

Food Security Index for Tajikistan

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Why a new index?

- The existing indices report the status of food security in a nation: the level of under nourishment, the morbidity status, mortality rates, etc.
- We wanted to develop an index that would act as a warning signal – It would monitor changes in some important economic factors and predict whether the food insecurity can increase. Thus corrective measures can be taken in time.
- In other words, we proposed to develop an index that would reflect changes in the explanatory variables to indicate likely changes in the food security situation. The explanatory variables might be moving in opposite directions, the index can sum up the total effect of such changes.

Factors affecting food security in Tajikistan*

- Agriculture Production: Although only 22.27% of the GDP comes from agriculture, 55% of the population is estimated to be employed in agriculture. Other 18% residing in rural areas also has strong direct and indirect links with agriculture. Food production increased by 169% between 1998-2013. The poverty and food insecurity must have declined due to this.
- International prices: More than 50% of cereals, 30% of bovine beef, 80% of poultry products and such rely on imports. If the fuel and grain prices increase in the international markets, Tajikistan's capacity to import them decreases, leading to increase in food insecurity.

*The data has been taken from world bank and FAP statistics.

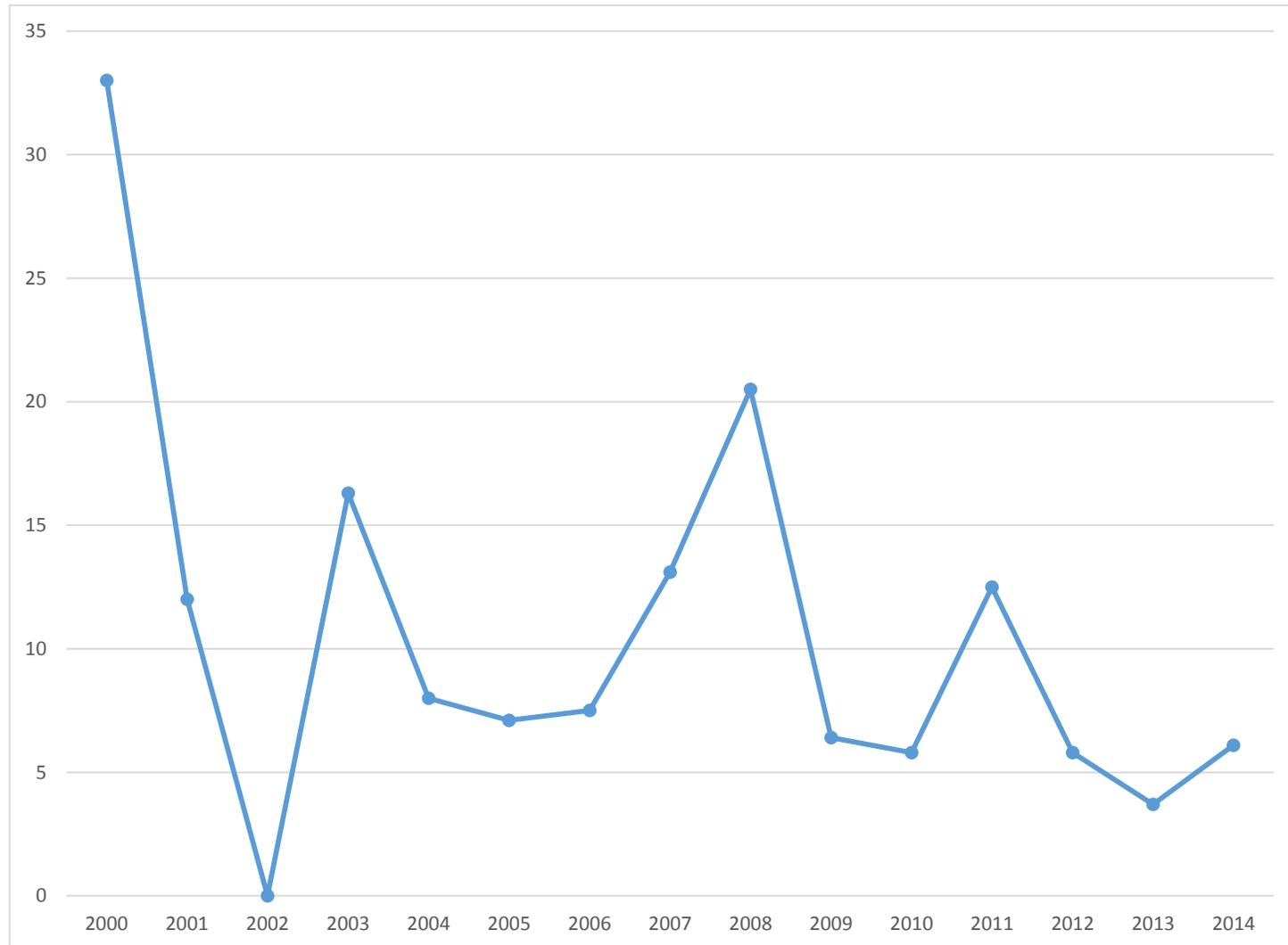
Year	Food Production Index (2004-2006 = 100)
1992	90.77
1993	81.01
1994	82.04
1995	77.18
1996	63.66
1997	63.96
1998	57.95
1999	60.94
2000	71.96
2001	75.14
2002	83.84
2003	88.66
2004	102.14
2005	98.24
2006	99.61
2007	102.87
2008	108.96
2009	118.37
2010	122.65
2011	132.29
2012	143.81
2013	155.73

Year	FAO Food price index
2000	91.1
2001	94.6
2002	89.6
2003	97.7
2004	112.7
2005	118
2006	127.2
2007	161.4
2008	201.4
2009	160.3
2010	188
2011	229.9
2012	213.3
2013	209.8
2014	201.8

Factors affecting food security in Tajikistan

- Inflation rate: It is a composite figure that reflects many factors like changes in domestic output, international prices, changes in incomes and affordability of necessities. The rate has been widely fluctuating from 33% to 5% in last 14 years (2000-2014).
- Population: The population is growing at 2.4% pa – one of the highest in the region. It has put pressure on food security situation
- Poverty: The absolute poverty decreased by 87% in last 10 years. It is expected that gains in nutrition would accompany such a decline. Still 10% of the children are severely malnourished.

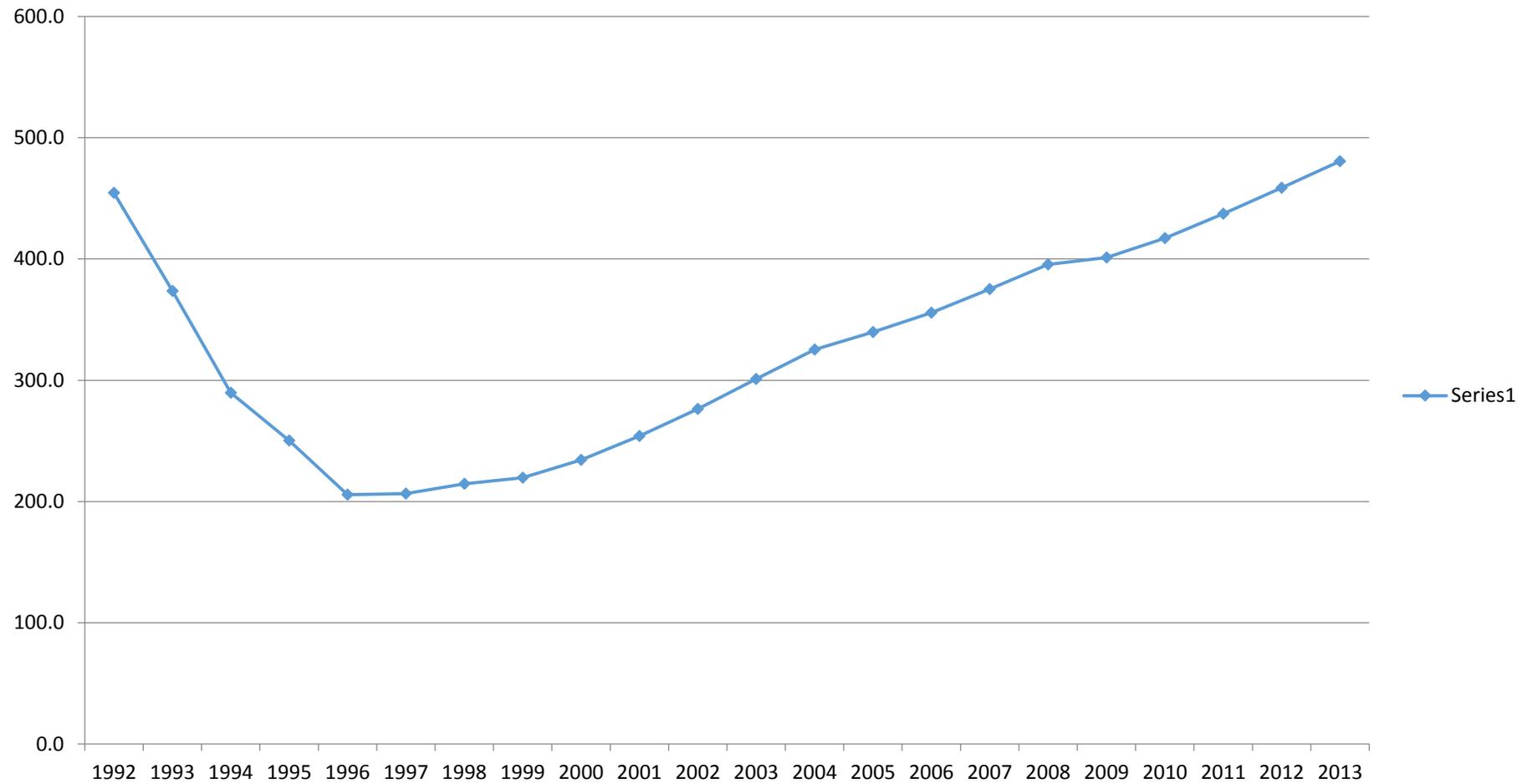
Annual Inflation rate in Tajikistan



Years	Annual population growth rate
1960	2.79
1970	2.97
1980	3.11
1990	3.46
2000	1.86
2005	2.08
2010	2.36
2013	2.38

Factors affecting food security in Tajikistan

- Remittances: 47.5% of the GDP came from remittances in 2012. However, the remittances have been found to have declined after 2014. This movement could have directly affected the food security.
- Economic growth: In 2011, the income level came back to the 1991 level. The economy grew at an average rate of 7.6% between 1997-2013. UNDP report says that growth in GDP seems to be directed towards poverty reduction.



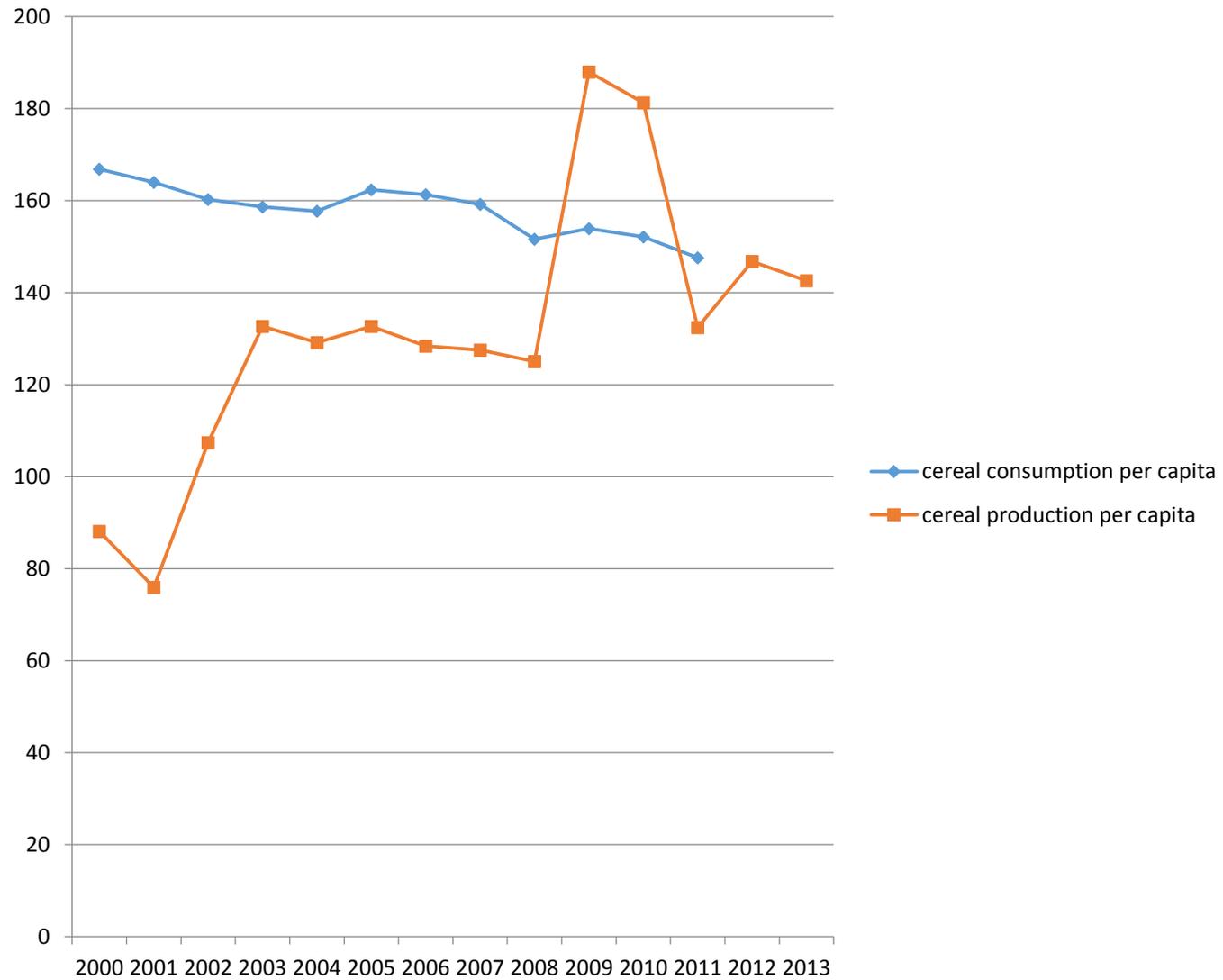
GDP per capita in constant 2005 USD

Dependent Variables

- We did not choose IMR and life expectancy because they change slowly, the small crises do not get reflected in them. Poverty data was available only for a few years.
- Cereal consumption per capita and percentage of people undernourished are two indicators for which continuous data is available and they change as economic situation changes. We found that they were very closely correlated with each other ($r = 0.86$). Thus any of the two could be used as dependent variable.

Some surprises

- We found that as food production increased, cereal consumption actually declined. We feel that this must have happened because the remittances increased at that time. The families that received remittances, must have switched over to fruits, vegetables, meat and milk products. Therefore consumption of cereals must have declined.
- Neither cereal consumption per capita nor proportion of population undernourished correlate well with population. Population growth by itself seems to have had weaker impact on food security compared to other factors. At least till now.
- Tajikistan suffers a lot from rain related disasters: floods, landslides and droughts. However, no reliable data on rainfall is available.



Cereal consumption and production, 2000-2013

Some surprises

- Cotton and aluminium are most important export items for Tajikistan. The changes in prices of these affect Tajikistan's capacity to import wheat and oil. But the correlation between food security indicators and these prices was very weak. We feel it is because the relationship is indirect and there are many factors that affect the movement of these variable independently.

The Regression Model

- Semi log regression equation model was used.

Determinants of Per Capita Cereal Consumption: Regression results on an 11 year period (2002-2012)

R square	0.992		
Adjusted R ²	0.984		
	<i>β</i>	<i>T</i>	<i>Significance (p)</i>
Constant	6.022	48.305	.000
Real GDP	-0.601	-5.109	.004
Time	0.009	2.017	.100
Remittances	0.038	3.824	.012
US crude oil price	-0.032	-1.861	.122
CPI	-0.263	-5.777	.002

Implications

- Except US crude oil price, all variables are statistically significant. However, GDP emerges as the most important variable, with β estimated at -0.601. The relation is negative because cereals are considered as inferior food products.
- But the degrees of freedom was only 5.
- Because of such overriding presence of GDP variable, the whole index seems to be almost identical to GDP series variations.

Proportion of undernourished people as a dependent variable

- The multi variate equation faltered and gave no statistically significant results. Maybe because of low degrees of freedom.
- Models with fewer variable gave robust results:
- GDP was negatively correlated
- Remittances significantly reversed undernourishment
- Inflation led to more undernourishment
- Wheat imports per capita reduced undernourishment

Variable names	<i>B</i>	<i>T</i>
GDP	-0.320	-4.022
Remittances	-0.061	-3.976
Us crude oil price	0.109	2.733
Wheat imports per capita	-0.255	-2.986
CPI	0.390	2.552
Time	0.017	4.734

Results for Percentage of Population undernourished as dependent Variable: equations with fewer variables

Proportion of undernourished people as a dependent variable

- When the β s of these variables were used in a composite equation and undernourished population was estimated, the correlation was high at 0.914.
- These estimates were used to build the index.

Building the index

- Percentage of population under nourished nominal value = -0.32
*real GDP per capita + 0.061 * remittances per capita + 0.109 * fuel price index + 0.390 * CPI - 0.255 * wheat imports per capita
- The index numbers were calculated using 2002 as base year.
- The correlation coefficient between the percentage of population undernourished and the index was -0.957: as the explanatory variables changed for better, undernourishment decreased.

Conclusion

- With this index, danger signals would be sent out to the government, as the composite effect of the explanatory variables change adversely for food security.
- It is easy to understand because it is just one number that should be monitored for increase or decrease. They can then know when the safety nets would be needed.
- At present, the Tajik government does not have any safety nets. It has to work proactively to reduce food insecurity. Otherwise the warning bells would ring but no one would take action.

THANK YOU!