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Is the New Path a Modified Old Path?

Smallholder Farmers' Perspectives on Cotton Farming in Khatlon, Tajikistan

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Abstract

This article reviews the Soviet legacy in relation to contemporary cotton production in south-western Tajikistan and asks why farmers are still locked in to Soviet cotton production policies and practices despite post-Soviet regulatory, societal and environmental changes. With hindsight on Soviet agricultural production policies in Central Asia, this contribution scrutinises the perception of smallholder *dehkhan* farmers towards continued cotton production as a primary crop choice, which continues to occupy most of the irrigated land in the Khatlon region. For the analyses of the post-Soviet agricultural developments, the paper applies a path dependence conceptual framework by positing the significance of historical and social contexts in policymaking and

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socio-economic development in cotton production. Fieldwork data collected in two districts of Khatlon region are used to explain that despite post-independence land reforms and the abolishment of Soviet authority over cotton production, smallholder *dehkhan* farmers are still cultivating cotton as a primary crop under deteriorating land and irrigation conditions.

Keywords

Soviet legacy – path dependence – lock-in effects – land degradation – Tajikistan

1 Introduction

Since the disintegration of the Soviet Union in 1991, the agriculture sector of Tajikistan has struggled to transition from a planned to a market economy.[1] This process was further slowed by the civil war of 1992–1997.[2] The newly independent Tajikistan had to develop its own agricultural sector by allocating land for producing food crops by decreasing the land area allocated to cotton.[3] Despite a significant decrease in cotton acreage after the demise of the Soviet Union, the long history of extensive cotton cultivation throughout Central Asia continues to result in a number of negative environmental changes, such as soil salinisation, desertification and water shortages, which remain evident today.[4] One established Soviet legacy recorded in the literature is the neglect of negative environmental consequences in achieving maximum production outputs across all sectors of the economy, including the agricultural sector.[5] Soviet-era agricultural policies still affect farming practices in Central Asian countries,[6]

1 Spoor, Max. "Transition to market economies in former Soviet Central Asia: Dependency, cotton and water." *The European Journal of Development Research* 5, no. 2 (1993): 142–158.

2 Shtaltovna, Anastasiya. "Knowledge gaps and rural development in Tajikistan: Agricultural advisory services as a panacea?" *The Journal of Agricultural Education and Extension* 22, no. 1 (2016): 25–41.

3 Van Atta, Don. "'White Gold' or Fool's Gold?: The Political Economy of Cotton in Tajikistan." *Problems of post-communism* 56, no. 2 (2009): 17–35.

4 Kienzler, Kirsten M., J. P. A. Lamers, A. McDonald, A. Mirzabaev, N. Ibragimov, O. Egamberdiev, E. Ruzibaev, and A. Akramkhanov. "Conservation agriculture in Central Asia—What do we know and where do we go from here?" *Field Crops Research* 132 (2012): 95–105.

5 Cole, Daniel H. "Marxism and the Failure of Environmental Protection in Eastern Europe and the USSR." *Legal Stud. F.* 17 (1993): 35.

6 Schmidt, Matthias. "Political ecology in high mountains: the web of actors, interests and institutions in Kyrgyzstan's mountains." (2008). Djanibekov, Utkur, Grace B. Villamor, Klara

manifested especially in the prioritisation of intensive over more sustainable production models, and despite the concerns and criticisms raised by environmental experts.[7] Intensive farming practices, including heavy use of chemicals and excessive irrigation, were underpinned by increasing benefits at the time, which created increasing returns processes with a high probability of undertaking further steps along the same path, rather than switching to an alternative route.[8] However, the continuation of such intensive production practices without proper land management, such as draining the excess irrigation water, practicing shallow tilling and crop rotation, among others, led to serious land degradation issues. These can be observed in the cotton-farming areas of Tajikistan despite post-independence land reforms targeting mono-cropping and the introduction of more diversified and less water-intensive farming practices, which were designed to improve agricultural land conditions and the socio-economic prospects of the rural population.[9]

Agricultural land in Tajikistan is affected by a number of types of land degradation, including soil salinisation, flooding and desertification, which have both anthropogenic and natural causes.[10] While reports from development organisations highlight this issue and reflect on its socio-economic consequences for the rural population in the country,[11] there is little scholarly evidence on the perspectives of smallholder farmers towards these environmental changes despite the fact that they play a central role in daily human-environment interaction.

Despite the abandonment of the Soviet command agriculture system, and the accompanying deterioration in land conditions, the emphasis on cotton cultivation as the primary crop has not been altered and farmers in Tajikistan

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Dzhakypbekova, James Chamberlain, and Jianchu Xu. "Adoption of sustainable land uses in post-Soviet Central Asia: The case for agroforestry." *Sustainability* 8, no. 10 (2016): 1030.

7 Gupta, R., K. Kienzler, C. Martius, A. Mirzabaev, T. Oweis, E. De Pauw, M. Qadir et al. "Research prospectus: a vision for sustainable land management research in Central Asia." *ICARDA Central Asia and Caucasus program. Sustainable agriculture in Central Asia and the Caucasus series* 1 (2009): 84.

8 Pierson, Paul. "Increasing returns, path dependence, and the study of politics." *American political science review* (2000): 251–267.

9 Spoor, Max. "Agrarian transition in former soviet Central Asia: A comparative study of Kazakhstan, Kyrgyzstan and Uzbekistan." *ISS Working Paper Series/General Series* 298 (1999): 1–29. Spoor, Max, and Oane Visser. "The state of agrarian reform in the former Soviet Union." *Europe-Asia Studies* 53, no. 6 (2001): 885–901. Rakhmon, Shukurov. "Economy of land degradation in the Republic of Tajikistan (Fayzabad district)." (2019).

10 Lerman, Zvi. *Tajikistan's vulnerability to climate change*. No. 888-2016-65133. 2011.

11 Bann, C., S. Rakhmon, L. Boziev, and D. Rakhmanova. "The Economics of Land Degradation for the Agriculture Sector in Tajikistan—A Scoping Study." *UNDP-UNEP, Dushanbe* (2012).

continue to grow cotton. Although cotton production has shrunk since the Soviet era mainly because of a drop in yields, it still takes the larger share of a limited arable land, which represents only 7 per cent of the whole country's territory.[12] This raises a question as to why farmers are still locked in the vicious cycle of Soviet cotton production policies despite post-Soviet regulatory, societal and environmental changes. In order to answer this question, the paper scrutinises pre- and post-independence agriculture policies and decision-making in Tajikistan, alongside the concomitant farming practices of the smallholder farmers in Tajikistan's Khatlon region, through the lens of the path dependence concept.

Zweynert and Goldschmidt (2005), in defining path dependence, highlighted the significance of historical and social contexts in policy-making and socio-economic development.[13] While post-Soviet institutional changes have broadly been viewed with respect to the agrarian practices of water and land allocation in Central Asia,[14] the role of path dependence in decision-making processes and policies in historical and contemporary cotton sector development under changing environmental conditions still remains a poorly addressed area of research within the context of rural Tajikistan.

The introduction herein is followed by an outline of the path dependence concept, which is applied to conceptualise the Soviet legacy in relation to the development of the cotton production sector and the associated degradation of arable land in southern Tajikistan. The next section describes the case study areas selected in the Khatlon region, as well as the research methods used for data collection and analysis. The subsequent sections are dedicated to a literature review of Soviet agricultural policies in Central Asia, drawing attention to traces of the Soviet legacy in current agriculture development in Tajikistan. The empirical analysis focuses on current cotton farming practices and concomitant land conditions, based on empirical data collected in the case study districts of the Khatlon region during November–December 2019, and September-October 2021, which coincided with the cotton harvest season.

12 Lerman, Zvi, and David Sedik. "The economic effects of land reform in Tajikistan." *Policy studies on rural transition* 1 (2008).

13 Zweynert, Joachim, and Nils Goldschmidt. "The two transitions in Central and Eastern Europe and the relation between path dependent and politically implemented institutional change." (2005).

14 Kandiyoti, Deniz. "Poverty in transition: an ethnographic critique of household surveys in post-Soviet Central Asia." *Development and Change* 30, no. 3 (1999): 499–524. Van Assche, Kristof, and Nodir Djanibekov. "Spatial planning as policy integration: The need for an evolutionary perspective. Lessons from Uzbekistan." *Land use policy* 29, no. 1 (2012): 179–186.

2 Conceptual Framework

The paper applies a path dependence concept to analyse the Soviet legacy in post-Soviet agriculture development in Tajikistan with a focus on current cotton farming practices, decision-making processes and deteriorating land conditions in the major cotton growing region of the country. The legacy of Soviet management practices and thinking persists in Central Asia to varying degrees to this day, making reforms and transformation to more suitable practices difficult to implement.[15] The central assumption of the path dependence concept is that historical, traditional and institutional structures shape contemporary policies and practices according to historical patterns, and this may occur even when a new policy dispensation calls for a complete break with established norms.[16] In this sense, historical experiences and policies that once proved successful now provide the basis for resolving current problems in the expectation that they will be suitable to address once more a number of economic and societal challenges.[17]

According to Thelen (1999), path dependencies create feedback mechanisms comprising both functional and distributional aspects. Under functional aspects, actors recreate the logic of institutions, which were once established and functioned successfully, by adapting the old strategies to contemporary institutions.[18] In this regard, institutional path dependence concepts have been used previously to describe and explain institutional continuities in former Soviet states. Distributional aspects refer to the power asymmetries that are reinforced by institutions and by doing so marginalise selected actors who may have an interest in developing alternative institutional arrangements. The reason for the genesis and persistence of institutions is hence not only that they perform a certain function, but also that they serve certain interests.[19] The path

15 Sehring, Jenniver. "Path Dependencies and Institutional Bricolage in Post-Soviet Water Governance." *Water alternatives* 2, no. 1 (2009). Abdullaev, Iskandar, and Shavkat Rakhmatullaev. "Transformation of water management in Central Asia: from State-centric, hydraulic mission to socio-political control." *Environmental Earth Sciences* 73, no. 2 (2015): 849–861.

16 Hausner, Jerzy, Bob Jessop, and Klaus Nielsen. *Strategic choice and path-dependency in post-socialism: institutional dynamics in the transformation process*. Edward Elgar, 1995.

17 Sehring, Jenniver. "Path Dependencies and Institutional Bricolage in Post-Soviet Water Governance." *Water alternatives* 2, no. 1 (2009).

18 Thelen, Kathleen. "Historical institutionalism in comparative politics." *Annual review of political science* 2, no. 1 (1999): 369–404.

19 Streeck, Wolfgang, and Kathleen Ann Thelen, eds. *Beyond continuity: Institutional change in advanced political economies*. Oxford University Press, 2005.

dependence concept suggests a number of ways to make sense of the post-Soviet development of Tajikistan's cotton production sector.

This concept is also supported by Ruttan (1996), who stated that the environment in which all present activities take place is shaped by pre-existing institutional and socio-economic structures, as well as by the lag effect of activities carried out in the past.[20] Researchers studying path dependence in terms of institutional lag effects have noted that nascent institutional structures may not be the most effective means of dealing with new and emerging conditions of societal and economic change, and that their evolutionary structure may be locked in for a significant period of time.[21]

The continuing production of cotton in Tajikistan can also be viewed from a technological path dependence, whereby farmers are locked in to one farming technology for an extended period of time. Societies are impacted by the technologies in which they emerge creating a socio-technological lock-in effect when a technology—once it is built—becomes integrated into a society and people's mindsets over time, which is then difficult to overcome, even if there are alternative technologies available that are more suitable to emerging changes.[22] In agriculture, a socio-technological lock-in often occurs with the targeted or intensive production of certain crops, which can be explained by the concept of increasing returns to adoption, i.e. the more technology adopted, the higher the benefit.[23] In the context of Soviet agricultural development, technologies included the expansion of irrigation systems, the installation of drainage infrastructure and the heavy use of machinery and chemicals. The agricultural policies of the Soviet Union are an illustration of this concept, when returns from cotton production in Uzbekistan, Turkmenistan and Tajikistan were reinforced by the constant expansion of irrigation systems, the introduction of new cotton varieties and the increased application of pesticides, herbicides and fertilisers.

The path dependence concept in agricultural research is used less widely than in other fields of research where technology plays a major role in

20 Ruttan, Vernon W. "Induced innovation and path dependence: a reassessment with respect to agricultural development and the environment." *Technological forecasting and social change* 53, no. 1 (1996): 41–59.

21 Liebowitz, Stan J., and Stephen E. Margolis. "Path dependence, lock-in, and history." *Journal of Law, Economics, & Organization* (1995): 205–226.

22 Meynard, Jean-Marc, François Charrier, Marianne Le Bail, Marie-Benoît Magrini, Aude Charlier, and Antoine Messéan. "Socio-technical lock-in hinders crop diversification in France." *Agronomy for Sustainable Development* 38, no. 5 (2018): 1–13.

23 Arthur, W. Brian. *Increasing returns and path dependence in the economy*. University of Michigan Press, 1994.

development.[24] However, in the study of agriculture development, the lock-in mechanism of the path dependence concept can be applied to explain the choice of particular land management practices such as irrigation or pest control. Despite increasing concerns about the possible negative effects of chemicals and pesticides in pest control, and the emergence of new alternative methods with fewer negative consequences, modern agricultural development is often locked in to the old ways of using chemicals as the primary method.[25] Moreover, many farmers are reluctant to adopt more suitable pest management strategies, partly because of uncertainty about their effectiveness, as well as the technological immaturity of innovations and the lack of coordination between the different agencies supporting them.[26]

The experience and knowledge gained throughout a considerable period of cotton monoculture in the Soviet past shape the trajectory of future development. For example, today's cotton production practices in Tajikistan, existing irrigation practices, land processing and chemical use, and a continuation of the monopsony markets for cotton in some districts find their roots in the Soviet past. Knowledge accumulation and innovation influence the current technological regime, but they also prevent the adoption of new technologies under the changing context in which the system operates. Similarly, if the current agricultural system is not flexible enough to introduce reasonable adjustments, it will not be able to adapt to emerging environmental conditions.[27]

Therefore, considering the above-mentioned approach, it makes sense to look at the current state of cotton production among smallholder *dehkhan* farmers from the perspective of different dimensions of path dependence—technology, market, historical policies and institutions.

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24 Chhetri, Netra B., William E. Easterling, Adam Terando, and Linda Mearns. "Modeling path dependence in agricultural adaptation to climate variability and change." *Annals of the Association of American Geographers* 100, no. 4 (2010): 894–907.

25 Cowan, Robin, and Philip Gunby. "Sprayed to death: path dependence, lock-in and pest control strategies." *The economic journal* 106, no. 436 (1996): 521–542. Wilson, Clevo, and Clem Tisdell. "Why farmers continue to use pesticides despite environmental, health and sustainability costs." *Ecological economics* 39, no. 3 (2001): 449–462.

26 Chhetri, Netra B., William E. Easterling, Adam Terando, and Linda Mearns. "Modeling path dependence in agricultural adaptation to climate variability and change." *Annals of the Association of American Geographers* 100, no. 4 (2010): 894–907.

27 Håkansson, Håkan, and Alexandra Waluszewski. "Path dependence: restricting or facilitating technical development?" *Journal of Business Research* 55, no. 7 (2002): 561–570. McGuire, Shawn J. "Path-dependency in plant breeding: Challenges facing participatory reforms in the Ethiopian Sorghum Improvement Program." *Agricultural Systems* 96, no. 1–3 (2008): 139–149. Vanloqueren, Gaëtan, and Philippe V. Baret. "Why are ecological, low-input, multi-resistant wheat cultivars slow to develop commercially? A Belgian agricultural 'lock-in' case study." *Ecological Economics* 66, no. 2–3 (2008): 436–446.

3 Field Study and Methodology

The case study area is located in the Khatlon region—in the south-western part of Tajikistan. Khatlon is one of two major agricultural zones in the country, and it accounts for 17 per cent of the nation's geographical area and 50 per cent of its arable land, producing half of the country's agricultural output.[28] The total territory of Khatlon stretches over 24,000 km^2, and it is home to a population of over 3 million people. The region is characterised in some parts by its relatively harsh natural conditions and arid climate conditions. The major part of the territory is located in the catchment area of the Vakhsh and Panj river basins. Around 77 per cent of the total land area is designated as agricultural land, and 68 per cent of the region's arable land is used by individual farms (locally known as *dehkhan* farms) established after the Soviet-era collective and state farms were dissolved.[29] In this study, smallholder farmers are referred to as *dehkhan* farms that were established on the sites of former Soviet collective farms, through division and transfer of the land to individual farmers depending on their shares in those collective farms. The land is provided to individual farmers under a system of long-term user rights that can be inherited, but with land ownership remaining with the state.

The respective case study areas are located in the lowlands of Tajikistan, in two neighboring districts of the Khatlon region—Jaloliddin Balkhi and Vakhsh districts. These districts play a crucial role in the development of cotton farming in historical perspectives, as the first experiments during the Tajik SSR in adapting imported cotton varieties of Egyptian and American origin to local climatic conditions started in these areas from the Vakhsh Agricultural Experimental Station. It was established in 1930 by the Soviet initiative, which has now been transformed into a branch of the Tajik Research Institute of Farming. The foundation laid by the scientists of this station has played an important role in the further development of cotton production in the Vakhsh Valley, in terms of knowledge and farming practices appropriate to local conditions. The experimental adaptations of certain cotton varieties to local soil conditions were followed by a massive expansion of irrigation systems, which produced a significant expansion of cotton farming in the region.

The first significant changes in the agricultural sector in Tajikistan came after the collapse of the Soviet Union. Lack of maintenance of the irrigation infrastructure has started to cause major water losses between sources and

28 Liebowitz, S. J., & Margolis, S. E. (n.d.). Path Dependence, Lock-In, and History.

29 Lerman, Zvi, and David Sedik. "The economic effects of land reform in Tajikistan." *Policy studies on rural transition* 1 (2008).

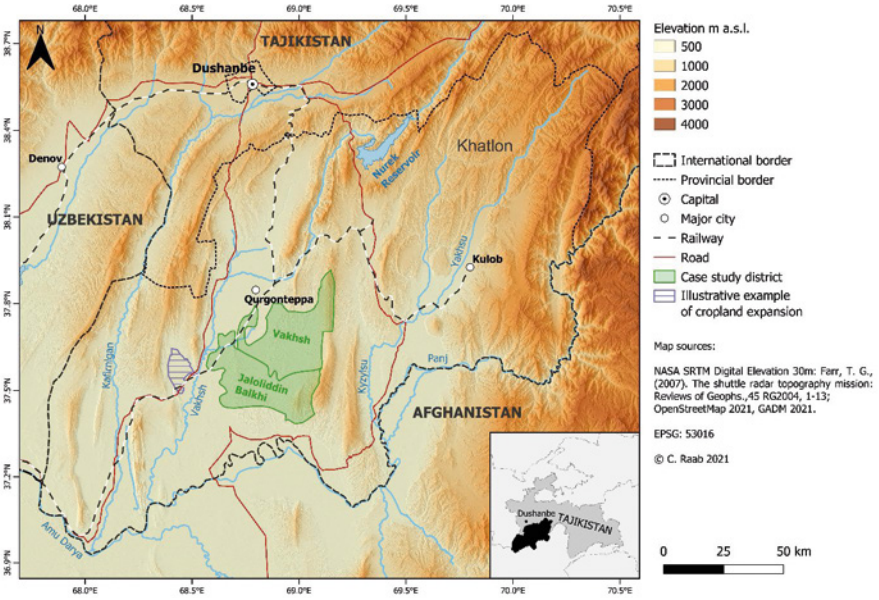

FIGURE 1 Topographic map of Tajikistan indicating the case study areas in the Khatlon region

fields, some of which have been reported at 50–65 per cent.[30] According to the State Agency of Land Reclamation and Melioration of Tajikistan, 16 thousand hectares of arable land in the Vakhsh catchment, which largely covers the chosen districts, was reported in 2017 to be out of use as a result of soil salinisation and waterlogging through heavy irrigation and the failure of drainage networks and facilities.[31] At the same time, areas under irrigation have failed to keep pace with a population growth rate of 2.4 per cent,[32] resulting in a reduction of irrigated land per inhabitant to 0.09 hectare.[33] These districts were chosen for this study primarily because of their history of cotton production and the current deteriorating land conditions to analyse the perspectives and response of the *dehkhan* farmers to these changes. The selection of

30 Frenken, Karen. "Irrigation in Central Asia in Figures: AQUASTAT Survey-2012." *FAO Water Reports* 39 (2013).

31 State Agency of Land Reclamation and Melioration of Tajikistan (2017).

32 World Bank. World Development Indicators (2019). Population growth (annual %)—Tajikistan. The World Bank Group. Accessed April 19, 2021. data.worldbank.org/indicator/SP.POP.GROW.

33 Hodzhaev, Sh. *Productivity of cotton on salinized and gypsum irrigated land of South-western part of Tajikistan*. Dushanbe (2018): 9–10.

case studies was also facilitated by the existing contacts of the authors and the research partner institutions.

Empirical data were collected during a four months of field visit to Tajikistan in November–December 2019, and September–October 2021 that coincided with the harvest season. The research methods included semi-structured interviews (n=60) with individual farmers, household members and agronomists. Further interviews were carried out with state officials of the chosen districts (5), scientists from research institutions (6), academic representatives from agrarian and technological universities (4), and local NGO representatives engaged in agriculture (n=6). In addition, focus groups (n=10) were conducted with the participation of around 10 individual farmers each, as well as participant observations while visiting the agricultural fields. The interviews were conducted in the Russian and Tajik languages, with detailed notes taken and then translated into English. The informants preferred not to be recorded during the interviews and focus groups. Topics in the group discussions and interviews included past and current farming practices, environmental changes with a special focus on the farmers' perspectives on cotton farming, land degradation, decision-making processes and local adaptation measures. For a review of the Soviet legacy in relation to current cotton production developments, policy documents, secondary literature and interview data were analysed.

4 Soviet Agricultural Policies in Central Asia

The roots of many of the current agricultural problems in the Central Asian republics, and particularly in Tajikistan, can be traced back to Soviet-era agricultural policies. Notably, production inefficiencies and a lack of accountability inherent in the collective farming systems, combined with a general disregard for the ecological consequences of farming and an overriding drive to intensify production, were often based on the excessive use of agro-chemicals to increase yields substantially, which resulted in a legacy of environmental degradation across the former Soviet Union.[34] Nikita Khrushchev's "Virgin Lands Program" in northern Kazakhstan in the 1950s opened up vast new tracts of often marginal land to farming as a means of solving the Soviet Union's food supply problems. Problems were exacerbated in the 1960s when the campaign to "chemicalise" agriculture began, and the development and widespread use

34 Sievers, Eric W. *The post-Soviet decline of Central Asia: sustainable development and comprehensive capital*. Routledge, 2013.

of agrochemicals became seen as the panacea for increasing crop production and ensuring food security throughout the Union.[35]

While some regions of Central Asia grew food crops, other regions, such as Tajikistan, Uzbekistan and Turkmenistan, concentrated on cotton farming, due to their more suitable climatic conditions. Through the central redistribution of resources, the Soviet government maintained the welfare of its population. By 1970, cotton farmers in the Fergana Valley were applying 400 kilograms of fertiliser per hectare and using more pesticides than any other agricultural sector in the Soviet Union. Already during the 1970s, such levels of chemical use were causing environmental issues and contaminating water supplies.[36] Despite the increasing production volumes the sustainability of these agricultural practices were of concern to scientists and agricultural specialists alike at the time, and despite warnings of impending land exhaustion, limited remedial measures were taken to mitigate the potential negative impacts on the environment. By 1991, the heavy use of pesticides and fertilisers had become a major cause of pollution in the Tajik Soviet Socialist Republic (SSR).[37]

Technological developments during the Soviet era were primarily focused on maximising the benefits from natural resource extraction across all sectors of the economy,[38] and as the ideology of the time stated, nature's role was to serve humanity.[39] The development of large-scale technological solutions to increase agricultural production, such as the construction of the Great Fergana Canal to bring irrigation to semi-arid and arid regions in the Uzbek, Tajik and Kyrgyz Soviet republics, aligned with reliance on the excessive use of agrochemicals were viewed as viable and preferred development pathways.[40] Such technical solutions were often implemented at the expense of more ecologically sustainable alternatives such as the introduction of lighter farm

35 Peterson, D. J. Troubled Lands. "The Legacy of Soviet Environmental Destruction." (1995).

36 Smith, Jenny Leigh. "Agricultural Involution in the Post-war Soviet Union." *International Labor and Working-Class History* (2014): 59–74.

37 Ulugov, Umidjon Amonovich, Lyudmila Sergeevna Bobritskaya, and Julia Sinitsky. "Inventory of Obsolete Pesticide Warehouses in Tajikistan and Implications for Removal of Contaminated Soil." *Journal of Health and Pollution* 8, no. 17 (2018): 1–5.

38 Ziegler, Charles E. "Soviet images of the environment." *British Journal of Political Science* 15, no. 3 (1985): 365–380.

39 Cole, D. H. (1993). Marxism and the Failure of Environmental Protection in Eastern Europe and the USSR. *Legal Stud. F.*, *17*, 35.

40 Saiko, Tatyana A., and Igor S. Zonn. "Irrigation expansion and dynamics of desertification in the Circum-Aral region of Central Asia." *Applied Geography* 20, no. 4 (2000): 349–367.

equipment that did not compact the ground, shallow tilling, contour ploughing and crop rotation.[41]

The Soviet drive for self-sufficiency in cotton production in Central Asia, and the development of large-scale irrigation schemes in marginal semi-arid and arid areas, has not only resulted in the gradual loss of the Aral Sea due to the extraction of water from the Amu Darya and Syr Darya river systems for irrigation, but it has also caused the soil in many areas to become waterlogged and saturated with salt. These problems have been exacerbated by a failure of the Soviet central planners to diversify crops to conserve soil quality, leading to the gradual degradation in terms of both quality and nutrients, and leaving the current farming community dependent on the use of fertilisers and other agrochemicals to maintain yields.[42]

4.1 *Soviet Irrigation Systems in Central Asia*

As mentioned earlier, agricultural development in Central Asia became possible due largely to the technological modernisation and central planning of the Soviet era.[43] Most parts of Central Asia were unsuitable for crop production due to the inaccessibility of water in remote areas, and agricultural production was based primarily on increasing arable land through expanding irrigation canals.[44] While success was gauged in terms of the economic contribution made to the state budget, the rollout of the irrigation schemes negatively affected natural resource use patterns.[45]

The expansion of irrigated land in Central Asia during the Soviet era was a key component of the nation-building process and a way of exerting control measures in the region.[46] In countries where large irrigation systems are

41 Kienzler, Kirsten M., J. P. A. Lamers, A. McDonald, A. Mirzabaev, N. Ibragimov, O. Egamberdiev, E. Ruzibaev, and A. Akramkhanov. "Conservation agriculture in Central Asia—What do we know and where do we go from here?" *Field Crops Research* 132 (2012): 95–105.

42 Smith, Jenny Leigh. "Agricultural Involution in the Postwar Soviet Union." *International Labor and Working-Class History* (2014): 59–74.

43 Glantz, Michael, ed. *Creeping environmental problems and sustainable development in the Aral Sea basin*. Cambridge University Press, 1999.

44 Lioubimtseva, E., and G. M. Henebry. "Climate and environmental change in arid Central Asia." *Journal of Arid Environments* (2017).

45 Djanibekov, Utkur, Grace B. Villamor, Klara Dzhakypbekova, James Chamberlain, and Jianchu Xu. "Adoption of sustainable land uses in post-Soviet Central Asia: The case for agroforestry." *Sustainability* 8, no. 10 (2016): 1030.

46 Abdullaev, Iskandar, and Shavkat Rakhmatullaev. "Transformation of water management in Central Asia: from State-centric, hydraulic mission to socio-political control." *Environmental Earth Sciences* 73, no. 2 (2015): 849–861.

developed, power dynamics subsequently become prominent between users and those who control the infrastructure.[47] In this sense, the Soviet state owned and maintained the infrastructure while its institutions guided and controlled farmers via production policies and a centralised market for all produced commodities.[48] As in the case of Tajikistan, the power dynamics were found to be quite prominent in the dry areas of Khatlon region such as Nasir Khusraw district where the supply of irrigation water is still managed by local village administrations that consider cotton as a priority crop for irrigation. As Mahoney (2000) rightfully describes the power relations between different groups, "once institutions are developed, it is reinforced through predictable power dynamics: the institution initially empowers a certain group at the expense of other groups; the advantaged group uses its additional power to expand the institution further."[49]

The overall area of irrigated land in Central Asia has increased threefold since the second half of the 20th century, due to the massive expansion of irrigation systems. As a result, the quantity of water withdrawn from rivers has increased significantly, and a huge amount has been wasted because of poorly designed irrigation networks in the region.[50] Under the Soviet centralised management system, the impact of water shortages within individual Central Asian nations was minimised through the diversion or division of water resources between the republics. This was no longer possible following the collapse of the Soviet Union when Central Asian republics gained national sovereignty, and so the established central system began to loosen and political borders gained importance; moreover, water transfers between the independent states became more complex and required multilateral agreements.[51]

47 Hofman, Irna, and Oane Visser. *Geographies of transition: The political and geographical factors of agrarian change in Tajikistan*. No. 151. Discussion Paper, Leibniz Institute of Agricultural Development in Transition Economies, 2014.

48 Pomfret, Richard. "Constructing market-based economies in Central Asia: A natural experiment." *The European Journal of Comparative Economics* 7, no. 2 (2010): 449–467.

49 Mahoney, James. "Path dependence in historical sociology." *Theory and society* 29, no. 4 (2000): 507–548, p. 521.

50 Saiko, Tatyana A., and Igor S. Zonn. "Irrigation expansion and dynamics of desertification in the Circum-Aral region of Central Asia." *Applied Geography* 20, no. 4 (2000): 349–367.

51 Борисова, Е. "История развития конфликтов по поводу водных ресурсов в Центральной Азии в постсоветский период." *Россия и мусульманский мир* 9 (267) (2014).

5 Post-soviet Agricultural Development in Khatlon, Tajikistan

The disintegration of the Soviet Union in 1991 brought about drastic changes in the agricultural sector in Tajikistan. In the absence of centralised government support systems, the newly independent nation urgently needed to realign its agricultural sector to support food production to feed its population—and as a consequence reduce the areas allocated to cotton production. In 1992, legal acts to promote land reforms and to restructure the farming sector were initiated, but their implementation was slowed down because of the civil war between 1992 and 1997. Therefore, the first important land code "On reorganization of agricultural enterprises and organizations" (the President's Decree No. 522) came into force only in 1996 with consecutive amendments and additions.[52] The land of Soviet *kolkhozes* and *sovkhozes* (collective and state farms) was divided into smaller land plots and distributed to individual farmers, in Tajik *dehkhan* farms in order to produce food and provide employment for the rural population. According to the abovementioned land code, the targeted command agriculture of Soviet era was abolished, prices were deregulated and farmers were formally granted the freedom to choose whichever crops they wished to cultivate.[53] However, it is important to note that prior to the 2000s, all the land reform initiatives were cosmetic and were reinforced by the occurrence of cotton debt scandals that attracted the attention of international development institutions.[54]

Tajikistan continued to support cotton production through state financing until 1996, when international donors insisted that Dushanbe must hand over cotton production to the private sector, which in turn served as an eligibility prerequisite for receiving development support funding.[55] Since cotton was a strategic agricultural export commodity, the Tajik government was interested in its continued production, and therefore it set up a three-pronged system involving state, domestic and international actors.[56]

The state-owned cotton processing ginneries were taken over by a few key individuals who maintained cotton production by advancing credits to local

52 Hofman, Irna, and Oane Visser. *Geographies of transition: The political and geographical factors of agrarian change in Tajikistan*. No. 151. Discussion Paper, 2014.

53 Ministry of Agriculture of the Republic of Tajikistan, Agricultural Reforms of Tajikistan for 2012–2020.

54 Hofman, Irna. "Soft budgets and elastic debt: Farm liabilities in the agrarian political economy of post-Soviet Tajikistan." *The Journal of Peasant Studies* 45, no. 7 (2018): 1360–1381.

55 Van Atta, Don. "'White Gold' or Fool's Gold?: The Political Economy of Cotton in Tajikistan." *Problems of post-communism* 56, no. 2 (2009): 17–35.

56 Hofman, Irna. "Soft budgets and elastic debt: Farm liabilities in the agrarian political economy of post-Soviet Tajikistan." *The Journal of Peasant Studies* 45, no. 7 (2018): 1360–1381.

farmers. This crediting system became known as the *futures system*—under which the cotton ginneries would provide the resource-poor farmers with in-kind credit for their farm inputs, on the agreement that they would repay the cost of the inputs on cotton harvest, as the only collateral the smallholder farmers could provide was the forthcoming crop.[57] Importantly, the cotton price set by the ginneries was often lower than the farmers anticipated, and as "price takers"[58] the farmers often made minimal profits or became submerged in debt. Such a credit system locked-in smallholder farmers to the production of cotton and obtaining credits or inputs from the same ginneries. The so-called 'privatisation' of funding for cotton production simply disguised the command-based agriculture of Soviet times, in that it was still funded and controlled through the state.[59] The path dependence concept explains this continuity of Soviet practice by showing "how institutions alter the power structure within society by strengthening subordinate actors at the expense of previously dominant ones."[60]

Interestingly, this type of credit system exists to this day, and farmers in each district can be dependent on local ginneries where some of them still get their production inputs for cotton farming. However, farmers nowadays have more freedom and off-farm income compared to the 2000s, which enables them to fund their own inputs and choose a more profitable buyer. As one of the informants during the interviews mentioned that as long as a farmer has alternative financial sources for the inputs he is then not obliged to sell his cotton to the local ginnery.

> It has been two years now since I do not take in-kind credits from the local ginnery, as my brothers are helping me financially from Russia. It turned out to be more beneficial as I can sell my cotton to any ginnery where I will get a higher price. Often prices for the inputs offered by the ginneries were higher than in the market and the purchase price lower than in other places.
>
> Farmer interview on 08.09.2021, Jaloliddin Balkhi district

57 Hofman, Irna. "Soft budgets and elastic debt: Farm liabilities in the agrarian political economy of post-Soviet Tajikistan." *The Journal of Peasant Studies* 45, no. 7 (2018): 1360–1381.

58 Singh, Inderjit, Lyn Squire, and John Strauss. *Agricultural household models: Extensions, applications, and policy*. The World Bank, 1986.

59 Van Atta, Don. "'White Gold' or Fool's Gold?: The Political Economy of Cotton in Tajikistan." *Problems of post-communism* 56, no. 2 (2009): 17–35.

60 Mahoney, James. "Path dependence in historical sociology." *Theory and society* 29, no. 4 (2000): 507–548, p. 522.

Despite the introduction of land reforms and freedom to choose a crop most of the established *dehkhan* farms, whose land plots vary from 2 to 5 hectares on average, continue to concentrate their efforts on cotton production while producing food crops at subsistence levels. From a path dependence approach, it can be seen as a continuation of historical production patterns where a farmer still has knowledge and farming experience and already existing market where he can sell his produce. Most farmers inherited the land and knowledge from their fathers, as most current farmers are a second generation of farmers after the collapse of the Soviet Union. The situation is different for other crops when a farmer needs to acquire new knowledge and change his farming practices and on top of it find a profitable market. However, according to conducted interviews the freedom to choose certain crops is not adhered to among smallholder farmers as they still have to follow certain production plan for different crops. The local state agronomist of the district explained that the government prepares a plan for the agricultural sector with respect to food and commercial crop production to make sure that the country is supplied with sufficient food, and at the same time to produce a certain amount of cotton for export. According to the expert interviews among state officials and institutes, cotton is still considered as a strategic crop for the economy of the country and follows the principle "the more the better". From the interviews with the local state officials, it was evident that actors at the local level believe that growing cotton is a solution for realising the agricultural potential of the country, as it has long been considered a strategic cash crop.

> We grow cotton for many years already and farmers have the required knowledge and experience, therefore we only encourage farmers to grow more cotton and when the conditions allow us, we would expand the areas for cotton farming. Nevertheless, we need to grow food crops as well otherwise we would not be able to feed our own population.
>
> Expert interview on 12.09.2021, Vakhsh district

The often mentioned "production quota" for cotton was clarified after a round of interviews with state officials at district levels. The quota is based on a state plan, which is prepared depending on the geographical conditions of different regions, for example whether it is an irrigated or rain fed land. The farmers who manage irrigated land, which is largely in Khatlon region, have to meet the production plan for cotton. This informally requires them to allocate at least 60 percent of the land to cotton. On the remaining land, they can choose to grow other priority crops such as wheat, maize, rice and vegetables for crop rotation purposes. For all the grown crops, farmers are accountable before the

local village administration and are asked to report to a local statistical agency according to the crop type and the corresponding land area.

Those who take in-kind credit from the local ginneries are also monitored by the local officials to make sure that they deliver their cotton to the same ginnery after the harvest. This is primarily because the Tajik government has an interest in sustaining cotton production, and therefore it exerts control over farmers through the agricultural land provided to them for a long-term use. It is important to note that while there are no government decrees or regulations that stipulate how the land is cultivated, there is evidence to suggest that cotton production is still demanded by the local *hukumats* (local state authorities). One of the authors observed an inspection by local authorities whilst interviewing a local farmer in the Jaloliddin Balkhi district. A *dehkhan* farmer mentioned that the local officials came to inquire about the remaining batch of cotton that he was supposed to deliver to the local ginnery:

> If you are late in delivering cotton to the local ginnery, the local authorities 'get worried' and come to your field to check if you are doing okay. They will visit more often towards the end of the season, in order to report the total harvest for the district.
>
> Farmer interview on 17.12.2019, Jaloliddin Balkhi district

As narrated by one of the *dehkhan* farmers, growing cotton is perceived as a guarantee that the land he cultivates will not be taken away by the state, and farmers have to agree to it to have a chance to grow other food crops on the remaining land:

> Cotton does not bring me much income unless the prices in the market are high enough to make a profit. I am happy if I can cover my expenses at least and can collect the cotton stalks for my *tanur* (in Tajik—oven made of clay) for baking bread. If I meet my production quota for cotton, I can grow other food crops for my own consumption on the remaining land.
>
> Farmer interview on 9.12.2019, Jaloliddin Balkhi district

However, a farmer is exempt from his obligation to supply the necessary quota if, due to some environmental circumstances such as temperature change, unexpected frost in spring or wind, was not able to reach the required yield for the season. One of the respondents lost almost his entire cotton yield because of the drought during the growing season and irrigation problems. Even though he was not required to meet production plan targets, he was still at a loss in terms of invested inputs and labour. The farmer himself commented that his

land was already exhausted and the quality of the soil was no longer good enough to ensure a decent harvest.

The research institutions and agricultural scientists look at cotton farming from a technical perspective in terms of its yields and sustainability to changing environmental conditions. They also note the increasing temperature, deteriorating soil conditions and shortage of water in some areas in recent years. Although there is limited capacity at the state institutions, cotton specialists are still breeding and experimenting with cotton varieties under local conditions. In an interview, one of the remaining experienced Soviet cotton breeders noted that in recent years farmers have started to complain more about unstable weather conditions, new pests and reduced yields. He stressed that a lot has changed since Soviet times, but while the climate is changing and the infrastructure is deteriorating, the farmers' habits remain mostly the same. During the interview, he shared his memories of the Soviet era:

> In Soviet times, sufficient funds were allocated and conditions were created for specialists and scientists to develop cotton farming, but now state funding has shrunk and everything has passed into private hands and farmers have become independent. Private suppliers bring in seeds from other countries and sell them to farmers. Often the seeds do not suit our local conditions. In the best way, those varieties should go through experimentation and adaptation from a scientific perspective. However, with the advent of the market economy, farmers are now free to choose and grow what is offered in the market.
>
> Expert interview on 28.09.2021, Tajik State Institute of Farming

The specialist responses were also supported by the results of farmer interviews who used Turkish *flash and flora* cotton variety seeds, which they buy in the market or the cotton processing plants themselves offer them to grow. This trend can be explained by the fact that some cotton processing plants work with Turkish buyers of raw cotton, who in turn offer Turkish cotton seeds.

Thus, despite the formal liberalisation policies that granted freedom to farmers in terms of crop selection and applied technologies, farmers are still locked in to cotton farming. Every economy with durable characteristics demonstrates path dependence in at least one of its forms. Tajikistan's cotton farming today is largely a result of the Soviet agricultural interventions, institutions and management patterns. Today's farmers have inherited the land, knowledge, skills, and technologies, which have become the national wealth of the country.[61]

61 Liebowitz, S. J., & Margolis, S. E. (n.d.). *Path Dependence, Lock-In, and History*.

6 Irrigation Systems and Land Use Changes in Khatlon Region

Irrigation systems in Tajikistan were built during the Soviet Union with the objective to expand the limited area of arable land. Figure 2 illustrates a land use change in the Dusti district of the Khatlon region, where the expansion of irrigation systems has transformed the arid range into cropland with the consequent expansion of farm areas. The chosen site was identified during the first explorative field trip by one of the authors in Khatlon region. It is given here although it is not located within the chosen case study areas, but is solely shown as an illustrative example of the cropland expansion during the Soviet ruling. The comparison of the area became possible because of the available satellite data for the chosen period between 1964 and 2020, where one can see the agricultural interventions during the Soviet era.

The irrigation system was central to the region and covered vast areas of Soviet collective farms at the time. All technical support and the uninterrupted functioning of irrigation and drainage systems during the Soviet Union was provided at state expense and by trained personnel.[62] However, the situation changed with the collapse of the Soviet Union in 1991 and the adoption of a new land code in Tajikistan, as mentioned earlier, when the collective farms

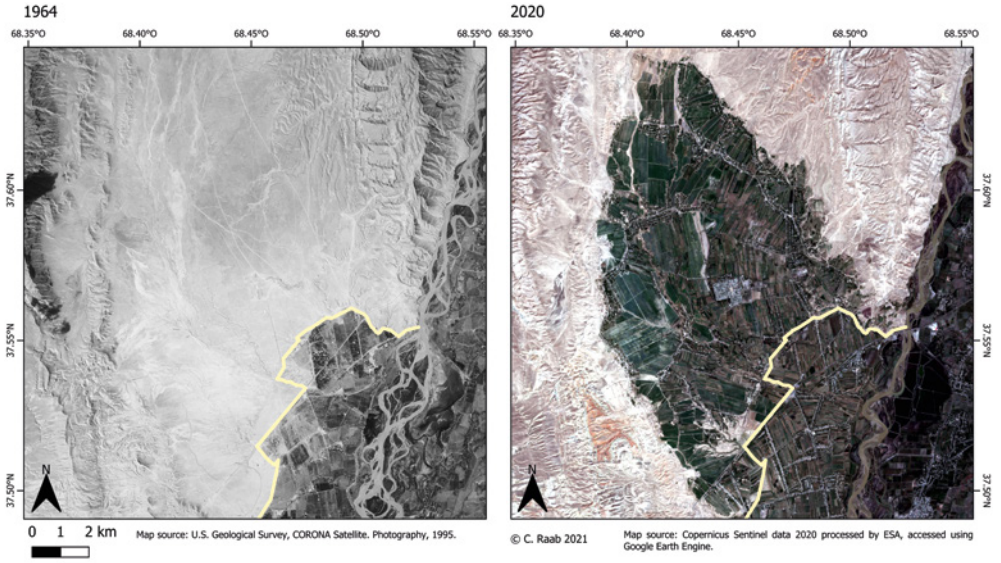

FIGURE 2 Comparative map of land use change in Dusti district, Khatlon (1964–2020)

62 Shtaltovna, Anastasiya. "Knowledge gaps and rural development in Tajikistan: Agricultural advisory services as a panacea?" *The Journal of Agricultural Education and Extension* 22, no. 1 (2016): 25–41.

were re-organised into smallholder or *dehkhan* farms. While the large amount of irrigated land was fragmented into smaller plots, the vast irrigation systems remained central to whole districts, and smallholder farmers found themselves unable to manage or maintain these systems independently. According to expert interviews with academic representatives and agricultural scientists, not every person receiving a land plot after the dissolution of large-scale collective farms was ready for individual farming. Most state or collective farm employees often had different professional backgrounds (e.g. driver, mechanic or teacher) and thus limited farming knowledge, including how to maintain a farm and operate the irrigation and drainage infrastructure. As a result, every element of the irrigation and drainage systems formerly maintained by large collective farms gradually began to fall into disrepair.

> At present, individual *dehkhan* farms are left alone with their so-called freedom and problems that they have to solve themselves. Often farmers themselves do not know why they are experiencing certain problems. The collective farms during the Soviet era had their own agronomists, engineers, and agricultural machinery. Now the individual farmers are managing their farms as best they can, while the common infrastructure, such as irrigation and drainage systems, is deteriorating because it is common to all and an individual farmer does not feel responsible for maintaining a common resource.
>
> Expert interview on 14.10.2021, Tajik Academy of Agricultural Sciences

The desire of most farmers to maximise the use of irrigation water—but their failure to technically maintain the viability of the entire central irrigation and drainage system—has currently created a free-rider problem, in that water and irrigation systems as common pool resources have become overused by farmers who are either not paying their fair share or are paying nothing at all for it.[63] Moreover, the excessive irrigation of agricultural land, largely for cotton cultivation, which is a water-intensive crop, has raised the water table, and so the failure of drainage systems largely after the demise of the Soviet Union has adversely affected soil quality through gradual salinisation.[64]

> Without timely and proper melioration activities, land will sooner or later begin to degrade, losing its nutritional properties. Therefore, we are

63 Hardin, Russell, and Garrett Cullity. "The free rider problem." (2003).

64 Ходжаев Ш.И. Продуктивность хлопчатника на засоленных и гипсоносных орошаемых землях Юго-Западного Таджикистана, Душанбе: « ЭР-Граф », 2018.

> now facing problems such as rising groundwater levels in intensively irrigated land, land salinisation, and as a result, reduced crop yields.
>
> Expert interview on 17.10.2021, Tajik Academy of Agricultural Sciences

The results of the interviews have shown that most farmers have a good understanding of the status of the irrigation infrastructure at a local level, they are often unaware of the wider network status, particularly transboundary issues, and thus, due to poor coordination, much of the infrastructure remains in a state of disrepair. A farmer from Jaloliddin Balkhi district, who owns 4 hectares of arable land, has been suffering from excessive accumulation of water on his land draining from neighbouring farms, which gradually affected his soil quality. This case is an indicator of a lack of coordination between farmers, or responsibility for common resources:

> My land plot is in a very unfavourable location, because it is lower than other farmers' plots. All the irrigation water from the neighbouring plots accumulates on my land and causes waterlogging, increases the level of ground water and affects the overall soil quality. And there is nothing I can do about it. It is my problem, and one that I have to deal with.
>
> Farmer interview on 15.11.2019, Jaloliddin Balkhi district

When the same farmer was interviewed two years later, the situation had not changed and even seemed to have worsened, as the saline spots in the field were now visible to the naked eye. Individual *dehkhan* farms now have limited capacity to adapt to such changes—lack of finances and machinery to clean the drainage systems. As for his neighbours, it was noticed that they have started growing rice in their fields to combat salinity, but such preventive methods as mentioned by soil scientists are not sustainable in the long-term.

During explorative field trips in the chosen districts, most of the irrigation and drainage infrastructure from Soviet times was found to be abandoned and non-functional, and the land around such obsolete infrastructure was at risk of irreversible degradation, due to heavy salinisation. At present, the area of irrigated land that subject to such decline is increasing in the Khatlon region, as noted by many farmers during the interviews and according to estimates made by the Agency of Land Reclamation and Melioration of Tajikistan.[65]

The growing demand for cotton, in combination with being Tajikistan's major export commodity, creates a need to cultivate the crop in large quantities,[66]

65 Agency of Land Reclamation and Melioration of Tajikistan, 2017.

66 OECD/FAO (2020), *OECD-FAO Agricultural Outlook 2020–2029*, OECD Publishing, Paris/FAO, Rome, https://doi.org/10.1787/1112c23b-en.

which in turn creates dependency on large-scale irrigation—often at the expense of natural resources and the socio-economic situation of cotton farmers. Thus, many smallholder farmers in Tajikistan have similarly become dependent on this path while being locked in to old Soviet irrigation systems and practices for growing cotton. This method of farming requires significant inputs including increased volumes of water, but the obsolete irrigation infrastructure inefficiently uses water, thereby making cotton production even more expensive in terms of resource use and causing long-term damage to the limited arable land in the country.

7 Use of Fertilisers and Agricultural Knowledge in the Khatlon Region

After the collapse of the Soviet Union in 1991, and the civil war that followed, Tajikistan experienced the steepest decline in agricultural production compared to other Central Asian countries, except for Kazakhstan.[67] The centralised supply of fertilisers and pesticides was suspended, and the newly independent Tajik state had to import them from other countries at market prices while producing only a small amount of nitrogenous fertilisers within the country. The differences in price were significant, and the amounts of pesticides and fertilisers used decreased considerably. In 1999, the use of fertilisers and pesticides was at its lowest, i.e. less than one sixth of 1992 levels.[68]

A sharp decline in fertiliser use after the collapse of the Soviet Union negatively affected soil fertility. Cotton is a nutrient-demanding crop, especially when it is grown in arid and semi-arid climates with high temperatures, where soil is prone to salinisation decreasing water and nutrient use efficiency.[69] Therefore, the amount of fertiliser used directly affects soil fertility by having a positive or negative effect on cotton yield.[70] However, the present situation of smallholder cotton farmers is different from the Soviet past. Nowadays

67 Robinson, Sarah, Ian Higginbotham, Tanya Guenther, and Andrée Germain. "Land reform in Tajikistan: Consequences for tenure security, agricultural productivity and land management practices." In *The socio-economic causes and consequences of desertification in Central Asia*, pp. 171–203. Springer, Dordrecht, 2008.

68 Food and Agriculture Organisation of the United Nations. FAOSTAT Statistical database. [Rome]: FAO, 2006.

69 Allanov, Kh, Kh Sheraliev, Ch Ulugov, Sh Ahmurzayev, O. Sottorov, B. Khaitov, and K. W. Park. "Integrated effects of mulching treatment and nitrogen fertilization on cotton performance under dryland agriculture." *Communications in Soil Science and Plant Analysis* 50, no. 15 (2019): 1907–1918.

70 ibid.

individual cotton farmers cannot always afford to use fertilisers in large amounts, as most is imported from neighbouring countries, namely Kazakhstan, Uzbekistan and Russia. Farmers usually buy fertilisers from middlemen in local markets; however, they are dependent on farming practices established during the Soviet era, i.e. large quantities of fertilisers to receive higher production outputs, which is quite challenging considering today's nutrient exhausted soil due to an a cotton monoculture past and increasing prices. One of the interviewed farmers in a selected case study area got the soil on his land tested in a laboratory in order to identify its fertility. In the interview, he mentioned that the laboratory test results showed very low content of nutrients resulting in its low fertility. As long as he applies fertilizers in large amounts, he will be able to get some yields from his land. Thus, current farming practices are strongly dependent on the use of additional nutrients for a good yield.

When revisiting the fertiliser shops and markets after two years it was noted that the prices have increased after the border closure with neighbouring countries during the COVID-19 pandemic, which affected the prices and quantities available. According to the owner of a shop, it has become even more challenging for farmers to meet the required levels of fertiliser use at increased prices—considering that the organic fertilisers in the selected areas are insufficient to cover large crop farming areas.

In view of the insufficient finance and farm inputs, farmers have no other option but to turn once more to the local cotton processing plants, where they can source the required inputs in advance and pay with the cotton grown at the end of the season. The elevated input prices make farmers even more dependent on the cotton plants, reminiscent of the centralised and targeted supply of inputs for growing cotton during the Soviet era. Only now, all necessary inputs are concentrated in private hands, thereby reinforcing the lock-in of cotton production around chemical and mineral use.

The use of excessive or increased fertiliser levels was established during the Soviet era, when high cotton production levels were achieved at the expense of high fertiliser inputs. The use of prolonged and intensive use of fertilisers has had a negative effect on soil productivity, and will do so for many years to come. According to the interview with a state agronomist, farming practices have remained the same from Soviet times but under deteriorating infrastructural, market and technological conditions.

> Agronomists from Soviet times, such as myself with about 40 years of experience apply the same knowledge and practices, although we see the changing conditions in our areas. Our knowledge and experience do not allow us to adapt to these changes because we do not have the

> necessary technologies and knowledge. For example, when cotton seeds are planted, about 60 percent of seeds are wasted without the precision mechanism of measuring distance and calculating seeds per linear meter in a bed, and imagine after planting that extra seed, the same amount of resources is required to grow them. Excess plants can only be removed after they have grown, by the principle of survival. This practice has been practiced since Soviet times to maximise production, but land has its own limits too.
>
> Expert interview on 1.10.2021, Vakhsh district

During the visits to the district departments of agriculture, it was observed that there was a shortage of young specialists, and that the agronomists working there were already at an advanced age. During a conversation with the head of the Agricultural Department in one of the chosen districts, it was mentioned that young specialists do not go to work in the districts due to low salaries and lack of incentives. There were currently four open vacancies for agricultural specialists such as engineers, soil scientists and agronomists in the Agricultural Department. As interviews with the students of local agricultural technical colleges and universities have shown, most of the graduates plan to go to Russia or Kazakhstan as labour migrants to support their families or find other profitable employment. Therefore, the current working specialists are mostly people approaching retirement age, whose knowledge and practice are mostly from Soviet times.

With respect to new technologies and practices, international or non-governmental organisations have developed programmes in the selected areas that introduce new technologies such as drip irrigation in dry areas and in places where there are problems with water delivery to the fields. However, the capacity of these projects is very small and they work mainly on vegetable and horticultural crops, but not on cotton.

> We help farmers develop horticulture by distributing seedlings of fruit trees such as peaches, pears and plums. We provide training on how to take care of and cultivate such trees. After the harvest, we help them find buyers and connect them to the right market. Our aim is to help farmers prepare products that meet the required international standards.
>
> Expert interview on 21.10.2021, representative of an NGO, Vakhsh district

Our observations have shown that the projects of international or non-governmental organisations in the chosen areas avoid working with cotton

production. Their focus is on improving and creating conditions for the food crops. One of the reasons according to the information of an ongoing project is the high rates of malnutrition and the high number of people living below the poverty line in the south-western part of Tajikistan. Thus, the south-western part of Khatlon being one of the important agricultural regions of the country, with existing problems of food security and malnutrition, largely remains locked in to cotton production to this day.

8 Conclusion

This article has scrutinised how smallholder *dehkhan* farmers in Tajikistan's Khatlon region remain locked in to cotton production—as viewed through the lens of the path dependence concept. Despite the disintegration of the Soviet Union in 1991, and subsequent post-Soviet land reforms to grant freedom to farmers in their choice of crops, the Tajik government continues to promote agricultural policies that favour cotton cultivation, in a way that is reminiscent of top-down Soviet agricultural governance.

The paper has identified several factors such as existing technologies, farming practices, knowledge, availability of in-kind credits and existing market for cotton as the drivers that cause dependency on cotton farming among the smallholder farmers despite poorly maintained irrigation systems and deteriorating soil conditions. However, the changing environmental conditions in some parts of the research areas clearly call for a change and the implementation of adaptive measures. Each individual farmer now takes adaptive measures at the level of his field boundaries and capacity both physical and financial after the division of Soviet collective farms, which has been one of the reasons for the deteriorating central irrigation and drainage systems since the Soviet era.

Since cotton is and remains a strategic crop for Tajikistan, it is quite difficult to imagine a complete rejection and transition to other crops. However, for the continuation and sustainable development of cotton production, where the benefits of all stakeholders are taken into account, it is necessary to move away from old technological and mental attitudes, taking into account the changing environmental conditions. The involvement and contribution of each stakeholder at every level of decision-making for maintaining sustainable and efficient cotton production is an important step in overcoming dependence on old production patterns. The analysis of the paper have shown that this will not be possible without a deliberate sequencing of reforms, stakeholder participation, and an integrated long-term approach.

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