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Nutrition sensitive agriculture: Evidence from Tajikistan

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Outlines

Issues

- Nutrition-sensitive agriculture
- Agricultural productivity
 - Linkage with nutrition
 - High production costs
 - Modern inputs and technologies
- Conclusions

Methodologies

- International perspectives
- Household data from Khatlon region in 2015: USAID Feed-the-Future midline survey
- Most qualitative evidence based on cross-section data
- However, it still informs of how agricultural, nutritional outcomes are associated with various agroecological and socio-economic factors in the cross-sectional context

Nutritional indicators in Tajikistan

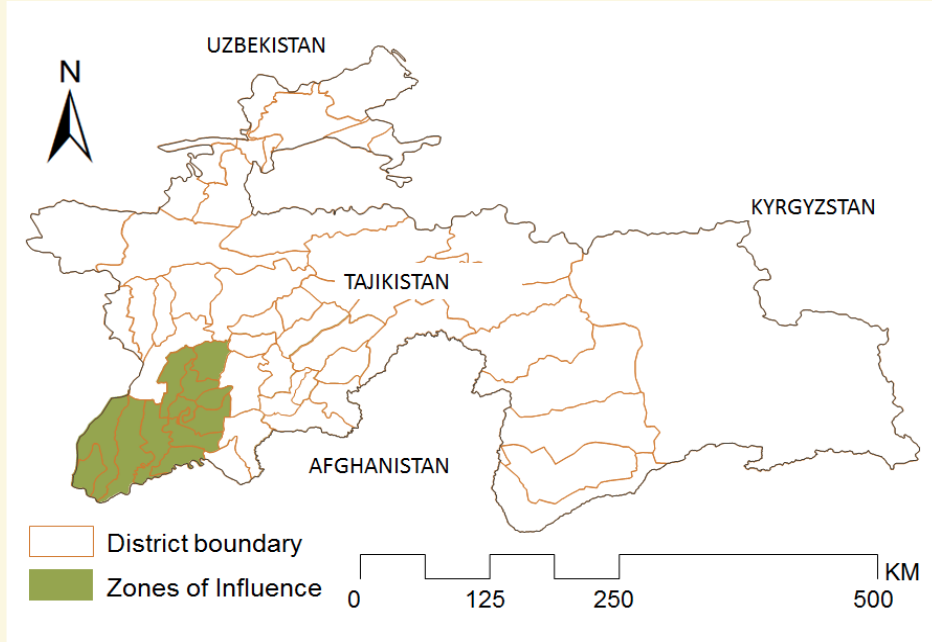
Prevalence of various nutritional outcomes (%)

	Tajikistan (2012)	Progress
Stunting	26.8	Off course
Wasting	9.9	Off course
Under-5 overweight	6.6	On course
Anemia for women of reproductive age	24.6 (2011)	Off course
Exclusive breast-feeding	34.3	On course
Adult obesity	12.1 (2010) 13.6 (2014)	Off course
Diabetes	12.1	Off course
Source: Global Nutrition Report (2014)		

% share of government budget allocated for nutrition-specific and nutrition-sensitive

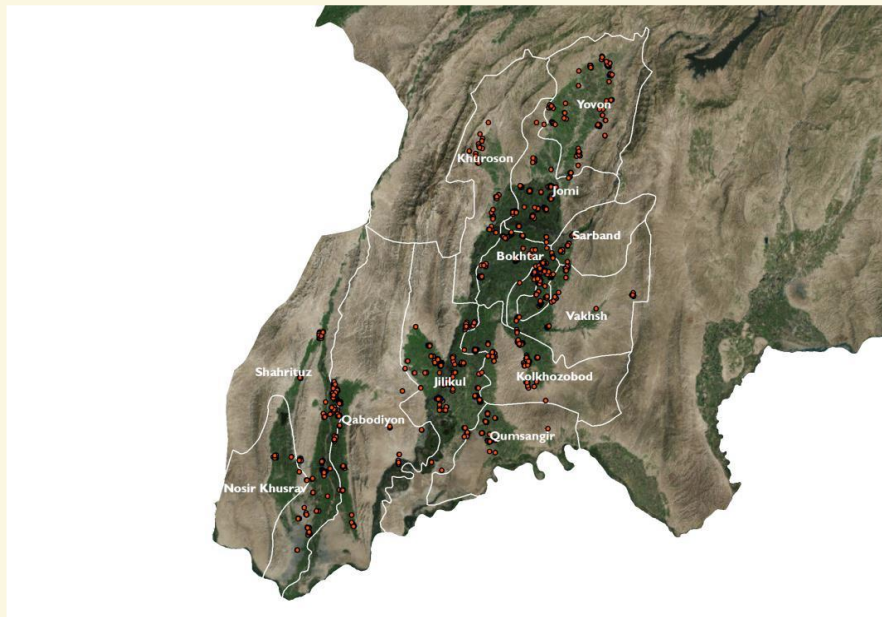
	Nutrition-sensitive interventions	Nutrition-specific interventions
Tajikistan	5 ~ 9	2.5 ~ 3.5
Sample means across countries	4.47 (2015)	0.47 (2015)
Source: Global Nutrition Report (2015, 2016)		

- Strong government's commitment
- However, more needs to be done, to achieve World Health Assembly (WHA) nutrition targets

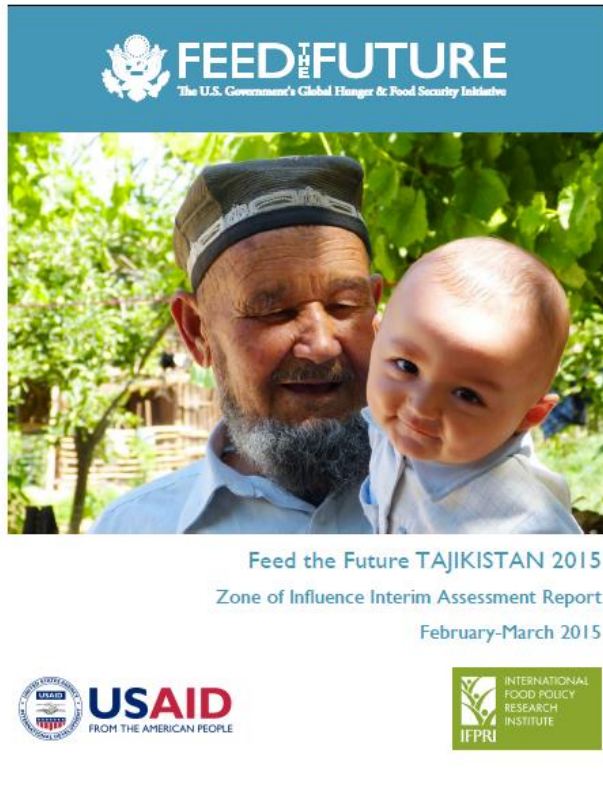


USAID Feed-the-Future-midline surveys

- 2015 February – March
- 2000 households in USAID-FTF Zones of Influence within Khatlon region
- Khatlon region
 - More agricultural based
 - One of the highest poverty rates in the country
- Data
 - Consumption / Poverty
 - Food security – hunger scale, dietary diversity
 - Anthropometrics
 - Migration
 - Agriculture



Highlights from FTF midline survey report



IFPRI. 2016. Feed the Future Tajikistan 2015 Zone of Influence Interim Assessment Report. Washington, DC.

Nutritional outcomes in 2015, Khatlon region

- Household hunger scale
 - Moderate / severe hunger 14%
- Women of reproductive age (15-49 yrs old):
 - Dietary diversity score 3.74
 - % consuming at least 5 of 10 food groups: 30%
- Infants (6-23 months)
 - % with minimum acceptable dietary diversity: 10%
 - 15% among 27 countries with data in 2014 (Global Nutrition Report 2014)

10 food groups: (1) grains, roots, and tubers; (2) legumes and beans; (3) nuts and seeds; (4) dairy products; (5) eggs; (6) flesh foods, including organ meat and miscellaneous small animal protein; (7) vitamin A-rich dark green leafy vegetables; (8) other vitamin A-rich vegetables and fruits; (9) other fruits; and (10) other vegetables

Agricultural productivity is associated with reduced hunger, better dietary diversity of infants and women

Elasticity of various nutritional indicators with respect to agricultural land productivity index

	Absence of hunger at household (negative hunger scale)	% with minimum acceptable dietary diversity (infant)	Consumed at least 5 of 10 key food groups (women)	Dietary diversity score (women)
Agricultural land productivity index (Production value per ha)	.127*** (.045)	.288* (.171)	.099** (.040)	.054*** (.014)
Sample size (agricultural households)	1427	433	2371	2371

Source: Analyses based on USAID FTF-Midline Survey by IFPRI (2015).

- In Tajikistan where smallholders dominate, own-farm agricultural land productivity remain important for nutritional outcomes for agricultural households who constitute the majority of the poor
- This is despite seemingly less comparative advantage in agriculture in Tajikistan, compared to more land-abundant countries in Central Asia

Potentially important role of domestic agriculture due to remittances shocks

	Height-for-age Z-score (under 5)	Height-for-age Z-score (6-23 months)	Not stunting (6-23 months)	Weight-for-height Z-score (6-23 months)	Weight-for-age Z-score (6-23 months)
Lost job in migration in 2014	-.799*** (.221)	-.924*** (.287)	-.288* (.171)	-.651** (.326)	-.893*** (.313)
Agricultural capital (doubling of its value)	.020*** (.007)	.059*** (.022)	.009** (.004)		
Sample size (agricultural households)	1058	361	361	361	361

Source: Analyses based on USAID FTF-Midline Survey by IFPRI (2015).

- Job losses at migration destination in 2014 - negative association with various anthropometric outcomes
- When remittance incomes decline or remain uncertain, local agricultural production may mitigate the nutritional insecurity

Regressions in previous slides also controlled for these variables

Categories	Variables
Farm characteristics	Owned farm size;
Household asset	Value of durable assets
Demographics	Household size Gender of household head
Human capital	Literacy, education years (working-age members)
Access to market, infrastructure	2 principal components of 45 access variables
House characteristics	Improved water; non-solid fuel; sanitation; finished floor; finished wall
Agroecological conditions	Latitude / Longitude Altitude Terrain ruggedness Per capita pasture area Soil types
Wealth	Per capita total expenditure Off-farm activities (women's participation)
Remittance	Any migrants in the household Any migrants lost job and returned home lately
Other factors	Number of other foreign aid projects in the area

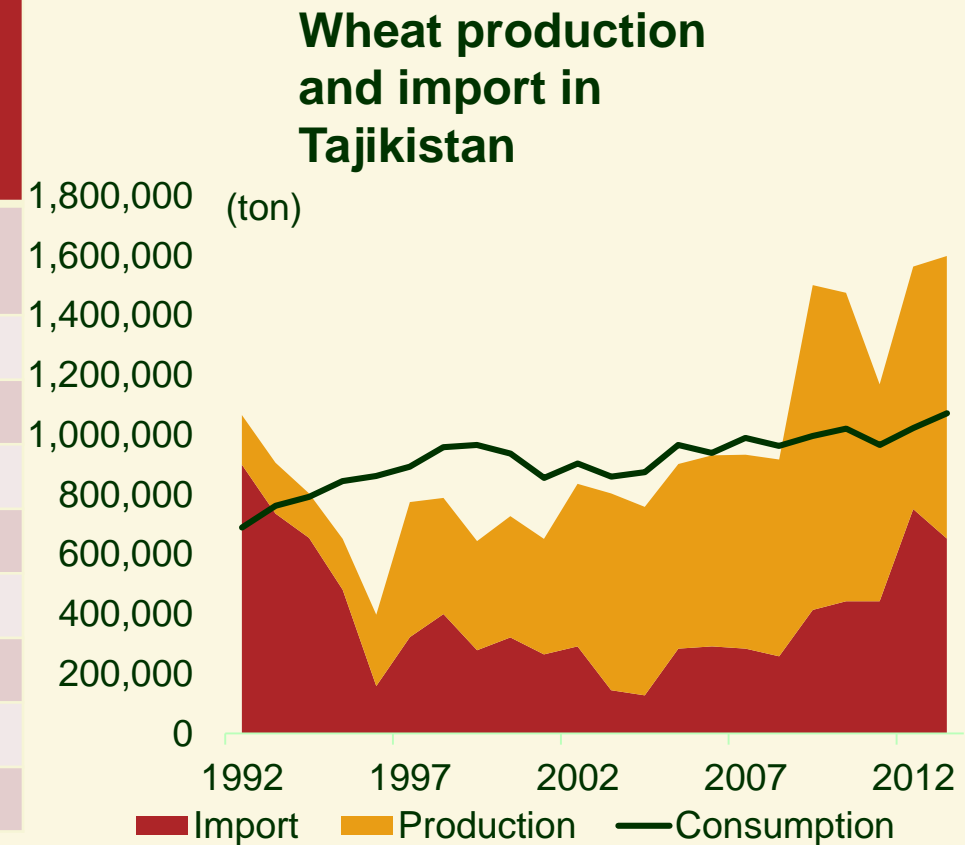
Key issues and challenges with regards to food and nutrition security

AGRICULTURAL PRODUCTIVITY IN TAJIKISTAN

Key food crops / livestock products in Tajikistan: Importance of domestic agricultural productivity

	kcal	Protein (g / capita / day)	Fat (g / capita / day)	Share (%) of production	Share (%) of import
Wheat and products	1045	29.3	11.6	48	49
Maize	70	1.6	0.2	100	0
Potato	66	1.6	0.1	96	4
Vegetables, fruits	157	5.0	1.2	100	< 1
Pulses / legumes	21	1.3	0.1	93	7
Milk	97	5.3	5.3	99	1
Meat	160	14.5	10.6	91	9
Total	2201	63.4	60.4		

Source: FAOSTAT.



Source: FAOSTAT.

- Domestic production as significant source, including wheat

Zinc biofortification of wheat

Table 10: Global BPI Ranking of Top 15 Countries, by Crop

Global Rank	Cassava	Maize	Sweet Potato	Beans	Pearl Millet	Rice	Wheat
1	Mozambique	Malawi	Angola	Rwanda	Niger	Cambodia	Tajikistan
2	Angola	Benin	Burundi	Benin	Gambia	Bangladesh	Turkmenistan
3	Ghana	Zambia	Uganda	Tanzania	Burkina Faso	Laos	Azerbaijan
4	Liberia	Kenya	Mozambique	Burundi	Chad	Myanmar	Afghanistan
5	Benin	Mozambique	Rwanda	Myanmar	Senegal	Viet Nam	Pakistan
6	Central African Republic	Angola	Tanzania	Togo	Nigeria	Indonesia	Kazakhstan
7	DR Congo	Burkina Faso	Sierra Leone	Haiti	Namibia	Sierra Leone	Uzbekistan
8	Sierra Leone	Zimbabwe	Madagascar	Uganda	Guinea-Bissau	Madagascar	Turkey
9	Côte d'Ivoire	Timor-Leste	Guinea	Angola	Uganda	Sri Lanka	India
10	Zambia	Mali	Haiti	Kenya	Nepal	Philippines	Iraq
11	Malawi	Togo	Kenya	Brazil	India	Nepal	Nepal
12	Congo	Tanzania	Mali	Cameroon	Ghana	Dem. Rep. Korea	Morocco
13	Togo	Ghana	Laos	Nicaragua	Togo	Liberia	Syria
14	Madagascar	Gambia	Benin	Chad	Sierra Leone	Guinea	Egypt
15	Guinea	Lesotho	Timor-Leste	Malawi	Myanmar	Guyana	Iran

- Tajikistan – one of the highest priority for zinc biofortification of wheat given:
 - Wheat harvested area
 - Wheat consumption
 - Zinc deficiency, child stunting prevalence
- However, standard fortification may be more cost-efficient than biofortification if most households buy wheat products from the market, rather than their own production

Asare-Marfo et al (2013): Prioritizing Countries for Biofortification Interventions Using Country-Level Data. IFPRI Harvest-Plus Working Paper 11.

Certain staple crops are also becoming important feed crops in Tajikistan

Use of different crops for livestock feed (1000 ton)

	1995	2005	2013
Wheat	30	336	774
Potato	1	247	742
Maize	8	92	107
Other vegetables	9	87	415
Bran	112	91	126
Cottonseed + Cotton cake	112	172	170

Source: FAOSTAT

- Increased use of staple crops as feed crops (wheat, potato, maize, other vegetables)
- Increasing importance of staple crop prices on the costs of livestock products

Productivity may be low relative to the production costs

Yield of major crops (ton / ha) and milk (litre / head)

	Wheat	Maize	Potato	Tomato	Milk per cow
Tajikistan	2.8	2.9	24.1	27.3	711
Central Asia	1.5	6.3	17.9	31.1	1865
Eastern Europe	2.7	5.1	15.7	23.6	4310
Russia	2.1	4.2	13.6	21.3	3894
Switzerland	5.9	8.9	40.5	204.5	6877

FAOSTAT (2017)

Maize yield is for Khatlon surveyed area.

Farmgate price of major crops (2010-12), USD / ton

	Wheat	Maize	Potato	Tomato
Tajikistan	424	431	416	343
Central Asia	278	297	336	373
Eastern Europe	212	229	250	663
Russia	170	191	304	1626
Switzerland	492	328	490	2399

FAOSTAT (2017).

- Modest yield with high farmgate price – typical of net food importing, low-income countries
- High production costs and high food price are major food / nutrition security concern
- Further increase in yield is often the way to reduce food price and improve food / nutrition security

Chemical fertilizer uses, irrigation, mechanization

Fertilizer, Irrigation	Tajikistan	Khatlon FTF ZOI	Central Asia	Eastern Europe	Russia	Asia
Fertilizer use (nutrients kg / ha)	84	62	31	47	16	235
Irrigated area share	> 90%	93%	27%	5%	3 ~ 4%	49%

Source: FAOSTAT (2017). Khatlon FTF ZOI – FTF midline survey by IFPRI (2015).

Mechanization	Khatlon FTF ZOI (household)	China (2012)	India (2014)
Land preparation – wheat	88%	78%	90 – 95%
Land preparation – corn	12% (much higher if area weighted)	61%	90 – 95%
Land preparation – potato	38%		90 – 95%
Land preparation – Tomato	45%		70 – 80%
Harvesting - wheat	16%	75%	80 – 90%
Harvesting - corn	6%	31%	50 – 60%

Source: Tajikistan – FTF midline survey. China – Zhang et al. (2015); India – Grant Thornton LLP. (2015).

- Mechanized land preparation of wheat, irrigation – comparable with other parts of Asia
- Fertilizer, mechanization of other operations or crops – still lagging behind other parts of Asia

Elasticity of crop yields with respect to inputs uses

Elasticity of yield with respect to inputs uses

	Wheat	Maize	Potato	Tomato
Chemical fertilizer per ha	.317***	.694**	.226**	.121***
Pesticide (dummy)	-.059	-.090	-.018	-.028
Irrigation (irrigated area share)	.818	.394	.397***	-.376
Household size per ha	.477***	.125	.174*	.383***
Share of household plot	.056	.073	.433	.202
Share of individual Dehkan	-.199	-.381	-.015	-.108
Mechanized land preparation	-.824	1.368**	.285**	.334***
Mechanized threshing	.002	-.393	.003	-.012
Mechanization (other operations)	.125**	-.178	-.012	-.007
Sample size	349	328	685	428

Source: Estimation based on FTF-midline survey by IFPRI (2015).

Key technological factors for raising nutrition-sensitive agricultural productivity in Tajikistan

- Chemical fertilizer for key crops
 - Positive response => potential for further raising yield by increased nutrients inputs
 - Important to look at other countries with higher fertilizer use intensity
- Mechanization
 - Different crops at different mechanization stages, but significant correlations with yields
 - Wheat – mechanization of planting, harvesting
 - Maize, potato, tomato – mechanization of land preparation
 - Mechanization important for raising profitability of high-yielding production system
- Irrigation
 - Important to keep investing in the maintenance of irrigation infrastructure, water resource managements
- Labor intensive nature
 - Relatively more competitive with returning migrants and declining foreign remittances

Concluding remarks

1. The prospect of relying on remittances to buy more imported food is uncertain, due to the economic conditions in Russia
2. Many crops consumed are still domestically supplied
 - a. Even wheat / wheat products – half of consumption is domestically produced
 - b. Share is likely to be higher in rural areas
3. Raising agricultural productivity and reducing food prices important for nutrition security in Tajikistan
 - a. Production costs are high for major crops
 - b. Low milk yield per cow may be due to high price of key feed crops (maize, wheat, potato)
 - c. Reducing production costs may require higher yields following
 - a. smallholder-based countries in Asia
 - b. more advanced mountainous countries in Europe
 - d. Chemical fertilizer: varietal improvement to raise yield response, fertilizer price policies
 - e. Mechanization: important for the profitability of higher-yielding production systems
 - f. Irrigation: continuous investments in maintenance of irrigation infrastructure
 - g. Research & Development: improve the overall production technologies,
 identify model countries and learn from their experiences

Thank you !

Dietary goal	Food system element			
	Food production	Food storage, transport, distribution	Cross-border food trade and investment	Food packaging and processing
Increase fruit and vegetable intake	Invest in mixed and integrated cropping systems in areas where markets are poorly developed	Invest in distribution infrastructure to enable establishment of local markets for low-income groups; develop public procurement mechanisms to ensure fruits and vegetables are served in public institutions	Use the World Trade Organization Aid for Trade initiative facility or Enhanced Integrated Framework aid for trade partnership to increase the supply of fruits and vegetables in low-income countries	Develop microenterprises for local processing to reduce waste
Increase intake of legumes/pulses	Improve varieties to boost yield	Train farmers on management practices to reduce loss during storage to insect damage/ improper drying	Safeguards to prevent distortions that discourage local production and regional trade in legumes	Develop quick-cooking bean flours
Increase intake of grains high in protein, micronutrients, and fiber	Incentivize the production of underutilized grains; promote biofortification using conventional breeding	Develop more efficient threshing and milling technologies for underutilized grains	Ensure that policies support open regional trade where neighboring countries produce underutilized grains	Set standards and marketing incentives for use of whole grains in processed food products; develop novel foods with underutilized species
Encourage balanced consumption of safe milk	Improve availability of animal health services; ensure women can have title to the animals they milk and care for	Invest in infrastructure to ensure safe transport of milk from farm to cooling center	Ensure effective food safety checks of imported milk powder	Train milk processors in food safety and quality assurance
Replace saturated and trans fats with unsaturated fats	Switch investments in palm oil to oils with healthier fatty acid profiles	Encourage cooperatives between healthier oil producers to lower prices	Lower tariffs on healthier oils relative to oils with saturated fats	Prohibit public investment and disincentivize private investment in facilities producing hydrogenated oils
Reduce intake of high-calorie, nutrient-poor sugary drinks and salty snacks	Use competition laws to combat excessive concentration in the agribusiness sector	Tax transportation of high-calorie, nutrient-poor sugary drinks and salty snacks	Codex Alimentarius Commission sets international guidelines for consumer-friendly nutrition labels	Mandate downsizing of all package sizes of sugar-sweetened beverages sold through retail outlets

Table 6.3: Some of the changes that can be made in food systems to achieve dietary goals (Global Nutrition Report 2016)

Plot types and crops

	Wheat (house hold weight)	Wheat (area weighted)	Feed corn (househo ld weight)	Feed corn (househo ld weight)	Potato	Potato	Tomato	Tomato
Household plot	35	5	55	15	96	92	98	85
Presidential plot	49	25	38	12	3	3	1	1
Individual dehkan	16	70	6	73	1	4	1	14
Collective dehkan	1	0	1	0	0	0	0	0
Others	0	0	0	0	0	0	0	0

More plots are associated with Certificate or Act (sealed documents) => land tenure may be strong