ASA "Support to Agricultural Modernization in Uzbekistan"

Policy Note

Making Farmland Work for Economic Development in Uzbekistan[1]

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Executive summary

What is produced on farmland is critical to the agriculture sector outcomes. If other objectives, such as farm incomes, jobs, water security, were considered as important as producing more of wheat and cotton in Uzbekistan, the farmland use structure would have looked differently. This report offers an example of more balanced allocation of farmland, which could increase agricultural production by 51 percent, employ 16 percent more people in primary agriculture, and save 11 percent water by 2030. All this could be achieved without undermining food security (e.g., wheat supply) and development of textile industry. Outlooks are subject to uncertainty and the identified gains may not be necessarily realized. Yet, the benefits of more balanced farmland use are too large to be ignored for the future of agriculture development in Uzbekistan.

I. Setting up the Stage

1 The existing farmland use in Uzbekistan is heavily skewed towards cotton and wheat, by the government's decision to allocate land for production of these crops. In 2017, 67 percent of the irrigated agricultural land was under these two crops [Table 1].

Table 1: Structure of farmland use in 2017

Crops	'000 ha	% of total
Wheat	**1,411**	**36.1**
Rice	73	1.9
Maize	38	1.0
Other grain	134	3.4
Cotton	**1,201**	**30.8**
Other technical crops	52	1.3
Potatoes	79	2.0
Vegetables	190	4.9
Melons	52	1.3
Fodder crops	243	6.2
Fruit orchards	293	7.5
Grapes	138	3.5
TOTAL	**3,904**	**100%**

Source: State Statistics Committee of Uzbekistan (2018).

2 The negative impact this land allocation has made to farm incomes, economic growth, overuse of water, and soil degradation has been increasingly recognized in the country. A lot has been written on this topic and since 2017, the start of economic liberalization, some of wheat and cotton land has been shifting to production of other crops. Yet, the size of these shifts remains modest and they are mostly related to cotton, not wheat. If the land shift is not increased over the next 5-10 years, this would seriously constraint the ability of agriculture sector to generate growth, jobs, and water savings undermining the Government's aspirations.

3 While the best solution aligned with the principles of market-led growth is to give farmers a choice to decide themselves on what to produce, which is practiced in most countries around the world, the Government of Uzbekistan prefers to continue using a farmland planning, at least as a transition instrument, to guide agricultural development. Without it much of the farmland under cotton and wheat would have shifted naturally to the production of other crops. Yet, with the land planning being in place, changes and gains can be achieved if more cotton and wheat land are administratively shifted to other crops. This report provides estimate of how a new, more balanced farmland use structure can look like to foster agricultural transformation, while leaving a sufficient basis for development of cotton and wheat sectors. By presenting the outlook by 2030 it shows a magnitude of potential economic benefits and offers a log frame for thinking about making farmland crop allocation more efficient and balanced. In this way the report seeks to inform political debate and help the Government make informed policy choices.

4 When determining the farmland use by 2030, among all the questions, the key to ask is how much land can be shifted away from cotton and wheat. Answering that would require an understanding of the outlook for wheat and cotton demand and a potential for growth in yields of

these crops. Then, allocation of the 'freed' land to other crops would need to be made based on considerations of competitiveness, profitability, job creation, and water savings. The analysis in this report, therefore, starts with the outlooks for wheat and cotton.

II. Outlook for Wheat Sector

5 Uzbekistan's Statistics Committee and the Ministry of Agriculture do not report the wheat balance. The report is, therefore, using the data from the US Department of Agriculture (USDA).[2] During 2010 and 2018, the area harvested stayed constant at 1.4 million ha [Table 2]. Wheat production was volatile, following fluctuations of yields. Imports increased from 1.7 million tons (or 26 percent of domestic food wheat consumption) in 2010/11 marketing season to 3.2 million tons in 2018/19 (42 percent of domestic food wheat consumption), reflecting: (i) the switch of Uzbekistan from importing flour to importing wheat and producing flour domestically and even exporting it Afghanistan; (ii) the decrease in wheat production; and (iii) the growing demand for higher quality wheat from Uzbek consumers. The entire wheat import comes from Kazakhstan.

Table 2: Wheat balance, 2010/11-2018/19

	Unit	2010/2011	2015/2016	2017/2018	2018/2019
Area Harvested	('000 ha)	1,400	1,400	1,400	1,400
Beginning Stocks	('000 tons)	917	2,200	2,652	2,652
Production	('000 tons)	6,500	7,200	6,900	6,000
Imports	('000 tons)	1,618	2,662	3,000	3,200
Exports	('000 tons)	500	200	200	200
Feed Dom. Consumption	('000 tons)	1,500	2,250	2,200	2,100
Food Wheat Consumption	('000 tons)	6,200	7,100	7,500	7,600
Domestic Consumption	('000 tons)	7,700	9,350	9,700	9,700
Ending Stocks	('000 tons)	835	2,512	2,652	1,952
Yield	(tons/ha)	4.64	5.14	4.93	4.29
Population	('000 people)	28,562	31,299	32,387	32,938
End stocks to food wheat demand	(%)	13%	35%	35%	26%
Import to food wheat use	(%)	26%	37%	40%	42%

Source: USDA.

6 The snapshot of the major changes during 2010-2018 and during the more recent period of 2016-2018 is presented in Table 3. During both periods, the wheat production declined. Consumption of food wheat grew annually by 2.4 percent on average, due to the 1.8 percent population growth and the 0.6 percent per capita consumption growth. Feed wheat consumption grew by 5 percent during 2010-2018 but dropped to less than 1 percent during 2016-2018. Import grew by 10 percent during 2010-2018, slowing down to 6 percent during 2016-2018.

7 This was the presentation of the past, but what is about the future? One of the key determinants of wheat outlook is the demand for food wheat. Will it continue to grow at the same speed as in the past? The answer is no, it will not. Future food wheat demand is anticipated to slowdown. There are three reasons for that. First, population growth in Uzbekistan is predicted to average 0.4 percent during 2018-2030 compared to 1.7 percent during 2016-2018. Second, per capita food wheat consumption will decline due to the already relatively high wheat consumption in the country. According to the USDA, average food wheat per capita consumption in 2017 in

[2] This database is available online at https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery.

Uzbekistan was 231 kg. In Ukraine this number was 141 kg, in Russia 156 kg and in Egypt, the net importer of wheat, the same as Uzbekistan, 190 kg. Some of this large wheat consumption in Uzbekistan is a result of increased milling of Kazakh wheat for exports to neighboring countries. But even accounting for this effect, per capita wheat consumption in Uzbekistan has a little room for a significant increase. This is because the wheat price outlook is heading upwards, which is the third reason for the lower future food wheat demand. Uzbekistan has been using the low state procurement price for wheat for many years, but which is now predicted to increase and eventually be abolished. The state procurement wheat price in 2019 is set at 1,250 soms/kg, which is almost as twice as high compared to 2018 (750 soms/ka). Higher wheat price would push flour prices up and eventually bread prices, the subsidy for which was eliminated in September 2018. Thus, higher wheat price will lower demand for wheat.

Table 3: Major changes in wheat balance, % per year

	2010/11-2018/19	2016/17-2018/19
Area Harvested	0.0	0.0
Yield	-0.2	-5.7
Production	-0.2	-5.7
Imports	10.1	6.4
Feed Dom. Consumption	4.9	0.5
Food Wheat Consumption	2.5	2.3
Population Growth	1.9	1.7
Per Capita Wheat Consumption	0.6	0.6
Ending Stocks	7.5	4.0

Source: USDA.

8 Key assumptions for the 2030 wheat outlook are presented in Table 4. Average yields are assumed to increase annually by 1.3 percent, which is a conservative and achievable target, assuming farmers have access to better seed varieties and to extension services supporting adoption of good agricultural practices (GAP). The growth rate of food wheat demand is anticipated to drop significantly due to the reasons discussed above, assumed in this outlook to decline from 2.3 percent to 0.8 percent. Demand for feed wheat is also projected to decline as farmers would switch to other, cheaper and more nutrient-rich feed. Wheat import from Kazakhstan will continue, but it is assumed to slow down to 3.5 percent compared to 6.4 percent in the past. In this outlook, the ratio of ending stocks to food wheat consumption is kept constant, at 32 percent, to ensure a sufficient buffer against volatile prices and possible trade disruptions.

Table 4: Assumptions for wheat outlook, %

	2016/17-2018/19	2018/19-2030/31
Yield	-5.7	1.3
Imports	6.4	3.5
Feed Dom. Consumption	0.5	0.1
Food Wheat Consumption	2.3	0.8
Population Growth	1.7	0.4
Per Capita Wheat Consumption	0.6	0.4
Ending Stocks	(32%)	(32%)

Source: The World Bank staff using the USDA data.

9 Against the above assumptions, it would be safe to reduce the wheat harvesting area to 1 million ha by 2030, down from 1.4 million ha in 2018 [Table 5]. This would represent an annual

reduction of 2.2 percent between 2018 and 2030. Rising yields and imports will help meet the rising demand for wheat, keeping the ratio of ending stocks to food wheat use at 32 percent. The globally accepted stocks to keep price volatility low is 15 percent, so 32 percent buffer is sufficient to withstand any shocks to wheat supply.

Table 5: Wheat outlook, 2016-18 to 2030

	Unit	2016-2018	2021	2025	2030
Area Harvested	('000 ha)	1,400	1,310	1,198	1,072
Beginning Stocks	('000 tons)	2,605	2,592	2,484	2,550
Production	('000 tons)	6,613	6,435	6,199	5,916
Imports	('000 tons)	2,967	3,289	3,774	4,483
Exports	('000 tons)	200	0	0	0
Feed Dom. Consumption	('000 tons)	2,100	2,106	2,115	2,125
Food Wheat Consumption	('000 tons)	7,467	7,640	7,879	8,187
Domestic Consumption	('000 tons)	9,567	9,747	9,993	10,312
Ending Stocks	('000 tons)	2,419	2,569	2,464	2,637
Yield	(tons/ha)	4.73	4.91	5.17	5.52
Population	('000 people)	32,391	33,305	33,800	34,430
End stocks to food wheat demand	(%)	32%	34%	31%	32%
Import to food wheat use	(%)	40%	43%	48%	55%

Source: The World Bank staff using the USDA data.

10 Without reducing the wheat area Uzbekistan will overproduce wheat in the longer run due to the declining rate of growth in demand for wheat. Keeping harvested area and import constant is projected to increase a ratio of ending stocks to food wheat use to 62 percent and increase of wheat production to 7.7 million tons by 2030 [Table 6]. If this happens, it will push wheat prices down and make wheat production even less attractive in Uzbekistan than is currently the case.

Table 6: Wheat outlook by 2030 with and without harvested area reduction

	Unit	With land reduction	Without land reduction
Area Harvested	('000 ha)	1,072	1,400
Beginning Stocks	('000 tons)	2,550	4,694
Production	('000 tons)	5,916	7,727
Imports	('000 tons)	4,483	2,976
Exports	('000 tons)	0	0
Feed Dom. Consumption	('000 tons)	2,125	2,125
Food Wheat Consumption	('000 tons)	8,187	8,187
Domestic Consumption	('000 tons)	10,312	10,312
Ending Stocks	('000 tons)	2,637	5,076
Yield	(tons/ha)	5.52	5.52
Population	('000 people)	34,430	34,430
End stocks to food wheat demand	(%)	32%	62%
Import to food wheat use	(%)	55%	36%

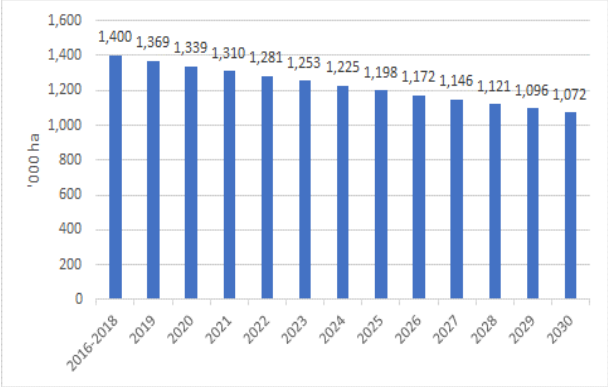
Source: The World Bank staff using the USDA data.

11 The decline in wheat area could go even further if farmers increase yields annually by 2 percent. If they can do it, the wheat area could decline annually by 2.9 percent. As a result, the projected wheat area by 2030 would be 983,000 ha [Figure 1]. This would free additional 100,000

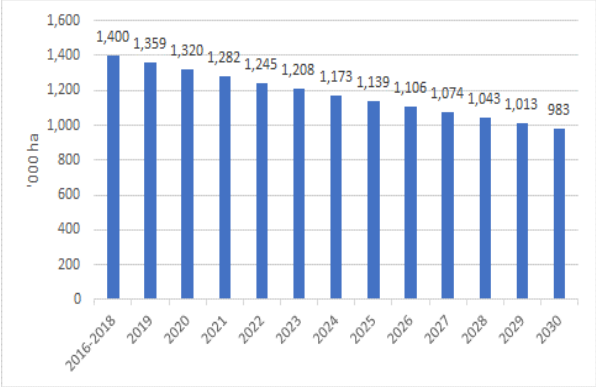
ha compared to the above scenario, under which the harvested area declines at 2.2 percent and yield grows at 1.3 percent. To achieve a 2 percent growth in yields, farmers would need to get access to improved seeds and extension services to help understand and adopt GAP, which in turn would require an increase in public expenditures for these programs.

Figure 1: Outlook for wheat harvested area, 2030

Yield growth: 1.3%; Area decline: 2.2%



Yield growth: 2.0%; Area decline: 2.9%



Source: The World Bank staff using the USDA data.

III. Outlook for Cotton Sector

12 The same as for wheat, Uzbekistan's Statistics Committee and the Ministry of Agriculture do not report the cotton balance data. Therefore, the USDA data is used instead. Between 2010 and 2018, the cotton area declined from 1.35 million ha in 2010 to 1.20 million ha in 2018 or by 11 percent [Table 7][3]. Volatility of the cotton yield led to the volatility in cotton production, which declined by 21 percent. Export of cotton also declined, due to the lower production and recently due to the increased domestic processing of cotton by textile industry. By 2021 the export of cotton is planned to cease and be replaced by the export of yarn and textile products.

Table 7: Cotton balance, 2010/11-2018/19

	Unit	2010/2011	2015/2016	2017/2018	2018/2019
Area Harvested	('000 ha)	1,350	1,285	1,250	1,200
Beginning Stocks	('000 tons)	206	283	234	334
Production	('000 tons)	914	827	860	729
Exports	('000 tons)	577	479	196	230
Domestic Consumption	('000 tons)	272	392	566	579
Ending Stocks	('000 tons)	304	239	332	255
Stocks-to-Use	(%)	32	27	44	34
Yield	(tons/ha)	3.11	2.96	3.16	2.75

Note: Figures on production, export, consumption, and stocks are presented for cotton fiber. Converting these figures into raw cotton figures requires multiplying them by a factor of 3.

Source: USDA.

13 How much cotton is required to satisfy the needs of textile industries going forward? These and other assumptions for the 2030 cotton outlook are presented in Table 8. One of the key

[3] This data differs from the official data. In 2010 the cotton harvesting area was 1,318,000 ha, which is 38,000 ha less than reported by the USDA. In 2018, it decreased to 1,071,000 ha, which is 1,300 ha less than reported by USDA.

assumptions is yield growth. In the last three years, yield declined by 2 percent. In a longer-term period, from 2010 to 2018, the annual yield decline was 0.5 percent. The 2030 outlook assumes that yield could grow by 5 percent annually by shifting out cotton land with low yields (such areas are large enough to influence the average cotton yield) and by promoting GAP adoption. By 2030 export of cotton is anticipated to be zero, implying a significant rate of annual reductions. Demand for domestic processing would continue increasing but at the lower rate than that over 2016-2018. The stocks-to-use ratio is kept at 30 percent, providing sufficient flexibility to textile factories at times of temporary drops in raw cotton production.

Table 8: Assumptions for cotton outlook, %

	2016-2018	2018-2030
Yield	-2.0 (2.8 tons/ha)	5.0 (5.5 tons/ha)
Exports	-27.0	-32.0
Domestic Consumption	15.0	6.5
Stocks-to-Use	33%	30%

Source: The World Bank staff using the USDA data.

14 Against the above assumptions, it would be safe to reduce the cotton area to 0.9 million ha by 2030, down from 1.2 million ha in 2018 [Table 9]. This would represent an annual reduction of 2.4 percent between 2018 and 2030. Rising yields on the remaining cotton areas and the ceased export of cotton will help meet the domestic demand for cotton, keeping the stocks-to-use ratio at the comfortable 33 percent.

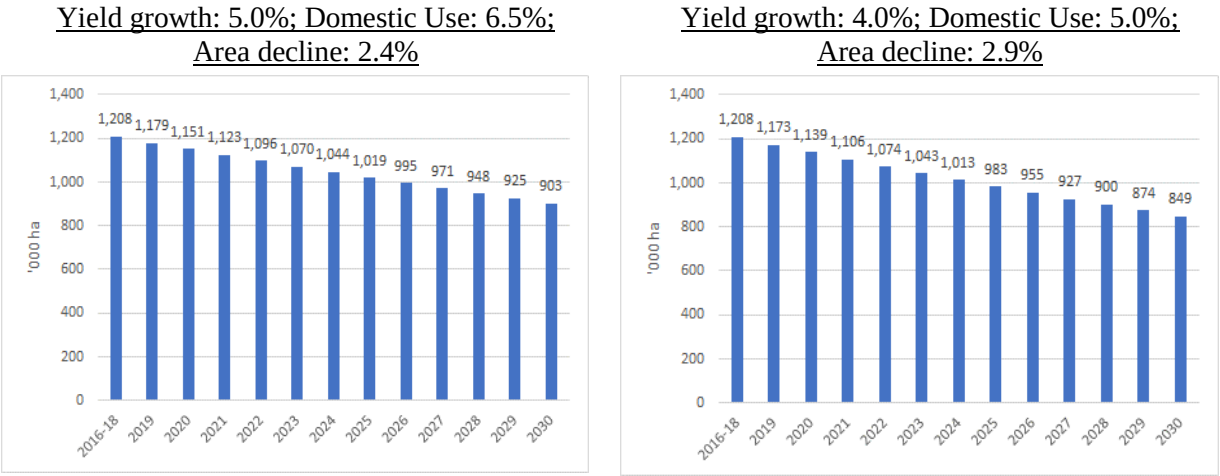
Table 9: Cotton outlook, 2016-18-2030

	Unit	2016-18	2021	2025	2030
Area Harvested	(‘000 ha)	1,210	1,125	1,021	903
Beginning Stocks	(‘000 tons)	269	397	710	532
Production	(‘000 tons)	800	861	949	1,073
Exports	(‘000 tons)	196	72	0	0
Domestic Consumption	(‘000 tons)	566	700	915	1,125
Ending Stocks	(‘000 tons)	332	486	743	370
Stocks-to-Use	(%)	33	69	83	30
Yield	(tons/ha)	2.75	3.50	4.25	5.46

Source: The World Bank staff using the USDA data.

15 In case of the lower-than-anticipated yield growth, more area would be needed to meet the domestic demand from the processing industry. On the other hand, textile factories would not necessarily be able to easily find export markets for growing textile outputs, so the growth in domestic demand for cotton could be lower than expected in Table 9. In the scenario of lower growth in both yields and domestic use, the decline in cotton area could be even larger, to 850,000 ha [Figure 2].

Figure 2: Outlook for cotton harvested area, 2030



Source: The World Bank staff using the USDA data.

IV. Other Factors Affecting the 2030 Farmland Use Outlook

16 There are a couple of other factors affecting the farmland use outlook. These factors are related to potential for water savings from change in land use, increase in profitability and yield growth, importance of economies of scale in production of some crops over others, and job creation. Other considerations matter too, for example a readiness of logistics to handle the export of an increased production of, let's say, perishable horticulture products; although the timeframe by 2030 is long enough to improve logistics accordingly.

Water savings

17 Some crops require more water than others. Thus, if more land is moved to less water-intensive crops, the overall water use in agriculture would decline. This is one of the important policy objectives in Uzbekistan, to reduce the water use in agriculture, which accounts for 90 percent of entire water use in the country, given the anticipated water deficit due to the climate change. By 2040, the water deficit can reach 8.0 percent under the increased flow of rivers in the basins of Amurdarya and Syrdarya; under the scenario of no change in river flows, water deficit would be 15.4%; and under the scenario of lower river flows, water deficit would be 33.5 percent.[4]

18 The most water intensive crop in Uzbekistan is rice, requiring 21,000 m^3 of water per hectare [Table 10]. Water intensity of cotton production is also high, at 6,300 m^3 of water per hectare. Yet, wheat is much less water-intensive crop, while vegetables, potatoes, and fodder require even more water than cotton. The least water-thirsty crops are melons, fruits, and grapes. They are also more profitable than cotton and wheat, so shifting more land to these crops would reduce the overall water use in the sector.

19 Note that the data in Table 10 shows only requirements for on-farm irrigation in Uzbekistan. It does not show the volumes of water that need to be delivered to farm fields to provide on-farm irrigation, which are significant. For example, total on-farm water requirement

[4] Hydrometeorological Center of Uzbekistan. 2016. *Third National Report of the Republic Uzbekistan under the UN Framework Convention on Climate Change*. Tashkent.

for 3.9 million ha in 2017 was about 29 billion m^3. To make that water volume available to farmers, the irrigation system had to bring 46 billion m^3 of water, implying the coefficient of irrigation efficiency of 0.64. Yet, since the water delivery does not differ by crop, these aspects are not considered in the report.

Table 10: Technical norms for on-farm irrigation water use in Uzbekistan

Crops	Water use, m^3/ha
Wheat	4,200
Rice	21,000
Corn	5,500
Other grains	4,000
Cotton	6,300
Other technical crops	5,000
Potatoes	11,000
Vegetables	11,500
Melons	4,100
Fodder/feed	8,700
Orchards/Fruits	4,400
Grapes	4,200

Source: Uzbekistan's Ministry of Water Resources, 2019.

Profitability

20 Profitability of some crops is higher than others so shifting farmland to more profitable crops would increase the overall profitability of the sector, farm incomes, and the rates of agricultural growth. Unfortunately, there is no accurate, consistent data on profitability of various crops in Uzbekistan. Instead, this report uses the value of gross agricultural production in 2017 as a proxy of profitability, which is very much in line with the information about relative profits found in other sources, for example the economic analysis of the Horticulture Development Project financed by the World Bank.

21 Production of cotton and wheat generates much smaller gross value than production of any other major crop in Uzbekistan [Table 11]. The gap is likely to be even bigger for actual profits given the high usage of intermediate inputs in production of cotton and wheat. It is worth noting, however, that higher value of horticulture products does not account for perishability and price volatility, which could constraint a significant increase in profitability of these crops once much of them is produced. Yet, weak logistics, which hamper their efficient exports from Uzbekistan, could be fixed by 2030 so in the long-term this is less an issue.

Table 11: Value of gross production of selected crops in Uzbekistan in 2017

Crops	Million soms/ha
Grains	3.2
Cotton	4.4
Potatoes	111.5
Vegetables	54.0
Melons	34.6
Fodder/feed	17.0
Orchards/Fruits	28.9
Grapes	62.9

Source: The World Bank staff using the data of Uzbekistan's State Statistics Committee.

Yield growth

22 When yield grows, less land is needed to produce the same amount of output. So, depending on yield growth outlook and the market perspectives, aligning the farmland use structure with the yield growth outlook would offer additional economic gains. Table 12 presents a relatively conservative and achievable yield growth outlook between 2018 and 2030, based on the past performance, yield gaps, and future market outlook.

Table 12: Yield outlook for selected crops by 2030

Crops	2017 (tons/ha)	Annual growth, %	2030 (tons/ha)
Wheat	4.2	1.3	5.0
Rice	3.1	1.0	3.5
Corn	4.8	1.5	5.8
Cotton	2.7	5.0	5.0
Potatoes	21.8	1.0	24.8
Vegetables	25.5	3.0	37.4
Melons	19.8	3.0	29.1
Fodder/feed	17.0	2.0	22.0
Orchards/Fruits	11.8	4.0	19.6
Grapes	15.7	3.0	23.1

Source: The World Bank staff using the data of Uzbekistan's State Statistics Committee.

Job creation

23 When people talk about jobs in agri-food sector, they usually talk about fewer jobs in agriculture and more jobs in input supply and food processing industries. This is the right perspective in the long run; in the short to medium run, however, many jobs can be still generated even in agriculture by shifting farmland from less to more labor-intensive crops (quantity of jobs). If that shifts in land use to more labor-intensive jobs are accompanied by the increase in labor productivity, it would create higher-quality, more desirable jobs (quality of jobs). The reality in Uzbekistan is that job creation in food processing and light industries could stay slow for some time as it was the case in the last decade, during which job numbers in these industries declined,[5] also because the skills of rural people could be insufficient to compete for new jobs in food processing, so primary agriculture is the best bet for many rural people to improve their incomes in medium run.

[5] From 1996 to 2016, the employment in the light industry declined by 34 percent and in food industry by 14 percent.

24 Table 13 shows that shifting land from cotton and wheat to horticulture crops will create many higher-paid jobs even in the primary agriculture. Fodder crops are not labor-intensive, but fodder is produced for labor-intensive and high-value livestock production, so fodder indirectly generates many farm jobs in rural areas.

Table 13: Technical norms of labor usage in Uzbekistan

Crops	People per ha
Grains	0.20
Cotton	0.83
Potatoes	1.78
Vegetables	2.10
Melons	1.62
Fodder/feed	0.16
Orchards/Fruits	0.74
Grapes	1.04

Source: Uzbekistan's Ministry of Agriculture, 2019.

25 Data is not available about spillover effects of producing specific crops on job creation in food processing or light industry. Textile factories, for example, could create more jobs if more cotton is produced, which has been happening in many cotton-textile clusters recently. On the other hand, increased production of horticulture products, which is already labor intensive, could lead to creation of more jobs in fruits and vegetable processing industry. So, the aggregate (agri-food system) job impact of shifting more farmland to horticulture could be even larger when compared with impact in only agriculture. Lacking data, however, does not allow to make such comparisons in Uzbekistan.

Economy of scale and other factors

26 Some other factors were considered to prepare the farmland use outlook. Some crops require larger fields and more land to achieve economies of scale and stay profitable. This refers to grains, cotton, and fodder crops. Others need smaller fields for efficient management, for example fruits, grapes, vegetables. This needs to be factored in the farmland outlook.

27 Final consideration is urgency of the problem. Take the livestock industry, which has been expanding the number of cattle in recent years without correspondent increase in land area for fodder production. Livestock production, if managed efficiently, generates good income and provides all-year job in rural areas. Yet, according to the AfD calculations, the area under fodder crops (excluding wheat and corn) was only 0.03 ha per cattle in 2015, which is even before the recent government programs to facilitate the import of high-productivity cattle are considered. In 2018, the pressure is even higher. On the other hand, the recommended area per unit of cattle for sustainable fodder production is 0.4-0.6 ha in irrigated areas and 1.5-2.0 ha in dry areas. That is why it is so urgent to allocate more land for fodder production in Uzbekistan.

V. Outlook for the 2030 Farmland Use

28 Applying the above filters provides the basis for making the 2030 farmland use outlook [Table 14 and Table 15]. To achieve a more balanced use of farmland, the area under cotton and wheat should drop from 2.6 million ha in 2018 to 1.9 million ha in 2030, or from 67 percent of total area in 2018 to 50 percent in 2030. A freed 0.7 million ha would be distributed to other crops, with the largest increase to go to fodder production.

29 It is worth noting that even a large increase in the area for fodder crops as made above would be insufficient to meet the full requirements of the livestock sector. In 2017, the country had 4.4 million cows and 20 million goats and sheep. The increased fodder area of 0.16 million ha of irrigated land would provide adequate feeding to only half a million cows or less than 17 percent of the total cattle herd. It means that more active exploration of other sources of feed are necessary such as shifting more of wheat land to production of better grain feeds such as maize and an integrated pasture management in dry zones to support the sustainable development of livestock sector.

Table 14: Outlook for farmland use, '000 ha

	2017	2021	2025	2030
Wheat	1,411	1,310	1,198	1,072
Rice	73	73	73	73
Maize	38	50	70	80
Other grain	134	134	134	134
Cotton	1,201	1,125	1,021	904
Other technical crops	52	52	52	52
Potatoes	79	80	77	75
Vegetables	190	250	350	400
Melons	52	65	75	85
Fodder crops	243	307	325	400
Fruit orchards	293	310	350	420
Grapes	138	145	180	210
TOTAL	**3,904**	**3,904**	**3,904**	**3,904**

Source: The World Bank staff's estimates.

Table 15: Outlook for farmland use, %

	2017	2021	2025	2030
Wheat	36%	34%	31%	27%
Rice	2%	2%	2%	2%
Maize	1%	1%	2%	2%
Other grain	3%	3%	3%	3%
Cotton	31%	29%	26%	23%
Other technical crops	1%	1%	1%	1%
Potatoes	2%	2%	2%	2%
Vegetables	5%	6%	9%	10%
Melons	1%	2%	2%	2%
Fodder crops	6%	8%	10%	10%
Fruit orchards	7%	8%	9%	11%
Grapes	4%	4%	5%	5%
TOTAL	100%	100%	100%	100%

Source: The World Bank staff's estimates.

VI. Impact of the Farmland Use Outlook for Water Security, Growth, and Jobs

30 This section explores of what the above changes in farmland use would mean to water use, economic growth, and job creation. These impacts are analyzed in turn.

Water savings

31 Changes in farmland use would affect water security. Yet, a more balanced land use presented in Table 14 alone is unlikely to lead to a significant reduction in water use. Our estimate

shows an increase in water use by 5.1 percent in 2025 and 7.4 percent in 2030 [Table 16]. This is because other crops such as potatoes, fodder and vegetables, to which some land from cotton and wheat is shifted, are also quite water intensive [Table 10].

Table 16: Water savings in the 2030 farmland outlook, million m^3 of water

	2017	2021	2025	2030
Wheat	5,926	5,500	5,032	4,502
Rice	1,533	1,533	1,533	1,533
Maize	208	275	385	440
Other grain	536	536	536	536
Cotton	7,566	7,077	6,422	5,688
Other technical crops	261	261	261	261
Potatoes	867	876	849	823
Vegetables	2,182	2,875	4,025	4,600
Melons	214	267	308	349
Fodder crops	2,118	2,669	2,826	3,479
Fruit orchards	1,287	1,364	1,540	1,848
Grapes	580	630	756	882
TOTAL	**23,278**	**23,863**	**24,472**	**24,940**
Changes compared to 2017, %		**2.5%**	**5.1%**	**7.4%**

Source: The World Bank staff's estimates.

32 Yet, the change in the farmland use could encourage a greater adoption of water-saving technologies. This would in turn lead to a significant reduction in water use in agriculture. Even in the absence of water pricing, incentives for adoption of water-saving technologies could come from several sides. First, new orchards require adoption of drip irrigation and other kinds of water-saving technologies by law. As more land is allocate to fruit production, an adoption of such technologies is expected to increase. Second, using water-saving technologies in production of fruits, vegetables, and grapes is profitable and it pays off fast enough to provide sufficient incentives to farmers. And third, adoption of water-saving technologies in cotton and production of other crops is anticipated to be promoted through government subsidies. Table 17 illustrates probabilities and expected rates for adopting water-saving technologies over time.

33 When adoption of water-saving technologies is taken into consideration, the reduction in water use by agriculture could be significant. On average, adoption of water saving technology such as drip or rain irrigation can save 30 percent of water. By 2025 total water saving could reach 8.6 percent, and by 2030 11.0 percent [Table 18].

34 Agriculture needs to be prepared for using less water not only because of the climate change. Demand for water in Uzbekistan from industry and urbanization will grow exponentially. The rate of urbanization is projected to increase from 37 percent in 2018 to 60 percent in 2030. So, water saving in Table 18 would be strongly required.

Table 17: Probabilities and rates of adoption of water-saving technologies

	2017	2021	2025	2030
Wheat	1.00	1.00	1.00	1.00
Rice	1.00	1.00	1.00	1.00
Maize	1.00	1,00	0.80	0.70
Other grain	1.00	1.00	1.00	1.00
Cotton	1.00	0.95	0.80	0.70
Other technical crops	1.00	1.00	1.00	1.00
Potatoes	1.00	0.95	0.90	0.75
Vegetables	1.00	0.95	0.75	0.60
Melons	1.00	0.95	0.75	0.60
Fodder crops	1.00	0.95	0.80	0.75
Fruit orchards	1.00	0.95	0.70	0.60
Grapes	1.00	0.95	0.80	0.60

Note: The figure 1.00 means that no water-saving technologies is adopted. The figure 0.70 means that water-saving technologies are adopted on 30 percent of the area under this crop.

Source: The World Bank staff's estimates.

Table 18: Water savings in the 2030 farmland outlook with adoption of water-saving technologies, million m^3 of water

	2017	2021	2025	2030
Wheat	5,926	5,500	5,032	4,502
Rice	1,533	1,533	1,533	1,533
Maize	208	275	362	400
Other grain	536	536	536	536
Cotton	7,566	6,971	6,037	5,176
Other technical crops	261	261	261	261
Potatoes	867	863	824	761
Vegetables	2,182	2,832	3,732	4,048
Melons	214	263	284	307
Fodder crops	2,118	2,629	2,699	3,218
Fruit orchards	1,287	1,344	1,401	1,626
Grapes	580	621	711	776
TOTAL	**23,278**	**21,663**	**21,290**	**20,742**
Changes compared to 2017, %		**-7.0%**	**-8.6%**	**-11.0%**

Source: The World Bank staff's estimates.

Growth

35 The above changes in farmland use would significantly accelerate agricultural growth. By 2025, the gross value of agricultural production in 2017 prices is projected to be 36 percent higher than it would be the case with the constant land use as in 2017 [Table 19]. By 2030, the difference would be even higher, 51 percent.

Table 19: Outlook for the value of agricultural production, in billion soms (in constant 2017 prices)

Crops	2017	2021	2025	2030
Grains	5,045	4,980	4,689	4,320
Cotton	5,301	4,988	4,527	4,009
Potatoes	8,783	8,881	8,605	8,337
Vegetables	4,779	13,492	18,889	2,587
Melons	924	2,251	2,597	2,944
Fodder/feed	4,138	5,320	5,745	7,215
Orchards/Fruits	10,379	8,972	10,130	1,156
Grapes	9,610	9,431	11,318	13,204
TOTAL	**48,959**	**58,316**	**66,499**	**73,772**
Change to 2017, %		**19%**	**36%**	**51%**

Source: The World Bank staff's estimates.

Job creation

36 The above changes in the farmland use would not be only growth inducing, they would also job creating. It is anticipated that 12 percent more workers would be employed in agriculture by 2025 and they would cultivate more crops, which generate higher profits [Table 20]. So, these jobs would be of higher quality. By 2030, 16 percent more workers would work in agriculture, would the farmlands use be more balanced than in 2017.

Table 20: Agricultural jobs outlook, '000 workers

Crops	2017	2021	2025	2030
Grains	331	313	295	272
Cotton	997	932	846	749
Potatoes	140	142	137	133
Vegetables	398	525	735	840
Melons	85	105	122	138
Fodder/feed	39	49	52	64
Orchards/Fruits	217	229	259	311
Grapes	144	156	187	218
TOTAL	**2,350**	**2,452**	**2,633**	**2,725**
Change to 2017, %		**4%**	**12%**	**16%**

Source: The World Bank staff's estimates.

VII. Conclusions

37 What is produced on farmland is critical to the agriculture sector outcomes. If other objectives, such as farm incomes, jobs, water security, were considered as important as producing more of wheat and cotton, the farmland use structure would have looked differently. A more balanced allocation of farmland, presented in this report, could increase agricultural production by 51 percent, employ 16 percent more people, and save 11 percent water by 2030. Outlooks are subject to uncertainty and all these gains may not be necessarily realized, but anticipated benefits from more balanced farmland use are too large not to be considered in future agriculture development in Uzbekistan.