Agricultural Transformation and Food and Nutrition Security in EurAsia
Issues, Challenges & Implications for Research

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Annual Eurasian Food Security Conference
Dushanbe, Tajikistan 2017
A Heterogenous Region

• Size (geographic, population, economic)
• Income, poverty, and food security
• Economic reforms
• Political transitions
• Resources
• Trade in agri-food products
• ...

Linked through geography and institutional history
Outline

1. Heterogeneity & geography
2. State of agriculture & food security
3. Structural transformation
4. Farm restructuring
5. The role of value chains
6. International integration
7. Climate change and natural resources
8. Stimulating research exchange and cooperation
Strong income growth but large variation
(constant GDP/capita 2011 USD)
Importance of remittances

Tajikistan: 48%
Kyrgyzstan: 31%
Armenia: 21%
Georgia: 11%
Ukraine: 5%
Azerbaijan: 3%
Belarus: 2%
Russia: 0%
Kazakhstan: 0%

Source: World Bank
Poverty declined strongly (2003 vs 2014)

Source: World Bank Development indicators
Significant improvements in FOOD SECURITY
Malnourishment Indicators (2015)

% of POPULATION % of CHILDREN under 5

Prevalence of waisting, weight for height (% of children under 5)

Prevalence of Undernourishment (% of Population)

Research: From undernutrition to obesity; from calories to micro-nutrients...

Source: World Bank Development indicators
Food security in Central Asia:

• Over the past 15 years: large decline in poverty and undernourishment due to a rapid increase in economic growth & remittances

  – 2009-10: economic crisis & food price spikes: decline in real GDP and remittances, but food security stable
  – Recent years: negative spillovers from Russian embargo and economic crisis (with declining commodity prices)

Research: Complex effects of commodity price fluctuations
RESTUCTURING, GROWTH AND PRODUCTIVITY IN AGRICULTURE
Agricultural Production

Change in GAO Index (percent)

-50 -40 -30 -20 -10 0 10 20 30

Central Asia
Central Europe
European CIS
Caucasus

Kazakhstan
Kyrgyzstan
Tajikistan
Turkmenistan
Uzbekistan
Lessons from Agricultural Transition

“Agricultural output is not (necessarily) a good indicator for success or failure of reforms”

Rozelle & Swinnen, J. Econ. Literature, 2004
Agric Labour Productivity

Source: FAO, ILOstat and Asian Development Bank
Total Factor Productivity

Change in Total Factor Productivity (1990=100)

Central Asia
Central Europe
European CIS
Caucasus
Land & labor productivity within Central Asia

Figure 2. Land and labor productivity in Central Asian Agriculture, 1990-2014

Source: Akramov, Park, Ilyanov (2017)
## Economic Reforms (EBRD indicator 2012)

<table>
<thead>
<tr>
<th>Category</th>
<th>Kazakhstan</th>
<th>Kyrgyzstan</th>
<th>Tajikistan</th>
<th>Turkmenistan</th>
<th>Uzbekistan</th>
<th>Poland</th>
<th>Russia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large scale privatisation</td>
<td>3.0</td>
<td>3.7</td>
<td>2.3</td>
<td>1.0</td>
<td>2.7</td>
<td>3.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Small scale privatisation</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>2.3</td>
<td>3.3</td>
<td>4.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Governance &amp; enterprise restruct.</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>1.0</td>
<td>1.7</td>
<td>3.7</td>
<td>2.3</td>
</tr>
<tr>
<td>Price liberal.</td>
<td>3.7</td>
<td>4.3</td>
<td>4.0</td>
<td>3.0</td>
<td>2.7</td>
<td>4.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Trade &amp; Forex system</td>
<td>3.7</td>
<td>4.3</td>
<td>3.3</td>
<td>2.3</td>
<td>1.7</td>
<td>4.3</td>
<td>4.0</td>
</tr>
<tr>
<td>Competition policy</td>
<td>2.0</td>
<td>2.0</td>
<td>1.7</td>
<td>1.0</td>
<td>1.7</td>
<td>3.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Overall</td>
<td>3.1</td>
<td>3.4</td>
<td>2.9</td>
<td>1.8</td>
<td>2.3</td>
<td>4.0</td>
<td>3.3</td>
</tr>
</tbody>
</table>
Research: An (important) Puzzle

• Why have the least reformed countries in Central Asia performed better in terms of
  – Less disruption (decline) ?
  – Higher productivity compared to 1990 ?

• Hypotheses :
  – Data ?
  – Methodology ? (esp productivity estimates)
  – Interpretation ?

• Implications for policy & reform advise ?
ROLE OF AGRICULTURE

**% GDP**

- **Kazakhstan**
- **Kyrgyzstan**
- **Tajikistan**
- **Turkmenistan**
- **Uzbekistan**

**% Employment**

- **Kazakhstan**
- **Kyrgyz Republic**
- **Tajikistan**
- **Turkmenistan**
- **Uzbekistan**

Source: ILO and National Statistics
Agriculture in the Economy

The Global Relationship

Income per person, GDP/capita in $/year adjusted for inflation & prices

INCOME (GDP/CAPITA)
Agricultural Transformation with Economic Growth
(Transition Countries 2015)

% of GDP

% of Employment

Research: Better understanding/measurement on actual contribution of agriculture to the economy

Sources: World Bank, Gapminder
FARM STRUCTURES & LAND USE
FARM STRUCTURES

• Extreme farm DIVERSITY
  – among transition countries
  – within some countries
    • E.g. Kazakhstan
      – Large grain farms in the North
      – Small dairy & FV farms in the South

• Current diversity is likely to be PERMANENT
Share of arable land in individual use

Source: CISSTAT 2010, Lerman 2010 as presented in Djanibekov (2016)
Efficiency of Large and Small Farms

- Labor intensive (eg DAIRY, F&V)
- Land & Capital intensive farm systems (eg WHEAT)

Scale Economies in Agriculture

Large Farms more efficient

Small Farms more efficient
Factor intensity and shift to small farms

An International Perspective

![Graph showing the relationship between small farm share of land use and labor intensity, with data points for Central Asia 1995, Central Asia 2005, Balkan, Core CIS, Caucasus, and China. The graph illustrates that small farms are more efficient in terms of labor intensity compared to large farms.](image)
Factor intensity and shift to small farms

An International Perspective

- Core CIS
- Central Eur
- Balkan
- Caucasus
- South Kazakhstan (Dairy)
- North Kazakhstan (Wheat)
- Large farms: more efficient
- Small farms: more efficient

Graph showing the relationship between factor intensity and the shift to small farms, with regions like China, the Caucasus, and Central Europe highlighted.

Labor intensity (person/ha)
Large Output from Small(er) Farms
Tajikistan

**Land use (%)**

- Corporate farms
- Peasant farms (mid-sized, commercially oriented)
- Households

**Agricultural output (%)**

- Corporate farms
- Peasant farms (mid-sized, commercially oriented)
- Households

Source: Lerman and Sedik (2009)
Research

Challenges and opportunities

• Many “non-traditional” farm structures & land rights
• Information/data on actual farm structures
• Role of property rights & land market constraints on productivity: important lessons
• Gender relationships in land and farming
• Etc ...
VALUE CHAINS AS ENGINE OF AGRICULTURAL TRANSFORMATION
KEY ROLE FOR VALUE CHAINS in bringing finance and technology to farms

“69% of 35 billion $ credit in the Brazilian agri-food system is supply-chain credit”
Banco do Brasil (March 2004)

“Trade credit from suppliers comprised virtually all of the family farm credit and the biggest share of liabilities of agricultural companies”
World Bank study on Lithuania (2005)
A simple value chain model

Input/Technology Company

Farmer

Processor

Consumer

Finance

PRODUCT (Technology & Inputs)

PRODUCT (Raw Material)

PRODUCT (Processed)
A simple value chain model

Input/Technology Company

Farmer

Processor

Consumer

Finance

PRODUCT (Technology & Inputs)

PRODUCT (Raw Material)

PRODUCT (Processed)

Problems!

=> Value chain breaks down
Value chain finance innovation 1

Diagram:
- Technology Company
- Farmer
- Processor
- Consumer
- Finance
- Raw Material
- Processed product

Connections:
- Technology Company to Farmer
- Farmer to Processor
- Processor to Consumer
- Finance flows between Technology Company and Farmer
- Finance flows between Processor and Consumer
- Raw Material flows from Farmer to Processor
- Processed product flows from Processor to Consumer

TECHNOLOGY
**IMPACT**

**Example: Polish Dairy**

Small farms investing in cooling equipment through value chain finance

<table>
<thead>
<tr>
<th>Size</th>
<th>Invests (%</th>
<th>Uses VCF (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>6-10</td>
<td>78</td>
<td>51</td>
</tr>
<tr>
<td>&gt;10</td>
<td>92</td>
<td>74</td>
</tr>
<tr>
<td>ALL</td>
<td>76</td>
<td>58</td>
</tr>
</tbody>
</table>
## VCF in Cotton Sector in Kazakhstan (2003)

<table>
<thead>
<tr>
<th></th>
<th>% of FARMERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit</td>
<td>89</td>
</tr>
<tr>
<td>Water</td>
<td>73</td>
</tr>
<tr>
<td>Seeds</td>
<td>65</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>40</td>
</tr>
<tr>
<td>Agronomic Support</td>
<td>4</td>
</tr>
<tr>
<td><strong>Farm loan guarantees</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Investment loans</strong></td>
<td>0</td>
</tr>
</tbody>
</table>
VALUE CHAINS FINANCE in KAZAKHSTAN -- Examples

– **Wheat (large farms):** through agroholdings specialized in wheat production

– **Cotton (small farms):** Interlinked contracting with cotton gins who pay in advance for inputs and labour (World Bank, 2003)

– **Various other sectors with small farms** (ADB 2008; EBRD, 2011)
Research

• What type of value chains have (not) emerged?

• What is constraining investments in the food industry and agribusiness? (Doing Business indicators)

• How are the value chains organized? (incl contract farming, vertical integration, ...)

• What are the spillover effects on the farms (inputs, finance, technology, productivity, incomes, ...)?

• What standards (private and public) are (not) introduced in value chains?

• What can policy do to improve?

• ...
INTERNATIONAL INTEGRATION & AGREEMENTS

• International agreements
  – WTO
  – EEU
    • Russia, Armenia, Belarus, Kazakhstan, Kyrgyzstan (2015)

• International integration
  – Recent harmonization of border-crossing procedures
  – China’s “One Belt. One Road”
  – …

• Affect many aspects
  – Goods: Trade (quantity & quality (standards))
  – Labor/people : Migration
  – Capital: Investment (& remittances)
  – Water …

RESEARCH : Need for trade, investment & migration models (-- may need to be integrated !)
Cereal Import Dependency Index

Imports as portion of domestic availability, 2000-2013

- Georgia
- Armenia
- Turkmenistan
- Uzbekistan
- Kyrgyzstan
- Azerbaijan
- Tajikistan
- Kazakhstan
- Republic of Moldova
- Belarus
- Kazakhstan
- Russian Federation
- Ukraine
- Georgia

Source: FAOstat
Questions with staple food import dependency

• Can you afford it?
• Can the exporters produce enough?
• Is it reliable? (Also during crisis times?)
• Need to balance (static) efficiency and (reduced) dependency?
• ...

Food Imports
as % of Merchandise Export

Value of Food Imports in total merchandise exports (percent)

- Kazakhstan
- Kyrgyzstan
- Tajikistan
- Turkmenistan
- Uzbekistan

%
Origin of Grain Imports (average of 2000-2013)

Source: FAOstat
Grain production potential?
Area planted with agricultural crops in Kazakhstan 1990-2016 (thousand ha)

Source: National Statistics
RUK : Bread Basket for the World/EurAsia?
Potential for wheat production RUK

<table>
<thead>
<tr>
<th>INTENSIFICATION @ 60% of Yield Potential</th>
<th>Base line</th>
<th>INTENSIFICATION</th>
<th>RECULTIVATION</th>
<th>CLIMATE CHANGE + INTENSIFICATION</th>
<th>INTENSIFICATION + RECULTIVATION + CLIMATE CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA (Mha) 2013</td>
<td>Total</td>
<td>Extra Land</td>
<td>60% of Yp</td>
<td>80% of actual yields</td>
<td>60% of Yp</td>
</tr>
<tr>
<td>Russia 46,2</td>
<td>51,5</td>
<td>5,3</td>
<td>47,2</td>
<td>52,5</td>
<td></td>
</tr>
<tr>
<td>Ukraine 16,1</td>
<td>16,9</td>
<td>0,9</td>
<td>16,4</td>
<td>17,3</td>
<td></td>
</tr>
<tr>
<td>Kazakhstan 15,4</td>
<td>17,8</td>
<td>2,4</td>
<td>15,5</td>
<td>17,8</td>
<td></td>
</tr>
<tr>
<td>Total 77,6</td>
<td>86,2</td>
<td>8,5</td>
<td>79,1</td>
<td>87,6</td>
<td></td>
</tr>
<tr>
<td>YIELDS (t/ha) 2008-2013</td>
<td>Total</td>
<td>Extra Land</td>
<td>60% of Yp</td>
<td>80% of actual yields</td>
<td>60% of Yp</td>
</tr>
<tr>
<td>Russia 2,1</td>
<td>2,0</td>
<td>1,6</td>
<td>2,3</td>
<td>2,3</td>
<td></td>
</tr>
<tr>
<td>Ukraine 3,2</td>
<td>3,0</td>
<td>2,0</td>
<td>3,5</td>
<td>3,5</td>
<td></td>
</tr>
<tr>
<td>Kazakhstan 1,2</td>
<td>1,1</td>
<td>0,9</td>
<td>1,4</td>
<td>1,3</td>
<td></td>
</tr>
<tr>
<td>PRODUCTION (Mt)</td>
<td>TOTAL</td>
<td>GROWTH</td>
<td>TOTAL</td>
<td>GROWTH</td>
<td>TOTAL</td>
</tr>
<tr>
<td>Russia 95,0</td>
<td>103,5</td>
<td>8,6</td>
<td>110,1</td>
<td>15,2</td>
<td>120,0</td>
</tr>
<tr>
<td>Ukraine 49,3</td>
<td>51,0</td>
<td>1,7</td>
<td>58,1</td>
<td>8,8</td>
<td>60,0</td>
</tr>
<tr>
<td>Kazakhstan 17,2</td>
<td>19,4</td>
<td>2,2</td>
<td>21,3</td>
<td>4,1</td>
<td>23,8</td>
</tr>
<tr>
<td>Total 161,5</td>
<td>174,0</td>
<td>12,5</td>
<td>189,5</td>
<td>28,0</td>
<td>203,8</td>
</tr>
</tbody>
</table>

Source: Swinnen et al (2017) in Global Food Security
But: Export Volatility!

Source: Sedik (2011)
CLIMATE CHANGE AND NATURAL RESOURCES
Climate change and yield changes

Source: World Bank
Upstream and downstream states opposed demand patterns for water and energy.

The numbers on the map indicate where there are dams build are currently under construction.
Research

• Understanding of local impacts
• How to build resilient food systems
• How can trade & international agreements play a role
• ...

STIMULATING EXCHANGE AND COOPERATION IN AGRI-FOOD RESEARCH IN EURASIA
Potential for collaboration with

*Regional association of agricultural/food economists*

(to be created – with support of the IAAE)
Concluding comments

• Heterogenous region
• Agriculture is important throughout the region but for different reasons
• Major challenges
  • Policies, institutions, infrastructure, …
• Major opportunities
• Lots of areas where research can improve insights and thus a better basis for policy-making
Some references
