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MUNDARIJA

Benazir ustozni yod etib	10
Samarqand davlat veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti jamoasi	
Qishloq xo'jaligi taraqqiyotining ustuvor yo'nalishlari.....	12
Yunusov Xudaynazar Beknazarovich	
Agroklasterlarda biznes jarayonlari moliyaviy natijalari hisobini takomillashtirish	14
Alikulov Abdimo'min, Koshkaldal Irina	
Assessment of the ESG rating of banks.....	19
Ruziyeva Elvira, Eshmuradov Ulugbek	
Contract Preferences of Smallholders: Evidence From a Study on Potato Production in Uzbekistan	24
Sanaev Golib, Sanaeva Rakhima, Nurullaev Ulmasjon, Nurullaeva Bakhora, Sanaev Anvar	
Taxation Systems in the Agricultural Production Sphere in the Context of Resistance to Shadow Economy	34
Koshkaldal Iryna, Dombrovska Olena, Alikulov Abdimumin	
Factors Influencing Farmers' Cooperation in Irrigation: A Study of Samarkand Province, Uzbekistan	39
Tadjiev Abdusame Abduxamidovich	
Xalqaro standartlar asosida qishloq xo'jaligida kapital qo'yilmalar hisobi hamda hisobotlarini takomillashtirish.....	43
Xasanov Baxodir Akramovich, Egamberdiyeva Salima Rayimovna, Raxmatov Jonibek Ismoil o'g'li	
Tijorat banklarida ichki auditida muhimlik va auditor riski masalalari.....	50
Ibragimov Abdugapur Karimovich, Qo'ldoshev Dilshod Melixurozovich	
Agroklasterlar ichki sotish jarayonida transfert baholarni belgilashni tashkiliy-uslubiy jihatlari	57
Eshmuradov Ulug'bek Tashmuratovich	
Auditda regression tahlilni qo'llashning xususiyatlari	64
Tajekeev Ziyatdin Kobeyisovich	
Uzumchilik fermer xo'jaliklarida ishlab chiqarish xarajatlari hisobini takomillashtirish.....	67
Ibragimov Mansur Mardonovich	
Xalqaro standartlar asosida qishloq xo'jaligida aktivlarni tasniflash, ularning hisobi va hisobotini takomillashtirish.....	71
Egamberdiyeva Salima Rayimovna	
The Place of Digitalisation in the Rural Areas Development of Ukraine.....	76
Riasnianska A. M., Kniaz O. V.	
Yalpi ichki va hududiy mahsulotning ko'payishida faol tadbirkorlikning o'rni	79
Salamov Ibroxim, Kudratov Rizo Turdibayevich, Nazarova Maryam Sharipovna	
Inflyatsion targetlash rejimining pul-kredit siyosatini amalga oshirishdagi ahamiyati	84
Fayziyev Oybek Raximovich	
Asalarichilikning qishloq xo'jaligi iqtisodiyotidagi o'rni va uni rivojlantirish istiqbollari.....	89
Alikulov Abdimo'min Ismatovich, Ishturdiyev Hasan Abdigapparovich	
Uzumchilik majmuining tashkiliy-iqtisodiy mexanizmi va uning tamoyillari.....	94
Boltayev Nazarbek Narzullayevich	
Mintaqaviy klasterning xususiyatlari.....	98
Urdushev Hamrakul	
Considerations for Bolstering Entrepreneurship in the Evolution of the Domestic Economy	102
Shadiyeva Gulnora Mardiyevna	
Chorvachilik tarmog'ida ishlab chiqarish samaradorligini oshirish imkoniyatlari.....	107
Kudratov Rizo Turdibayevich, O'roqov Feruz Ibodullayevich	
Oziq-ovqat xavfsizligini ta'minlashda qishloq xo'jaligi mahsulotlari yetishtirishning hududiy jihatlari	112
Kazakova Zulayho Salaxiddinovna, Nazarova Maryam Sharipovna	



Yalpi ichki mahsulot va uni hisoblashni takomillashtirish yo'llari.....	117
Xalmurzaev Mansur, Abdushukurov Xondamir	
Qishloq xo'jaligi korxonalarida tovar-moddiy qiymatliklar hisobini takomillashtirish yo'nalishlari.....	122
Raximova Umida Rabbimovna	
Mamlakatimiz agrar tarmog'ida innovatsiyalarga asoslangan tadbirkorlikni rivojlantirish.....	127
Olimova Nodira hamrakulovna	
Banklarda ichki auditni xalqaro audit standartlari asosida takomillashtirish.....	131
Rizayev Nurbek Qodirovich, Boymatova Chinora Ilxomovna	
Agroklastarlarda asosiy vositalarni modernizatsiyalash va ta'mirlash xarajatlari hisobini takomillashtirish.....	137
Alikulov Abdimo'min Ismatovich, Ibodullaev D., Abdushukurov Xondamir Botiraliyevich	
Davlat budjetida boshqaruv xarajatlarini moliyalashtirishni takomillashtirish yo'llari va xarajatlarining optimallashtiruv muammolari.....	142
Narziyeva Guzal Baxtiyorovna	
Bandlikni ta'minlash va kambag'allikni qisqartirishni yuzaga keltiruvchi sabablar hamda ularning yechimi.....	146
Ahmatova Qunduzbonu Asliddinovna, Sunnatullayev Musurmon Sunnatullo o'g'li, Salamov Ibroxim	
Global iqtisodiy rivojlanish sharoitida yashil iqtisodiyot muammolari	151
Tirkashev Farhod Mahmudovich, Musurmonov Nodirbek Ahmadovich	
Menejer boshqaruvida boshqaruv mehnati va guruhlar dinamikasi	155
Xasanova Sitara Islamovna	
G'allachilik klasterlarida buxgalteriya hisobi shakllarini takomillashtirish.....	158
Yuldashev Sherali Xaitovich	
Современность услуг агропромышленного комплекса в условиях инновационной экономики положение дел	163
Тураев Баходир Хатамович, Рузиев Хамрокул Жураевич	
Влияние внешних факторов на эффективность производства животноводства.....	170
Хамдамова Насиба Аблакуловна	
Banklarda ichki auditni rejalashtirish masalalari.....	173
Ibragimova Iroda Rashid qizi, Safarov Abdumajit Abdixamidovich	
The Importance of Digital Technologies in the Development of Agriculture.....	179
Rabbimov Elbek Abdulloyevich	
Yakka tartibdagi tadbirkorlarni soliqqa tortish o'zini o'zi band qilishni davlat tomonidan tartibga solish shakli sifatida.....	182
Pardayeva Ozoda Mamayunusovna, Javmanov Jamshed Abdusamatovich	
O'zbekiston pensiya tizimida pensiya hisoblash va to'lashni rivojlantirishda xorijiy mamlakatlar tajribasini uyg'unlashtirish.....	186
Xasanov Baxodir Akramovich, Nurmanov Din-Axmed Tileubayevich	
Uzumchilik mahsulotlari eksportini oshirish omillari	193
Ibragimov Mansur Mardonovich	
Korxonalarning xo'jalik faoliyati hisobining mohiyati, ahamiyati va hisob turlari.....	196
Ishturdiyev Hasan Abdigapparovich, Tilabov Shohruh Baxriddin o'g'li, Irisboyev Raxmatilla Shavkat o'g'li	
Raqamli iqtisodiyotning o'zbekistondagi holati va uning rivojlanish istiqbollari	200
Kazakova Zulayho Salaxiddinovna, Abdullayev Sanjar Sayfiddin o'g'li, Sunnatullayev Musurmon Sunnatulla o'g'li	
Fermer xo'jaliklar faoliyatida investitsiyalarning o'rni.....	204
Nomozova Mahliyo Mamirjon qizi, Yuldashev Muhammad Utkir o'g'li, Solijonova Diyora Xaydarali qizi, Saydullayev Akbarali Akram o'g'li, Urazov Jamshidjon Sa'dullayevich	
Raqamli iqtisodiyotning o'rni va joriy etishdagi imkoniyatlari.....	209
Salamov Ibroxim, Javmanov Jamshed Abdusamatovich, Ummatov Begzod Ikrom ugli, Bekpolatov Sultonxon Sherzod ugli	
Raqamli iqtisodiyot sharoitda asosiy vositalarni hisobga olishni takomillashtirish.....	214
Xatamov Kobil Xayriyevich, Sodiqov Xayrulla Sattorovich	
Improving Cost Accounting for Sales of Agricultural Products in Farms	218
Abdimumin Alikulov, Ulugbek Eshmuradov, Khondamir Abdushukurov	



Servis korxonalarini raqamli iqtisodiyotga o'tkazishning tashkiliy-iqtisodiy mexanizmlarini takomillashtirish	224
Kurbanova Raxima Jamshedovna	
Raqamli iqtisodiyotning bugungi kundagi holati.....	228
Nurmanov Sherzod Xujayarovich, Eshimova Gulandom Botir qizi, Daniyarov Xurshid Baxtiyarovich	
Qoramolchilikda ozuqa ta'minotini yaxshilash yo'llari	233
Nurullayev Ulug'bek Uytalovich, Urazov Jamshidjon Sa'dullayevich	
Meva-sabzavotchilik klasterlarida faol tadbirkorlikning iqtisodiy samaradorlikni oshirishdagi o'rni	236
Ibroxim Salamov, Roziyeva Gulxayo Chorievna	
Qishloq xo'jaligini rivojlantirishning o'ziga xos xususiyatlari.....	242
Tirkashev Farhod Mahmudovich, Isaxonov Shaxzodjon Nurali o'g'li	
O'zbekiston chorvachiligidagi muammolar va ularning yechimi.....	246
Xudoyberdiyeva Marifat Umarovna, Xamdamova Nasiba Ablakulovna, Esirgapov Diyor Akramovich, Ulmasov Tohir Suvonqulovich	
Qishloq xo'jaligi iqtisodiyotini rivojlantirishda raqamli texnologiyalarning o'rni va ahamiyati	249
Kazakova Zulayho Salaxiddinovna, Ulmasov Amirxon Rasul o'g'li, Botirov Bekzod Ulug'bek o'g'li	
Механизмы и инструменты финансирования малых и средних сельскохозяйственных предприятий (На примере Центральноазиатского региона).....	253
Худойбердиева Асила	
Agroklastarlarda kapital qo'yilmalar hisobini xalqaro standartlar asosida takomillashtirish masalalari.....	259
Irisboyev Rahmatillo Shavkat o'g'li, Jo'rayeva Diyora Olimjonovna, Eshmuradov Ulug'bek Tashmuratovich	
Milliy iqtisodiyotda kichik biznes va xususiy tadbirkorlikni rolini oshirishning ustuvor yo'nalishlari	265
Saidxonov Akmalxon	
Improving Accounting and Auditing of Inventories in Agricultural Clusters	269
Raximova Umida Rabbimovna	
Maishiy xizmatlar sohasining rivojlanish tendensiyalari va kambag'allikni qisqartirishdagi o'rni.....	272
Rajabov Navruzbek Azimjonovich	
Chorvachilik tarmog'ida mahsulotlarni qayta ishlash samaradorligini oshirish imkoniytlari	277
Salamov Ibroxim, Nurmanov Sherzod Xujayarovich, Hotamov Adhamjon Asqarjon o'g'li	
Порядок применения и актуальность международных стандартов финансовой отчетности в деятельности коммерческих банков и предприятий	282
Нарзиева Гузал Бахтиёровна, Хомидов Асилбек Отабек угли, Асомиддинов Хусан Асомиддин угли, Болтабаев Диёрбек Омондурди угли	
Savdo korxonalarida segmentar hisobning o'rni va ahamiyati	286
Mardonov Mamed Shavkatovich, Bobomuradova Sarvinov Ziyadullayevna	
Livestock Development Problems and Prospects in Uzbekistan	289
Khamdamova Nasiba Ablakulovna, Ulmasova Oyul Bakhtiyarovna, Xudayberdiyeva Marifat Umarovna	
Понятие и учет капитальных вложений в агрокластерах.....	292
Жураева Диёра Олимджановна	
Xizmat ko'rsatish korxonalarini innovatsion modernizatsiyalashda iqtisodiy samaradorlikni hisoblash metodini takomillashtirish	297
Kurbanova Raxima Jamshedovna, Umurzoqova Sevinch Karim qizi	
Tarmoq mahsulotlarini ishlab chiqarish va sotishda innovatsion texnologiyalarni qo'llashning iqtisodiy samaradorligi	301
Nazarova Maryam Sharipovna, Kazakova Zulayho Salaxiddinovna	
Maishiy xizmatlar sohasini tashkiliy-iqtisodiy mexanizmlarini takomillashtirishda raqamli innovatsion texnologiyalarning roli va ahamiyati	304
Quliyev Begimqul Melikovich	
O'zbekiston iqtisodiyotining rivojlanishi va iqtisodiy o'sish uchun barqaror investitsiya muhitini ta'minlash masalalari.....	308
Raximova Umida Rabbimovna, Elmurodova Dilnoza Farxodovna	



Biznesni qo'llab-quvvatlashda iqtisodiy-ijtimoiy holatni yaxshilash imkoniyatlari	311
Salamov Ibroxim, Janibekov Faxriddin Beknazarovich, Ulmasova Oygul Baxtiyorovna, Xudayberdiyeva Marifat Umarovna	
G'alla urug'chiligida boshlang'ich hisob va ichki nazoratni takomillashtirish	315
Yuldashev Sherali Xaitovich, Yusupov Uchqun, Zokirov Behruz	
Baliqchilik xo'jaliklarini rejalashtirishning ahamiyati va bosqichlari	318
Dosmuratova Shaxista Kengashovna	
"Yashil" iqtisodiyot: konsepsiyaning shakllanishi va asosiy kategoriyalari	321
Tirkashev Farhod Mahmudovich, Toshpulatova Kamola Xurshed qizi	
Sutchilik yo'nalishidagi xo'jalik yurituvchi subyektlar faoliyatida marketing elementlaridan foydalanish	324
Urazov Jamshidjon Sa'dullayevich	
Biznes jarayonlarida "xarajat" va "tannarx" kategoriyalarining nazariy jihatlarini	328
Xondamir Abdushukurov, Ulug'bek Eshmuradov	
Перспективы развития бухгалтерского учета и аудита на основе международных стандартов	333
Рахимова Умида Раббимовна, Асомиддинов Хусан Асомиддин угли, Болтабаев Диёрбек Омондурди угли, Хомидов Аслбек Отабек угли	
Asosiy vositalarni hisobga olishning xalqaro va milliy standartlarda aks ettirishning farqli jihatlarini	336
Xatamov Kobil Xayrievich, Turabaeva Ozoda Ilxambekovna	
Qishloq hududlarida ekoturizm maskanlarining turistik salohiyati va sig'imi tahlili	340
Abduraxmanova Aqida Fayzulla qizi, Xoshimova Sevara Bahromovna, Sayfullaev Umidulla Fazliddin o'g'li	
Chorvachilik tarmoqlarida otchilik infratuzilmasining hozirgi holati va istiqboldagi iqtisodiy samaradorligini oshirish imkoniyatlari	346
Salamov Ibroxim, Nurmanov Sherzod Xujayarovich, Tursunov Alpomish Amanovich, Yo'ldoshev Raxim Nuriddin o'g'li	
Qishloq xo'jaligi klasterlari va fermer xo'jaliklari faoliyatida raqamli texnologiyalardan foydalanish imkoniyatlari	351
Nasimjon Babayev, Dilorom Yorbekova, Umidullo Fayzullayev	
Agroklasterlarda biznes jarayonlari sotish hisobini takomillashtirish	354
Abdunazarova Sevinch, Aliqulova Zebuniso, Eshmuradov Ulug'bek Tashmuratovich	
Iqtisodiyotni modernizatsiyalash sharoitida qishloq xo'jalik ishlab chiqarishining samaradorligi	360
Kudratov Rizo Turdibayevich, Abduxaliqova Farangiz Abduxoliq qizi	
Increasing Efficiency of Catering Enterprises Through Modernization	365
Kurbanova Rakhima Jamshedovna	
Chorvachilik majmuasi infratuzilmasi va uni rivojlantirish	369
Nurmanov Sherzod Xujayarovich, Aslonov Xotamjon Sharibboy o'g'li	
Davlat-xususiy sherikchiligini rivojlantirishda klasterlarning ahamiyati	373
Tirkashev Farhod Mahmudovich, Raxmatullayev Sherzod Mexriddinovich	
Studying the Features of Innovative Development in The Agricultural Sector of the Economy	377
Yorbekova Dilorom Muxammadkulovna	
Chorvachilikda klasterlashning ayrim masalalari	380
Urdushev Hamrakul, Mavliyanov Majid Tuychiyevich	
Issues of Development of "Green Economy" in the Context of the Actualization of the Problem of Ecology and Climate Change	385
Mukhayyo Dustova	
Xizmatlar sohasi rivojlanishining aholi turmush darajasiga ta'siri	390
Xudoyberdiyeva Marifat Umarovna	
Baliqchilik xo'jaliklarini rivojlantirish prognozini ishlab chiqish masalalari	393
Dosmuratova Shaxista Kengashovna	
Mahalliy soliqlar va mahalliy yig'implarning iqtisodiy mohiyati	396
Tirkashev Farhod Mahmudovich, Asomiddinov Husan Asomiddin o'g'li	
Turizm korxonalari hisob siyosatini shakllantirish	400
Ibragimov Mansur Mardonovich	



Korxonalarda moliyaviy holatini ifodalovchi ko'rsatkichlar tahlili	404
Isturdiyev Hasan Abdigapparovich, Tilabov Shohruh Baxriddin o'g'li, Yusupova Ergashoy	
Innovatsiya, innovatsion iqtisodiyot atamalarining mohiyati va ulardan samarali foydalanish yo'llari.....	408
Xudoyberdiyeva Marifat Umarovna, Boyjigitov Kamronmirzo Sobirjon o'g'li, Obloberdiyev Shuxrat Sharof o'g'li	
The Processing Indicators of Livestock Products on the Basis of Economic Statistical Models	411
Yorbekova Dilorom Muxammadkulovna, Hotamov Adhamjon Asqarjon o'g'li	
Paxta-to'qimachilik klasterlarida tola ishlab chiqarish xarajatlari tahlili	414
Alikulov Abdimo'min Ismatovich, Farangiz Rustamova	
Meva-sabzavotchilikni rivojlantirishda klaster yondashuvining afzalliklari	419
Eshankulov Sirojiddin Xakimovich	
Prospects for Leaving the Population Out of Poverty	424
Javmanov Jamshed Abdusamatovich, Radjabov Navruzbek Azimjonovich, Uralov Baxtiyor Maxmudovich, Fayzullayev Umidullo Xayrullo o'g'li	
Tijorat banklarida korrupsiyaga qarshi kurashishning kompayens nazorati usullarini takomillashtirish.....	429
Sultonov Abrorbek Umarali o'g'li, Axmedov Shuxrat Xikmatullayevich	
Segmentar va moliyaviy hisobot tuzishda xo'jalik yurituvchi subyektlar mulkini baholashning metodologik muammolari	435
G'olibjon Alikulov	
Raqamli iqtisodiyotga o'tish orqali yashirin iqtisodiyotni jamiyatga ta'sirini kamaytirish	439
Uralov Baxtiyor Maxmudovich, Abdusalomov Farruh G'ayrat o'g'li	
Sustainable Farming Futures: the Economic Need of Climate Change Program in Uzbekistan.....	443
Akhmadjon Nurullaev, Sanayeva Raxima Amirqulovna, Visola Khasanova, Bakhora Nurullaeva, Anvar Sanaev	
Problems and Prospects of Cadastral Valuation of Land Resources in the Republic of Kazakhstan	447
Berdimurat Nazimgul, Bassybekova Zh.B.	
Значение цифровизации в сельском хозяйстве	451
Сыздықова Азиза Оралбайқызы, Сапарова Айнура Алпамысовна	
Xizmatlar sohasi samaradorligini oshirish masalalari	456
Mirzayev Qulmamat Jonuzakovich, Mardanova Mohidil Otabek qizi, Mirzayev Azzamjon Jonuzokovich	
Aholini o'z-o'zini bandlikka jalb qilish orqali ishsizlik darajasini pasaytirish.....	461
Javmanov Jamshed Abdusamatovich, Jo'rayev Sherali Anor o'g'li	
Innovatsiyani joriy qilishning fermer xo'jaliklari daromadlariga ta'siri	465
Eshboyev Diyorbek Yo'ldosh o'g'li, Sinayev Sherali Islom o'g'li, Ismoyilov Azamat Isroyilovich	
Moliyaviy hisobotning xalqaro standartlariga muvofiq daromadni tan olish masalalari.....	471
Kozimjonov Abrorbek	
O'zbekistonda kichik biznes va xususiy tadbirkorlikni rivojlantirishda raqamli texnologiyalarning yutuqlari va muammolari.....	475
Ochilova Mohigul Toshtemir qizi	
Soliq ma'murchiligida raqamli iqtisodiyotning ahamiyati va uning ilmiy-nazariy asoslari tahlili	479
Uralov Baxtiyor Maxmudovich, Javmanov Jamshed Abdusamatovich, Holmirzayev Sardor Ravshan o'g'li, Tursinaliyev Abdulaziz Shokirjon o'g'li	
O'zbekistonda davlat xizmatlari ko'rsatish milliy tizimini rivojlanishi: xronologik tahlil.....	484
Hasanov Habibullo	
Chorvachilikning mamlakat iqtisodiyotidagi ahamiyati va uning rivojlanishi.....	488
Xamdamova Nasiba Ablakulovna, Tirkashev Farxod Mahmudovich, Sayfullayev Akbar Xoljigit o'g'li, Erkinov Samandar Maxmudovich	
O'zbekiston chorvachiligiga oid FAO ma'lumotlari haqida	493
Pardayeva Kamola	
Moliyaviy hisobotning xalqaro standartlariga muvofiq xaridorlar bilan tuziladigan shartnomalar asosida tushumni hisobga olishning ahamiyati	498
Norbekov Davron	
Paxtachilik klasterlarida ishlab chiqarishga ta'sir etuvchi omillarning tahlili	502
Javmanov Jamshed Abdusamatovich, Abduraxmonov Orifbek Odiljon o'g'li	



Raqamli iqtisodiyotning zamonamizdagi bugungi o'rne	506
Tirkashev Farhod Mahmudovich, Zarmaxmatov Nomojjon Baxodir o'g'li	
Improving Cost Audit in Innovation Activities	510
Mustafoev is the son of Akbar Mustafa	
Konsolidatsiyalashgan moliyaviy hisobotni mxs asosida transformatsiya qilish zaruriyati	514
Xolmurodov Otabek	
Klasterlarni tashkil etishning tashkiliy-iqtisodiy mexanizmlari va ularning mamlakat iqtisodiyotida tutgan o'rne	521
Javmanov Jamshed Abdusamatovich, Homidov Aslbek Otabek o'g'li, Asomiddinov Husan Asomiddin o'g'li, Boltayev Diyorbek Omondurdi o'g'li	
Soliq imtiyozlarini nazariy asoslash va huquqiy tartibga solish	526
Uralov Baxtiyor Maxmudovich	
Sug'urta shartnomalari va sug'urta majburiyatlari hisobini moliyaviy hisobotning xalqaro standartlari asosida takomillashtirish	531
Ochilov Ilyos Keldiyorovich	
Обеспечение привлекательности инвестиции коммерческих банков	537
Назаров Килич Холмурадович, Нафасов Шохрухбек Хошимович	
O'zbekistonda tashqi savdoning rivojlanishi va muammolari	539
Xudayberdiyev U.	
Raqamli iqtisodiyot sharoitida mehnatga haq to'lashning nazariy jihatdan tashkiliy-iqtisodiy asoslari	542
Rajabov Navruzбек Azimjonovich, Toshmurodova Dilbar Muzaffar qizi	
Human Capital in Education	546
Ibragimov Mansur Mardonovich, Ergashev Olloyor	
Qishloq joylarida xizmat ko'rsatish sohasini rivojlantirish hamda o'zini o'zi band qilish orqali ishsizlikni kamaytirishning nazariy asoslari	551
Jo'rayev Sherali Anor o'g'li, Abdikarimov Nazirbek Odil o'g'li, Uralov Baxtiyor Maxmudovich	
Uchqora uzumi-mayizini yetishtirishning iqtisodiy samaradorligini oshirish imkoniyatlari	555
Salamov Ibroxim, Kudratov Rizo Turdibayevich, Janibekov Faxriddin Beknazarovich	
Moliyaviy natijalarning tavsifini takomillashtirish	561
Yusupova Farizabonu Zarifovna	
Kambag'allik va uni qisqartirish yo'llari	564
Tirkashev Farhod Mahmudovich, Do'stiyorov Mirabbos Erkin o'g'li	
Raqamli iqtisodiyot sharoitida aholi turmush darajasini oshirishda xizmat ko'rsatish sohasining ahamiyati	568
Xolmurodov Otabek	
O'zbekistonda aholi turmush darajasi va daromadlarining o'ziga xos xususiyatlari	570
Rajabov Navruzбек Azimjonovich, Uralov Baxtiyor Maxmudovich, Saidmurodov Sardor Mirsalohovich	
SWOT-анализ конкурентоспособности национального туризма в Узбекистане в условиях преодоления последствий пандемии	574
Ochilova Mohigul Toshtemir qizi, Abduzoirov Sarvarbek	
Ijtimoiy-iqtisodiy rivojlantirish va aholi turmush darajasini yanada yaxshilashda iqtisodiy samaradorlikni oshirishning ahamiyati	577
Salamov Ibroxim, Kudratov Rizo Turdibayevich, hamdamova Nasiba Ablakulovna	
Jahon iqtisodiyoti va xalqaro savdo munosabatlari	582
Tirkashev Farhod Mahmudovich, Xo'jaqulov Inomjon Rustam o'g'li	
Xizmat ko'rsatish sohasini raqamli iqtisodiyot sharoitiga mos rivojlantirishning ayrim masalalari	586
Mirzayev Qulmamat Jonuzakovich, Sherzodova Diyora Sherzod qizi	
Turistik destinatsiyalarni rivojlantirish orqali turistik zonalarini takomillashtirish	589
Raxmonov Siyovush Turob ug'li, Ochilova Mohigul Toshtemir qizi	
Ivermektin, klozantel, iversantapulus dori vositalarining marketing tahlili	592
Raxmadullayev Humoyun Rashid o'g'li, Farmonov Nizom, Salamov Ibroxim	
Цифровая оптимизация для экологической безопасности в агропромышленном комплексе	597
Юнусов Худайназар Бекназарович, Сафарова Лола Улмасовна	



Смысловой – системный анализ процессов обработки плодов и овощей энергии начального импульса.....	602
Курбанов Жамшед Маджидович, Курбонова Мадина Жамшедовна	
Формирования алгоритма расчета эффективности транспортно-логистической системы поставок грузов.....	605
Кубаев Улугбек	
Роль и потенциал севооборота в создании устойчивых и экологически чистых систем в сельском хозяйстве на основе цифровизации	611
Юнусов Худайназар Бекназарович, Сафарова Лола Улмасовна	
Qoramollar uchun ozuqa ratsionini tuzishda innovatsion yondashuv	617
Mavlyanov Majid Tuychiyevich	
Landshaft bog'dorchilikni rivojlantirishda autocad dasturining o'rni.....	624
Ravshanov Sanjar Tolibjonovich, Sulaymonov Mirobid Abduxolikovich	
Aniq qishloq xo'jaligida o'zgaruvchan me'yorlarni qo'llash	628
Akbarov Husan O'zbekxonovich, Bekzod Qudratov	
Raqamli iqtisodiyotda neyron tarmoqlaridan foydalanishning ahamiyati.....	634
Otoboyeva Aziza Shakirovna	
Iqtisodiy masalalarni tahlil qilish, me'yorlash, rejalashtirish, baholash hamda bashorat qilishda korrelyatsiya va regressiya usuli	637
Aktamova Vasila Uktamovna, Axtamova Umida O'ktam qizi	
Iqtisodiy ekonometrik modelni tuzish hamda avtokorrelyatsiya mavjudligini aniqlash	641
Raximov Abdulaxad Nematovich	
O'zbekistonda qishloq xo'jaligi mahsulotlarini yetishtirishda agrovoltaiika texnologiyasini qo'llash istiqbollari	646
Berdiyev G'ayrat Ibragimovich, Eshpulatov Dostonbek Baxodir o'g'li, Malikova Sevinch Telman qizi	
Развитие системы цифровизации в сельском хозяйстве и в народной медицине	650
Рахмонов Фариз Зафаржонович, Мухиддинова Сабрина Мунисовна, Усманова Лайло Рахматуллаевна, Рахмонова Хабиба Нуруллаевна	
Raqamli iqtisodiyot fanlarini o'qitishda zamonaviy pedagogik metodlar va virtual onlayn kurslardan foydalanish.....	653
Sulaymonov Mirobid Abduxolikovich	
Qishloq xo'jaligini boshqarishda raqamli texnologiyalardan foydalanishning afzalliklari	656
Ravshanov Sanjar Tolibjonovich	
Ekin maydonlari tuproqlarini tahlil qilish va boshqarishda sun'iy intellekt tizimlaridan foydalanishning o'rni..	660
Otoboyeva Aziza Shakirovna, Artikov Farxod Sayfiddinovich, Usanov Yoqub Dilmurod o'g'li	
О некоторых нестандартных способах решения иррациональных уравнений	664
Актамова Васида Уктамовна	
Корхоналарни тугатишнинг норматив ва ташкилий-услугий таъминотини такомиллаштириш	666
Дусмуратов Раджапбай Давлатбаевич	
Юридик шахсларни тугатишнинг норматив-ҳуқуқий таъминоти.....	670
Давлетов Икрам Рахимберганович	
Саноат корхоналарида мулкый муносабатларни тартибга солишнинг илмий назарий асослари.....	674
Бобобеков Эргаш Абдумаликович	



CONTRACT PREFERENCES OF SMALLHOLDERS: EVIDENCE FROM A STUDY ON POTATO PRODUCTION IN UZBEKISTAN

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Abstract: Modernization and globalization of agri-food systems in developing countries are increasing the role of contract farming. In most developing countries, smallholder farmers' resource endowments are limited; they lack access to credit, input and output markets and market information. While most available studies on contract farming concentrate on smallholder farms in developing countries such as Asia, Latin America, and Africa, empirical research on smallholders' motivation to participate in contract farming in Central Asia is scarce. This paper explores preferences of smallholder farmers for contract attributes in Uzbekistan where smallholder farmers dominate in the production of agricultural food crops. We employ conditional and mixed logit models to elicit smallholder potato producers' preferences for contractual arrangements using a structured questionnaire for 180 potato growing smallholder farmers. The most important contract attributes are found to be price, payment method, input provision, and relation to the buyer. As the relation to a buyer is important for smallholders' participation in contract farming, programs (such as local agri-fair) to link producers and retailers will be important.

Annotatsiya: Rivojlanayotgan mamlakatlarda qishloq xo'jaligining oziq-ovqat tizimini modernizatsiya qilish va globallashuvi shartnomaviy dehqonchilik rolini oshirmoqda. Aksariyat rivojlanayotgan mamlakatlarda kichik fermerlarning resurslari cheklangan, ular kredit, kirish va chiqish bozorlari va bozor ma'lumotlariga kirish imkoniga ega emaslar. Shartnomali dehqonchilik bo'yicha mavjud tadqiqotlarning aksariyati Osiyo, Lotin Amerikasi va Afrika kabi rivojlanayotgan mintaqada mamlakatlarda kichik fermer xo'jaliklariga qaratilgan bo'lsa-da, Markaziy Osiyoda kichik fermer xo'jaliklarining shartnomaviy dehqonchilikda ishtirok etish motivatsiyasi bo'yicha empirik tadqiqotlar kam. Ushbu maqola qishloq xo'jaligi oziq-ovqat ekinlarini yetishtirishda kichik fermerlar ustunlik qiladigan O'zbekistonda kichik fermerlarning shartnoma atributlariga bo'lgan afzalliklarini o'rganadi. Biz 180 ta kartoshka yetishtiruvchi fermerlar uchun tuzilgan so'rovnomadan foydalangan holda, kichik fermer xo'jaliklari kartoshka ishlab chiqaruvchilarning shartnoma tuzish bo'yicha imtiyozlarini aniqlash uchun shartli va aralash logit modellaridan foydalanamiz. Shartnomaning eng muhim atributlari narx, to'lov usuli, kiritilgan ma'lumotlar va xaridorga munosabatdir. Kichik xo'jaliklarning shartnomaviy dehqonchilikda ishtirok etishi uchun xaridor bilan munosabat muhim bo'lganligi sababli, ishlab chiqaruvchilar va chakana sotuvchilarni bog'lovchi dasturlar (masalan, mahalliy qishloq yarmarkasi) muhim ahamiyatga ega bo'ladi.

Аннотация: Модернизация и глобализация агропродовольственных систем в развивающихся странах повышают роль контрактного сельского хозяйства. В большинстве развивающихся стран ресурсы мелких фермеров ограничены; у них нет доступа к кредитам, рынкам ресурсов и продукции, а также рыночной информации. В то время как большинство доступных исследований по контрактному сельскому хозяйству сосредоточены на мелких фермерских хозяйствах в развивающихся странах, таких как Азия, Латинская Америка и Африка, эмпирические исследования мотивации мелких землевладельцев к участию в контрактном сельском хозяйстве в Центральной Азии скудны. В данной статье исследуются предпочтения мелких фермеров в отношении условий контракта в Узбекистане, где мелкие фермеры доминируют в производстве сельскохозяйственных продовольственных культур. Мы используем условные и смешанные логит-модели, чтобы выявить предпочтения мелких производителей картофеля в отношении контрактных соглашений, используя структурированный вопросник для 180 мелких фермеров, выращивающих картофель. Установлено, что наиболее важными атрибутами контракта являются цена, способ оплаты, предоставление ресурсов и отношение к покупателю. Поскольку отношения с покупателем важны для участия мелких землевладельцев в контрактном сельском хозяйстве, большое значение будут иметь программы (такие как местные агроярмарки), связывающие производителей и розничных продавцов.

INTRODUCTION

Agricultural transformation in developing countries is changing agri-food systems where farmers are becoming more linked to consumers through various marketing channels. As an agricultural institution, Contract Farming (CF) is gaining more interest among researchers, which is thought to coordinate farmers in agricultural production and marketing processes especially in the context of developing countries. In general, the impact of CF on rural economies in improving the welfare of farmers found to be positive (Barrett et al., 2012; Bellemare, 2010; Reardon et al., 2009). While it is believed that positive effects of CF can lead to reduce of transaction costs, manage production and marketing risks, debates around CF also exist (Key and Runsten, 1999; Oya, 2012).

As an institutional tool, CF has a long history, which is linked to Japanese colonial state for sugar production (Little and Watts, 1994). CF has become more crucial at the end of the 20th century in the agricultural and food industries of both developed and developing countries (Bijman, 2008). Although reasons for emerging CF in developed and developing countries are similar, CF's role in the latter is linked to economic development since CF can be seen as an institutional arrangement that leads farmers to modern agriculture (Wang et al., 2014). According to Eaton and Shepherd (2001), "Contract farming can be defined as an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices." Contracts can be divided into production and marketing contracts. According to MacDonald et al. (2004), marketing contracts are based on predetermined price and quantities of agricultural products where farmers control most of their assets and production. On the other hand, in production contracts, the contractor controls production decisions and farmers receive a fee for rendered services.

According to Kirsten and Sartorius (2002), the rationale for CF as an institutional arrangement can be linked to solving the problems of market failure, which is caused by asymmetric information between contractor and farmer. Another rationality of CF refers to the failures of the factor markets such as land, credit, inputs, and services (Kirsten and Sartorius, 2002). Smallholder farmers' participation in CF schemes is an actively discussed topic and studies are focusing on CF in developing countries such as Latin America, Africa and recently China (Key and Runsten, 1999; Barrett et al., 2012; Blandon et al., 2009; Wang et al., 2014).

Empirical studies related to analyzing smallholders' participation and welfare effects of CF, in general, are found to be positive (Abebe et al., 2013). For example, Barrett et al. (2012) concluded that participation improves smallholder's income based on meta-narrative analysis from five countries (Ghana, India, Madagascar, Mozambique, and Nicaragua). Other authors argue that CF can lead farmers to negative effects such as loss of autonomy, high production risks and debts (Little and Watts, 1994; Rehber, 1998; Singh, 2002). From institutional economics' perspective, the role of CF increases in addressing input and output markets' failures, limited access to credit and insurance associated with transaction costs (Barrett, 2008; Key and Runsten, 1999; Minten et al., 2009). Smallholder farmers involved in contractual arrangements may benefit from higher prices, as well as better access to inputs, technology and information (Berdegue et al. 2005; Sartorius and Kirsten 2007; Blandon et al. 2009; Barrett et al. 2012; Reardon and Timmer 2014). Smallholder participation in CF is actively discussed topic and several researchers addressed farmers' preferences for the contract terms (Blandon et al., 2009; Schipmann, Qaim, 2011; Abebe et al., 2013). The general idea behind of conceptual framework used in these studies is that contract terms and conditions represented by various contract design attributes affect farmer's decision to participate in CF, which is based on utility from participation.

In reviewing the CF literature, we found that although recent studies related to designing contract attributes for a particular crop are actively discussed, contract preferences of smallholders in the context of Uzbekistan has not been studied. Some studies claim that smallholder farmers are valuable resources for the agricultural production of individual farmers, as they are in demand for labor services and expertise, and they can make the land more productive and utilize it more profitably for individual farmers and themselves (Djanibekov et al. 2013). The relationships between individual farmers and smallholders are studied in detail by many authors from different angles (for an overview see Veldwisch and Spoor 2008; Lerman 2008a; Veldwisch and Bock 2011; Djanibekov et al. 2013).

We think that participation of smallholder farmers in CF is of great importance in Uzbekistan where smallholder farmers' share in agricultural production is high. In this regard, potato production presents an interesting case of a high-value crop expanded in Uzbekistan and other Central Asian countries largely after the collapse of the former Soviet Union. It is noticeable that potato is mainly produced by smallholder farms. These farms in Uzbekistan contribute a significant share of potato output, while facing increased uncertainty due to production and marketing risks. In many instances, these risks can be linked to underdevelopment input markets, poor quality of seed potato as well as fluctuations in potato prices. While smallholder farmers are producing about 77% of potato output agro-industrial technologies and mechanization is hard to apply in these farms (Buriev et al., 2005). To supply the demands of population for high quality potato, it is crucial to develop stable supply

of potato output. Although the government of Uzbekistan initiated several attempts to boost potato production through introducing Dutch technology for potato growing, improve the system of seed potatoes to endure self-sufficiency in potato production, these policies mainly target individual farms. We think that contracting smallholders can ensure more stable supply of potato output if contracted farmers benefit from agreed terms. Understanding smallholders' preferences for contract terms are, thus, crucial from institutional economics' perspective.

The main objective of the present study is to understand the importance of contract design attributes and to examine smallholder farmers' preferences and attitudes toward contractual arrangements. We focus our analysis on smallholder farmers in the Bulungur district, which is known as potato producing area of the Samar-kand region located in the middle of Uzbekistan. In the next section, we provide an overview about smallholder farmers in Uzbekistan. In the material and method section, we present methods that we use. This section is followed by results and discussion, where we give empirical results and discuss policy implications. The last section concludes.

SMALLHOLDER FARMERS IN UZBEKISTAN

Restructuring of Soviet-style enterprises in Uzbekistan created a dual production system comprising two types of agricultural producers, namely individual farms and smallholders. Despite the efforts to establish a class of middle-sized farms, smallholders account for the largest share of agricultural output, particularly of high value crops such as vegetables and fruits. For instance, in 2016, smallholders possessed 13% of all irrigated arable land, while contributing over 65% of the national gross agricultural output. Agricultural policies in Uzbekistan target individual farms and in spite of smallholder farmers' significant shares in gross agricultural output, their interests are less addressed.

In 2016, smallholder farmers produced 77% of potato, which shows the important role of smallholders in potato production. The share of Samarkand region in potato production is the highest among other regions and in 2016, 21% of potato was produced in this region.

Since 1991, potato harvest areas in Samarkand region changed in favor of smallholders and individual farms (Fig. 2). Starting from 2007 potato planted areas almost disappeared in agricultural enterprises. From 1991 to 2017, potato production in the region increased tenfold due to expansion of potato planted areas as well as productivity growth. It can be seen that from 2005, potato production area in individual farms has gone up followed by an increase in potato output.

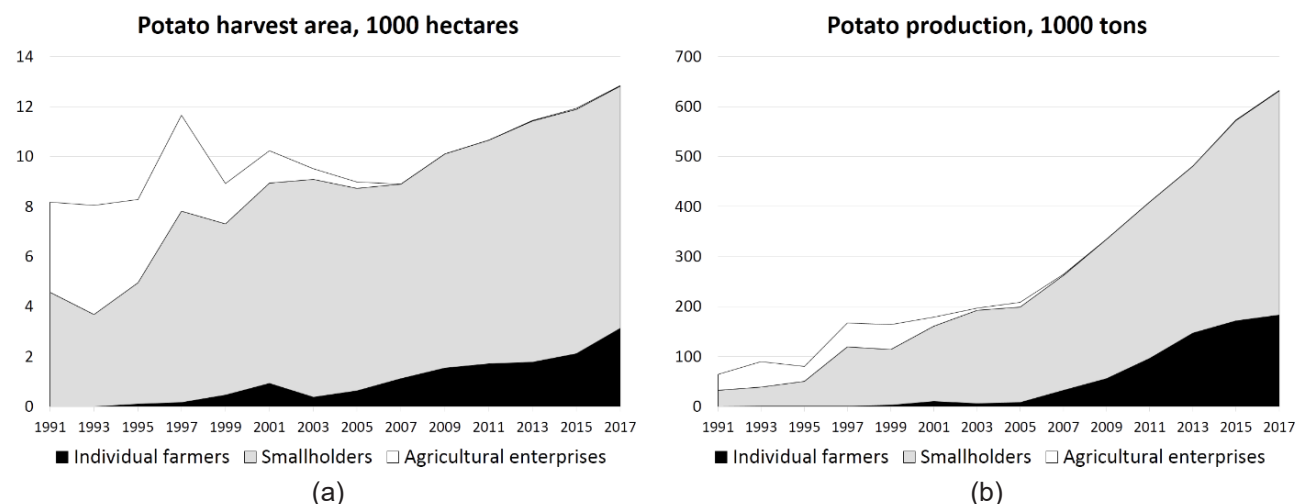


Figure 2: Potato harvest area by producer categories in Samarkand region, 1000 hectares (a), potato production by producer categories in Samarkand region, 1000 tons (b)

Source: State Committee of Uzbekistan on Statistics (2017).

MATERIAL AND METHODS

Data

Data was collected from October to November 2016 using a structured questionnaire from 180 randomly selected smallholder potato producers. All respondents were randomly chosen from six administrative zones, each consisting of 30 smallholder farmers. Before the collection of survey data, specifications of contractual arrangements were carefully explained to farmers. In particular, farmers were assured that the survey was



used to gain necessary information about production and marketing preferences based on hypothetically constructed contracts.

Model Specification

Following Lancaster's consumer demand theory (Lancaster, 1966), McFadden's random utility theory (McFadden), the utility that smallholder farmer n obtains from alternative j in period or choice situation t is

$$U_{njt} = V_{njt} + e_{njt} \quad (1)$$

where V_{njt} is a part of utility function that can be observed, and e_{njt} a random term to account for the aspects of utility that that researcher cannot observe. U_{njt} equals one if smallholder farmer chooses choice alternative j given choice options t . The systematic utility, V_{njt} is a function of predictors that can be specified as a generalized regression function (Ben-Akiva and Lerman, 1985):

$$V_{njt} = BX_{njt} \quad (2)$$

Two common estimation methods that are used in these studies are conditional logit and mixed logit models. Following McFadden (1974), conditional logit assumes independent and identically distribution of error term in the utility function with an assumption of that independence of irrelevant alternatives (IIA) holds. Based on these assumptions, the probability that smallholder farmer n chooses alternative j can be expressed as:

$$P_{njt} = \frac{\exp(V_{njt})}{\sum_{k=1}^J \exp(V_{nkt})} \quad (3)$$

Since conditional logit does not allow for unobserved preference heterogeneity, mixed logit model can be used which takes into account preference heterogeneity in β . Following Train (2003), the mixed logit can be expressed as:

$$P_{njt} = \frac{\exp[(\beta_k + w_k)X_{kij}]}{\sum_{j \in C} \exp[(\beta_k + w_k)X_{kij}]} \quad (4)$$

where β_k is a vector of random effects and includes alternative specific intercepts. The term w_k represents the vector of individual-specific attributes deviation associated with the matrix of covariates X_{kij} and X_{kij} . Following Train (2004), the parameters of mixed logit can be estimated with maximum simulated likelihood. It is relatively easy to estimate the parameters of the mixed model with regard to their marginal effects. The marginal effects tell us about the change in the probability of an event given a unit change in one independent variable, keeping constant all other variables (Liao, 1994; Louviere et al., 2000). The marginal effects are defined as the partial derivatives of the probability of the event. Regarding categorical variables, however, the marginal effects can be described as the change in the predicted probability in each category (Greene, 2000; Liao, 1994). A goodness of fit in choice models can be measured by pseudo – R^2 , which is estimated as:

$$\rho^2 = 1 - \frac{LL_f}{LL_o} \quad (5)$$

where LL_f is the log-likelihood of the model and LL_o is the log-likelihood of the function with only the interception (Lattin et al., 2003).

Conceptual framework

In order to elicit smallholder potato producers' preferences toward contracts we used stated preference method. Stated-preference data are the data collected in experimental or survey situations where respondents are presented with hypothetical choice situations, while revealed preferences data refer to situations where the choice is actually made in the real market situation (Train, 2003; Hensher et al., 2005). The use of stated preference method became popular among researchers especially in health, environmental and agricultural economics as well as in trade and marketing research (Louviere et al., 2010). A stated preference method or experiment has the advantage of testing the consumers' preference before a product is released to the market. For each experiment, a set of alternative products with different attributes is described, and the respondent is asked to state which product he would choose. A series of such questions is asked, with attributes of the product varying to determine how the respondent's choice changes when the attributes change. The researcher therefore observes the sequence of choices by each respondent. Data that represent repeated choices like these are called panel data (Train, 2003). In our case, it was appropriate to use the stated preference method since smallholder farmers in the Bulungur district produce and sell potatoes in traditional markets, in most cases to

traders at the farm gate and nearby or other markets, and therefore, farmers are not engaged in contractual arrangements.

In designing choice experiments, it is important to choose relevant attributes that are assumed to characterize contracts for smallholder potato producers. Recent studies where choice experiments were used to assess smallholder farmers' preferences for contracts in developing countries show that common attributes which can describe contracts are price, payment method, type and length of contract, selling place, grading, input supply, farmer's relation to buyer, etc. (Blandon et al., 2009; Schipmann and Qaim, 2011; Abebe et al., 2013; Ochieng et al., 2017).

In the experimental design and questionnaire, we identified six contract attributes that might characterize contracts based on discussions with several smallholder potato producers. These are price, payment method, grading, place of sale, input provision, and relation to the buyer. While price and input provision have three levels, payment method, grading, place of sale, and relation to buyer have two levels (Table 1).

We analyzed the choice data using a conditional and mixed logit models. We include contract attributes as explanatory variables:

We analyzed the choice data using a conditional and mixed logit models. We include contract attributes as explanatory variables:

$$V_{njt} = \alpha_n ASC + \beta_1 P_{njt} + \beta_2 M_{njt} + \beta_3 G_{njt} + \beta_4 S_{njt} + \beta_5 I_{njt} + \beta_6 B_{njt} \quad (6)$$

P, M, G, S, I and B are the contract attributes price, payment method, grading, place of sale, input provision and relation to the buyer, respectively, whereas β_i are parameters to be estimated. Since we included a third alternative representing the traditional marketing channel, we employ an alternative specific constant (ASC) for the third alternative, following Schipmann and Qaim (2011) and Ochieng et al. (2017). The estimated ASC coefficient reflects the general attitude of farmers towards traditional marketing channels. A positive ASC coefficient means a general preference for traditional marketing channels.

Since we observed price fluctuations in the market during the study, the price attribute was expressed in three levels depending on the market price. Price is one of the main attributes that might affect smallholder farmers' decision to participate in contract farming.

The second attribute is method or time of payment with two attribute levels. Choosing the first or the second level of payment method can be explained by the strength of trust between farmer and buyer (Reardon and Berdegue, 2002). Nevertheless, we expect that farmers prefer immediate payment. In our case, it was common for sampled smallholder farmers to receive payment as soon as the potatoes were harvested.

The third contract attribute is grading. This attribute is associated with the fact that potato farmers who supply graded products may get higher prices. We hypothesize that in general smallholder farmers may prefer markets without grading requirements, yet accepting or rejecting grading requirements depends on the price offered to a farmer as well as quality standards.

Table 1: Contract attributes and their levels

Attribute	Levels	Description of attribute levels	Values	Expected sign
Price	Price1	10% less than market price	0	+
	Price2	Market price*	1	
	Price3	10% more than market price	2	
Payment method	Method1	Immediately after harvesting*	0	-
	Method2	Two weeks after delivering	1	
Grading	Grading1	No grading is required by buyer*	0	-
	Grading2	Grading is required by buyer	1	
Place of sale	Place1	Farm gate*	0	-
	Place2	Buyer's premise	1	
Input provision	Input1	No input is provided*	0	+
	Input2	Potato seeds	1	
	Input3	Potato seeds and chemicals	2	
Relation to buyer	Buyer1	Buyer is personally known *	0	-
	Buyer2	Buyer is not known	1	

*This attribute level is used in traditional marketing channels



The fourth attribute is the place of sale, with two attribute levels. While most of the surveyed smallholder farmers sell their output at the farm gate, those who have their own transport deliver output to local markets in the Bulungur district or to Siyob Bazaar¹. This level was chosen to test how constraining transportation costs can really be to farmers.

The fifth contract attribute relates to the understanding of the development of input markets. It has three levels, with one that assumes no inputs option and the other two, which include seeds alone and seeds and chemicals together. Seeds and chemicals were chosen purposely, since their shares in potato production costs are usually high.

The last attribute refers to the relation of the buyer to the smallholder farmer. Here we wanted to test how familiarity with the buyer may affect a farmer's decision when choosing a contract. Personally knowing the buyer can be a substantial factor, and can indicate the level of trust between the farmer and buyer.

Once all attributes and their levels were identified the next step was to develop an appropriate design. The set of all attributes and their levels implies that there are a total of 144 ($3 \times 2 \times 2 \times 2 \times 3 \times 2$) theoretically possible alternatives. Evaluating all 144 alternatives may not be practically feasible. Following Hole (2016) we used STATA software to develop a D-efficient design. We obtained a fraction of the full factorial, comprised of sixteen alternatives. However, while testing the choice experiment four alternatives were assessed by smallholder farmers as unrealistic. For example, a combination of the attribute levels "10% less than market price" with "Two weeks after delivering" and "Buyer is not known" was excluded from alternatives. We excluded four unrealistic alternatives in the trade-off between statistical efficiency and market realism (Lancsar and Louviere 2006).

The remaining twelve alternatives were allocated to six choice sets, each consisting of three alternatives; to each choice set as the last alternative, we added a choice, which described a situation without contact farming or in other words, the current traditional marketing channel. Careful consideration is required in selecting the data collection mechanism as there are several factors such as an overestimation of willingness to pay, an inappropriate order of choice sets, etc. that might lead to biased results (Hensher et al., 2005; Schipmann and Qaim, 2011). Therefore, only four out of six choice sets were allocated to each respondent. We applied a "combination without repetition algorithm" in order to choose four choice sets to give to each respondent out of all six choice sets. As a result, 15 different groups, each consisting of 4 choice sets, were listed. Following Hensher et al. (2005), these 15 different groups were modified to 6 different blocks. Hence 90 (15×6) different groups, each consisting of 4 choice sets, were integrated to 90 questionnaires. Finally, we collected data from 180 smallholder farmers by distributing 90 questionnaires two times, with each choice set assessed by 120 farmers.

RESULTS AND DISCUSSION

Summary Statistics

Summary statistics of the selected socioeconomic variables of sampled smallholder farmers are presented in (Table 2). Most farmers own very small plots of land, averaging 0.26 hectares. We did not include potato area since on average all farmers grow potatoes on 70-80% of their farmland. In addition to potatoes, farmers grow vegetables such as tomatoes, onions, and other types of vegetables; however, potatoes are considered to be the main cash crop. The average age of sampled farmers was 43, with 27 years old being the youngest and 66 years the oldest. Rather than measuring education in years, we categorized farmers according to their level of education. Only 12% of farmers have higher education, and others have general and secondary special education. Farmers who are involved in off-farm economic activities such as those in public and private sectors comprised 21% of sampled farmers. An average farmer has 26 years of farming experience.

Table 2: Summary statistics of selected socioeconomic variables

Variable	Description of variables	Mean	Standart Deviation	Min	Max
Farm size	Land owned by smallholder farmer (hectares)	0.26	0.16	0.08	0.7
Farmer's age	Age of household head (years)	43.15	10.74	27	66
Farmer's education	Education of household head (dummy)	0.12	0.33	0	1
Off-farm income	Household has off-farm income source	0.21	0.41	0	1
Farming experience	Farming experience of household head (years)	25.61	11.62	4	49

¹ Siyob Bazaar is one of the largest traditional wholesale markets of agricultural products located in Samarkand city

Estimation Results

The estimation results of conditional and mixed logit models are reported in Table 3. It can be seen except for place of sale, all other contract attributes are significant. The pseudo – R^2 for conditional and mixed logit is 0.025 and 0.147, respectively, indicating that the mixed logit has a better goodness of fit. In mixed logit model the standard deviation of ASC, payment method, place of sale, inputs, when provided together with potato seeds and chemicals are found to be significant implying that considerable preference heterogeneity exist among smallholders.

Following Train (2003), it is assumed that coefficients have independent normal distribution and depending on the mean and standard deviation, it is possible to calculate the proportion of individuals who can give positive or negative value to each attribute. The estimate of the ASC coefficient is insignificant, implying that smallholder farmers are indifferent between contracts and traditional marketing channel. Yet, preferences towards contracts are heterogeneous, and for 51% of smallholders ASC is positive, which can be found from a mean (0.058) and standard deviation (2.698). This finding is in contrast with the results of the case of sweet pepper farmers in Thailand (Schipmann and Qaim, 2011) and with the results of rice farmers' participation in fairtrade contracts in Benin (Van den Broeck et al., 2017).

A priori, we would expect smallholders to prefer higher prices; as expected a priori, price was significant and positive attribute. We fixed price by assuming that all smallholders' preferences are homogenous for this attribute. Our findings are in line with the results of Schipmann and Qaim (2011), Van den Broeck et al. (2017), Ochieng et al. (2017).

Payment method is negative and significant at the 5% level, meaning that in general farmers prefer payment being made immediately. This result is in line with the a priori expectations that farmers prefer immediate payment. However, not all farmers share the same opinion, 36% of smallholders value payment method as positive, implying that *ceteris paribus*, they may accept delayed payment for two weeks, perhaps in the trade of other attributes. Last column in Table 3 also shows marginal effects of mixed logit model. For smallholders delaying payment two weeks after delivering decreases the probability of choosing contracts offering immediate payment for 4.7%. Our findings are different from the study of Schipmann and Qaim (2011), where payment in advance was insignificant for sweet pepper farmers in Thailand and in line with the findings of Ochieng et al. (2017), where payment mode is found to be negative for farmers in Kenya.

Grading is significant at the 5% level. Contrary to our expectations, it is positive, which perhaps can be explained by the fact that all sampled smallholder farmers usually do grading before they sell their output, either at the farm gate or before delivering to locations nearby and other markets. This result is not in line with findings of Ochieng et al. (2017) where sold in washed and sorted form was negative for Kenyan farmers. Other authors, Bandon et al. (2009) found that grading was insignificant for small-scale producers of fruits and vegetables in Honduras. In terms of marginal effects, the probability of choosing contracts requiring grading increases for 3.5% compared with no grading option.

For 45% of smallholder farmers the place of sale is not significant, implying that in general, the portion of transportation costs in terms of all costs faced by farmers is not much; however, for the rest 55% of farmers the sign was positive implying that they face transportation problems. In comparison with our findings, Bandon et al. (2009) find that farmers in Honduras prefer selling at farm gate.

As expected a priori, the estimate of coefficient of potato seed input was positive and significant at 1%, implying that smallholders prefer contracts offering potato seed. It is worth to mention that all smallholders' preferences for this attribute was homogeneous which indicates that potato seed is an important input in potato production. Indeed, potato seeds are usually considered as the most expensive input to potato cultivation. In terms of marginal effects, contracts offering potato seed increases the probability of contracting for 17.8% compared with contract alternatives without provision of inputs.

Input provision offering potato seeds and chemicals are also positive and significant as expected. Contracts with potato seed and chemicals option increases the probability of contracting for 18.3% compared with contract alternatives without provision of inputs. The results of both input attributes are in agreement with Schipmann and Qaim (2011), Abebe et al. (2013). We think that these results make sense, since input markets are less developed for smallholder farmers rather than for individual farmers, who usually receive inputs from the government in the form of subsidies.

The last contract attribute, relation to the buyer, was found to also be very important for all smallholder farmers. The sign is negative and significant as we expected, implying that knowing the buyer personally is very important for all sampled smallholder farmers. Hence, farmers do not trust less known contract agents, and indeed, trust is crucial for a partnership like contract farming. This result is in line with Schipmann and Qaim (2011).



Table 3: Estimation results of conditional and mixed logit models

Variables	Conditional logit	Mixed logit		
	Coefficient	Coefficient	SD	Marginal effects
ASC	0.131 (0.234)	0.058 (0.409)	2.698*** (0.374)	-
Price	0.398*** (0.127)	0.783*** (0.198)	-	-
Payment method (Two weeks after delivering)	-0.222* (0.126)	-0.444** (0.222)	1.245*** (0.307)	-0.047
Grading (Required by buyer)	0.169* (0.097)	0.295** (0.146)	-0.178 (0.358)	0.035
Place of sale (Buyer's premise)	-0.025 (0.092)	-0.247 (0.228)	2.190*** (0.362)	-0.013
Input provision (Potato seeds)	0.616** (0.256)	1.466*** (0.398)	0.023 (0.223)	0.178
Input provision (Potato seeds and chemicals)	0.736*** (0.269)	1.547*** (0.418)	0.711** (0.323)	0.183
Relation to the buyer (Buyer is not known)	-0.321** (0.138)	-0.618*** (0.210)	0.216 (0.370)	-0.072
Pseudo – R ²	0.025	0.147		
Log likelihood	-771.22	-657.56		
Chi2 (p-value)	39.56 (<0.000)	227.33 (<0.000)		

Notes: The number of observations is $n = 3 \times 4 \times 180 = 2160$. Standarts errors are shown in parentheses.

*Significant at the 10% level, **significant at the 5% level, ***significant at the 1% level.

CONCLUSION

The study analyzed the contract farming preferences of smallholders producing potato in Uzbekistan in the light of agricultural transition. In particular, we examined the role of contract farming characterized by its attributes in potato production and marketing in the case of smallholder farms. While providing a significant share in potato output, smallholders' role are less addressed in agricultural policies of Uzbekistan, and more importantly their production and marketing needs are not studied. We analyzed behavior of smallholders by introducing contract schemes, which could offer benefits for them, and can serve as an institutional tool.

A choice experiment was used to examine smallholders' attitudes towards hypothetically constructed contracts. Mixed logit model was used which allowed better goodness of model fit. Results revealed that there was a heterogeneity among smallholders for contracts in general and contract attributes. While half of the sampled smallholders prefer traditional marketing channel, the remaining half of them select contracts. For better understanding contract preferences of smallholders each contract attribute was examined.

As expected farmers preferred higher prices for their potato output, *ceteris paribus*. In addition, they preferred payment being made immediately. Existing payment system in smallholder farms is based on immediate payments and two third of farmers preferred contracts offering immediate payments. This result imply that farmers do not want to rely on delayed payments.

Grading was normal practice for smallholders and had positive effect on contracts. This result imply that if contracts are introduced, farmers are ready to cope with grading requirements. Although, the area of our study roads and transportation services were well established and place of sale was less important for smallholder farmers, however, there was heterogeneity among farmers, 55% of them preferred to sell their produce at farm gate. This result may inform that better infrastructure of roads could lead more active participation in contract farming.

The two input provision schemes (potato seed alone, and potato seeds with chemicals) were the most important contract attributes for smallholders; results revealed that participating in contracts offering inputs could increase the probability of choosing contracts for 17.8% and 18.3%, respectively, compared with contract alternatives without provision of inputs. Inputs such as mineral fertilizers are mainly provided to individual farms for the production of state orders crops such as wheat and cotton. Smallholders have to purchase mineral fertilizers in informal markets and contracts offering inputs could assure more stable input provision.

Knowing the buyer personally was very important for all sampled smallholder farmers. According to the results, smallholders do not trust less known contract agents, and indeed, trust is crucial for a partnership like contract farming. As the relation to a buyer is important for smallholders' participation in contract farming, programs (such as local agri-fair) to link producers and retailers will be important.

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