



## Mechanizing Cotton Harvesting in Uzbekistan

### KEY MESSAGE

- Mechanizing cotton harvesting improves farm technical efficiency, although benefits vary due to farm-specific factors such as labor availability, agricultural practices, and farm size.
- While mechanization reduces the need for manual labor, it also raises concerns about rural employment, especially among female workers.
- Diversified crop cultivation can reduce inefficiencies associated with cotton monoculture, helping to stabilize farm income and enhance soil quality.

### INTRODUCTION

In Uzbekistan, the agriculture sector accommodates 27% of the labor force with a substantive (28.5%) share in the national GDP and approx. 50% of the country's population resides in rural areas.<sup>1</sup> The cotton sector in Uzbekistan plays a crucial role in the country's agricultural and economic landscape. As part of ongoing agricultural reforms, Uzbekistan has been

<sup>1</sup> Statistics Agency of Uzbekistan (2022) <https://stat.uz/en/>

pushing towards the mechanization of cotton harvesting, a shift driven by the need to eliminate forced labor practices and improve the international perception of its agricultural practices.

Historically, Uzbekistan's reliance on manual labor, particularly involving women and children, became entrenched during the Soviet period, when economic policies and labor mobilization practices shaped the agricultural workforce. Under Soviet planning, labor-intensive cotton production was viewed as more economically feasible than mechanization due to abundant, low-cost labor.<sup>2</sup> This legacy has left a complex socio-economic environment in which mechanization, though advantageous for efficiency, raises significant challenges in terms of rural employment and social adaptation.<sup>3</sup>

In recent years, Uzbekistan has committed to phasing out forced and child labor,

<sup>2</sup> Pomfret, R. (2002). State-Directed Diffusion of Technology: The Mechanization of Cotton Harvesting in Soviet Central Asia. *The Journal of Economic History*, [online] 62(1), pp.170–188. Available at: <https://www.jstor.org/stable/2697976>.

<sup>3</sup> Keller, S. (2015). The puzzle of manual harvest in Uzbekistan: economics, status and labor in the Khrushchev era. *Central Asian Survey*, 34(3), pp.296–309. doi:<https://doi.org/10.1080/02634937.2015.1022037>.

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improving labor rights, and promoting wider adoption of cotton combines that align with international standards and ethical practices. This shift is partly driven by a need to enhance the country's global image as a responsible cotton producer and to respond to calls from international organizations and consumer markets for sustainable agricultural practices. Mechanization is seen as a pathway to increase technical efficiency, reduce dependence on seasonal labor mobilization, and decrease the labor intensity of cotton harvesting.<sup>4</sup>

The future of Uzbekistan's cotton sector depends on the ability of policymakers to balance the benefits of mechanization with the needs of its rural labor force, ensuring that both farm productivity and rural livelihoods are enhanced in the process. However, the transition to mechanized cotton harvesting requires careful consideration of its economic, social, and environmental impacts. Many rural communities, particularly women, rely on seasonal cotton-picking income to sustain their livelihoods.<sup>5</sup> The potential of mechanization to enhance farm efficiency and productivity, thus, remains contentious.

This policy brief examines the potential benefits and challenges of adopting cotton combine services in Uzbekistan and provides recommendations for policy-

<sup>4</sup> Swinkels, R., Romanova, E., Kochkin, E. (2016) Assessing the Social Impact of Cotton Harvest Mechanization in Uzbekistan, World Bank, Washington DC.

<sup>5</sup> Swinkels, R., Romanova, E., Kochkin, E. (2016) Assessing the Social Impact of Cotton Harvest Mechanization in Uzbekistan, World Bank, Washington DC.

-makers to ensure a balanced and effective transition towards mechanization. Key considerations include enhancing rural employment alternatives, fostering crop diversification, improving technical support and training for farmers, and ensuring that mechanization aligns with Uzbekistan's sustainable development objectives.

## CURRENT STATE OF COTTON HARVESTING IN UZBEKISTAN

In Uzbekistan, in the agricultural calendar year 2023-2024, cotton is harvested on approx. 950,000 hectares (ha), slightly less (3%) than in 2022-2023, mainly due to the government's land redistribution policy to improve food security and household incomes. Cotton harvesting is primarily ascribed to cotton clusters; according to the Uzbek Association of Cotton-Textile Clusters (UACC), there are currently 134 cotton clusters consisting of private firms that produce gin and spin cotton. Cotton clusters have promoted and invested in mechanized harvesting due to the increase costs of manual harvesting.<sup>6</sup> Historically, Uzbekistan's cotton sector has been labor-intensive, with manual harvesting dominating the landscape. The country's large rural labor force, mostly comprised of women, has traditionally been mobilized for manual harvesting, which has kept labor costs low.

<sup>6</sup> USDA & GAIN (2023) Uzbekistan: Cotton and Products Annual. UZ2023-0001. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Cotton%20and%20Products%20Annual\\_Tashkent\\_Uzbekistan%20-%20Republic%20of\\_UZ2023-0001.pdf](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Cotton%20and%20Products%20Annual_Tashkent_Uzbekistan%20-%20Republic%20of_UZ2023-0001.pdf)

However, with increasing global scrutiny on labor practices, Uzbekistan has committed to transitioning away from forced labor, which has historically involved the large-scale mobilization of public workers, including students, to participate in cotton harvesting.

Mechanization is now seen as an essential step in modernizing Uzbekistan's cotton sector. The introduction of cotton combines has been central to this transition. However, only a small proportion of cotton harvests in Uzbekistan have been mechanized so far, compared to countries like Kazakhstan, where approximately 60% of the cotton harvest is mechanized. Cotton farmers in Uzbekistan remain skeptical of the benefits of mechanization, particularly due to concerns about the potential negative impacts on cotton quality and farm revenue.

## POTENTIAL BENEFITS OF COTTON HARVEST MECHANIZATION

1. **Increased Technical Efficiency:** According to the findings from the joint study on Kazakhstan and Uzbekistan, the use of cotton combines has the potential to increase technical efficiency. Mechanization reduces the time and labor required for harvesting, allowing for quicker and more efficient cotton collection. Cotton farms that have adopted mechanization demonstrate significantly higher levels of technical efficiency compared to those relying on manual labor. Cotton combines improve the harvesting process by reducing labor requirements and organizing the process more effectively, which can lead

to higher yields and better-quality cotton when the machinery is properly calibrated.

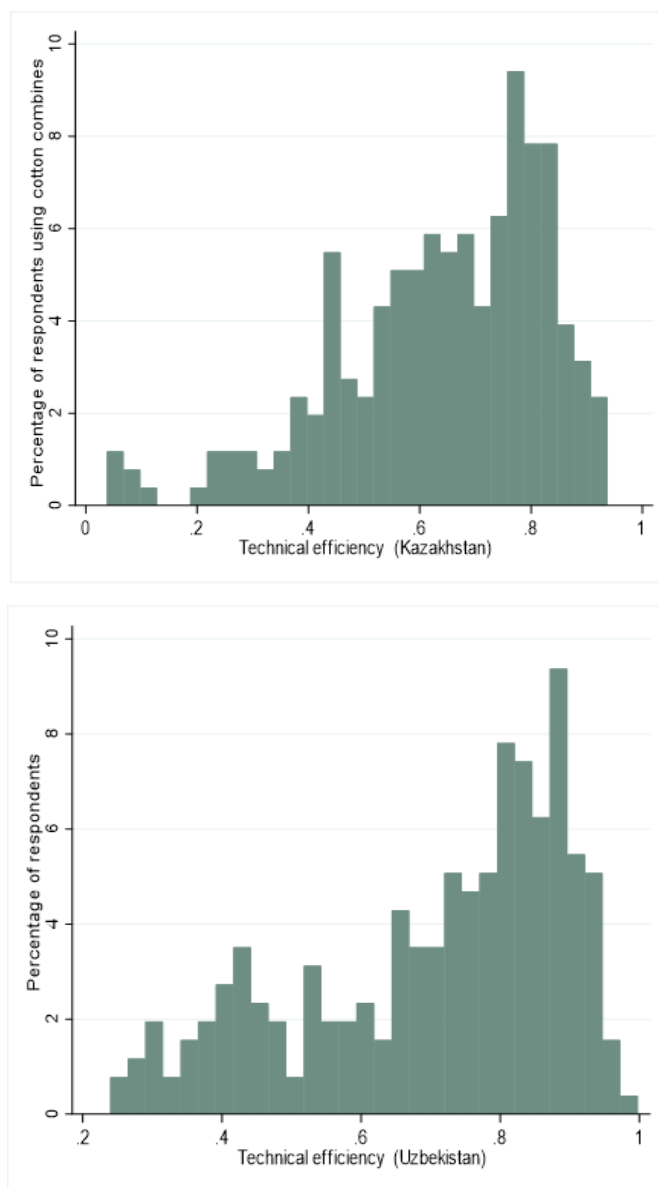


Figure 1: Distribution of technical efficiency of cotton-growing farmers using cotton combines in Kazakhstan (N=255) and technical efficiency of cotton-growing farmers without cotton combines in Uzbekistan (N=256)

2. **Labor Reallocation and Economic Diversification:** By freeing up labor previously dedicated to manual cotton picking, mechanization can enable rural workers to shift towards other agricultural or economic activities. This shift is essential in boosting overall agricultural productivity in Uzbekistan, where rural areas are

heavily dependent on labor-intensive farming practices. Policymakers can redirect labor to other parts of the cotton value chain, such as processing and textile production, or to other agricultural tasks like weeding and pest control.

3. Environmental and Agronomic Benefits: Mechanized harvesting also presents potential environmental benefits. The presidential decree issued in 2022 regarding creation of *dekhan farms* is one encouraging step to promote diversification farming and to support smallholder's livelihood.<sup>7</sup> Crop diversification, often seen in conjunction with cotton harvest mechanization, can improve soil health and reduce the negative impacts of cotton monoculture. Diversification helps to prevent soil depletion and salinization, both of which are major concerns in Uzbekistan's cotton-growing regions.

## CHALLENGES TO ADOPTION

1. Economic Concerns: While mechanization has the potential to improve technical efficiency, the high costs associated with acquiring and maintaining cotton combines are a significant barrier for many Uzbek farmers. The study highlights that Uzbekistan's cotton farmers have lower productivity levels compared to their Kazakh counterparts, in part because of the high initial costs of mechanization and the perceived risks of using

complex technology.

2. Social Impacts: Mechanization threatens to displace a large portion of Uzbekistan's rural labor force, particularly women, who have traditionally been employed in manual cotton picking. While mechanization frees up labor for other tasks, it also creates a need for alternative employment opportunities in rural areas. Without careful planning, this shift could exacerbate rural poverty and increase unemployment among vulnerable populations.

3. Technical Training and Support: The study also highlights the need for better technical training and support for cotton farmers to adopt mechanization successfully. Uzbek farmers currently lack experience with cotton combines, and the poor quality of agricultural extension services exacerbates the problem. Farmers who do not receive adequate training and support are unlikely to fully realize the potential efficiency gains offered by mechanization.

4. Infrastructure and Institutional Support: For mechanization to succeed, significant improvements are required in Uzbekistan's agricultural infrastructure, particularly in terms of access to modern machinery and inputs such as fuel and spare parts. Moreover, institutions like farmers' unions, which play a central role in disseminating information and providing technical support, need to be strengthened. Currently, farmers' unions are not equipped to offer the necessary agronomic guidance to support the widespread adoption of cotton combines.

<sup>7</sup> USDA & GAIN (2023) Uzbekistan: Cotton and Products Annual. UZ2023-0001. [https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Cotton%20and%20Products%20Annual\\_Tashkent\\_Uzbekistan%20-%20Republic%](https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Cotton%20and%20Products%20Annual_Tashkent_Uzbekistan%20-%20Republic%20)

## POLICY RECOMMENDATIONS

A long history of reliance on manual labor in Uzbekistan's cotton sector, rooted in Soviet-era economic policies, presents a unique challenge to the sustainability of cotton harvest mechanization. The abundance of low-cost rural labor, especially among women, under past state policies has left a legacy that affects current mechanization initiatives. Addressing this issue requires not only technical changes but also social adaptations to shift from traditional labor practices:

1. **Gradual State-Directed Diffusion of Cotton Combines:** Previous attempts at rapid, state-directed mechanization in Soviet Central Asia led to inefficiencies, with costly cotton combines often left idle by farmers. These past efforts ignored local economic conditions and labor costs, leading to resistance among cotton-growing farmers. Learning from this experience, a gradual, market-responsive approach to mechanization could help ensure that farmers have both the resources and incentives to adopt and maintain cotton combines effectively and sustainably. Policymakers should aim for a phased approach to mechanization, starting with more extensive, better-capitalized farms that can absorb the initial costs of acquiring cotton combines. This will allow for a more manageable transition and provide valuable insights for scaling up mechanization efforts.
2. **Focus on Cotton Harvest Mechanization among Smaller Farms:** Given the high costs of mechanization, a targeted financial incentive program could be instrumental in driving adoption, especially among small-sized farms. Policy options include targeted subsidies on cotton combines for small farms to reduce the financial burden while encouraging mechanization. Developing frameworks for cooperative ownership models to make the cotton combines more accessible for small farms will allow them to share this machinery and reduce individual costs related to its purchase and maintenance.
3. **Enhance Training and Extension Services:** Public and private investments should be promoted to improve the quality of agricultural extension services and provide farmers with the technical training needed to efficiently operate and maintain cotton combines. Specialized training programs should be developed in partnership with international agricultural institutions to ensure that Uzbek farmers are equipped with the knowledge needed to make the most of mechanized harvesting technology.
4. **Encourage Crop Diversification:** Policies that promote crop diversification will not only improve technical efficiency but also enhance environmental sustainability and economic resilience. Farmers should be provided with incentives and an enabling environment, e.g. higher autonomy in crop choices, to diversify their cropping systems. This can reduce



the risks associated with cotton monoculture, such as soil degradation and water depletion. Diversification can also provide farmers with alternative revenue streams, reducing their reliance on cotton alone.

5. **Develop Rural Employment Opportunities:** Mechanization in the cotton sector reduces the need for manual labor and thus poses a risk of income loss, particularly for rural women who rely on cotton picking. Creating alternative income-generating opportunities, such as microfinance and vocational training for women, is essential to mitigate these social impacts. To support sustainable rural livelihoods, policies must include measures to transition workers to new roles in the agricultural value chain or other sectors, such as processing and textile manufacturing, logistics, and agricultural extension services, which can absorb displaced workers. Additionally, promoting other labor-intensive agricultural activities like weeding, pest control, and crop monitoring will provide job opportunities for rural workers.

6. **Strengthen Institutional Support and International Collaboration:** The role of institutions like farmers' unions and cooperatives should be enhanced to provide better support for farmers during the transition to mechanization. These institutions should focus on offering agronomic advice, facilitating access to finance and machinery, and advocating farmers' interests. International partnerships with agricultural research

organizations can also help Uzbekistan access cutting-edge technology and best practices for mechanized cotton harvesting.

## DISCLAIMER

The findings, interpretations, views, conclusions, and recommendations of the study, as contained in this publication, reflect the views of the authors and do not necessarily reflect the official opinion of WIUT or CPRO.

## AUTHORS

Muhammad Bilal PhD, Senior Lecturer, WIUT

Nodir Djanibekov, PhD, Research Associate, IAMO

Abdusame Tadjiev, PhD, Doctoral Researcher, IAMO

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