetishtirishdagi samaradorlik hamda resurslardan foydalanishda farqlarni ifodalaydi (5-rasm).



5-rasm. O‘zbekiston sharoitida kartoshka yetishtirish dinamikasi

Rasmdan ko‘rinib turbdiki, umumiy o‘sish 2020-2024-yillarda kuzatilgan, 2025-yilda pasaygan. Ushbu o‘zgarishlar kartoshka yetishtirishdagi texnologiyalar, iqlim omillari va boshqa ta’sirlar natijasida yuzaga kelgan. Ekologik muammolar agrar tarmoqdagi amaliyotlarni

[15] https://www.spot.uz/oz/2025/10/13/potato-import/?utm_source, https://www.fao.org/4/i0200e/I0200E10.htm?utm, https://news.sustainability-directory.com/food/new-potato-breeding-boosts-yields-enhancing-global-food-security/?utm_source “Parameters”.

qiyinlashtirmoqda va oziq-ovqat xavfsizligiga tahdid solmoqda.[16] Kartoshkachilikda **Niderlandiya, Fransiya, Germaniya hamda** Misr kabi davlatlar tajribasidan kelib chiqib (2-jadval) amaliy choralar ko‘rish tavsiya qilinadi.

2-jadval

Kartoshka urug‘chiligida xorij tajribasining qiyosiy-tahlillari (2024-y.)

Texnologiya va natijadorlik	O‘zbekiston bilan qiyosiy tahlillar
Niderlandiya. 300 ta nav, 90 % in vitro, qat’iy sertifikatlash tizimi, yuqori sifatli urug‘lik yetarli. 763,7 mln $ eksport	Laboratoriyalar mavjud, eksport hajmi va nav xilma-xilligi kam, xalqaro sertifikatlash tizimi mavjud emas
Fransiya. “Bretagne Plants Innovatsion” va “Orsay” unv., yiliga 21 ming ga-630 ming tn urug‘lik, 240 ming tonna eksport	Klaster tizimi shakllanmoqda, lekin kompleks tizim hamda navlar soni cheklangan
Germaniya. Seleksiya, genetik monitoring, agrotexnologiyadan keng foydalaniladi. 102,9 mln kg eksport, gektariga 40 tonna	Seleksiya va genetik monitoring mavjud, hosildorlik kam hamda texnologiyalar yetarli emas
Misr. In vitro jadal rivojlangan. Lady Rosetta, Spunta-49,5 mln $ eksport Afrika va Yaqin Sharq	Laboratoriyalar kam, lekin akklimatizatsiya va eksport hajmi oz
Jan. Koreya. In vitro ko‘paytirishdan yiliga 10 mln mikro-tuganak yetishtiriladi. Eksport cheklangan, Osiyoda yetakchi	Innovatsion tizimni joriy qilmoqda, avtomatlashtirish va mikro tuganak yetishtirish hajmi cheklangan

Iqtisodiy samaradorlik yetishtirish jarayonida resurslar tannarxiga bog‘liq bo‘lib, mahsulot xarajatlariga nisbatan daromadni ko‘rsatadi. Buni quyidagi formulada hisoblash mumkin:

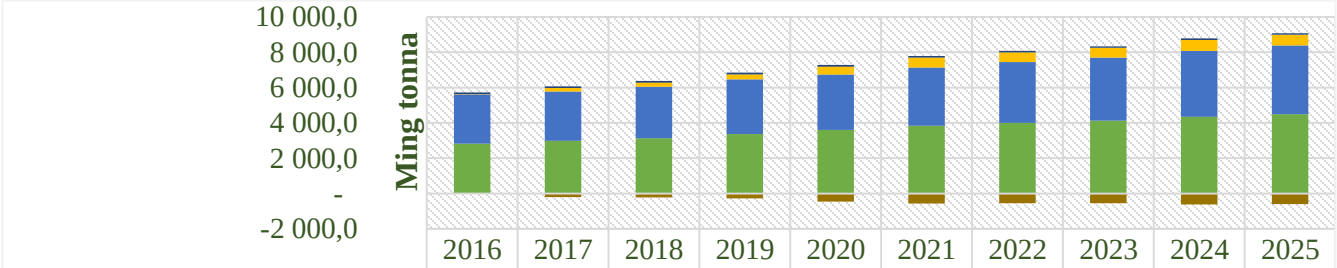
$$IS = \frac{\text{Daromad}}{\text{Umumiy xarajat}} \qquad (4).$$

Bu yerda, IS-iqtisodiy samaradorlik, UX-Mahsulotni yetishtirish uchun sarflangan umumiy xarajatlar. IS>1-ishlab chiqarish iqtisodiy jihatdan samarali, daromad xarajatlardan ko‘p. IS<1-ishlab chiqarish iqtisodiy jihatdan samarasiz, xarajatlar daromaddan ko‘p. Misol uchun, O‘zbekistondagi laboratoriyalarda 3 oy davomida 2 mln dona in vitro o‘simlik yetishtirish uchun 4 mlrd 172 ming so‘m (1 dona mini tuganak uchun 2 086,2 so‘m) mablag‘ zarur. Himoyalangan issiqxonalarda 10 mln donagacha mini tuganak yetishtiriladi (unuvchanlik 85 %), mini tuganaklardan 2 ming tonnagacha (hosildorlik gektariga o‘rtacha 160 s) super-super elita urug‘ olinadi. 1 gk urug‘ xarajati 8 ming so‘m (5,5 ming so‘m yetishtirish va saqlash xarajati 2,5 ming so‘m). 1 kg super-super elita urug‘i o‘rtacha 10 ming so‘m, jami daromad 20 mlrd so‘mni tashkil qiladi.

[16] Ahatqulov B. Oziq-ovqat xavfsizligini ta’minlashda biologik yondashuvlarning iqtisodiy tahlillari// Agro Biznes Inform, 1-son, 3-b.

Dissertatsiyaning **“O‘zbekistonda kartoshka urug‘chiligi tizimining tashkiliy-iqtisodiy mexanizmlari”** deb nomlangan II bobida in vitro ko‘paytirishni iqtisodiy samaradorlik ko‘rsatkichlarini baholash asoslangan. Bugungi kunda O‘zbekiston kartoshka genofondida 250 dan ortiq navlar mavjud, ulardan 27 tasi milliy urug‘ sifatida yaratilgan.[17] Muammo shuki, kafolatlangan urug‘ yetmaydi, ko‘p hollarda R1 dan R5 gacha avlodli va iste’mol kartoshkadan urug‘ sifatida foydalaniladi.

Import qilishda tadbirkorlarning aylanma mablag‘lari yetarli emas, kreditlar foizi yuqori (27 % gacha), transport-logistika xarajatlari qimmat. Bundan tashqari, import navlar yuqori avlodli emas, xarajatlar ko‘pligi uchun arzonlari olib kelinadi, import navlar 15-50 ming so‘mgacha sotiladi. Yetishtirishda urug‘lik materiallari, mineral o‘g‘itlar, yoqilg‘i mahsulotlari va ishchi kuchi uchun 1 gektar maydonga 60-70 mln so‘m sarflanadi, xarajatlar boshqa ekinlarga qaraganda 2-4 barobar ko‘p. Import hisobiga mahalliy yetishtirilgan ertaki kartoshkalar tannarxi ancha arzon, mahalliy kartoshka eksportiga taqiqlar mavjud. O‘zbekistonda kartoshka yetishtirish uchun resurslar cheklangan. Masalan, o‘rtacha 1 gektar kartoshka o‘simligini nasos orqali sug‘orish uchun 7 ming m^3 suv va 2,3 ming kilovatt elektr energiyasi sarflanadi (~2,1 mln so‘m), bu esa tannarxni 3,5-4 % oshiradi. Uning ustiga tuproqlarning unumdorligi yildan yilga pasayib bormoqda. Statistik ma’lumotlarga qaraganda, yetmaydigan kartoshka hajmi va import ko‘rsatkichlari yuqori (6-rasm).[18]



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Ortiqcha yoki yetishmaydigan hajmi, (+/-)	-25,2	-193,6	-224,4	-276,1	-449,8	-559,0	-552,5	-544,8	-622,2	-602,9
Ehtiyojning ta'minlanganlik darajasi, %	99,1	93,5	92,8	91,8	87,5	85,5	86,2	86,8	85,7	86,6
Eksport	0	0	0,3	6,1	0,3	0	2,8	4,2	3,2	3,6
Import	25,2	193,6	224,7	282,2	450,1	559,0	555,3	549,0	625,3	606,6
Ishlab chiqarish	2 789,	2 793,	2 911,	3 089,	3 143,	3 285,	3 441,	3 574,	3 721,	3 888,
Umumiy iste'mol hajmi	2 814,	2 987,	3 136,	3 365,	3 593,	3 844,	3 994,	4 118,	4 343,	4 491,

6-rasm. O‘zbekistonda kartoshka yetishtirish ko‘rsatkichlari

Rasmdan ma’lumki, import hajmi 10 % atrofida, o‘sishni yer maydoniga mos bo‘lishi hamda import urug‘ narxi mahalliy urug‘ narxiga nisbatan 30 % gacha qimmat bo‘lishi me’yoriy hisoblanadi. Urug‘larning tovarlik sifati 90 % dan past bo‘lmasligi, virus va kasalliklarga chidamli bo‘lishi zarur. Mavjud navlarga nisbatan 25 % gacha hosildorlik talabi qo‘yilgan. Bugungi kunda mamlakatimizda kartoshkaning ertaki hamda o‘rtapishar navlari nisbatan yuqori

[17] https://aniq.uz/uz/yangiliklar/kartoshkachilikni-rivojlantirish-choralari-belgilandi?utm.
[18] https://siat.stat.uz/reports-filed/323/table-data.

hosildorlikni (20-30 tonna/ga) ta’minlaydi. Shuning uchun an’anaviy va biotexnologik usullar o‘rtasida farqlar mavjud (3-jadval).

3-jadval

Kartoshka urug‘chiligida an’anaviy va biotexnologik usullarning solishtirma tahlillari[19]

An’anaviy usul	Biotexnologik usul
Tabiiy usulda yetishtirish, virus xavfi yuqori	Virussiz toza urug‘lik, sifat va barqarorlik
O‘rtacha, 20-30 tonna/ga	O‘rtacha, 40-50 tonna/ga
Mavsumdan mavsumga o‘zgaruvchan	Barqaror va yuqori samarali
Yetishtirish va saqlashda xarajatlar kam, yo‘qotishlar ko‘p	Laboratoriya va texnik jihozlar uchun sarf ko‘p, sifati va miqdori yuqori
Texnologiya oddiy va eskirgan	Ilmiy kadrlar va laboratoriya zarur
Hosil o‘rtacha, xarajatlar kam	Hosildorlik yuqori, xarajat ko‘proq
Viruslar, zararlanish, kam hosil	Laboratoriya, mablag‘ risklari
Urug‘ yetarli emas, importga bog‘liqlik	Urug‘ ko‘payadi, importga cheklanadi
An’anaviy usul qo‘llab-quvvatlanadi	Ilg‘or texnologiyalar va yuqori sifat

In vitro ko‘paytirishda bir dona sog‘lom kartoshkadan 20-50 ta mini tuganak olinadi, bu an’anaviy usul (8-10 ta)dan ancha ko‘p demakdir. Gektaridan 40-50 tonnagacha hosil olish mumkin, bunda hosildorlik 30 %ga oshadi (an’anaviyda gektaridan 18-25 tonna).

Tannarx: $T=X+M+E+Q$ (5).	**Foyda:** $F = \text{daromad} - \text{tannarx}$ (6). **Rentabellik:** $P = \frac{\text{Daromad}}{\text{Tannarx}} * 100\%$ (10).
Shudgorlash, kultivatsiya hamda ekish xarajatlari, urug‘ narxi, o‘g‘it, suv va mehnat sarfi, yoqilg‘i va ish haqi.	Agar rentabellik 25-40% atrofida bo‘lsa, urug‘chilik xo‘jaligi samarali hisoblanadi.
Ishlab chiqarish qiymati (daromad): $D = \text{hajm}\left(\frac{ga}{tn}\right) \text{ sotish narxi}\left(\frac{so'm}{tn}\right)$ (7).	**Ishlab chiqarish samaradorligi:** $IS = \frac{\text{daromad}}{\text{xarajat}}$ (8).
Urug‘ini sotishdan kelib tushadigan tushum.	1 gektardan sof foyda (so‘m/ga), 1 kg urug‘ yetishtirish xarajati (so‘m/kg) va qaytarish koef. (IS>1) bo‘lsa samaralidir.

7-rasm. Kartoshka urug‘chilik tizimining iqtisodiy ko‘rsatkichlari[20]

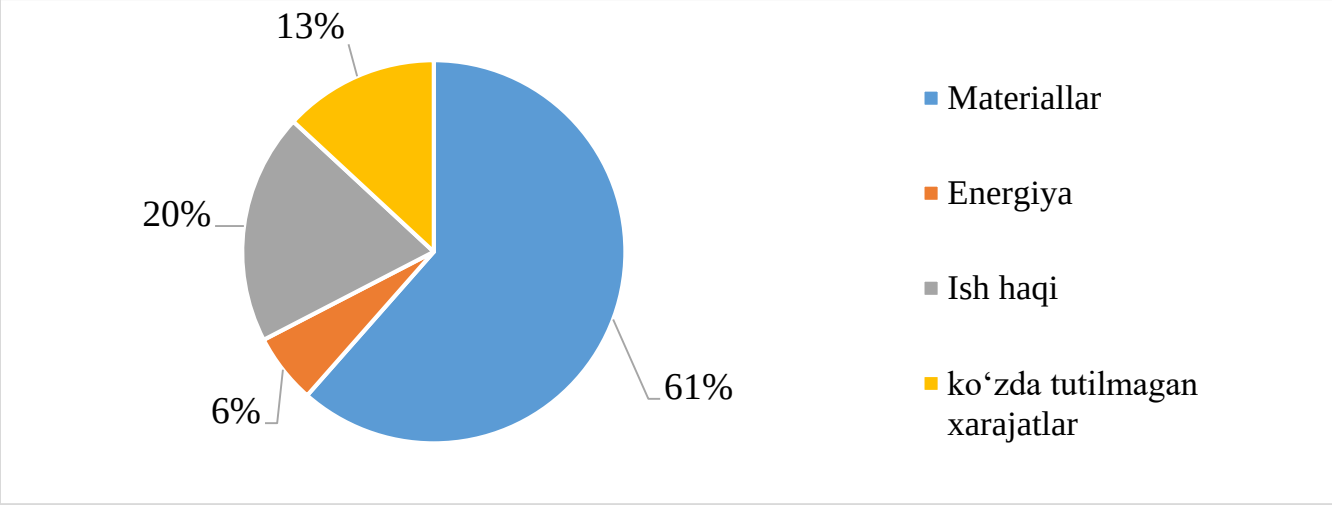
400 ming dona in vitro o‘simlik yetishtirishda xarajatlarga ko‘ra tannarxlar shakllanishi integral nisbatda ifodalangan (8- va 9-rasmlar):

$$\mathbf{T=(MT+EI+MR)\ LK\ (1+KX)} \quad (9).$$

[19] Tadqiqotga asoslangan muallif ishlanmasi.
[20] Tadqiqotga asoslangan muallif ishlanmasi.

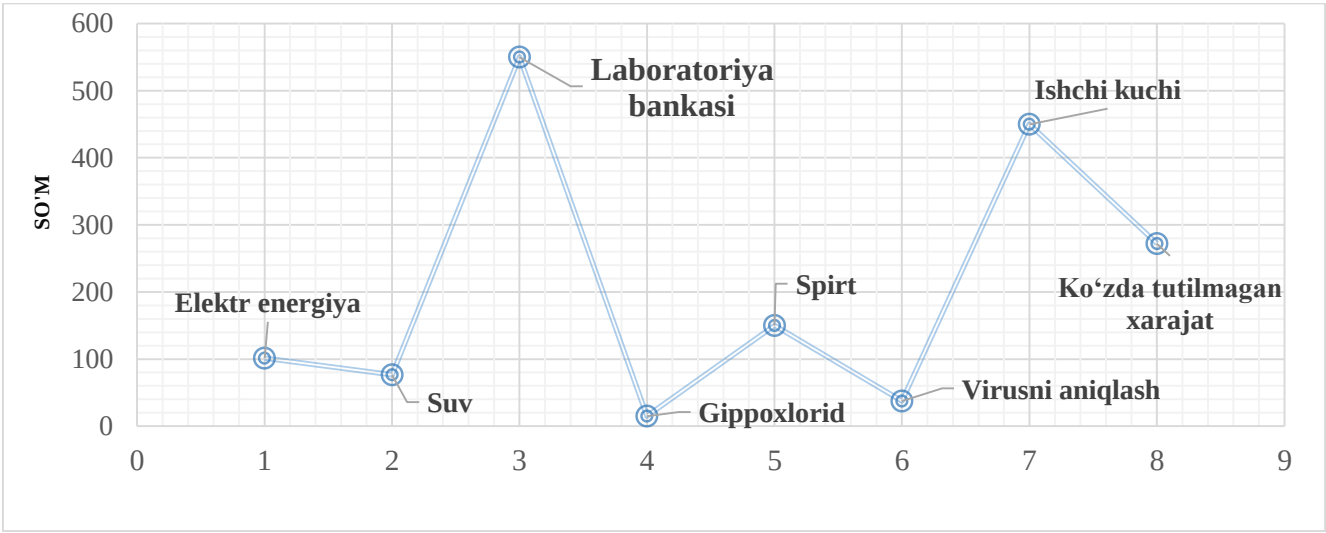
Bu yerda: MT-materiallar qiymati, EI-energiya iste'moli, MR-mehnat resurslari xarajatlari, LK-laboratoriya quvvatining tannarxga ta'sir koeffitsiyenti (1 ga teng), KX-ko'zda tutilmagan xarajatlar koeffitsiyenti (0,15).

T=(791500000+75600000+252000000)×1×1,15=1286965000 so'm, 1 dona in vitro o'simlik (1286965000:4000=3217,4) 3217,4 so'm.



8-rasm. 400 ming dona in vitro o'simlik yetishtirish xarajatlari[21]

Tahlillarga ko'ra, oziqlantiruvchi muhitga oid sarflar va energiya iste'moli eng yuqori ulushga ega, bu jarayonlarning texnologik talablari bilan bevosita bog'liq. In vitro ko'paytirishda ish haqi, sterilizatsiya vositalari va texnik xizmat ko'rsatish xarajatlari barqarorlashadi. Amortizatsiya sarflari uskunalarning xizmat muddati bo'yicha taqsimlagan holda jarayonni real iqtisodiy yuklamasini aks ettiradi.



9-rasm. 1 dona mini tuganak yetishtirish xarajatlarining o'sishi[22]

[21] Tadqiqotga asoslangan muallif ishlanmasi.
[22] Tadqiqotga asoslangan muallif ishlanmasi.

Shuningdek, mini tuganaklar tannarxini aniqlash uchun analiz va regressiya tenglamalaridan foydalanildi. Bunga ko‘ra: $\mathbf{Y=\beta_0+\beta_1X_1+.....+\beta_{14}X_{14}+\epsilon}$ (10).

Bu yerda: Y-tannarx (1 dona). X_1-energiya xarajat (2,6 so‘m), X_2-energiya xarajat (1,2 so‘m), X_3-go‘ng xarajat (96 so‘m), X_4-o‘g‘it xarajat (120 so‘m), X_5-mosket setka xarajat (330 so‘m), X_6-sholi qipig‘i xarajat (34,6 so‘m), X_7-yoqilg‘i moylash xarajat (3,5 so‘m), X_8-kasallik va zararkunandalarga qarshi kurash xarajat (21,6 so‘m), X_9-ish haqi (360 so‘m), X_{10}-yashik xarajat (30 so‘m), X_{11}-sug‘orish xarajat (60 so‘m), X_{12}-texnika xarajat (3,6 so‘m), X_{13}-boshqa xarajat (159,5 so‘m), X_{14}-QQS (146,7 so‘m), β_0=0 (energiya, suv, ozuqa va boshqa xarajatlar, hosil va tannarxni ko‘rsatadi), β_1=(energiya xarajat 1:1 ta’sir koef.), β_2=(suv xarajat 1:1 ta’sir koef.), β_3=(go‘ng xarajat 1:1 ta’sir koef.), β_4=(o‘g‘it xarajat 1:1 ta’sir koef.), β_5=(mosket setka xarajat 1:1 ta’sir koef.), β_6=(sholi qipig‘i xarajat 1:1 ta’sir koef.), β_7=(yoqilg‘i moylash xarajat 1:1 ta’sir koef.), β_8=(kasallik va zararkunandalarga qarshi kurash xarajat 1:1 ta’sir koef.), β_9=(ish haqi xarajat 1:1 ta’sir koef.), β_{10}=(yashik xarajat 1:1 ta’sir koef.), β_{11}=(tomchilatib sug‘orish xarajat 1:1 ta’sir koef.), β_{12}=(texnika xarajat 1:1 ta’sir koef.) β_{13}=(ko‘zda tutilmagan xarajat 1:1 ta’sir koef.) β_{14}=(QQS 1:1 ta’sir koef.), ε=xatolik ($\varepsilon=Y_{haqiqiy}-Y_{taxmin}$=1369,3-1507,5) 0,1 teng.

Ko‘rsatkichlar: X_1=2,6; X_2=1,2; X_3=96; X_4=120; X_5=330; X_6=34,6; X_7=3.5; X_8=21,6; X_9=360; X_{10}=30; X_{11}=60; X_{12}=3,6; X_{13}=159.5; X_{14}=146,7; ε=0,1.

Natijada: Y=1369.3 so‘m.

$Y_{og‘irlik}$=N×0,06=10 000 (1 dona massasi ~ 60 g) 0,06= 600 kg / 0,6 t.

Hisob-kitobning ishonchliligi. $\mathbf{F-stat\equiv\frac{R^2/k}{(1-R^2)/(n-k-1)}}$ (11).

Bu yerda:

R^2-regressiya modeli koeffitsiyenti;

model o‘zgaruvchanlik ($0\le R^2\le 1$)=0,9;

k-mustaqil o‘zgaruvchilar soni k=$X_1\ldots X_{14}$)=14;

n-kuzatuvlar soni (ma’lumotlar punktlari soni, gektar)=29;

(n-k-1)-modelning erkinlik darajalari=14.

F-statistika butun mexanizmning ishonchliligini baholaydi (F>0).

$$\mathbf{F-stat\equiv\frac{R2/k=0.9/14=0.06429}{(1-R2)/(n-k-1)=0.1/14=0,00714};F-stat\approx 9,0}$$

An’anaviy usulda o‘rtacha hisobda 1 gektarda kartoshka yetishtirish uchun 3 tonna urug‘lik (45-50 mln so‘m), sof holda 500 kg mineral o‘g‘it (6,4 mln so‘m), 230 kg yoqilg‘i mahsulotlari (3 mln so‘m), mexanizatsiya xizmati (2 mln so‘m), soliqlar (2 mln so‘m), ish haqi (10-12 mln so‘m) va 1,5 mln so‘m boshqa xarajatlar sarflanadi. O‘rtacha 20-25 nafar ishchiga kunlik 200-400 ming so‘mgacha to‘lanadi.

Dissertatsiyaning “**O‘zbekistonda zamonaviy biotexnologiyalarga asoslangan kartoshka urug‘chiligi tizimini qo‘llab-quvvatlash va iqtisodiy samaradorligini oshirish istiqbollari”** deb nomlangan III bobida kartoshka urug‘chiligida an’anaviy usullardan farqli ravishda in vitro

ko‘paytirish usulini qo‘llash orqali mahsulot hajmining bosqichma-bosqich multiplikativ o‘sishi va iqtisodiy samaradorligini ta’minlash (4-jadval), kartoshka urug‘chiligining iqtisodiy samaradorligini baholashda “Samaradorlik indeksi”ni takomillashtirish, samaradorlik darajalarini mezonlar orqali baholash (5-jadval), Samarqand viloyati misolida DXSh negizida urug‘lik kartoshka hajmini oshirish hamda yetishtirish jarayonlarini tizimli yondashuv asosida optimallashtirishga qaratilgan tashkiliy-iqtisodiy mexanizmi (12-rasm), O‘zbekistonda zamonaviy biotexnologiyalarga asoslangan hamda iqtisodiy parametrlarga mos urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha prognoz ko‘rsatkichlari ishlab chiqilgan (5-jadval).

4-jadval

In vitro ko‘paytirish texnologiyasi asosida kartoshka urug‘chiligida mahsulot hajmining bosqichma-bosqich multiplikativ o‘sishi va iqtisodiy samaradorligini ta’minlash mexanizmi[23]

1-bosqich (laboratoriya-issiqxona amaliyoti)		
1 yil. Ilmiy muassasalarga tanlov asosida 1,5 mln doll byudjet (transfer) mablag‘i ajratiladi; - Respublika komissiyasi tuziladi.	5 ta laboratoriyada 3 oyda 400 ming dona o‘simlik, 5 oyda 2 mln dona mikro tuganak yetishtiriladi.	24 gektar issiqxonalarda 10 mln dona mini tuganak yetishtirish mumkin.
2-bosqich (dala amaliyoti)		
2 yil. Qo‘rg‘ontepa, Baxmal, Zomin, Kitob, Shahrisabz, Yangiqo‘rg‘on, Bulung‘ur va So‘x tumanlariga (120 ga) mini tuganak tarqatiladi.	Min 2,5 ming tonna super-super elita urug‘lik yetishtirilib, o‘sha tuman fermer xo‘jaliklarga sotiladi.	Komissiya nazorat tadbirlarni tizimli o‘tkazadi, hokimliklar sotishda yordam beradi.
3-bosqich (dala amaliyoti)		
3 yil. 23 ta tuman, 1 ming gektar fermer xo‘jaliklari yerlarida min 25 ming tonna super elita urug‘lik yetishtiriladi.	**4 yil**. 25 ming tonna urug‘lik 10 ming gektar ekilib, min 250 ming tonna hosil olinadi. 100 ming tonna iste’mol va 150 ming tonna (60 %) elita urug‘likka olinadi.	**5 yil**. 150 ming tonna elita urug‘ 50 ming gektarga ekilib, o‘rtacha 1 mln 250 ming tonna hosil olinadi. 750 ming tonna R1 urug‘lik va 500 ming tonna iste’molga ajratiladi.

Ushbu mexanizm texnologik uzviylikni mustahkamlaydi, resurs sarfini kamaytirib yuqori hosil beruvchi urug‘ ko‘paytirish amaliyotlari bajariladi. Mexanizm orqali kartoshka urug‘chiligida an’anaviy usullardan farqli ravishda in vitro ko‘paytirish usulini qo‘llash orqali viruslardan xoli va sifatli boshlang‘ich urug‘lik material olinadi hamda uni tez ko‘paytirish imkoniyati yaratiladi.

Bu usulda bir o‘simlikdan ko‘p miqdorda sog‘lom urug‘lik olinishi hisobiga mahsulot hajmi bosqichma-bosqich ortib boradi va multiplikativ o‘sish ta’minlanadi. Mazkur jarayon

[23] Tadqiqotga asoslangan muallif ishlanmasi.

3 bosqichda (laboratoriya, issiqxona va dala sharoiti) amalga oshirilib, urug‘lik sifatining yaxshilanishi, kasalliklar kamayishi va hosildorlikning oshishiga olib keladi. Natijada xarajatlar kamayib, daromad oshishi hisobiga iqtisodiy samaradorlik asoslanadi.

Shuningdek, kartoshka urug‘chiligida ortiqcha xarajatlarni kamaytirish hamda qo‘shimcha daromadni oshirish uchun yuqori sifatli urug‘larni raqamli amaliyotlar asosida urug‘chilik xo‘jaliklariga imtiyozli narxlarda yetkazish va hosil natijalarini muvofiqlashtirish bo‘yicha monitoring asoslangan. Ushbu yondashuv orqali xizmat ko‘rsatish, ortiqcha xarajatlar va urug‘ yo‘qotishlarning oldini olish hisobiga iqtisodiy samaradorlik aniqlangan (5-jadval).

5-jadval

Kartoshka urug‘chiligida “Samaradorlik indeksi”ni takomillashtirish hamda “Yetishtirish-saqlash-sotish”da yagona raqamli axborot tizimi orqali samaradorlik mezonlarini baholash mexanizmi[24]

Asosiy jarayonlar	Ko‘rsatkichlar	Samaradorlik indeksi
Ilmiy-tadqiqot va seleksiya bosqichi		
Virussiz navlar yaratish	90-95 % chidamli, 35-40 t/ga	3.5 – 4.0
Urug‘ yetishtirish (in vitro) bosqichi		
Mikroklonal ko‘paytirish	1:5 → 1:10, xarajat –10-15 %	3.8 – 4.3
Dalada ko‘paytirish bosqichi		
Elita urug‘ yetishtirish	25-30 t/ga, foyda +15-20 %	3.9 – 4.4
Saqlash bosqichi		
Yetishtirish va saqlash ishlari “E-urug‘” raqamli elektron platformasi orqali onlayn monitoring qilinadi, qulay logistika, aqlli datchiklar va avtomatik boshqaruv orqali urug‘ yo‘qotishlar 5 % gacha kamayadi.	Yo‘qotishlar 10 % → 5 %	4.1 – 4.3
Bozor va marketing bosqichi		
Takliflar qabul qilinadi. Urug‘lar va urug‘chilik xo‘jaliklari to‘g‘risida ma’lumotlar bazasi yaratilib, tanlov asosida onlayn savdolar yo‘lga qo‘yiladi. Ortiqcha xarajatlarning oldi olinadi, sotish va yetishtirishda 20% mablag‘ tejaladi.	Xarajatni tejash 20%	4.0 – 4.5
Yagona raqamli axborot tizimida integral baholash bosqichi		
Yagona raqamli tizim yuritiladi. Ilmiy-tadqiqot, seleksiya, urug‘ yetishtirish, dalada ko‘paytirish, bozor va marketing bosqichlari bitta raqamli “E-urug‘” raqamli elektron platformasiga integratsiya qilinib avtomatik boshqariladi	Samaradorlik 76,67 %, +115 mln so‘m	4.2 *(“YEFC Plants Tissuye Culture S.A.Y.” kompaniyasi misolida)*

[24] Tadqiqotga asoslangan muallif ishlanmasi.

Ushbu yondashuv kartoshka urug‘chiligida barcha bosqichlarni raqamlashtirish hamda “Samaradorlik indeksi” orqali kompleks baholash samaradorlikni oshirishga xizmat qiladi. Bunda yetishtirishda tannarx, hosildorlik, urug‘ yo‘qotish va sof foyda kabi ko‘rsatkichlar kompleks baholanadi. Natijalar normallashtirilib, 1.0 dan 5.0 gacha bo‘lgan shkalaga o‘tkaziladi va ushbu diapazon orqali samaradorlik indekslari (1.0 – 1.4 → juda samarasiz, 1.5 – 2.4 → samarasiz, 2.5 – 3.4 → qisman samarali, 3.4 – 4.4 → samarali va 4.5 – 5.0 → juda samarali) darajasi tasniflanadi.

Tadqiqotda “YEFC Plants Tissuye Culture S.A.Y.” kompaniyasi misolida “E-urug‘” avtomatlashtirilgan axborot tizimida integratsiya qilinib integral baholandi. Yetishtirilgan 150 tonna super-super elita urug‘ni 6 oy maxsus omborlarda saqlab, yo‘qotishni 5 % – 7,5 tonna (avvalgi holat 10 %-15 tonna) qisqartirish mumkin. Bunda belgilangan talablarga ko‘ra o‘rtacha 10 ming so‘mdan 50 gektarga ekish uchun sotiladi, 1,5 ming tonna hosil olish (10 ming so‘mdan 1 mlrd 425 mln so‘m) ortiqcha xarajatlar (10 % – 150 mln so‘mgacha) kamaytirish prognoz qilingan.

Umumiy iqtisodiy samaradorlik (FAO metodikasi) bo‘yicha:

$$E=((b-a)-(y-x))/(x) \quad (12).$$

E=((1 mlrd 425 mln-1 mlrd 325 mln)-(135 mln-150 mln))/(150 mln) 100.

Umumiy iqtisodiy samaradorlik E=76,67 %;

a – tizim joriy etmasdan oldingi yalpi daromad (so‘m)-1 mlrd 325 mln so‘m;

b – “E-urug‘” tizimi orqali yalpi daromad (so‘m)-1 mlrd 425 mln so‘m;

x – tizim joriy etilmasdan oldingi xarajatlar (so‘m)-150 mln so‘m;

y – tizim joriy etilgandan keyin xarajatlar (so‘m)-135 mln so‘m (10 % kam).

$$\text{Sof iqtisodiy foyda: } F=(b-y)-(a-x) \quad (13).$$

F=(1 mlrd 425 mln-135 mln)-(1 mlrd 325 mln-150 mln).

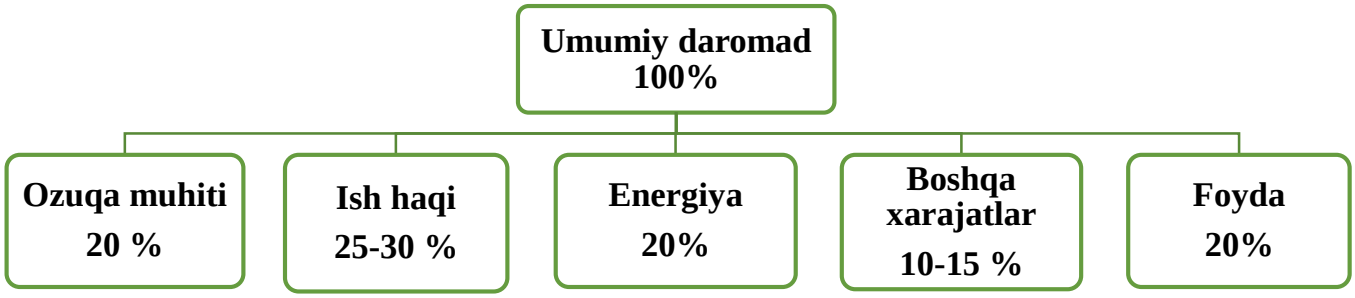
Yalpi foyda, F=115 mln so‘m. GM (Gross Margin) sotishdan tushgan umumiy daromad bilan yetishtirish xarajatlari orasidagi farqni hisoblab beradi.

$$\text{Gross Margin \%} = \frac{\text{Daromad-tovarlar/xizmatlar narxi}}{\text{Daromad}} 100\ \% \quad (14).$$

Masalan, issiqxonalardan 2 ming tonnagacha super-super elita urug‘ olish mumkin (1 kg super-super elita urug‘i o‘rtacha 10 ming so‘m). Jami daromad (20 mlrd-16 mlrd so‘m) 4 mlrd so‘m, yetishtirishda tovar va xizmatlar 2 mlrd so‘m, aynan, sotishdan tushgan umumiy daromad va xarajatlar orasidagi farq 50 %.

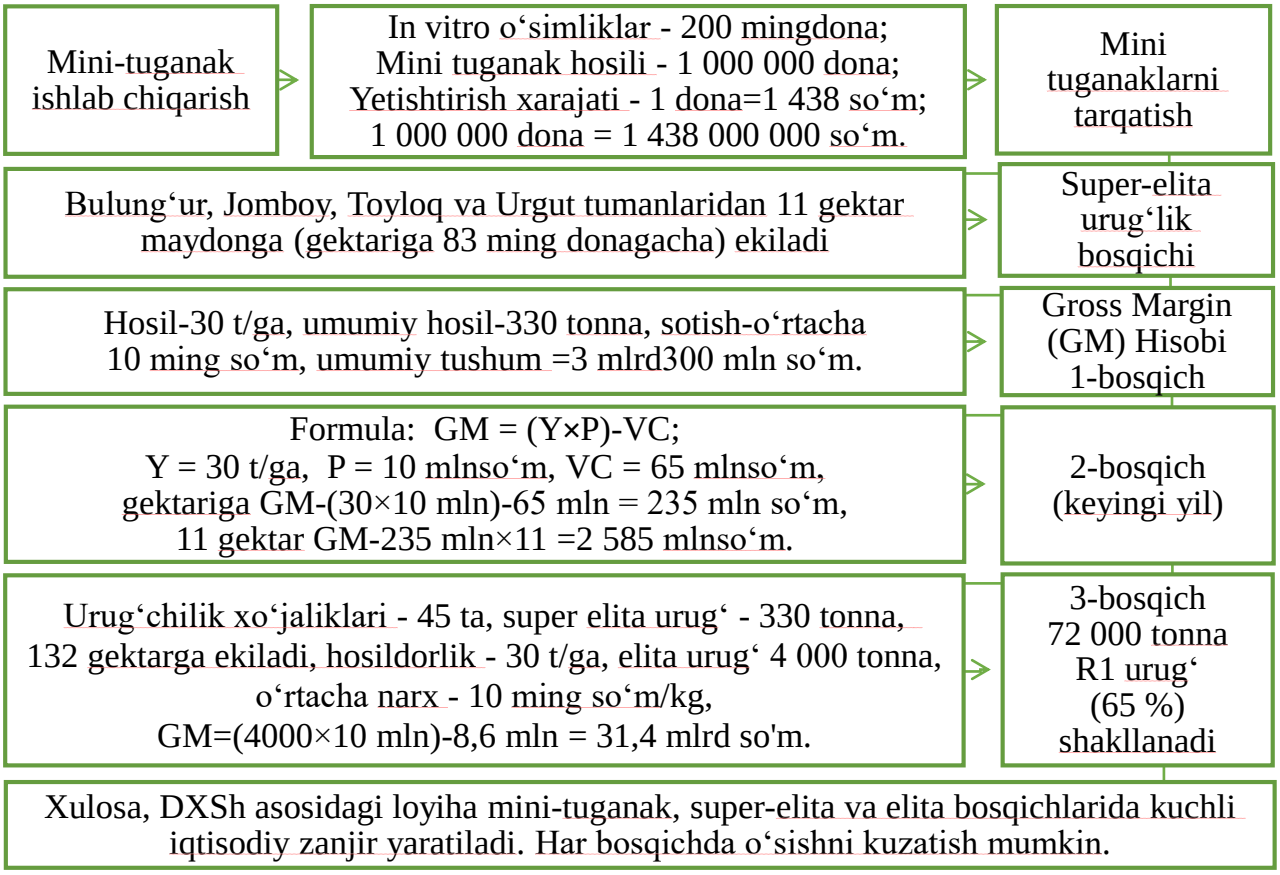
$$\text{Gross Margin \%} = \frac{\text{4 mlrd so‘m-2 mlrd so‘m}}{\text{4 mlrd so‘m}} 100\ \% = 50\ \%$$

Ushbu modelga asoslanib, kartoshka urug‘chiligida in vitro ko‘paytirishni xarajat va daromad normalari ishlab chiqilgan (10-rasm).



10-rasm. Gross Margin modeliga asoslangan in vitro ko‘paytirishning xarajat va daromad normalari[25]

Tadqiqotda Samarqand viloyati misolida DXSh negizida yetishtirish jarayonlarini tizimli yondashuv asosida optimallashtirishga qaratilgan tashkiliy-iqtisodiy mexanizmi asoslangan (11-rasm).



11-rasm. DXSh asosida kartoshka urug‘chiligini tizimli aptimallashtirishga qaratilgan tashkiliy-iqtisodiy mexanizm (Samarqand viloyati misolida)[26]

[25] https://www.cognitivemarketresearch.com/seed-potatoes-market-report#:~:text=As%20per%20Cognitive%20Market%20Research’s, 2.97%25%20from%202024%20to%202031.
[26] Tadqiqotga asoslangan muallif ishlanmasi.

Ushbu mexanizm asosida Samarqand viloyati misolida qiymati 2 mlrd so‘mlik DXSh mexanizmni amalga oshirish tavsiya qilingan. In vitro texnologiyalar asosida mini-tuganaklardan super-elita urug‘lik olish zanjiri shakllantirildi. Natijada hosildorlikni oshishi va tannarxni pasayishi aniqlangan, tizimli yondashuv hisobiga samaradorlikka erishish asoslangan.

Hisob-kitoblarga ko‘ra, Samarqand agroinnovatsiyalar va tadqiqotlar instituti qoshidagi O‘zbekiston–Koreya kartoshka urug‘chiligi markazi bazasida 200 ming dona in vitro o‘simlik olinadi va ulardan issiqxona sharoitida 1 mln dona mini-tuganak yetishtirish rejalashtirilgan. Ushbu mini-tuganaklar Bulung‘ur, Jamboy, Samarqand, Toyloq va Urgut tumanlaridagi urug‘chilik xo‘jaliklarining 11 gektar maydoniga (gektariga 85 ming dona ekish zichligida) beg‘araz tarqatiladi.

Natijada hosildorlik 30 tonna/gektarni tashkil etib, jami 330 tonna super-elita urug‘lik olishga erishiladi. 1 dona mini-tuganak yetishtirish xarajati 1 438 so‘mni tashkil etadi va 1 mln dona uchun jami 1 mlrd 438 mln so‘m sarflanadi. Olingan urug‘lik mahsulotning 1 tonnasi o‘rtacha 10 mln so‘mdan baholanib, sof marja quyidagi formula asosida aniqlandi:

$$\mathbf{GM=(Y\times P)-VC} \quad (15).$$

Bunda, Y-o‘rtacha hosildorlik, s/ga, P-1-mahsulotni sotish narxi, VC-1-mahsulot o‘zgaruvchan xarajati, so‘m. GM=(30×10 mln)-65 mln=235 mln so‘m. Gektaridan 235 mln so‘mlik sof marja hisoblanadi. Bunda, birinchi bosqichda 11 gektar maydon bo‘yicha sof marja 235 mln so‘m/gektarni tashkil etib, jami 2 mlrd 858 mln so‘m foyda olinadi. Keyingi bosqichda tizim 45 ta urug‘chilik xo‘jaligiga kengayadi, natijada 9900 tonna elita urug‘lik shakllanishi prognoz qilindi. Hisob-kitoblarga ko‘ra, GM=(9900×10 mln) − 715 mln=98,2 mlrd so‘m iqtisodiy samaradorlikka erishish imkoniyati mavjudligi aniqlandi.

Statistik ma’lumotlarga ko‘ra, 2024-yilda global urug‘lik kartoshka bozori 13 863,2 mln AQSH dollarni tashkil qilgan va bu ko‘rsatkich 2030-yilga kelib 16 558,05 mln dollarga etishi, yillik o‘rtacha o‘sish 2024-yildan 2031-yilgacha 2,97 % bo‘lishi kutilmoqda.[27] Shu nuqtayi nazardan, tadqiqot asosida O‘zbekiston Respublikasida zamonaviy biotexnologiyalarga asoslangan va iqtisodiy parametrlarga mos urug‘lik kartoshka yetishtirish hajmining 2030-yilgacha bo‘lgan prognoz ko‘rsatkichlari ishlab chiqilgan (6-jadval).

[27] https://www.cognitivemarketresearch.com/seed-potatoes-market-report#:~:text=As%20per%20Cognitive%20Market%20Research’s, 2.97%25%20from%202024%20to%202031.

Prognoz ko‘rsatkichlarga ko‘ra, 2030-yilda jami 617 ming tonna, shundan: 2 500 tonna super-super elita, 22 500 tonna super elita, 112 000 tonna elita va 480 000 tonna R1 urug‘lik shakllanadi. Shuningdek, 4 mln tonna iste’mol uchun kartoshka yetishtiriladi. 2028-2030-yillarda rentabellik yuqori, sarmoya tez qoplanadi, yuqori avlodli urug‘ yetishtirish hisobiga iqtisodiy barqarorlik ta’minlanadi. 2030-yilga kelib to‘liq urug‘ yetishtirish zanjiri shakllanadi.

6-jadval

O‘zbekiston Respublikasida kartoshka urug‘chiligini rivojlantirishning 2030-yilgacha prognoz ko‘rsatkichlari[28]

Yillar kesimida kutilayotgan natija	Shundan	
	Maydon, ga	Hosil, tonna
2026-yilda		
10 mln dona mini tuganak	120	2 500
2027-yilda		
10 mln dona min tuganak	120	2 500
2 500 tn original urug‘	880	22 500
2028 yilda		
10 mln dona mini tuganak	120	2 500
2 500 tonna original urug‘	880	22 500
22 500 tonna yuqori avlodli urug‘	7 500	187 000 (60%)
2029-yilda		
10 mln dona mini tuganak	120	2 500
2 500 tonna original urug‘	880	22 500
22 500 tonna yuqori avlodli urug‘	7 500	187 000 (60%)
112 000 tonna avlodli urug‘	32 000	800 000 (60%)
2030-yilda		
10 mln dona mini tuganak	120	2 500
2 500 tonna original urug‘	880	22 500
22 500 tonna yuqori avlodli urug‘	7 500	187 000 (60%)
112 000 tonna urug‘lik	32 000	800 000 (60%)
480 000 tonna avlodli urug‘	160 000	4 000 000 (iste’mol)

[28] Tadqiqotga asoslangan muallif ishlanmasi.

XULOSA

1. Kartoshka urug‘chiligining iqtisodiy samaradorligi yuqori hosildor, kasalliklarga chidamli navlar va zamonaviy agrotexnologiyalarni qo‘llashga bog‘liq. Infratuzilmalarni modernizatsiya qilish, mutaxassislar tayyorlash va davlat tomonidan qo‘llab-quvvatlash urug‘chilik tizimi barqarorligini ta’minlaydi.

2. Kartoshka urug‘chiligida milliy standartlar yetishmaydi. Standartlarni joriy etish in vitro ko‘paytirish usuli asosida yo‘lga qo‘yilsa, sifatli boshlang‘ich materiallarni olish imkoniyatini mustahkamlaydi. Shu o‘rinda, xorijiy ilg‘or tajribalarni joriy etish, bosqichli urug‘chilik tizimini rivojlantirish kartoshka urug‘chiligini strategik rivojlantirishga xizmat qiladi.

3. O‘zbekistonda kartoshka urug‘chiligini rivojlantirishda yuqori unumli va virussiz urug‘lik material yetishtirishni kengaytirish maqsadida in vitro ko‘paytirish texnologiyasini amaliy ishlab chiqarish jarayonlariga keng joriy etish taklif etiladi. Bunda ilmiy-tadqiqot institutlari hamda urug‘chilik xo‘jaliklari o‘rtasidagi ilmga asoslangan hamkorlik muhim.

4. Urug‘chilik tizimi uchun sovitkich omborlarni ko‘paytirish hamda modernizatsiya qilish muhim. Ayniqsa, ekin maydonlari yaqinida kichik omborlar tashkil etish hamda imtiyozli kreditlar ajratish fermerlar daromadini oshirishga xizmat qiladi. Shuningdek, nazorat va shaffoflikni oshirish uchun QR-kod tizimi zarur.

5. Kartoshka urug‘chiligida iqtisodiy samaradorlikni baholashda yagona standart sifatida “Samaradorlik indeksi” tizimini amaliyotga joriy etish taklif etiladi. Bu tizim urug‘chilikni rivojlantirishda aniq va shaffof qaror qabul qilish uchun zarur. Shuningdek, DXSh asosidagi loyihalarni rivojlantirish, grant ajratish hamda ilmiy-tadqiqot ishlarini kengaytirish iqtisodiy samaradorlikni oshirishga xizmat qiladi.

6. Kartoshka urug‘chiligini barqaror rivojlantirish maqsadida “E-urug‘” avtomatlashtirilgan axborot tizimini joriy etish hamda 2030-yilgacha mo‘ljallangan prognoz ko‘rsatkichlar asosida strategik dasturlar ishlab chiqish va amaliyotga joriy etish taklif etiladi. Bunda raqamli monitoring tizimlari va qo‘shilgan qiymat zanjirini kengaytirish ustuvor yo‘nalish sifatida belgilanishi lozim bo‘ladi.

7. Ilmiy asoslangan agrotexnologiyalar orqali yetishtirilgan kartoshkaning mini tuganaklari yuqori hosildor va sifatli urug‘lik material hisoblanadi. Ayni paytda, saralangan mini tuganaklar dehqon va urug‘chilik bilan shug‘ullanuvchi subyektlarga bepul tarqatish amaliyoti kelgusida bozorbop, raqobatbardosh va sifatli kartoshka yetishtirishni ta’minlaydi.

8. Kartoshka urug‘chiligida iqtisodiy samaradorlik yuqori hosildor, kasalliklarga chidamli va virussiz navlardan foydalanish, bozor infratuzilmasini rivojlantirish hamda davlat tomonidan moliyaviy qo‘llab-quvvatlash mexanizmlarini takomillashtirishga bog‘liq. Bundan tashqari, zamonaviy laboratoriyalar, sertifikatlash tizimi va malakali mutaxassislar tayyorlash samaradorlikni oshirish uchun muhim omillar hisoblanadi.

9. Kartoshka urug‘chiligida biotexnologik usullardan, xususan, in vitro ko‘paytirish texnologiyasidan foydalanish sog‘lom urug‘lik bazasini shakllantirish, hosildorlikni

oshirish va biologik xavfsizlikni ta’minlash imkonini berishi asoslandi. Organik qishloq xo‘jaligini rivojlantirishda bioo‘g‘itlardan foydalanish hamda yagona biologik xavfsizlik tizimini joriy etish zarurligi aniqlandi.

10. Kartoshka urug‘chiligi tizimini rivojlantirishda mahalliy sharoitga mos, yuqori hosildor va kasalliklarga chidamli navlarni yaratish, ilmiy-tadqiqot muassasalari hamda xorijiy urug‘chilik kompaniyalari bilan hamkorlikni kengaytirish muhim. Shuningdek, urug‘lik importchilari va fermer xo‘jaliklarini imtiyozli kreditlar hamda soliq mexanizmlari orqali qo‘llab-quvvatlash samarali iqtisodiy vosita ekanligi isbotlandi.

11. Kartoshka urug‘chiligida saqlash infratuzilmasini rivojlantirish, jumladan, sovutkich omborxonalarini tashkil etish va modernizatsiya qilish mahsulot yo‘qotilishini kamaytirishi hamda bozorda narx barqarorligini ta’minlashi aniqlandi. Bunda imtiyozli kreditlar, kooperativ modellar va yer ijara huquqi asosida moliyalashtirish mexanizmlarini joriy qilish talab qilinadi.

SAMARKAND INSTITUTE OF AGROINNOVATIONS AND RESEARCH
DIGITAL SCIENTIFIC COUNCIL DSc.08/2025.27.12.I.07.02

INTERNATIONAL CENTER FOR STRATEGIC DEVELOPMENT AND RESEARCH IN FOOD AND AGRICULTURE

AKHATKULOV BAKHRIDDIN MATLABOVICH

IMPROVING THE ECONOMIC EFFICIENCY OF POTATO SEED PRODUCTION BASED ON MODERN BIOTECHNOLOGIES

08.00.04 – Agricultural Economics

ABSTRACT OF THE DISSERTATION FOR THE DEGREE OF DOCTOR OF PHILOSOPHY (PhD) IN ECONOMIC SCIENCES

Samarkand – 2026

The topic of the Doctor of Philosophy (PhD) dissertation has been registered with the Higher Attestation Commission under the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan under registration number B2025.3.PhD/Iqt5660.

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INTRODUCTION (Abstract of the PhD Dissertation)

Relevance and Necessity of the Research Topic. Potato occupies an important place in the diet of the world's population. It is a strategic product that ensures consumer market stability and strengthens food security. According to available data, in recent years potato cultivation areas have expanded by 382% in Africa and by 162% in Central Asia, while declining by 69 % in Europe.[1] In this regard, scientific research aimed at improving the economic efficiency of potato seed production based on modern biotechnologies has become critically important in all potato-growing countries of the world, including the Republic of Uzbekistan.

A wide range of scientific research is being conducted worldwide to create high-yielding varieties and produce high-quality potato tubers through the application of innovative approaches. In this context, the multiplication of micro- and mini-tubers from high-quality potato tissues, along with the development of domestic seed production, is among the foremost priorities. Currently, potato yields in Uzbekistan do not meet the country's food and seed requirements. As a result, prices are rising due to unmet demand, import volumes are expanding, production costs are increasing, and sales profitability is declining.

In the republic, across several agroclimatic zones, certain results have been achieved in organizing potato seed production based on the intensive method of in vitro propagation using virus-free source material, which enables higher yields compared to traditional methods. In the "Uzbekistan – 2030" Strategy, ensuring domestic production of vegetable and melon crops, as well as seed potatoes, at 50% (Goal 54), together with mechanisms for food production, are identified as priority directions of the Agricultural Development Strategy for 2020–2030.[2]

This dissertation research contributes to the implementation of tasks established in the Presidential Decree of the Republic of Uzbekistan dated October 23, 2019, No. PF-5853, "On Approval of the Agricultural Development Strategy of the Republic of Uzbekistan for 2020–2030"; the Decree dated February 14, 2025, No. PF-22, "On Additional Measures for Introducing a Modern Organizational System for the Activities of Homestead Plot Owners and Peasant Farms and Their Financial Support"; and the Resolutions dated September 8, 2025, No. PP-269, "On Additional Measures to Increase Potato Production in the Republic and Further Development of Seed Production," and dated May 6, 2020, No. PP-4704, "On Measures to Expand Potato Production and Further Develop Seed Production in the Republic," as well as other relevant regulatory acts.

Connection of the Research Topic with the Priority Areas of Science and Technology Development of the Republic. The dissertation research was conducted within the priority areas of science and technology development of the republic: II. "Spiritual, moral, and cultural-educational development of a democratic and law-governed society, and the formation of an innovative economy," and V. "Agriculture, biotechnology, ecology, and environmental protection."

[1] Хамидреза Ваджданы. 2022. "Применение картофеля в прикладных науках". https://pem.areeo.ac.ir/article_128058_a9bb42c14a2d7c8705f67a7b32b25344.

[2] Decree No. PF-158 of the President of the Republic of Uzbekistan dated September 11, 2023, "On the Strategy 'Uzbekistan–2030'."

Degree of Study of the Problem. Foreign scientists, including Vishegurov S.Kh.[3], Belova M.V.[4], Chagin V.V.[5], Naser M.[6], and Oves J.V.[7], have conducted scientific research on improving modern cultivation methods for high-yielding potato varieties, increasing yields, analyzing the economic aspects of agrotechnical practices, reducing production costs, improving seed productivity, assessing the economic efficiency of organic fertilizer application, obtaining source material through in vitro propagation, and substantiating opportunities for improving economic efficiency.

In the Republic of Uzbekistan, leading scientists, including Sherkabilov Sh.A., Dilmurodov O.G., Iskandarov S.T., Alimov U.Z., Saidzhanov S.J., and Khasanov B.T.[8], have conducted research on improving the economic efficiency of potato seed production and developing value-added chains in the agro-industrial complex. However, scientific research specifically focused on improving the economic efficiency of potato seed production based on modern biotechnologies under the conditions of the republic remains insufficiently developed.

Connection of the Dissertation Topic with the Research Plan of the Organization in Which the Dissertation Was Conducted. The dissertation research was carried out in accordance with Item 6 of the research plan of the International Center for Strategic Development and Research in Food and Agriculture within the framework of supporting food sector development and conducting economic analysis of current projects and programs.

Research Objective. The objective of the study is to develop theoretical foundations and scientifically substantiated proposals and recommendations for improving the efficiency of potato seed production based on the biotechnological in vitro propagation method.

Research Tasks:

to justify the multiple increase in net income per unit area compared to extensive methods through resistance to viruses and various diseases, as well as optimization of the growing period;

to calculate energy, labor, environmental, material, and other costs at different stages of seed potato production, study their impact on production costs, and develop new mechanisms based on economic analysis;

to develop a systematic economic and legal support framework aimed at increasing potato production volumes and improving production processes;

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[3] Вишегуров С.Х. “Совершенствование агротехнических приемов выращивания разных сортов оздоровленного семенного картофеля в лесостепи приобья” (2000 г).

[4] Белова М.В. “Повышение экономической эффективности производства и реализации картофеля” (2004).

[5] Чагин В.В. “Сортовой потенсиал и семенная продуктивност картофеля в степной зоне Рес. Хакасия” (2011 г).

[6] Naser M. “Effect of Fish Amino Acid on Potato Growth and Yield under Natural Science Farming” (2018-y).

[7] Овес Й.В. “Биотехнологические основы совершенствования процесса получения и размножения исходного материала в оригинальном семеноводстве картофеля” (2021 г).

[8] Sherkabilov Sh.A. Improving the Economic Foundations of Sustainable Potato Farming: author’s abstract dissertation. Tashkent, 2025. 57 p.; Dilmurodov O.G. Improving the Logistics Chain of Product Sales in the Fruit and Vegetable Complex under Economic Liberalization Conditions: dissertation for the degree of Candidate of Economic Sciences. Tashkent, 2010. 152 p.; Iskandarov S.T. Improving the Economic Foundations of Protected Vegetable Farming: author’s abstract dissertation for the degree of Candidate of Economic Sciences. Tashkent, 2018. 46 p.; Alimov U.Z. Ways to Increase the Economic Efficiency of Melon Crop Production: author’s abstract dissertation for the degree of PhD in Economics. Tashkent, 2023. 52 p.; Saidjonov S.J. Development of Potato Farming and Increasing Its Economic Efficiency: author’s abstract dissertation for the degree of Candidate of Economic Sciences. Tashkent, 2009.; Hasanov B.T. Improving the Activities of Potato Production Value Chain Entities in Food Supply (on the Example of Samarkand Region): author’s abstract dissertation for the degree of PhD in Economics. Tashkent–Karshi, 2024.

to develop recommendations for ensuring efficiency in the production, storage, and marketing of seed material based on public-private partnership (PPP) principles, taking into account the role of potatoes in the population's diet;

to assess potato seed production efficiency through the "Efficiency Index";

to develop forecast indicators for potato seed production in the Republic of Uzbekistan up to 2030 based on new mechanisms with high in vitro propagation efficiency.

Research Object. The research object is seed potato-producing farms, and for monographic research, the research station of the Research Institute of Vegetable, Melon Crops, and Potato Growing in Taylak District.

Research Subject. The subject of the research is the system of intersectoral economic relations aimed at developing potato seed production through the in vitro propagation method, increasing yields, improving quality, and enhancing seed productivity.

Research Methods. Comparative and economic analysis, scientific-logical reasoning, monographic observation, synthesis, expert assessment, economic-mathematical modeling, and forecasting were used in the study.

Scientific Novelty of the Research:

unlike traditional potato seed production methods, progressive multiplication of production volume through the application of the in vitro propagation method has been established, and its economic efficiency has been justified;

the "Efficiency Index" used to assess the economic efficiency of potato seed production has been improved. The evaluation criteria for efficiency levels have also been substantiated as follows: extremely inefficient (1.0–1.4), inefficient (1.5–2.4), partially efficient (2.5–3.4), efficient (3.5–4.4), and highly efficient (4.5–5.0);

an organizational-economic mechanism aimed at increasing seed potato production volumes and systematically optimizing production processes based on PPP has been developed and improved using Samarkand Region as a case study;

forecast indicators for seed potato production volumes in the Republic of Uzbekistan up to 2030, based on modern biotechnologies that meet established economic parameters, have been developed.

Practical Results of the Research:

as a result of applying a three-stage approach based on the in vitro propagation method in potato seed production, it was established that net income per unit area can increase by up to 30% through multiplicative growth compared to extensive methods;

assessment of the economic efficiency of potato seed production using the "Efficiency Index" and its criteria (extremely inefficient, inefficient, partially efficient, efficient, highly efficient) demonstrates a reduction in seed material losses by up to 5% and excess costs by up to 20%;

using Samarkand Region as a case study, the possibility of obtaining a gross harvest of 93 thousand tons was forecast through a three-year mechanism for improving production processes and support based on public-private partnership;

practical forecast models for seed potato production volumes in the Republic of Uzbekistan up to 2030, based on modern biotechnologies and established economic parameters, have been developed.

Reliability of the Research Results is ensured by statistical processing of data related to cost optimization, improvement of economic efficiency, and rational resource use in potato seed production; the application of questionnaires, monographic observation, forecasting, and experimental methods; consistency between theoretical and practical results; implementation of findings in practice; as well as discussion of research results at republican and international scientific-practical conferences and publication in scientific journals recommended by the Higher Attestation Commission of the Republic of Uzbekistan.

Scientific and Practical Significance of the Research Results. The significance of the research is determined by the development of scientific approaches to creating added value and reducing technological stages in seed potato production; justification of opportunities to reduce excess costs and introduce modern economic mechanisms in potato seed production; development of a harvest monitoring system; improvement of the PPP-based seed potato production mechanism using Samarkand Region as a case study; and development of forecast indicators for seed potato production volumes in the Republic of Uzbekistan up to 2030 based on modern biotechnologies.

The research creates opportunities to increase added value by introducing modern biotechnologies, such as the in vitro propagation method, into seed potato production and by using virus-free source material, while also simplifying production processes. The developed scientific proposals and recommendations make it possible to achieve high yields and profitability in agricultural enterprises. Moreover, the research results can be applied to improve economic relations in potato production and to develop the academic discipline of "Agricultural Economics."

Implementation of Research Results. Based on the scientific and practical results obtained in improving the economic efficiency of potato seed production:

the approach aimed at progressive multiplicative growth of production volume based on the in vitro propagation method and improvement of economic efficiency was introduced into the system of the Ministry of Agriculture on an area of 17 hectares, resulting in yield increases of 48 centners per hectare (Certificate of the Ministry of Agriculture dated August 14, 2025, No. 05/05/4953; Program of measures approved by Order of the Minister of Agriculture dated March 10, 2026, No. 01/27-4-51);

the approach aimed at improving efficiency through enhancement of the "Efficiency Index" in potato seed production and automation of the "production–storage–marketing" cycle was incorporated for implementation throughout the republic (Order of the Minister of Agriculture dated September 11, 2025, No. 218; Certificate of the Ministry dated August 14, 2025, No. 05/05/4953). Using the relevant enterprise as a case study, a 10% reduction in excess costs, a 5% reduction in seed material losses, and a 76.67% improvement in economic efficiency were demonstrated;

the organizational-economic mechanism of seed potato production based on PPP, using Samarkand Region as a case study, together with a forecast for producing 93 thousand tons of seed potatoes over three years, was introduced into the activities of the "Uzbek-Korean Potato Seed Production Center" at the Samarkand Institute of Agroinnovations and Research (Minutes of Supervisory Board meetings dated June 14, 2024, No. 2, and December 4, 2025, No. 3; Certificate of the Ministry of Agriculture dated February 13, 2026, No. 06/26-2-10-05/16);

proposals on forecast indicators for seed potato production volumes up to 2030 based on modern biotechnologies were taken into account in the development of Presidential Resolution of the Republic of Uzbekistan dated September 8, 2025, No. PP-269, under which achieving economic efficiency through the production of 617 thousand tons of high-quality seed potatoes by 2030 is planned (Action Plan approved by Order of the Minister of Agriculture dated September 11, 2025, No. 218; Certificate of the Ministry dated February 13, 2026, No. 06/26-2-10-05/16).

Approbation of Research Results. The research results were discussed and approved by the Academic Council of the International Center for Strategic Development and Research in Food and Agriculture and were presented at international and national conferences. The findings were presented and discussed at two international and four republican scientific and practical conferences.

Publications Based on the Dissertation Findings. Based on the research findings, three articles were published in scientific journals recommended by the Higher Attestation Commission of the Republic of Uzbekistan, including two in domestic journals and one in an international scientific journal.

Volume and Structure of the Dissertation. The dissertation consists of 113 pages and includes an introduction, three chapters, conclusions and recommendations, a list of references, and appendices.

MAIN CONTENT OF THE DISSERTATION

In the introduction, the relevance and necessity of the research are justified. The objective, tasks, object, and subject of the research are stated; correspondence with the priority areas of science and technology development of the republic is shown; scientific novelty and practical results are formulated; information on the implementation of the obtained results in practice, publications, and the structure of the dissertation is provided.

Chapter I. Theoretical Foundations of Economic Efficiency of Potato Seed Production Based on Modern Biotechnologies. The first chapter of the dissertation reveals the theoretical-methodological foundations of seed potato production based on modern biotechnologies, ways to improve efficiency, and organizational-economic mechanisms based on foreign experience. Potato is one of the products with high nutritional value. Its chemical composition includes 62–82% water and 23–34% dry matter, including 16% starch, 1.2–3% protein, 0.9% sugar, and other biologically active substances.

According to estimated data, more than 1 billion people consume potatoes in their daily diet.[9] Currently, research on potato genetics is conducted in more than 50 countries of the world, and intensive, high-yielding varieties are being created. Notably, biological changes open up the possibility of forming biometric data on potato varieties, identifying genetic traits in the breeding process[10], and creating economically stable hybrid varieties with new properties, all of which are scientifically grounded.

[9] Rahimov G., Massino I., Qurbonov G., Alimov A. Plant Science. Potato. Tashkent, 2006. pp. 55–203.
[10] Борис К.В., Рижова Н.Н., Кочиева Й.З. “Изучение внутривидового полиморфизма фрагмента гена сахарозосинтазы сус4 картофеля (Solanum tuberosum) // Genetika, 2011, t.47, 190-198 стр.

Based on the organizational foundations of potato seed production, new intensive and high-yielding varieties are created through in vitro propagation, mutagenesis, and genetic methods. The German scientist Otto Appel, in particular, developed a methodology for certification to detect potato diseases and combat viral infections. This methodology is aimed at obtaining high-quality seed material while maintaining quality and sanitation standards (see Fig. 1).

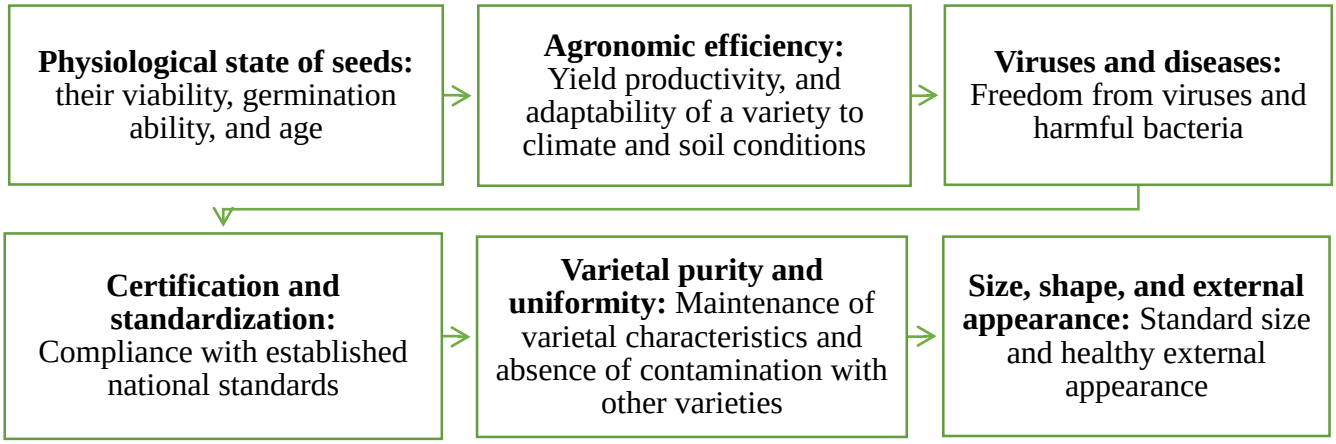


Fig. 1. Otto Appel's Methodology for Assessing Seed Productivity[11]

The methodology is aimed at ensuring varietal purity and yield quality stability, thereby reducing breeding costs. In particular: potential yield, where N is the number of tubers per 1 ha (pcs.), B is the number of tubers per plant (pcs.), and M is the average weight of one tuber (g).

Gross yield accounting for disease infection:

$$\mathbf{Y_h=(N-N_k)\times B\times M+N_k\times B\times M\times(1-P_k)} \quad (1).$$

Yield reduction: $\mathbf{\Delta Y=Y_p-Y_h}$ (2).

Where Y_h is gross yield, N_k is the number of infected plants, and Pk is the yield reduction in infected plants (range: 0 – 1). In percentage terms: $K=(Y_p-Y_h)/Y_p\times100\%$. For example, when calculated for 10 million mini-tubers: $N_k=N\times C=10$ million$\times0.1=1$ million pcs; potential yield: $Y_p=10$ million$\times8\times60=4{,}800$ t/ha; Y_h =(9 million$\times8\times60$)+(1 million$\times8\times60\times0.6$)=4,608 t/ha; reduction: K=4%. Empirically, potato demand is calculated taking into account population growth and the significance of this product. In this study, a methodological classification of potato seed production was developed (see Fig. 2).

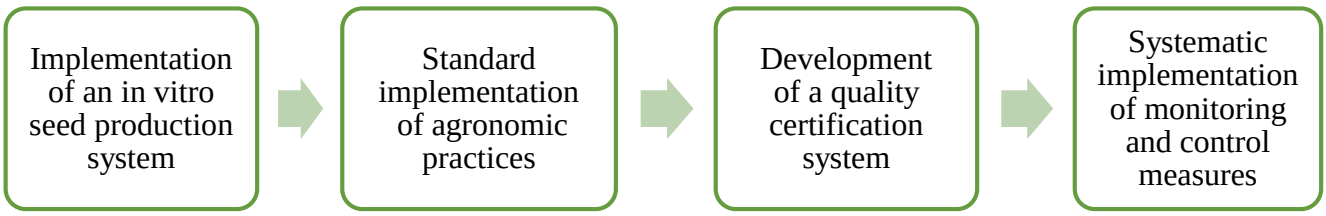


Fig. 2. Methodological Classification of Potato Seed Production Based on Modern Biotechnologies[12]

[11] www.openagrar.de/receive/openagrar_mods_00036264, Virus and Virus-like Diseases of Potatoes and Production of Seed-Potatoes, Die Pflanzkartoffel (1918; 2-nashr 1920).

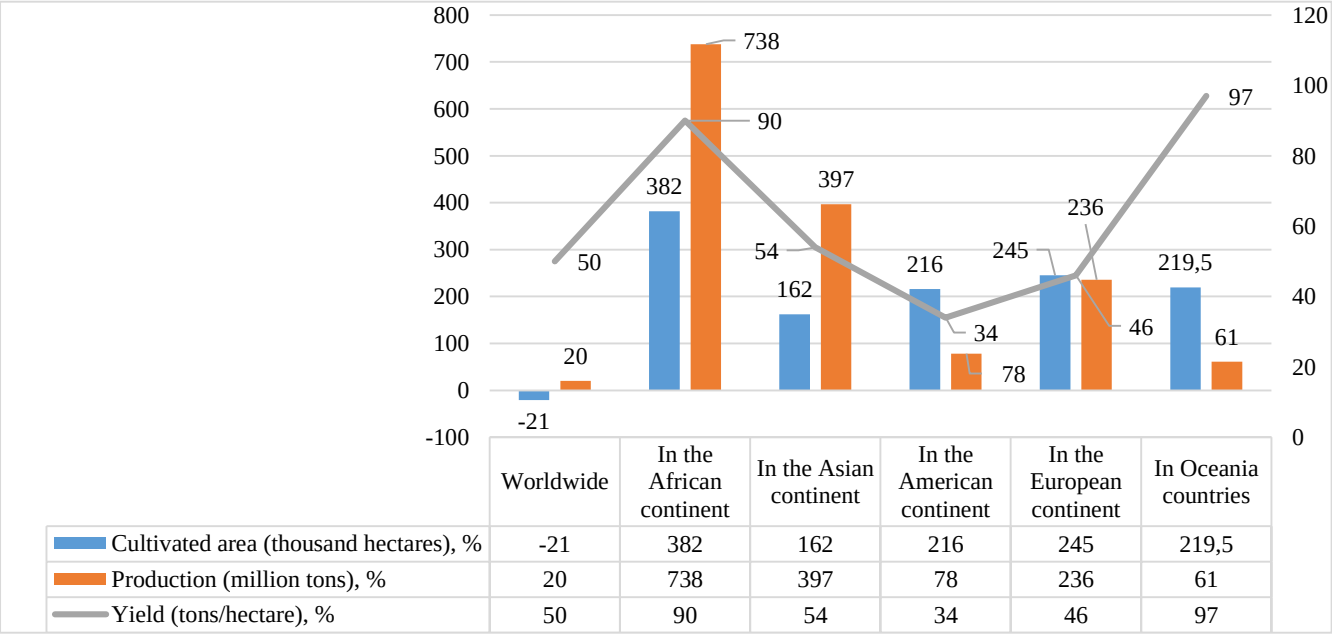
[12] The author's original research-based work.

In Fig. 2, within the first stage, a high multiplication rate of in vitro technology is forecast over a short period; the second stage provides for agrotechnical activities adapted to aeroponic, hydroponic, or open-field conditions; the third stage involves the introduction of control procedures, varietal purity checks, virus freedom assessment, laboratory diagnostics, and identification using molecular markers. The fourth stage covers "from laboratory to field" monitoring and phytosanitary observations during the growing season. As a result, losses are reduced by up to 15%, yield quality improves, and overall production efficiency increases. The overall indicator of economic efficiency of land use can be determined by the following formula:

$$\mathbf{I=SD/(L+M+E)} \quad (3).$$

Where I is the coefficient of economic efficiency of land use, SD is the net income per 1 ha of the relevant land type (sum), L is labor costs (workforce) (sum/ha), M is material resource costs (sum/ha), and E is land resource costs (energy costs) (sum/ha). In the calculation: SD=10 million sum/ha, L=2 million sum/ha, M=1,5 million sum/ha, and E=700 thousand sum/ha.

Result: I=10 million/(2 million+1,5 million+700 thousand)=10 million/4,2 million=2,38. Thus, the coefficient of economic efficiency of land use is 2,38, meaning that for every 1 sum spent, 2,38 sums of income are generated. On a global scale, according to potato production volume and yield indicators, in 2025 the market volume was USD 119,79 billion, and by 2030 it is expected to grow to USD 142,27 billion. In the Asia-Pacific region, this growth is driven by expanding consumption and production volumes (see Figs. 3 and 4).



	Worldwide	In the African continent	In the Asian continent	In the American continent	In the European continent	In Oceania countries
Cultivated area (thousand hectares), %	-21	382	162	216	245	219,5
Production (million tons), %	20	738	397	78	236	61
Yield (tons/hectare), %	50	90	54	34	46	97

Fig. 3. Analysis of Global Potato Production and Yield Indicators[13]

[13] https://pem.areeo.ac.ir/article_128058_a9bb42c14a2d7c8705f67a7b32b25344.

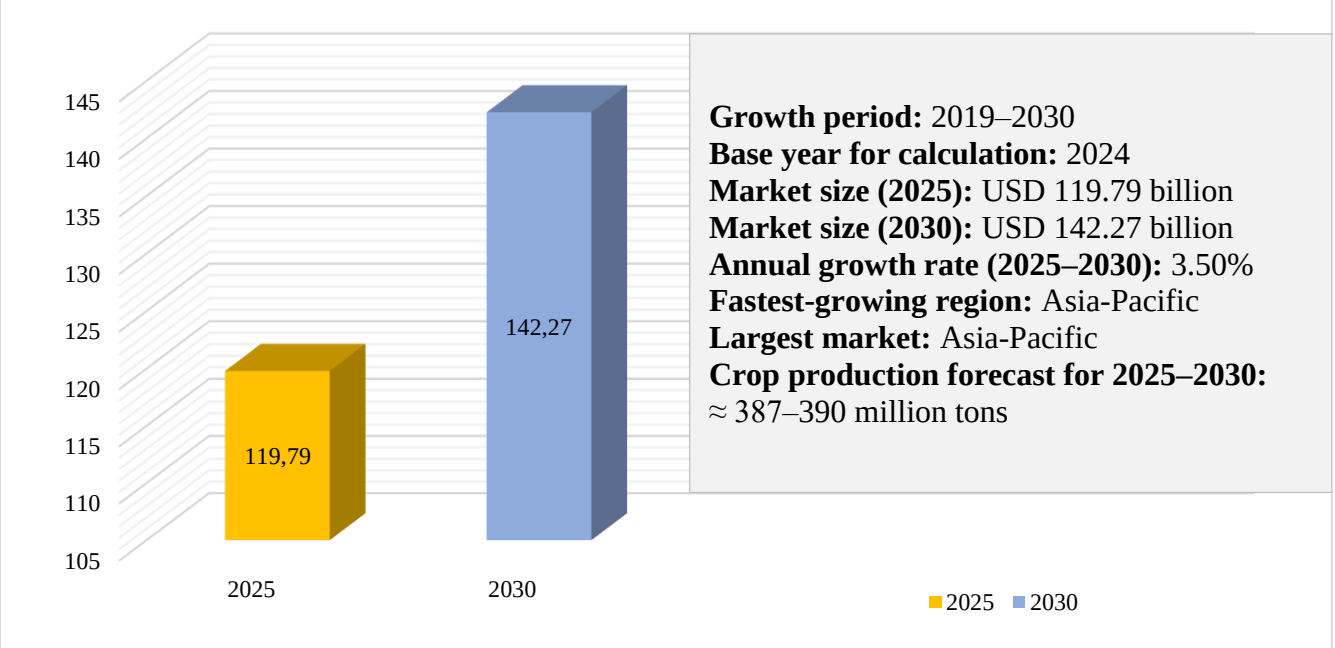


Fig. 4. Forecast of Global Potato Market Growth for 2025–2030[14]

In order to reduce potato imports and provide the population of Uzbekistan with high-quality potatoes, improvement of the seed production system is necessary. For this purpose, it is important to create a management system providing for the stepwise free supply of producers with high-quality seed material. Potato seed production is economically necessary since domestic yields are below world standards, and import volumes in 2025 reached 490.8 thousand tons (a 9.1 % increase). Imports of seed material are increasing, indicating insufficient development of the domestic seed production system. As a solution to this problem, through the application of modern biotechnological methods, it appears possible to increase yields by up to 100 % (see Table 1).

Table 1. Economic Necessity of Improving the Efficiency of Potato Seed Production[15]

Direction	**Indicators**
Import volume (2025)	490.8 thousand tons of potatoes
Import growth	Increased by 9.1%
Seed material import (2025)	4 thousand tons
Domestic yield	163 centners/ha
World yield	16 t/ha (in experiments – 40 – 80 t/ha)
Efficiency of advanced technologies	Capable of increasing yield by 50–100%

[14] https://www.mordorintelligence.com/industry-reports/potato-market.

[15] https://www.spot.uz/oz/2025/10/13/potato-import/?utm_source, https://www.fao.org/4/i0200e/I0200E10.htm?utm, https://news.sustainability-directory.com/food/new-potato-breeding-boosts-yields-enhancing-global-food-security/?utm_source "Parameters".

Thus, due to dependence on imported varieties in potato seed production in Uzbekistan, unstable yield results have been observed in recent years. Gross harvest has increased significantly, but a slight decline has been noted recently. The sown area initially showed an expansion trend and then somewhat declined. These changes reflect differences in the efficiency of potato cultivation and resource use (see Fig. 5).

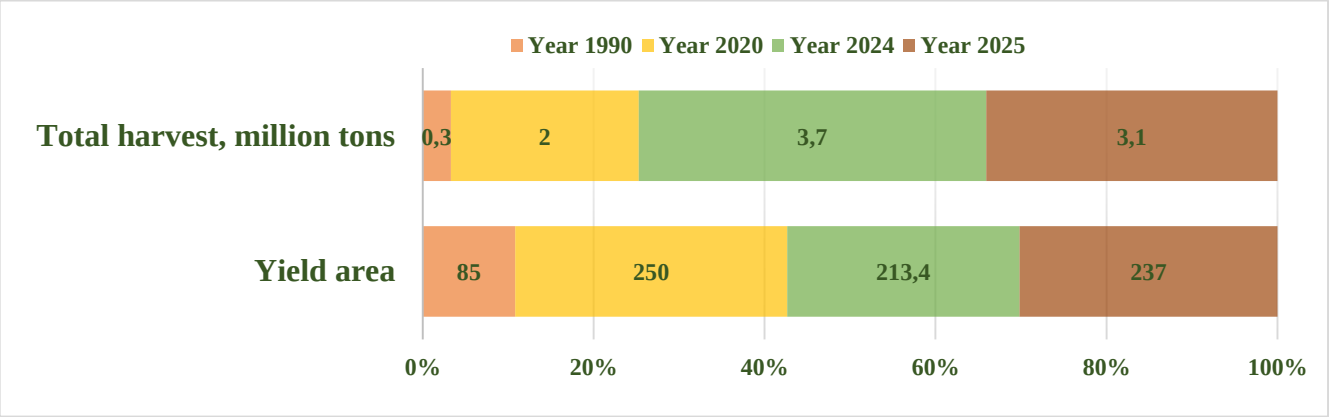


Fig. 5. Dynamics of Potato Production in Uzbekistan.

The diagram shows overall growth in 2020–2024 and a decline in 2025. These changes are due to the technologies used in potato cultivation, climatic factors, and other influences. Environmental problems complicate agricultural practices and create food security threats.[16] Based on the experience of countries such as the Netherlands, France, Germany, and Egypt, practical measures are recommended for adoption in potato cultivation. (see Table 2).

Table 2. Comparative Analysis of Foreign Experience in Potato Seed Production (2024).

Technology and Performance	Comparative Analysis with Uzbekistan
Netherlands. 300 varieties, 90 % in vitro, strict certification system, sufficient high-quality seed material. Export – USD 763,7 million.	Laboratories exist, but export volumes and varietal diversity are small; the international certification system is absent.
France. "Bretagne Plants Innovation" and University of Orsay; annually – 21 thousand ha, 630 thousand t of seed material, 240 thousand t of exports.	A cluster system is being formed, but the comprehensive system and variety assortment are limited.
Germany. Breeding, genetic monitoring, and agrotechnologies are widely applied. Export – 102,9 million kg, yield – 40 t/ha.	Breeding and genetic monitoring are underway, but yields are low and technologies are insufficiently developed.
Egypt. In vitro is intensively developing. Lady Rosetta and Spunta varieties – exports of USD 49,5 million to Africa and the Middle East.	There are few laboratories; acclimatization and export volumes are negligible.
South Korea. Through in vitro propagation, 10 million micro-tubers are produced annually. Exports are limited; South Korea is a leader in Asia.	An innovation system is being introduced; automation and micro-tuber production are limited.

[16] Ahatqulov B. "Economic Analysis of Biological Approaches in Ensuring Food Security" // Agro Biznes Inform, No. 1, p. 3.

Economic efficiency in the production process depends on the cost of resources and expresses the ratio of income to total production costs. The calculation is performed using the following formula:

$$IS = \frac{\text{Income}}{\text{Total Costs}} \quad (4).$$

Where IS represents economic efficiency, if IS>1, production is economically efficient (income exceeds expenditure), if IS<1, production is economically inefficient (expenditure exceeds income). For example: the production of 2 million in vitro plants over 3 months in the laboratories of Uzbekistan requires 4,172 million sums (2,086.2 sums for per 1 mini-tuber). According to the obtained results, up to 10 million mini-tubers can be grown in heated greenhouses (85 % germination), from which up to 2 thousand tons of super-super-elite seed material can be obtained from mini-tubers (average yield of 160 centners/ha). The cost of 1 kg of seed material is 8 thousand sum (5,5 thousand sums – production and storage costs, 2,5 thousand sums – markup). Average price of 1 kg of super-super-elite – 10 thousand sums; total income – 20 billion sums.

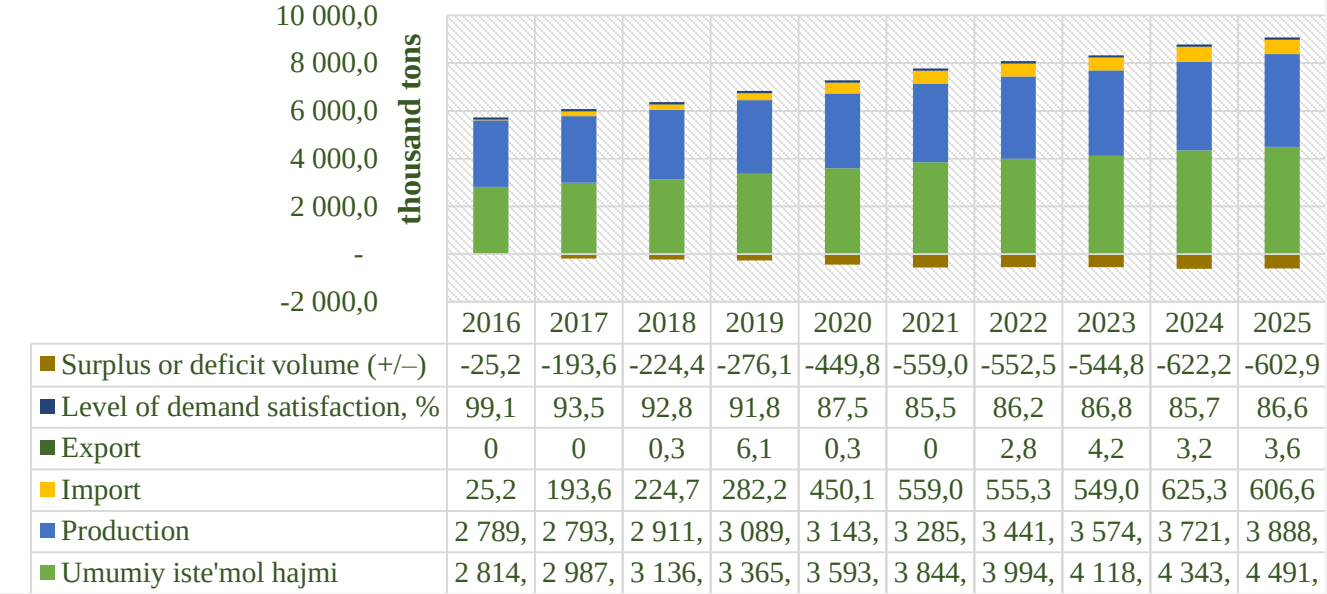
Chapter II. Organizational-Economic Mechanisms of the Potato Seed Production System in Uzbekistan. The second chapter of the dissertation justifies the assessment of economic efficiency indicators of in vitro propagation. Currently, the gene pool of Uzbekistan's potatoes contains more than 250 varieties, of which 27 were created as national seed material.[17]

The problem is that guaranteed seed material is insufficient; in many cases, potato from R1 to R5 generations and even food-grade potatoes are used as seed material.

When importing, entrepreneurs lack working capital, interest rates on loans are high (up to 27 %), and transportation and logistics costs are significant. Moreover, imported varieties are not of high reproduction quality: cheaper variants are imported due to high costs; imported varieties are sold at prices of 15–50 thousand sums. When producing on 1 ha, 60 – 70 million sums are spent on seed material, mineral fertilizers, fuel and lubricants, and labor, which is 2 – 4 times more than for other crops. Domestic early potatoes have significantly lower production costs than imported ones; however, restrictions on the export of domestic potatoes are in effect.

In Uzbekistan, resources for potato production are limited. For example, irrigating 1 ha of potatoes using a pump consumes approximately 7 thousand m³ of water and 2.3 thousand kWh of electricity (~2.1 million sums), which raises production costs by 3.5 – 4%. In addition, soil fertility decreases annually. Statistical data on the potato deficit and high import indicators are presented in Fig. 6.[18]

[17] https://aniq.uz/uz/yangiliklar/kartoshkachilikni-rivojlantirish-choralari-belgilandi?utm.
[18] https://siat.stat.uz/reports-filed/323/table-data.



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Surplus or deficit volume (+/–)	-25,2	-193,6	-224,4	-276,1	-449,8	-559,0	-552,5	-544,8	-622,2	-602,9
Level of demand satisfaction, %	99,1	93,5	92,8	91,8	87,5	85,5	86,2	86,8	85,7	86,6
Export	0	0	0,3	6,1	0,3	0	2,8	4,2	3,2	3,6
Import	25,2	193,6	224,7	282,2	450,1	559,0	555,3	549,0	625,3	606,6
Production	2 789,	2 793,	2 911,	3 089,	3 143,	3 285,	3 441,	3 574,	3 721,	3 888,
Umumiy iste'mol hajmi	2 814,	2 987,	3 136,	3 365,	3 593,	3 844,	3 994,	4 118,	4 343,	4 491,

Fig. 6. Potato Production Indicators in Uzbekistan.

From the diagram it follows that import volume at ~10 %, correspondence of growth to sown areas, and the excess of the price of imported seed material over domestic by up to 30 % are considered the norm. The commodity quality of seed material must not be lower than 90 %, it must be resistant to viruses and diseases. A requirement is set for yields – to be up to 25% higher than existing varieties. Currently, early and medium-ripening potato varieties in the country provide relatively high yields (20 – 30 t/ha). In this connection, there are fundamental differences between traditional and biotechnological methods (see Table 3).

Table 3. Comparative Analysis of Traditional and Biotechnological Methods in Potato Seed Production[19]

Traditional Method	Biotechnological Method
Natural cultivation method; high risk of viral infection	Virus-free clean seed material; quality and stability
Average 20–30 t/ha	Average 40–50 t/ha
Unstable from season to season	Stable and highly efficient
Low production and storage costs, high losses	High laboratory equipment costs; high quality and volume
Simple and outdated technology	Qualified personnel and laboratory are required
Average yield, small costs	High yield, increased costs
Viruses, infection, low yield	Laboratory and financial risks
Seed material deficit, import dependence	Seed material volume increases; import dependence decreases
Supported by traditional methods	Advanced technologies and high quality

[19] The author's original research-based work.

With in vitro propagation, 20 – 50 mini-tubers are obtained from one healthy potato plant – significantly more than with the traditional method (8 – 10 pcs.). Up to 40 – 50 t of yield can be obtained from one hectare, with yields increasing by 30% (compared to the traditional method 18 – 25 t/ha).

Production cost: $T=X+M+E+Q$ (5).	**Profit:** F = Income − Production Cost (6). **Profitability:** $P = \frac{\text{Daromad}}{\text{Tannarx}} * 100\%$ (10).
Plowing, cultivation and sowing costs, seed price, fertilizer, water and labor costs, fuel and wages.	If profitability is in the range of 25–40%, the seed production enterprise is considered efficient.
Production income: $D = \text{Area}\left(\frac{ga}{t}\right) \text{Sale price}\left(\frac{sum}{t}\right)$ (7).	**Production efficiency:** $IS = \frac{\text{Income}}{\text{Costs}}$ (8).
Income from selling seeds.	Net profit per 1 hectare (UZS/ha), production cost per 1 kg seed (UZS/kg), and profitability coefficient (IS > 1 indicates efficiency).

Fig. 7. Economic Indicators of the Potato Seed Production System[20]

When producing 400 thousand in vitro plants, the formation of production cost depending on expenses is expressed by the following formula (see Figs. 8 and 9):

$$\mathbf{T = (MC + EC + LC) \times LF \times (1 + UF)} \quad (9).$$

Where: MC – material costs, EC – electricity consumption, LC – labor resource costs, LF – coefficient of laboratory capacity influence on production cost (=1), UF – unforeseen cost coefficient (0.15).

$T = (791{,}500{,}000 + 75{,}600{,}000 + 252{,}000{,}000) \times 1 \times 1{,}15 = 1{,}286{,}965{,}000$

Production cost of 1 in vitro plant $(1{,}286{,}965{,}000 \div 400{,}000 = 3{,}217.4)$ is 3,217.4 sum.s

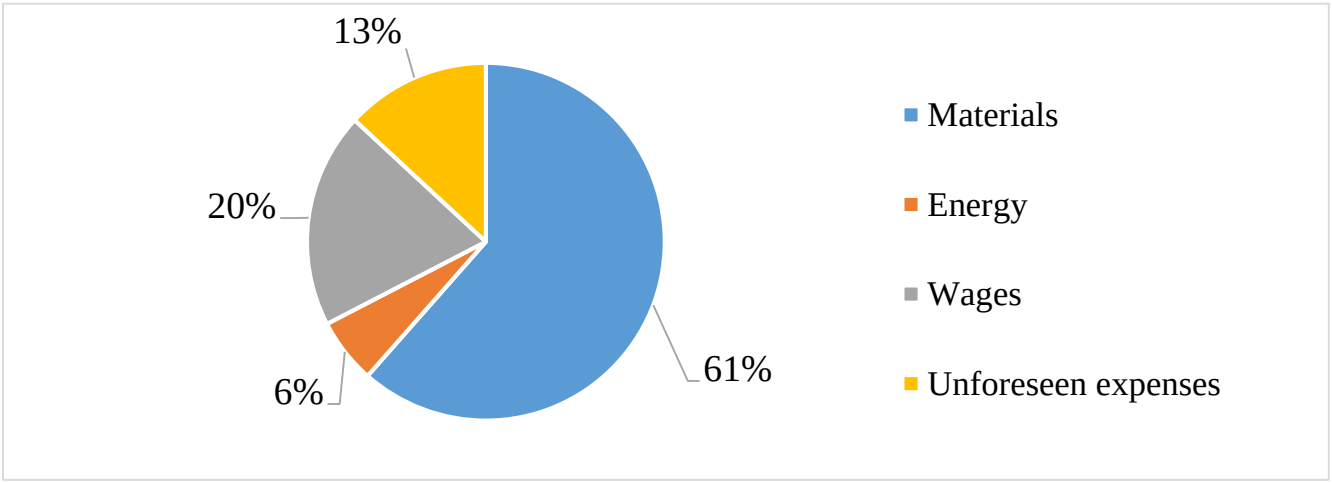


Fig. 8. Costs for Producing 400 Thousand In Vitro Plants[21]

[20] The author's original research-based work.
[21] The author's original research-based work.

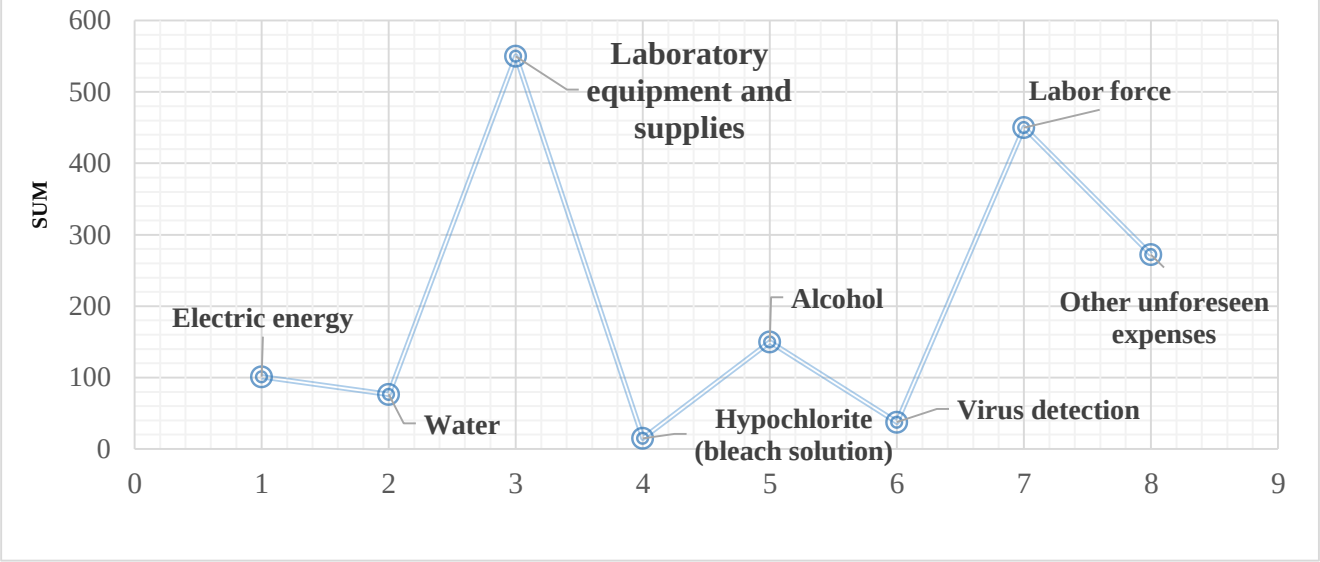


Fig. 9. Dynamics of Cost Growth for Producing 1 Mini-Tuber[22]

In addition, for determining mini-tuber production costs, regression analysis and regression equation were applied:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \ldots + \beta_{14} X_{14} + \varepsilon} \quad (10).$$

Where: Y – production cost (1 pc.), X_1 – electricity costs (2,6 sums), X_2 – (1,2 sums), X_3 – manure costs (96 sums), X_4 – fertilizers (120 sums), X_5 – mosquito net (330 sums), X_6 – rice husks (34,6 sums), X_7 – fuel and lubricants (3,5 sums), X_8 – disease and pest control (21,6 sums), X_9 – wages (360 sums), X_{10} – boxes (30 sums), X_{11} – irrigation (60 sums), X_{12} – equipment (3,6 sums), X_{13} – other costs (159,5 sums), X_{14} – VAT (146,7 sums), $\beta_0=0$, all β coefficients from 1 to 14 have an influence coefficient 1:1, ε=margin of error ($\varepsilon = Y_{actual} - Y_{forecast} = 1{,}369.3 - 1{,}507.5$) ≈ 0.1.

Result: Y=1,369.3 sum.

$$\text{Mass} = \text{N} \times 0{,}06 = 10{,}000 \times 0{,}06 = 600 \text{ kg}/0{,}6 \text{ t}.$$

The reliability of calculations was assessed using the F-statistic formula:

$$\mathbf{F - stat} \equiv (\mathbf{R^2/k})/((\mathbf{1 - R^2})/(\mathbf{n - k - 1})) \quad (11).$$

Where: R^2=0,9 (coefficient of determination of the model), k=14 (number of independent variables), n=29 (number of observations), (n−k−1)=14 (degrees of freedom of the model).

$$\mathbf{F - stat} \approx (\mathbf{0,9/14})/(\mathbf{0,1/14}) = \mathbf{0,06429/0,00714} \approx \mathbf{9,0}.$$

F>0, which confirms the reliability of the entire mechanism.

With the traditional method, the following expenses are incurred on average per 1 ha under potatoes: 3 t of seed material (45 – 50 million sums), 500 kg of mineral fertilizers in pure form (6.4 million sums), 230 kg of fuel and lubricants (3 million sums), mechanization services (2 million sum), taxes (2 million sum), labor (10 – 12 million sums), and 1.5 million sums of other costs. On average, 20 – 25 workers receive a daily payment of up to 200 – 400 thousand sums.

[22] The author's original research-based work.

Chapter III. Prospects for Supporting and Improving the Economic Efficiency of the Potato Seed Production System Based on Modern Biotechnologies in Uzbekistan the third chapter of the dissertation develops: a mechanism for ensuring stepwise multiplicative growth of production volume and economic efficiency through the application of the in vitro propagation method in potato seed production, unlike traditional methods (see Table 4), a mechanism for improving the "Efficiency Index" in assessing the economic efficiency of potato seed production and assessing efficiency levels by criteria (see Table 5), an organizational-economic mechanism aimed at increasing seed potato production volumes and systemic optimization of production processes based on PPP using Samarkand Region as an example (see Fig. 12), as well as forecast indicators of seed potato production volume in the Republic of Uzbekistan up to 2030 based on modern biotechnologies meeting established economic parameters (see Table 6).

Table 4. Mechanism for Ensuring Stepwise Multiplicative Growth of Production Volume and Economic Efficiency of Potato Seed Production Based on In Vitro Propagation Technology[23]

Phase 1 (laboratory–greenhouse practice)		
1 year: Scientific institutions receive a competitive budget allocation of USD 1.5 million (transfer funds). A national commission is established.	In 5 laboratories, 400,000 plants will be produced in 3 months, and 2 million micro-tubers will be produced in 5 months.	It is possible to produce 10 million mini-tubers in 24 hectares of greenhouses.
Phase 2 (field practice)		
2 years: Mini-tubers will be distributed to the districts of Qo'rg'ontepa, Baxmal, Zomin, Kitob, Shahrisabz, Yangiqo'rg'on, Bulung'ur, and So'x (total area: 120 ha).	At least 2,500 tons of super-super elite seed potatoes will be produced and sold to farm enterprises in those districts.	The commission will systematically conduct monitoring and control activities, and the local administrations (khokimiyats) will assist in sales and distribution.
Phase 3 (field practice)		
3 years: At least 25,000 tons of super elite seed potatoes will be produced on 1,000 hectares of farm lands across 23 districts.	**4 years:** 25,000 tons of seed will be planted on 10,000 hectares, producing at least 250,000 tons of yield. Out of this, 100,000 tons will be used for consumption and 150,000 tons (60%) will be allocated as elite seed material.	**5 years:** 150,000 tons of elite seed will be planted on 50,000 hectares, producing an average of 1,250,000 tons of yield. From this production, 750,000 tons will be allocated as R1 seed, and 500,000 tons for consumption.

This mechanism strengthens technological continuity, reduces resource consumption, and ensures the implementation of practical activities for multiplying high-yielding seed material. The methods applied in this research study the economic potential of in vitro propagation based on biotechnologies. Through the mechanism in potato seed production – unlike traditional

[23] The author's original research-based work.

methods – virus – free, high – quality source seed material is obtained through the application of the in vitro propagation method, and the possibility of its rapid multiplication is created.

Thanks to this method, through obtaining a large number of healthy seeds from one plant, production volume gradually increases, ensuring multiplicative growth. This process is carried out in three stages (laboratory, greenhouse, and open ground) and leads to the improvement of seed material quality, the reduction of disease incidence, and an increase in yields. Based on the reduction of costs and growth of income, economic efficiency is justified.

Furthermore, for reducing excess costs and increasing additional income in potato seed production, monitoring is justified – the delivery of high-quality seed material to seed production enterprises at concessionary prices based on digital technologies and coordination of harvest results. By preventing maintenance costs, excess costs, and seed material losses through this approach, economic efficiency has been established (see Table 5).

Table 5. Mechanism for Improving the "Efficiency Index" in Potato Seed Production and Assessing Efficiency Criteria in the "Production – Storage – Marketing" Cycle through a Unified Digital Information System[24]

Main Processes	Indicators	Efficiency Index
Research and Breeding Stage		
Creation of virus-free varieties.	90–95% resistance, 35–40 t/ha	3.5 – 4.0
Seed Material Production Stage (in vitro)		
Microclonal propagation.	1:5 → 1:10, costs −10–15%	3.8 – 4.3
Field Propagation Stage		
Production of elite seed material.	25–30 t/ha, profit +15–20%	3.9 – 4.4
Storage Stage		
Production and storage with online monitoring on "E-urug'" digital platform; thanks to convenient logistics, smart sensors, and automatic management, losses are reduced to 5%.	Losses 10% → 5%	4.1 – 4.3
Marketing and Sales Stage		
Proposals are accepted. A seed and seed-producing enterprise database is formed; online auctions are organized. Excess expenditures are prevented; 20 % is saved in sales and production.	Cost savings 20%	4.0 – 4.5
Integral Assessment Stage in Unified Digital Information System		
A unified digital system is maintained. R&D stages, breeding, seed production, field propagation, marketing, and sales are integrated into a single "E-urug'" digital platform and managed automatically (using "YEFC Plants Tissue Culture S.A.Y." company as an example).	Efficiency 76.67%, +115 million sum	4.2

[24] The author's original research-based work.

This approach ensures the digitization of all stages of potato seed production and improvement of efficiency through comprehensive assessment via the "Efficiency Index". Indicators such as production cost, yield, seed material losses, and net profit are comprehensively assessed. Results are normalized and converted to a scale of 1.0 to 5.0, efficiency index levels are classified within this range: 1.0–1.4 → extremely inefficient; 1.5–2.4 → inefficient; 2.5–3.4 → partially efficient; 3.4–4.4 → efficient; 4.5–5.0 → highly efficient.

In the research, using the "YEFC Plants Tissue Culture S.A.Y." company as an example, integration into the automated information system "E-urug'" was carried out and an integral assessment was conducted. Storing 150 tons of super-super-elite seed material in specialized warehouses for 6 months reduces losses to 5 % – 7,5 tons (previous indicator – 10 %, 15 tons). At the same time, according to established requirements, the average sale price is 10 thousand sum for sowing an area of 50 ha; obtaining 1.5 thousand tons of harvest is forecast (at 10 thousand sum – 1,425 million sums) with a reduction in excess costs (by 10 % – to 150 million sums).

Total economic efficiency (by FAO methodology):

$$\mathbf{E = ((b - a) - (y - x))/x \times 100} \quad (12).$$

$$\mathrm{E} = ((1{,}425\ \text{million} - 1{,}325\ \text{million}) - (135\ \text{million} - 150\ \text{million}))/150\ \text{million} \times 100.$$

Total economic efficiency;

E=76,67 %.

Designations: a – gross income before implementation of the system = 1,325 million sum, b – gross income through the "E-urug'" system = 1,425 million sums, x – costs before implementation = 150 million sums, y – costs after implementation 135 million sums (10% less).

Net economic profit:

$$\mathbf{F = (b - y) - (a - x)} \quad (13).$$

$$\mathrm{P} = (1{,}425\ \text{million} - 135\ \text{million}) - (1{,}325\ \text{million} - 150\ \text{million}) = 115\ \text{million sum}.$$

Gross Margin reflects the difference between total sales income and production costs:

$$\mathbf{Gross\ Margin}\ \% = ((\mathbf{Income - Cost\ of\ Goods/Services})/\mathbf{Income}) \times \mathbf{100}\% \quad (14).$$

For example, up to 2 thousand tons of super-super-elite seed material can be obtained from greenhouses (1 kg at 10 thousand sums). Total income – (20 billion − 16 billion sums) = 4 billion sums, goods and services in production – 2 billion sums; difference between total income and costs – 50 %.

$$\mathbf{Gross\ Margin}\ \% = (\mathbf{4\ billion - 2\ billion})/\mathbf{4\ billion} \times \mathbf{100}\ \% = \mathbf{50}\ \%$$

Structure of total income (100 %) distribution by five items: nutrient medium – 20 %, labor 25 – 30%, energy – 20 %, other costs 10 15 %, profit – 20 %.

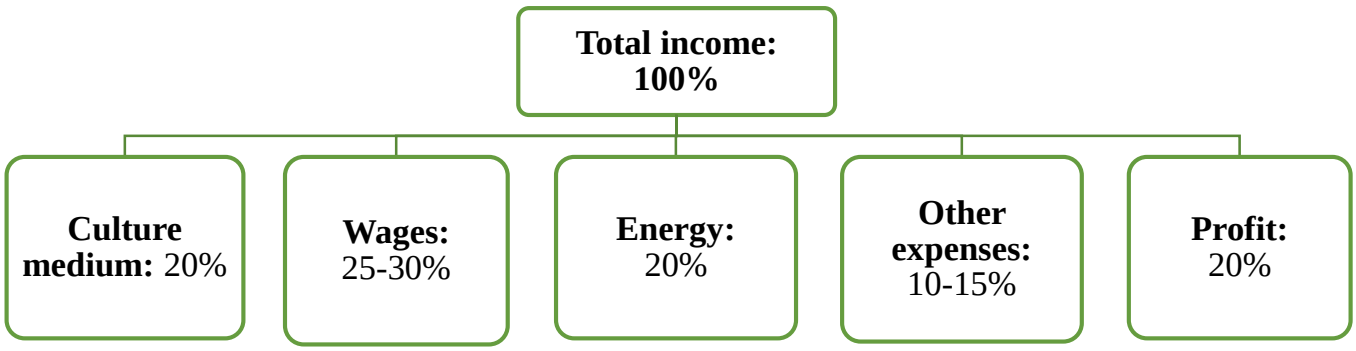


Fig. 10. Cost and Income Standards of In Vitro Propagation Based on Gross Margin Model[25]

In the research, an organizational-economic mechanism aimed at systemic optimization of production processes based on PPP using Samarkand Region as an example was developed (see Fig. 11).

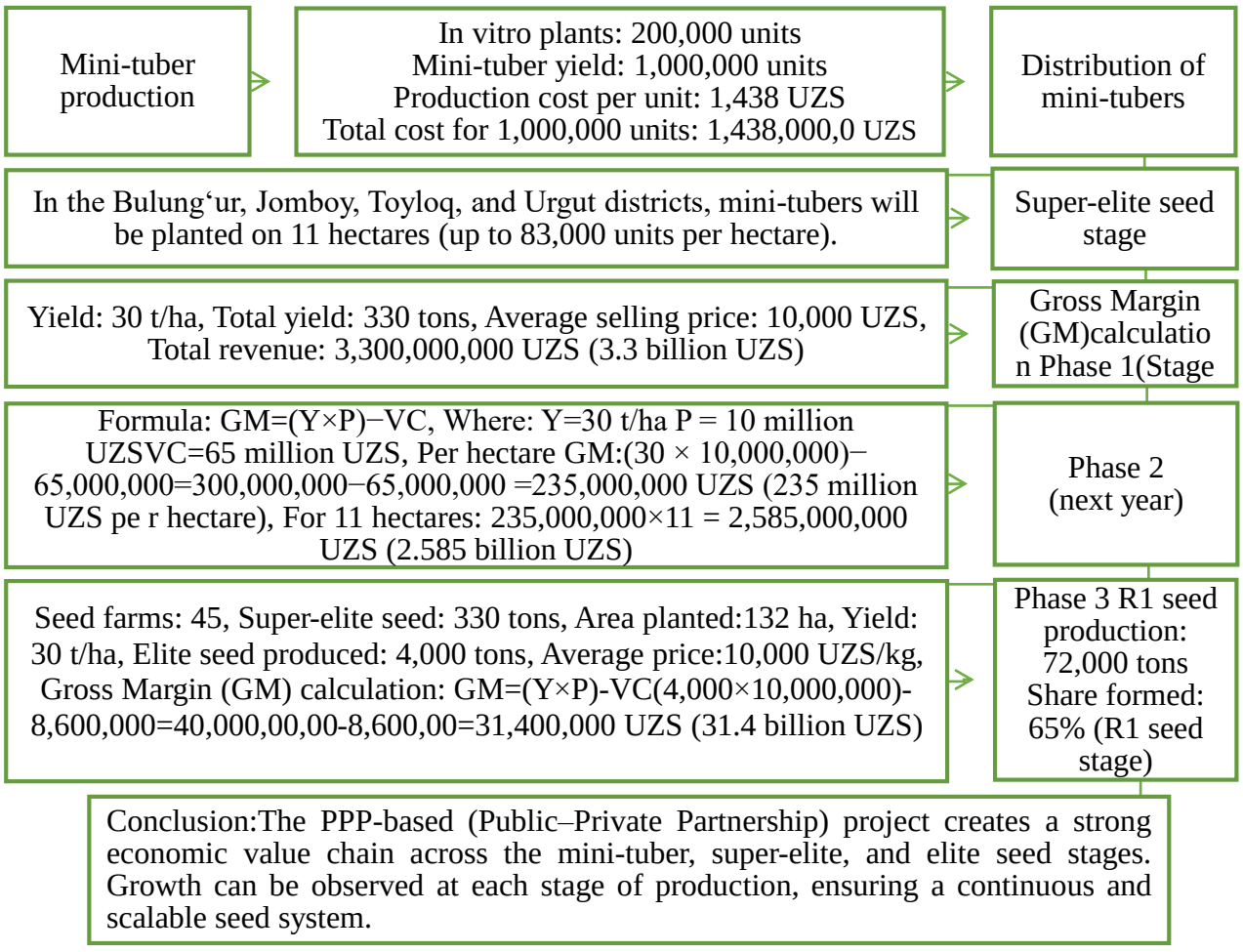


Fig. 11. Organizational-Economic Mechanism Aimed at Systemic Optimization of Potato Seed Production Based on PPP (Using Samarkand Region as an Example)[26]

[25] https://www.cognitivemarketresearch.com/seed-potatoes-market-report#:~:text=As%20per%20Cognitive%20Market%20Research’s, 2.97%25%20from%202024%20to%202031.
[26] The author’s original research-based work.

Based on this mechanism, using Samarkand Region as an example, it is recommended to implement a PPP mechanism worth 2 billion sums. Based on in vitro technologies, a chain for obtaining super-elite seed material from mini-tubers was formed. As a result, an increase in yields and a reduction in production costs were established, and the achievement of efficiency through a systemic approach was justified.

According to estimated data, at the base of the Uzbek-Korean Potato Seed Production Center at the Samarkand Institute of Agroinnovations and Research, it is planned to obtain 200 thousand in vitro plants, from which 1 million mini-tubers are to be grown in greenhouse conditions. These mini-tubers are distributed free of charge to seed production enterprises in five districts – Bulungur, Jambay, Samarkand, Taylak, and Urgut – on an area of 11 ha (at a sowing rate of 85 thousand pcs./ha). As a result, yield will be 30 t/ha, allowing 330 t of super-elite seed material to be obtained. The production cost of 1 mini-tuber is 1,438 sums; total costs for 1 million pcs. –1,438 million sums. The sale price of 1 ton of seed products is set at an average of 10 million sums; net margin is determined by the formula:

$$\mathbf{GM} = (\mathbf{Y} \times \mathbf{P}) - \mathbf{VC} \quad (15).$$

Where: Y – average yield (centners/ha), P – sale price of 1 unit of production, VC – variable costs per 1 unit of production.

$$\mathrm{GM} = (30 \times 10 \text{ million}) - 65 \text{ million} = 235 \text{ million sums/ha}.$$

At the first stage for an area of 11 ha, the net margin is 235 million sums/ha, total profit – 2,858 million sums. At the next stage, the system expands to 45 seed production enterprises, formation of 9,900 t of elite seed material is forecast. According to calculations:

$$\mathrm{GM} = (9{,}900 \times 10 \text{ million}) - 715 \text{ million} = 98{,}2 \text{ billion sums}$$

This represents 98,2 billion sums of economic efficiency.

According to statistical data, in 2024 the global seed potato market was USD 13,863.2 million; it is expected that by 2030 this figure will reach USD 16,558.05 million, with an average annual growth rate of 2.97 % from 2024 to 2031[27]. Taking this into account, based on the conducted research, forecast indicators of seed potato production volume in the Republic of Uzbekistan up to 2030 based on modern biotechnologies meeting established economic parameters were developed (see Table 6).

According to forecast indicators, in 2030 a total of 617 thousand tons of seed material will be formed, including, 2,500 t of super-super-elite, 22,500 t of super-elite, 112,000 t of elite, and 480,000 t of R1 seed material. In addition, 4 million tons of food potatoes will be produced. In 2028 – 2030, profitability is high and investments are recouped in a short time; through the production of high-reproduction seed material, economic sustainability is ensured. By 2030, the seed material production chain will be fully formed.

[27] https://www.cognitivemarketresearch.com/seed-potatoes-market-report#:~:text=As%20per%20Cognitive%20Market%20Research's, 2.97%25%20from%202024%20to%202031.

Table 6. Forecast Indicators of Potato Seed Production Development in the Republic of Uzbekistan up to 2030[28]

Expected results by years	Of which	
	Area (ha)	Yield (tons)
2026		
10 million mini-tubers	120	2 500
2027		
10 million mini-tubers	120	2 500
2,500 tons of original seed	880	22 500
2028		
10 million mini-tubers	120	2 500
2,500 tons of original seed	880	22 500
22,500 tons of higher-generation seed	7 500	187 000 (60%)
2029		
10 million mini-tubers	120	2 500
2,500 tons of original seed	880	22 500
22,500 tons of higher-generation seed	7 500	187 000 (60%)
112,000 tons of seed material	32 000	800 000 (60%)
2030		
10 million mini-tubers	120	2 500
2,500 tons of original seed	880	22 500
22,500 tons of higher-generation seed	7 500	187 000 (60%)
112,000 tons of seed	32 000	800 000 (60%)
480,000 tons of generational seed	160 000	4 000 000 (iste'mol)

CONCLUSION

1. The economic efficiency of potato seed production depends on the use of high-yielding, disease-resistant varieties and modern agro-technologies. Modernization of infrastructure, training of specialists, and state support ensure the stability of the seed production system.

2. National standards for potato seed production are insufficient. If standardization is introduced based on in vitro propagation methods, it will strengthen the possibility of obtaining high-quality initial material. In this regard, the introduction of advanced international experience and the development of a stepwise seed production system serve the strategic development of potato seed production.

3. In order to expand the production of high-yielding and virus-free seed material in potato seed production in Uzbekistan, it is proposed to widely implement in vitro propagation

[28] The author's original research-based work.

technology into practical production processes. In this regard, science-based cooperation between research institutes and seed-producing farms is of great importance.

4. It is important to increase and modernize refrigerated storage facilities for the seed production system. In particular, the establishment of small storage facilities near cultivation areas and the allocation of preferential loans contribute to increasing farmers' income. In addition, a QR-code system is necessary to improve control and transparency.

5. In assessing the economic efficiency of potato seed production, it is proposed to introduce a "Performance Index" system as a unified standard. This system is essential for making accurate and transparent decisions in the development of seed production. In addition, the development of PPP-based projects, grant allocation, and expansion of research activities increase economic efficiency.

6. In order to ensure sustainable development of potato seed production, it is proposed to introduce an automated "E-seed" information system and develop and implement strategic programs based on forecast indicators up to 2030. In this process, digital monitoring systems and expansion of the value chain should be defined as priority directions.

7. Mini-tubers produced through scientifically based agro-technologies are high-yielding and high-quality seed material. At the same time, the free distribution of selected mini-tubers to farmers and seed-producing entities will ensure the future production of marketable, competitive, and high-quality potatoes.

8. The economic efficiency of potato seed production depends on the use of high-yielding, disease-resistant, and virus-free varieties, the development of market infrastructure, and the improvement of state financial support mechanisms. In addition, modern laboratories, certification systems, and training of qualified specialists are important factors for increasing efficiency.

9. It has been substantiated that the use of biotechnological methods in potato seed production, particularly in vitro propagation technology, enables the formation of a healthy seed base, increases productivity, and ensures biological safety. The necessity of using bio-fertilizers in organic agriculture development and introducing a unified biological safety system has been identified.

10. In the development of the potato seed production system, it is important to create locally adapted, high-yielding, and disease-resistant varieties and expand cooperation between research institutions and foreign seed companies. It has also been proven that providing preferential loans and tax mechanisms to seed importers and farmers is an effective economic tool.

11. It has been determined that the development of storage infrastructure in potato seed production, including the establishment and modernization of refrigerated warehouses, reduces product losses and ensures price stability in the market. The introduction of financing mechanisms based on preferential loans, cooperative models, and land lease rights is required.

САМАРКАНДСКИЙ ИНСТИТУТ АГРОИННОВАЦИЙ И ИССЛЕДОВАНИЙ
ЦИФРОВОЙ НАУЧНЫЙ СОВЕТ DSc.08/2025.27.12.I.07.02

МЕЖДУНАРОДНЫЙ ЦЕНТР СТРАТЕГИЧЕСКОГО РАЗВИТИЯ И ИССЛЕДОВАНИЙ

АХАТКУЛОВ БАХРИДДИН МАТЛАБОВИЧ

ПОВЫШЕНИЕ ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ СЕМЕНОВОДСТВА КАРТОФЕЛЯ НА ОСНОВЕ СОВРЕМЕННЫХ БИОТЕХНОЛОГИЙ

08.00.04 – Экономика сельского хозяйства

АВТОРЕФЕРАТ ДИССЕРТАЦИИ НА СОИСКАНИЕ УЧЁНОЙ СТЕПЕНИ ДОКТОРА ФИЛОСОФИИ (PhD) ПО ЭКОНОМИЧЕСКИМ НАУКАМ

Самарканд – 2026

Тема диссертации доктора философии (PhD) зарегистрирована в Высшей аттестационной комиссии при Министерства высшего образования, науки и инноваций Республики Узбекистана номером B2025.3.PhD/Iqt5660.

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

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

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Защита диссертации состоится «____» _____ 2026 года в _____часов на заседании Научного совета No DSc.08/2025.27.12.I.07.02 по присуждению ученых степеней Самаркандского института агроинноваций и исследований. Адрес: 141001, Самаркандская область, Акдарьинский район, поселок Дехбед, улица А.Темура, дом 7. Тел.: (99866) 492-81-41, (99866) 492-81-16; e-mail: info@samaguni.uz.

С диссертацией доктора философии (PhD) можно ознакомиться в Информационно-ресурсном центре Самаркандского института агроинноваций и исследований (зарегистрирована за _____). Адрес: 141001, Самаркандская область, Акдарьинский район, поселок Дехбед, улица А.Темура, дом 7. Тел.: (99866) 492-81-16, e-mail: info@samaguni.uz.

Автореферат диссертации разослан «____ »_____ 2026 г.
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ВВЕДЕНИЕ (Аннотация диссертации доктора философии (PhD))

Цель исследования заключается в разработке теоретических положений и научно обоснованных предложений и рекомендаций по повышению эффективности семеноводства картофеля на основе биотехнологического метода размножения in vitro.

Задачи исследования:

обоснование мультипликативного роста чистого дохода с единицы площади по сравнению с экстенсивными методами, обусловленного устойчивостью к вирусам и различным заболеваниям, а также оптимизацией продолжительности вегетационного периода;

исчисление затрат энергии, труда, ресурсов среды, материалов и иных расходов на этапах производства семенного картофеля, изучение их влияния на себестоимость и разработка новых механизмов на основе экономических анализов;

разработка системной экономической и правовой поддержки, направленной на увеличение объёмов производства картофеля и совершенствование производственных процессов;

выработка рекомендаций по обеспечению эффективности в производстве, хранении и реализации семенного материала на принципах государственно-частного партнёрства (ГЧП) с учётом роли картофеля в потребительском рационе;

оценка эффективности семеноводства картофеля посредством «Индекса эффективности»;

разработка прогнозных показателей семеноводства картофеля для Республики Узбекистан до 2030 года на основе новых механизмов, обладающих высокой эффективностью размножения in vitro.

Предмет исследования составляет система межотраслевых экономических отношений по развитию семеноводства картофеля методом размножения in vitro, повышению урожайности, качества и семенной продуктивности.

Научная новизна исследования состоит в следующем:

в отличие от традиционных методов семеноводства картофеля, установлен поэтапный мультипликативный рост объёма продукции посредством применения метода размножения in vitro и обоснована его экономическая эффективность;

усовершенствован «Индекс эффективности» в оценке экономической эффективности семеноводства картофеля, обоснована оценка уровней эффективности по следующим критериям: крайне неэффективно [1.0–1.4], неэффективно [1.5–2.4], частично эффективно [2.5–3.4], эффективно [3.4–4.4], весьма эффективно [4.5–5.0];

разработан и усовершенствован организационно-экономический механизм, направленный на увеличение объёмов производства семенного картофеля и системную оптимизацию производственных процессов на основе ГЧП на примере Самаркандской области;

разработаны прогнозные показатели объёма производства семенного картофеля в Республике Узбекистан до 2030 года на основе современных биотехнологий, соответствующего установленным экономическим параметрам.

Внедрение результатов исследования. На основе полученных научных и практических результатов по повышению экономической эффективности семеноводства картофеля:

подход, направленный на поэтапный мультипликативный рост объёма продукции на основе метода размножения in vitro в семеноводстве картофеля и повышение экономической эффективности, внедрён в системе Министерства сельского хозяйства на площади 17 га, при этом урожайность увеличена на 48 ц/га (справка Министерства сельского хозяйства от 14 августа 2025 года № 05/05/4953, «Программа мер по гарантированному обеспечению потребностей населения в картофеле, увеличению объёмов его производства и стабилизации цен на рынках», утверждённая приказом Министра сельского хозяйства от 10 марта 2026 года № 01/27-4-51, состоящая из 13 пунктов);

подход, направленный на повышение эффективности за счёт совершенствования «Индекса эффективности» в семеноводстве картофеля и автоматизации цикла «производство – хранение – реализация», нацелен на обеспечение его исполнения по всей республике (приказ Министра сельского хозяйства от 11 сентября 2025 года № 218 «О мерах по исполнению постановления Кабинета Министров Республики Узбекистан от 18 марта 2025 года № 166», справка министерства от 14 августа 2025 года № 05/05/4953). На примере компании доказано снижение избыточных затрат на 10 %, сокращение потерь семенного материала на 5% и повышение экономической эффективности на 76,67 %;

организационно – экономический механизм производства семенного картофеля на основе ГЧП на примере Самаркандской области, а также прогноз производства 93 тысяч тонн семенного картофеля за три года внедрён в деятельность «Узбекско-Корейского центра семеноводства картофеля» при Самаркандском институте агроинноваций и исследований (протоколы заседаний Наблюдательного совета Самаркандского института агроинноваций и исследований от 14 июня 2024 года № 2 и от 4 декабря 2025 года № 3, справка Министерства сельского хозяйства от 13 февраля 2026 года № 06/26-2-10-05/16);

предложения по прогнозным показателям объёма производства семенного картофеля до 2030 года на основе современных биотехнологий приняты во внимание при издании постановления Президента Республики Узбекистан от 8 сентября 2025 года № ПП-269, согласно которому запланировано достижение экономической эффективности путём производства 617 тысяч тонн высококачественного семенного картофеля к 2030 году (план мероприятий, состоящий из 16 пунктов, утверждённый приказом Министра сельского хозяйства от 11 сентября 2025 года № 218, а также справка министерства от 13 февраля 2026 года № 06/26-2-10-05/16).

E’LON QILINGAN ISHLAR RO‘YXATI
СПИСОК ОПУБЛИКОВАННЫХ РАБОТ
LIST OF PUBLISHED WORKS

I бўлим (I часть; part I)

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5. Ahatqulov B.M. O‘zbekistonda kartoshka urug‘chiligi tizimining ahamiyati va rivojlantirish imkoniyatlari // Academic Research in Modern Science international scientific-online conference. – 2025. – 80–86 bb.
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