

The Role of Fertilizers in Transforming Agriculture in the Kyrgyz Republic

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Introduction

The Republic of Kyrgyzstan is a landlocked country where nearly 65 percent of the population lives in rural areas. Wheat is the staple crop in Kyrgyzstan; however, average wheat yields were just 2.4 metric tons (MT)/ha as of 2013, which is well below potential yield estimates of 5.5 MT/ ha. The country is classified by the UN FAO as a low-income, food-deficit country that relies on wheat imports from Kazakhstan and Russia to cover 25 percent of its consumption requirements. Agriculture contributes 20.8 percent of GDP and more than 1 million smallholder households are involved in the agriculture sector. Agriculture in the northern region of the country is more industrialized, with farm activities fully mechanized compared to the southern region. The south is highly populated, but the availability of arable land is limited.

Land was reorganized and redistributed to private individuals after the collapse of the Soviet Union, according to a three phase land reform conducted by the Government of the Kyrgyz Republic between 1991 and 2009. Labor productivity subsequently declined due to a large increase in the agricultural labor force and the widespread lack of farming know-how among newly privatized farmers. Private enterprise farms have been growing while state and collective farms have diminished. Nearly 67 percent of individuals involved in the agricultural sector are smallholder farmers, although their share of land is only 8.3 percent of total arable land; private farms control 85 percent of land and are the main source of crop production.

Fertilizer Use and Efficiency

Since independence from the Soviet Union in late 1991, fertilizer application has declined by 24 percent. Many farmers, lacking technical knowledge, are unaware of the potential impact that balanced fertilizer application can have on production. Between 1991 and the beginning of fertilizer-sector interventions in 2002, Kyrgyz farmers typically applied nitrogen fertilizers, generally ammonium nitrate, as it was thought that Kyrgyz soils had enough phosphate and potash nutrients.

Fertilizer is currently used on about one third of cultivated land in Kyrgyzstan and is mostly used on commercial crops (cotton and potato); average fertilizer use on food crops was about 18 kg/ ha in 2011. Farmers in the Southern Oblasts of Osh, Jalalabad, and Batken use more fertilizer (48 percent of the recommended amount) than farmers in the north (11 percent of the recommended amount). This is partly because the USAID financed Kyrgyzstan Agro-Input Enterprise Development (KAED) project implemented by the International Fertilizer Development Center (IFDC), which began in 2002, was based in the south and directed technical support and training to agro-input dealers and farmers in that region. The project helped establish the Association of Agro-Businessmen of Kyrgyzstan (Jer-Azygy) and boost the amount of legal fertilizer supplies available in the region.

Box 1: USAID/KAED fertilizer market development – From a base of \$US 2 million, the project-supported dealers increased their fertilizer sales turnover to \$US 45 million in 2008, opened 35 retail farm stores and supply modern inputs to farmers. There was virtually no legally imported fertilizer in the south in 2001 and the total for the country was only 21,843 MT. Sales of fertilizer rose every year reaching 86,748 MT in 2009 and 137,051 MT in 2012 according to official statistics.

Figure 1—Fertilizer requirements and use in '000 MT, 2011

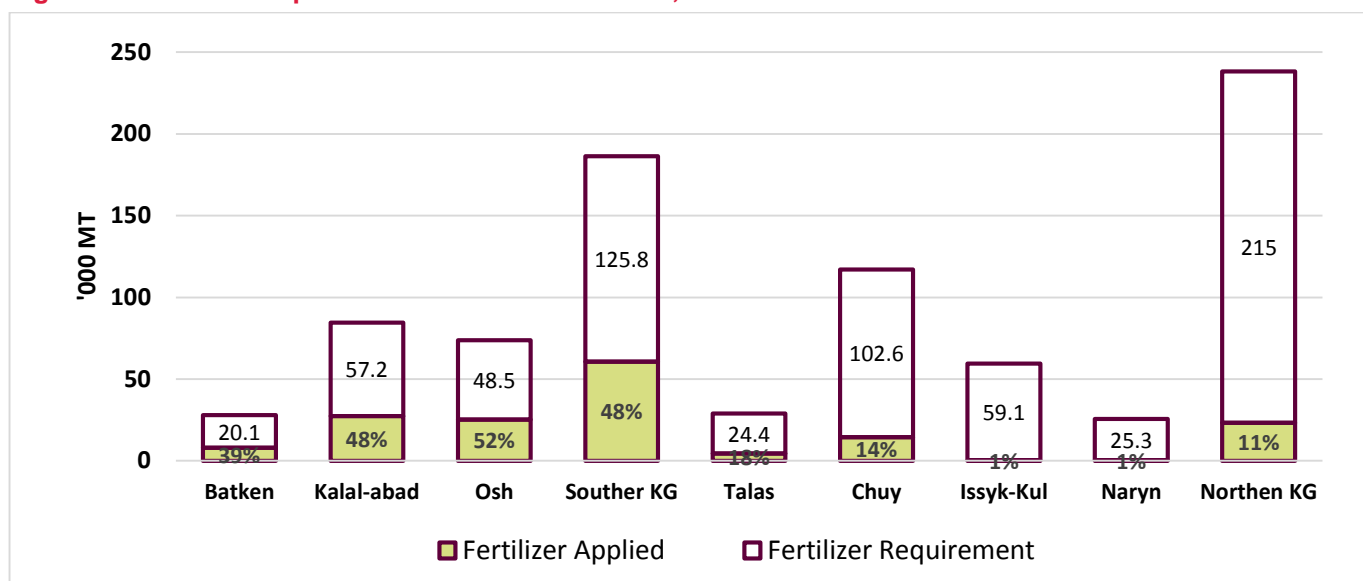
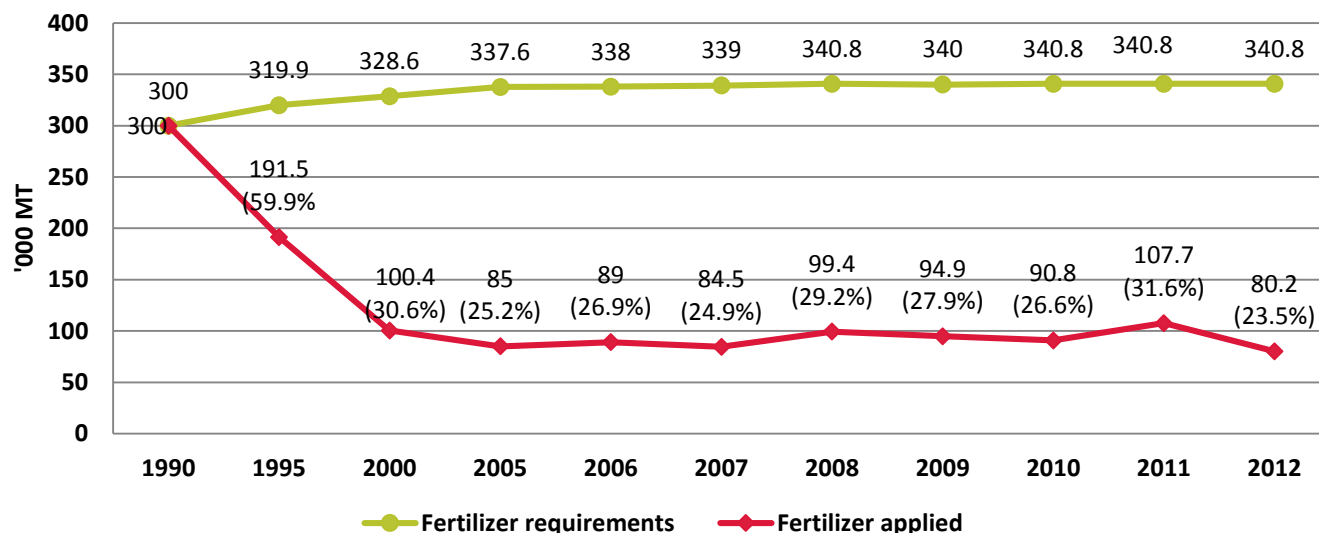


Figure 2—Fertilizer requirements and consumption, 1990-2012, '000 MT



A 2008 study by the USAID/ KAED project found that a balanced fertilizer application including nitrogen, phosphate and potash had a greater impact on crop yields than nitrogen application alone; this proved true for the yields of wheat, maize and potatoes using both improved crop varieties and unimproved crop varieties (non-certified seeds, or NSC). Yield gains due to nutrient balancing were roughly twice as large for the improved versus the unimproved varieties.

Table 1—Response or recommended levels of balanced fertilizer application

Crop	Fields A (N only)		Fields B (NPK blends)		Yield increase per kg of NPK		Cost of added fertilizers (USD/kg/ ha)
	Type of fertilizer used (kg)	Yield (kg/ha)	Type of fertilizer used (kg)	Yield (kg/ha)	(kg of crop per ha)	Value of additional crop (USD/kg/ha)	
Wheat	N ₁₂₀	3,932	N ₁₂₄ P ₁₃₈ K ₉₀	5,514	6.8	\$1.55	\$0.85
Winter Wheat (ncs*)	N ₁₂₀	3,110	N ₁₂₄ P ₁₃₈ K ₉₀	3,780	2.9	\$0.66	\$0.85
Maize	N ₁₀₃	7,998	N ₁₅₃ P ₉₅ K ₉₅	11,123	10.1	\$2.19	\$1.00
Maize (ncs)	N ₁₀₃	6,500	N ₁₅₃ P ₉₅ K ₉₅	7,300	2.6	\$0.56	\$1.00
Potato	N ₁₂₀	24,225	N ₁₃₆ P ₁₃₀ K ₁₃₀	32,138	28.7	\$4.75	\$0.95
Potato (ncs)	N ₁₂₀	18,050	N ₁₃₆ P ₁₃₀ K ₁₃₀	21,000	10.7	\$1.77	\$0.95

*ncs – non certified seeds (unknown quality)

Table 2—Fertilizer Nutrient Requirements and Consumption in Kyrgyzstan in 2002-2011

Products\Years		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Nitrogen	Requirement	66,798	67,253	67,708	68,162	68,235	68,437	68,802	68,638	68,800	68,800
	Applied	9,232 (13.8%)	31,383 (46.7%)	27,232 (40.2%)	29,589 (43.4%)	26,842 (39.3%)	26,141 (38.2%)	22,530 (32.7%)	24,523 (35.7%)	25,252 (36.7%)	29,952 (43.5)
Phosphate (P2O5 equiv- alent)	Requirement	43,118	43,412	43,705	43,999	44,046	44,176	44,412	44,306	44,410	44,410
	Applied	205 (0.5%)	1,810 (4.2%)	1,684 (3.9%)	2,034 (4.6%)	1,652 (3.8%)	2,601 (5.9%)	1,747 (3.9%)	2,301 (5.2%)	3,200 (7.2%)	3,796 (8.5%)
Potash (K2O equiva- lent)	Requirement	3,908	3,934	3,961	3,987	3,992	4,004	4,025	4,015	4,025	4,025
	Applied	46 (1.2%)	18 (0.5%)	8 (0.2%)	0 (0%)	0 (0%)	1 (0.02%)	1 (0.02%)	1 (0.02%)	0 (0%)	0 (0%)

Market Structure and Performance

Although a domestic nitrogen fertilizer plant is reportedly being explored, Kyrgyzstan currently relies on imports to meet its fertilizer needs. Until 2010, when violence in Kyrgyzstan’s south disrupted supply chains from Uzbekistan, almost all fertilizer (95 percent) was imported from Uzbekistan, home to three nitrogen fertilizer plants (in Ferghanaazot, Navoiazot, and Chirchik) in the Fergana Valley. Following the 2010 clashes, the share of fertilizer imports from Uzbekistan dropped to 60 percent. The Navoiazot plant uses a commodity exchange to sell fertilizer but Kyrgyz dealers are unable to participate in the commodity exchange. Therefore, although the fertilizer is produced in Uzbekistan, it is routed to Kyrgyzstan via Kazakhstan: Kazakh dealers request fertilizer for the early spring to sell to Kyrgyz farmers and firms.

Other major suppliers of fertilizer are Russia and Kazakhstan. There are a large number of nitrogen and phosphate fertilizer plants in Russia, but fertilizer demand is high within Russia, so there are few contracts between the two countries. Kazakhstan’s rich natural gas resources are ideal for fertilizer production. KazAzot is the sole producer of ammonia and ammonium nitrate in Kazakhstan, although there are other plants that are developing phosphate fields and producing nitrogen fertilizers. Few Kyrgyz dealers receive large shipments of nitrogen and phosphate fertilizer directly from Kazakh plants; instead, small agro-input dealers purchase fertilizer and then resell it to Kyrgyzstan. Kyrgyz dealers do not operate with long-term contracts and instead look for the cheapest fertilizer and transportation routes each year during October and November when costs are lower - the fertilizer is then stored until the spring and sold.

Figure 3—Market Share of Fertilizer Imports by Country, 2011-2013, %

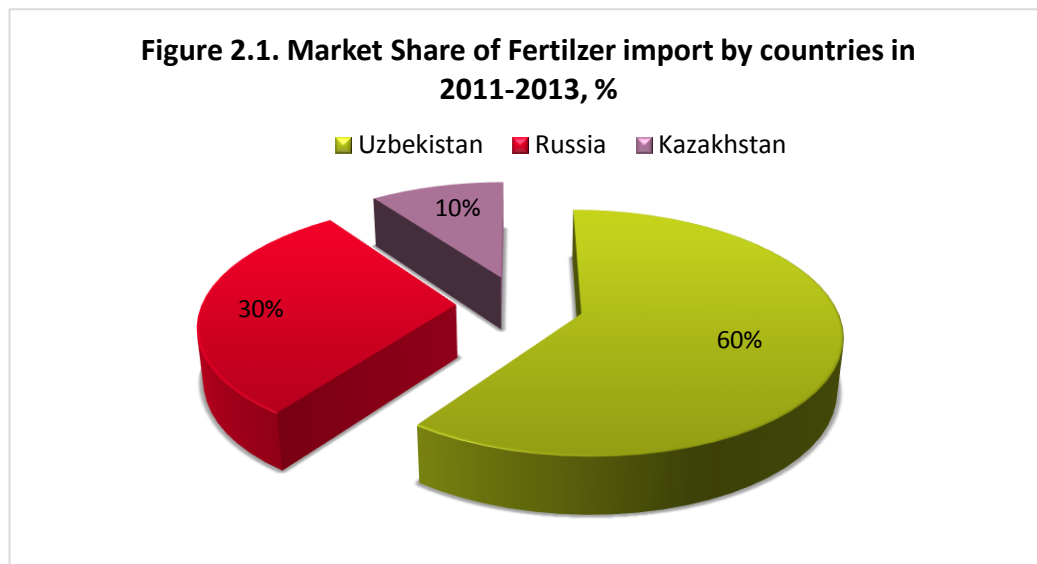
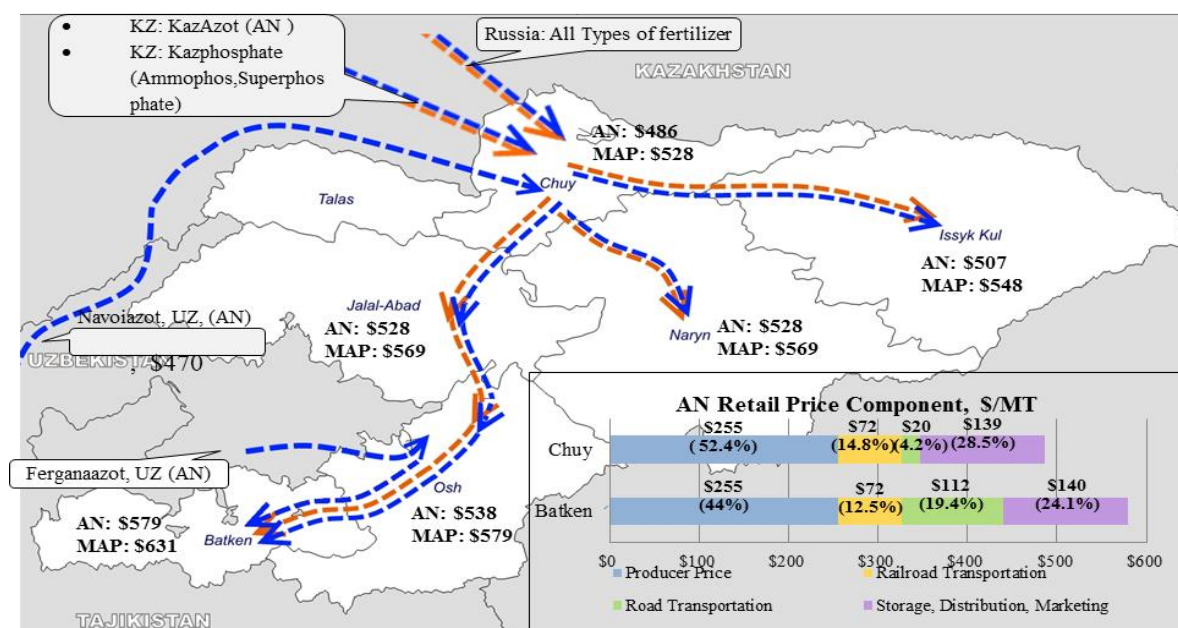


Figure 4—Flow of Fertilizer from Uzbekistan, Kazakhstan, and Russia and further distribution, 2014



Fertilizer prices are highly dependent on costs accrued by road transportation, storage, handling, distribution, and marketing. The increased price in Kyrgyzstan ranges from 68 percent to 101 percent of the producer’s original price. The table below represents the costs associated with the supply of nitrogen and phosphate fertilizers to Kyrgyzstan’s Oblasts.

Generally, the fertilizer market has been fully privatized since the country’s independence, without public sector involvement or subsidies, although recently the government has increased its involvement, as demonstrated by its 2014 agreement with the Government of Uzbekistan to purchase 200,000 MT of ammonium nitrate and urea from Uzbekistan for sale to farmers via the State Fund of Material Reserves at prices approximately 35 percent lower than market prices. This recent move was justified by the government on the grounds that subsidized fertilizer supplies will encourage risk-averse or low income farmers to purchase fertilizer, but this may also discourage private sector businesses who have already purchased and stored fertilizer during the winter and would be unable to compete on price with government subsidized sales.

Farmers in landlocked Kyrgyzstan (and Tajikistan) are markedly affected by geography, resulting in significantly higher fertilizer prices than neighboring countries. Small market size and poor roads contribute to higher costs, while dealers importing small quantities of fertilizer pay higher prices for the product and its shipment as compared to dealers purchasing larger quantities and realizing economies of scale. It should also be considered that the Kazakh government provides and repays subsidies of 50 percent and 30 percent of applied local and imported fertilizer, respectively, while the federal government of Russia provides fertilizer subsidies to farmers on a per-hectare basis.

Table 3: Supply Chain Costs of Fertilizer by Oblast, 2013

Fertilizer Retail Price Component	Ammonium Nitrate (Tolyatti, Russia)			Ammonium Nitrate (NavoiAzot, Uzbekistan)			Ammophos (Kazphosphate, Kazakhstan)		
	Costs	% of retail price	Cum. Costs	Costs	% of retail price	Cum. Costs	Costs	% of retail price	Cum. Costs
Import Parity Price costs									
Producer price, USD/MT	\$210.00	41.42%	\$210.00	\$255.00	52.44%	\$255.00	\$310.00	58.75%	\$310.00
Railroad Transportation costs:									
Russia	\$19.84	3.91%	\$229.84	\$0.00	0.00%	\$255.00			\$310.00
Uzbekistan			\$229.84	\$30.05	6.18%	\$285.05			\$310.00
Kazakhstan	\$53.91	10.63%	\$283.75	\$27.98	5.75%	\$313.03	\$24.21	4.59%	\$334.21
Kyrgyzstan	\$6.13	1.21%	\$289.88	\$6.13	1.26%	\$319.16	\$6.13	1.16%	\$340.34
Custom duties	\$1.00	0.20%	\$290.88	\$1.00	0.21%	\$320.16	\$1.00	0.19%	\$341.34
Total Rail transportation, USD/MT	\$80.88	15.95%	\$290.88	\$65.16	13.40%	\$320.16	\$31.34	5.94%	\$341.34
Unloading/Uploading	\$7.00	1.38%	\$297.88	\$7.00	1.44%	\$327.16	\$7.00	1.33%	\$348.34

Import Parity Price	\$297.88			\$327.16			\$348.34		
Chuy Oblast									
Road Transportation	\$20.49	4.04%	\$318.37	\$20.49	4.21%	\$347.65	\$20.49	3.88%	\$368.83
Storage, distribution, net margin	\$188.58	37.20%	\$506.95	\$138.59	28.50%	\$486.24	\$158.79	30.10%	\$527.62
Retail Price, USD/MT	\$506.95		\$506.95	\$486.24		\$486.24	\$527.62		\$527.62
Issyk-Kul Oblast									
Road Transportation	\$38.49	7.29%	\$336.37	\$38.49	7.59%	\$365.65	\$38.49	7.02%	\$386.83
Storage, distribution, net margin	\$191.26	36.25%	\$527.63	\$141.28	27.87%	\$506.93	\$161.48	29.45%	\$548.31
Retail Price, USD/MT	\$527.63		\$527.63	\$506.93		\$506.93	\$548.31		\$548.31
Naryn Oblast									
Road Transportation	\$54.60	9.96%	\$352.48	\$54.60	10.35%	\$381.76	\$54.60	9.60%	\$402.94
Storage, distribution, net margin	\$195.84	35.72%	\$548.32	\$145.87	27.65%	\$527.63	\$166.06	29.18%	\$569.00
Retail Price, USD/MT	\$548.32		\$548.32	\$527.63		\$527.63	\$569.00		\$569.00
Osh Oblast									
Road Transportation	\$69.22	12.39%	\$367.10	\$69.22	12.87%	\$396.38	\$69.22	11.95%	\$417.56
Storage, distribution, net margin	\$191.55	34.29%	\$558.65	\$141.50	26.31%	\$537.88	\$161.79	27.93%	\$579.35
Retail Price, USD/MT	\$558.65		\$558.65	\$537.88		\$537.88	\$579.35		\$579.35
Jalalabad Oblast									
Road Transportation	\$61.84	11.28%	\$359.72	\$61.84	11.72%	\$389.00	\$61.84	10.87%	\$410.18
Storage, distribution, net margin	\$188.52	34.39%	\$548.24	\$138.62	26.27%	\$527.62	\$158.82	27.91%	\$569.00
Retail Price, USD/MT	\$548.24		\$548.24	\$527.62		\$527.62	\$569.00		\$569.00
Batken Oblast									
Road Transportation	\$112.47	18.43%	\$410.35	\$112.47	19.41%	\$439.63	\$112.47	17.82%	\$460.81
Storage, distribution, net margin	\$199.89	32.76%	\$610.24	\$139.72	24.12%	\$579.35	\$170.27	26.98%	\$631.08
Retail Price, USD/MT	\$610.24		\$610.24	\$579.35		\$579.35	\$631.08		\$631.08

Key Challenges and Options for the Future

Improving agricultural productivity in Kyrgyzstan is in large part dependent on the increased usage of agricultural inputs, and fertilizer is a key part of this package. Farmer usage of fertilizers has been shown to be quite low throughout the country, particularly in the northern oblasts and is skewed towards nitrogen application alone. A reduction in the gap between fertilizer requirements and application rates requires improved farmer and dealer knowledge of appropriate and efficient balanced fertilizer application rates, reinforced by greater supply chain efficiencies and, potentially, market-smart subsidies to encourage balanced fertilizer use.

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Dilshod Abdulhamidov is a researcher with the IFDC KAED project in Kyrgyzstan.

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