Vulnerability Assessment of the Agricultural Economy in Russia (Using the Example of Rostov Region, Southern Federal District)

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Over the past decade, Rostov region of the Southern Federal District in Russia has experienced a major reduction in agricultural production due to climate variability and imperfect institutional mechanisms. Rural communities and agricultural producers, especially in small and medium scale businesses, have been affected by climate change and human-induced disasters in the form of drought, floods, and unusual hot and cold weather. This research identifies the vulnerability profile in the agricultural sector and studies the principle drivers of vulnerability in the region using an extraction method. A total sample of 75 specialists were interviewed via a field survey. Priority setting of related risks was done using a cross tabulation between the binomial and Friedman tests and the coefficient of variation. The findings indicate that the community's vulnerability is a composite effect of five latent constructs which act concurrently to produce the net effect. They were identified as unemployment, centralized state economy, economic instability, production costs, and social instability. These factors together explain 70% of the variation in the data.

Key words: exploratory factor analysis, institutions, risk analysis, Rostov region, rural economy, vulnerability

Definition of "vulnerability" by different scientific approaches

The Intergovernmental Panel on Climate Change defines climate vulnerability as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability in relation to individuals or groups of people (in the context of this article – farmers and rural communities) depends on the extent to which they are exposed to external change, including environmental or socio-political stress, the sensitivity or the degree to which they are affected due to this exposure, and their adaptive capacity or ability to make changes necessary to avoid adverse consequences [Reducing Vulnerability 2011, p. 16]. As well as social vulnerability there are sensitive populations that may be less likely to respond to, cope with, and recover from natural disasters. Social vulnerability is complex and dynamic, changing over space and through time [*Cutter, Finch* 2007] including the socio-economic and demographic factors that affect the resilience of communities [*Flanagan, Gregory, Hallisey, Heitgerd, Lewis* 2011]. Social vulnerability is the culmination of economic, demographic and housing characteristics which influence a community's ability to respond to, cope with, recover from, and adapt to environmental hazards [Social Vulnerability Index n.d.]. In many ways, it mirrors the geography of inequality and poverty [*Cutter, Finch* 2007]. In the broader context of social policy, it means socially based services – health, welfare, housing, education – which would not improve the quality of life of residents directly but would improve their ability to respond to and recover from disaster events [*Cutter, Finch* 2007].

Vulnerability is shown to be a vital component of risk and the principal element of disaster impacts [*Alexander* 2012]. Turner et al. [2003] assert that vulnerability is not only the result of exposure to hazards (perturbations and stress) but also the sensitivity and resilience of the system experiencing risks. Vulnerability is the degree to which a system, subsystem or system component is likely to experience harm due to exposure to a hazard, perturbation or stress.

Vulnerability can be broadly defined as the potential for loss, the "state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt" [*Endfield* 2011], or "the degree to which human and environmental systems are likely to experience harm due to a perturbation or stress" [*Endfield* 2011].

Vulnerability of agricultural production

Vulnerability is a term increasingly used in economic policy to describe the risks posed to yield variability and climate change. Despite its frequent use, the concept of vulnerability is rarely converted into analytical measures that can be used to prioritize political interventions and to evaluate their impact [*Nelson, Kokic, Crimp, Meinke, Howden* 2010].

Russia has an enormous potential for expanding agricultural production. Nevertheless, despite the fact that Russia has 9% of the world's productive arable land, 20% of freshwater resources and 8.5% of mineral fertilizers available for agricultural production, it currently produces only about 5% of dairy products, 3% of cereals and legumes and 2% of meat [*Kalugina* 2014].

Briefly stated, during the period 2006–2011 the average annual growth rate in agricultural production was 4.4%, despite a number of negative trends in the global and national economy. In 2008 the grain harvest and the harvest of leguminous crops was 108 million tons, in 2010 it was 61 million tons, in 2012 – 71 million tons, and in 2016 – 116 million tons. This could be explained by adverse weather conditions and a shortage in financing of particular measures. "There were years when the harvest was good and years when it was bad [*Zhebit* 2013]. In 2011, there was an increase of 22.1% in agricultural production as a result of favorable weather conditions and with effective state support of the agricultural sector, with the harvest of sugar beets and potatoes , sunflower seeds and the gross grain harvest. In 2012, despite some positive trends in increasing livestock production as compared with 2011 (by 6.8%) and those in meat and dairy products, agricultural production in other fields fell: the total gross harvest of grain was 70.7 million tons, which was 25% less than values of the previous year. In 2012, the growth rate of agricultural production became negative. However, in 2013, Russian agriculture grew by 6.2%, despite a series of adverse weather events; the Southern Federal District and Volga Federal District faced a drought over large areas and the Far East of Russia was also hit by serious flooding (*Table 1*) [*Belokrylova, Cherkezov* 2015, pp. 13–14].

Table 1. **Economic Development of Russia during 2007–2013 (%)**

Indicator	2007	2008	2009	2010	2011	2012	2013
GDP, growth rate	8.5	5.2	-7.8	4.3	4.3	3.4	1.3
Industry	6.8	0.6	-9.3	8.2	4.7	2.7	0.3
Agriculture	3.3	10.8	1.4	-11.3	23.0	-4.2	5
Final consumption of households	14.3	10.6	-5.1	5.5	6.4	6.9	3.4
Investment in fundamental capital	22.7	9.9	-15.7	6.0	8.3	8.4	1.4

Source: [*Belokrylova, Cherkezov* 2015, p. 14].

Sannikova and Bokushtva [2007] showed that most of the available technology and production methods used on Russian farms are not adapted to prevailing climatic conditions; this considerably limits the prospects for reducing high yield variability and for adopting higher levels of crop diversification. They also show that Russian farms, like farms in other post-Soviet countries, only have limited capabilities for overcoming risk [*Sannikova, Bokushtva* 2007].

The projected increase in the negative effects of the global crisis of 2008–2009, which reduced the economic growth in Russia to 1.3% in 2013 and to -3.7% in 2015, is a problem of survival and competitiveness, the improvement of domestic agricultural production and a number of subsectors [*Barsukova* 2014]. Financial institutions and land property are considered important obstacles in Russian agriculture. Although many

Russians support decreasing dependence on the West, the prospects of increase domestic agricultural production do not look positive for the nearest future. In November 2014, the Moscow Times published an article explaining one of the major obstacles to increasing domestic agricultural production: small farmers cannot get loans [*Girard* 2015, p. 17].

Losev from the Russian Ministry of Agriculture singles out seven key problems in the Russian agriculture sector:

1) insufficiently stable financing due to market volatility, price fluctuations and the shortfall in private investment;

2) manufacturers of agricultural products have a limited access to sales markets. The infrastructure is outdated, and with each passing day the monopoly of major retail networks grows stronger;

3) agriculture has fallen behind from a technical and technological point of view as manufacturers are not profitable enough for modernization. Therefore, we see stagnation in the agricultural machinery industry and in the food manufacturing industry;

4) the pace of social development is slower in agricultural areas;

5) there is a shortage of qualified labor resources in all agricultural production and processing branches within the sector;

6) almost all beef in Russia comes from dairy herds which have high production costs, and food costs are twice;

7) there is practically no system of land-improvement works. This means that Russia has to build everything from scratch and even to train its own experts [*Zhebit* 2013].

By mid-2015, the Russian food policy had become more protectionist as the food embargo was enforced [*Wegren* 2016]. Due to the sanctions imposed on Russia in 2014, both Russia's agricultural revenues and gross trade have been negatively impacted. Presently, Russia cannot sustain itself domestically in terms of total agricultural production, or in terms of providing the variety of foods previously available due to the sanctions. The principle reasons are as follows: the lack of loans available to farmers, the limited availability of land, the lack of a young workforce, and minimal foreign investment. Domestically Russia can keep its population from starving with agricultural production as it currently stands. Sustainability is referred to in terms of agricultural diversity. In other words, the agricultural market will not be able to satisfy Russian consumers, who have developed increasingly sophisticated tastes [*Girard* 2015, p. 1]. These circumstances prompted this research into agricultural production vulnerability in Russia and our analysis was carried out on the Rostov region.

Vulnerability of Rostov Region's agricultural production

Rostov region is situated in the southern part of the East European Plain and in the North Caucasus. It occupies a vast territory in the lower Don river basin. Much of the region's territory is farmland, mostly highly fertile black earth [Zone of Agriculture in Rostov Region (2013–2020) 2012]. Rostov region is the largest producer of agricultural products in the Russian Federation, providing about 5% of Russian agricultural production [Development Strategy 2013, p. 2]. About 4.2 million people live in the territory of 100 000 square kilometers, one third – 1.4 million people – reside in rural areas. The share of the Rostov region in the total area of Russian farmland is 3.9%. In terms of farm

field areas and areas of cereal crops the region is 2nd in Russia, in terms of soil fertility it is 10th. Soil and climatic conditions in the region, despite drought periods, are favorable for agricultural production. 1 700 agricultural organizations, 12 900 farms, 2 000 individual enterprises and 547 000 individual plots are engaged in agricultural production. Rostov region produces about 20% of the total agricultural output of the Southern Federal District [Southern Federal District's Socio-economic Situation 2015, pp. 167, 187].

Research shows that financial and economic reform restricted agricultural development in the region, i.e. production and agribusiness are unprofitable and inefficient. The amount of agricultural processing in the food industry is also being dramatically reduced. This arose because of the reduction in raw material production and imperfect economic relations between processing companies and suppliers of raw materials. A significant reduction in the production of many kinds of agricultural products was also the result of the withdrawal of lands from agricultural use [*Usenko, Sklyarova* (n.d.)].

This research identifies the main characteristics of the risks of yield variability depending on climatic factors that determine the vulnerability of agricultural production and the detection of major drivers of vulnerability in the region. This research is quantitative and applied; it is based on exploratory factor analysis using the vulnerability structure of the local economy to study the agricultural sector of the Southern Federal District of Russia. As part of the quantitative evaluation, we ranked vulnerability features in the agricultural production of the Rostov region.

The face and content validity of the research questionnaire was evaluated and refined by members of the research team and by two specialists in the subject matter via email survey. A total sample of 75 specialists in the subject matter outside the Southern Federal University (Rostov on Don) and a number of governmental experts from administrations of rural districts of the Rostov region, farmers, managers, agronomists, livestock farms, scientists were selected (*Table 2*).

This research was conducted from March to August, 2015. In the factor analysis, missing values were replaced with the mean using the interpolation method**.**

Table 2. **The industry experts profile surveyed in the research**

Position	Rostov region district						
	Myas-nikovsky district	Okty-abrsky district	Salsky district	Novo cherkassk	Rostov-on-Don	Persiya novka	others
Farmers	3	4	3				
Heads of individual farm	11	6	8				
Managers of rural districts	2	3	3				
Agronomists	1	2	2				
Zootechnicians	1	2	2				
Scientists				3	8	2	9

Vulnerability profile

In order to explain the vulnerability of agricultural production, a set of factors was chosen on the basis of a literature review and in accordance with the environmental, economic and social characteristics of the region. A nonparametric binomial test was used to examine the current situation for each item. In other words, we identified the difference between what the situation should be like and what it is like; between the ideal and the real situation. In this regard, the respondents as subject matter specialists were asked to determine which factor had what impact on the rural economy for the past five years. These views were measured using a 10-point scale (1 = unimportant or ineffective, 10 = extremely important). In order to establish priorities for agricultural risks, some of the most important risks were selected based on the previous research. *Table 3* shows 91% of specialists stated that unusually hot weather had a significant impact on agriculture during the past 5 years; 88% drought; and 73% crop pests and livestock diseases.

Table 3. **Binomial Test of agricultural risks**

Item	Category		N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
(A1) Drought	Group1 Group 2 Total	<= 5 > 5	9 66 75	0.12 0.88 1.00	0.50	0.0001
(A2) Flood	Group1 Group 2 Total	<= 5 > 5	35 40 75	0.47 0.53 1.00	0.50	0.644
(A3) Unusual cold weather	Group1 Group 2 Total	<= 5 > 5	29 46 75	0.39 0.61 1.00	0.50	0.064
(A4) Unusual hot weather	Group1 Group 2 Total	<= 5 > 5	7 68 75	0.09 0.91 1.00	0.50	0.0001
(A5) Crop pests	Group1 Group 2 Total	<= 5 > 5	20 55 75	0.27 0.73 1.00	0.50	0.0001
(A6) Livestock diseases	Group1 Group 2 Total	<= 5 > 5	20 55 75	0.27 0.73 1.00	0.50	0.0001
(A7) Stock feed shortage	Group1 Group 2 Total	<= 5 > 5	56 19 75	0.75 0.25 1.00	0.50	0.0001

Table 4. **Priority setting of agricultural risks**

Freidman[*]	CV (%)	Binomial Test	Ranking
A1 (5.35)	A4 (19.76)	(A1) <0.05	A1 (Drought)
A4 (5.13)	A1 (23.87)	(A4) not sig	A4 (Unusual hot weather)
A5 (4.29)	A5 (31.49)	(A5) not sig	A5 (Crop pests)
A6 (4.07)	A6 (33.31)	(A6) <0.05	A6 (Livestock disease)
A3 (3.78)	A7 (71.58)	(A3) <0.05	A2 (Flood)
A2 (3.31)	A2 (191.54)	(A2) <0.05	A7 (Stock feed)
		(A7) <0.05	A3 (Unusual cold weather)

[*]Test Statistics: Chi-Square 142.278, df: 6, Asymp.Sig 0.0001

Table 5. **Binomial Test of production risks**

Item	Category		N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
(B1) Low level of profitability in the agricultural sector	Group1 Group 2 Total	<= 5 > 5	9 66 75	0.12 0.88 1.00	0.50	0.0001
(B2) Strong increase in prices of agricultural inputs (fertilizers, pesticides, stock feed)	Group1 Group 2 Total	<= 5 > 5	1 74 75	0.01 0.99 1.00	0.50	0.0001
(B3) Strong decrease in prices of agricultural products	Group1 Group 2 Total	<= 5 > 5	26 49 75	0.35 0.65 1.00	0.50	0.011
(B4) Sharp rise in prices of grain and cereals	Group1 Group 2 Total	<= 5 > 5	28 47 75	0.37 0.63 1.00	0.50	0.037
(B5) High production costs in the agricultural sector	Group1 Group 2 Total	<= 5 > 5	6 69 75	0.08 0.92 1.00	0.50	0.0001
(B6) Poorly developed local economy	Group1 Group 2 Total	<= 5 > 5	24 51 75	0.32 0.68 1.00	0.50	0.002
(B7) Extensive state regulation and control in the agricultural economy	Group1 Group 2 Total	<= 5 > 5	40 35 75	0.53 0.47 1.00	0.50	0.644

Table 6. **Priority setting of production risks**

Friedman[*]	CV (%)	Binomial test	Ranking
B2 (5.83)	B2 (13.02)	(B2) <0.05	B2 (Strong increase in prices of agricultural inputs)
B5 (5.19)	B5 (22.62)	(B5) <0.05	B5 (High production costs in the agricultural sector)
B1 (4.48)	B1 (26.09)	(B1) <0.05	B1 (Low level of profitability in agriculture)
B3 (3.61)	B6 (41.16)	(B3) <0.05	B6
B6 (3.29)	B4 (41.71)	(B6) <0.05	B3
B4 (3.01)	B3 (43.26)	(B4) <0.05	B3
B7 (2.58)	B7 (45.08)	(B7) not sig	B7

[*]Test Statistics: Chi-Square 160.485, df: 6, Asymp.Sig 0.0001

Table 7. **Binomial test of socio-economic challenges**

Item	Category		N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
(C1) Widespread unemployment in the agricultural sector	Group1 Group 2 Total	<= 5 > 5	20 55 75	0.27 0.73 1.00	0.50	0.001
(C2) Shifting of manpower from the formal sector to the informal employment sector (informal economy)	Group1 Group 2 Total	<= 5 > 5	24 51 75	0.32 0.68 1.00	0.50	0.002
(C3) A glut of unskilled workers	Group1 Group 2 Total	<= 5 > 5	32 43 75	0.43 0.57 1.00	0.50	0.248
(C4) Limited social assistance offered to people who have lost their main source of income	Group1 Group 2 Total	<= 5 > 5	35 40 75	0.47 0.53 1.00	0.50	0.644
(C5) Agrarian overpopulation	Group1 Group 2 Total	<= 5 > 5	66 9 75	0.88 0.12 1.00	0.50	0.0001
(C6) Inefficient pension system	Group1 Group 2 Total	<= 5 > 5	28 47 75	0.37 0.63 1.00	0.50	0.037
(C7) Slower social development in agricultural areas	Group1 Group 2 Total	<= 5 > 5	33 42 75	0.44 0.56 1.00	0.50	0.356
(C8) High levels of rural poverty, inequality and social disparities	Group1 Group 2 Total	<= 5 > 5	27 48 75	0.36 0.64 1.00	0.50	0.020

Table 8. **Priority setting of socio-economic challenges**

Friedman[*]	CV (%)	Binomial test	Ranking
C1 (5.54)	C1 (34.88)	(C1) <0.05	C1 (Widespread unemployment in the agricultural sector)
C8 (5.25)	C2 (37.93)	(C8) <0.05	C2 (Informal economy)
C2 (4.85)	C3 (40.35)	(C2) <0.05	C8 (High levels of rural poverty, inequality and social disparities)
C6 (4.76)	C8 (40.75)	(C6) <0.05	C6
C7 (4.73)	C6 (42.99)	(C7) Do not sig	C3
C3 (4.67)	C4 (43.22)	(C3) Do not sig	C4
C4 (4.35)	C7 (43.42)	(C4) Do not sig	C7
C5 (1.86)	C5 (82.32)	(C5) <0.05	C5

[*]Test Statistics: Chi-Square 127.649, df:7, Asymp.Sig 0.0001

Priority setting of these items was done using a cross tabulation between the binomial and Friedman tests and the coefficient of variation (CV) (see *Table 4*). CV can be calculated and interpreted in two different settings: analysing a single variable and interpreting a model. The standard formulation of CV – the ratio of the standard deviation to the mean value – applies in the single variable setting. CV for a single variable describes the dispersion of the variable in a way that does not depend on the variable's unit. The higher the CV, the greater the dispersion in the variable [Institute for Digital Research and Education 2016].

The results indicate that drought, unusual hot weather and crop pests were three of the most important risks in agriculture in the Southern Federal District of Russia.

For production risks, the synthesis of the seven indicators shows that the agricultural sector and the rural economy in the region are vulnerable because of the low level of profitability, the reduction of net income, the high cost of production and the dominance of a monocultural economy. All of these, except the last, are statistically significant as shown in *Table 5*.

On the basis of the triangulation between the Friedman test, CV and the binomial statistical test, three of the most important factors of production risks were selected (*Table 6*):
1. A significant increase in prices of agricultural inputs (fertilizers, pesticides, stock feed).
2. High fixed production costs in the agricultural sector.
3. The low level of profitability in the agricultural sector.

The results of socio-economic problems are shown in *Tables 7–8*. From the viewpoint of respondents, unemployment is identified as the dominant problem of agriculture and the rural economy in the past five years, as stated by 73% of respondents. Also, shifting of manpower from the production sector to the shadow economy, an inefficient pension

system, high levels of rural poverty, inequality and social disparity together reinforce the social vulnerability of agricultural production in the region.

Three of the most important factors of social vulnerability of agricultural production are as follows (Table 8):

1. Widespread unemployment in the agricultural sector.
2. The shift of manpower from the formal sector to the informal employment sector.
3. High levels of poverty and inequality in rural areas.

Factor Analysis

An exploratory factor analysis was made to refine the conceptual model and to scale the development. We perform a specification search for better testing of the model. This was performed using a principal component analysis and orthogonal rotation among the 15 elements. In this study, a factor-loading criterion level of 0.50 [*Mansourfar* 2009; *Kalantari* 2006] was used in order to identify the structure of the correlations among the variables. The findings show that five extracted factors together explain 70% of the variation in the data scores; KMO[1] was calculated as 0.678 along with a p-value <0.0001 (*Table 9*). This demonstrates that the identity matrix is acceptable and confirms the ability of the factor analysis to explain the model.

Table 9. **Principal Component Analysis (PCA). Rotation Sums of Squared Loadings***

Factor	Eigenvalues	% of variance	Cumulative % of variance
1	2.748	18.319	18.319
2	2.251	15.006	33.325
3	2.051	13.676	47.001
4	1.839	12.260	59.261
5	1.605	10.703	69.964

*KMO measure of sampling adequacy: 0.678; Batlett's Test for Sphericity 430.973, df: 105, Sig:0.0001

Table 10 shows component loadings and the communality extraction. The communality extraction and factor loading for all variables is calculated greater than 0.50.

Table 11 shows that vulnerability could be explained by five underlying factors, namely unemployment, the centralized state economy, economic instability, production costs and social instability. As stated before, these variables explain 70% of the variation in the data scores.

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1   Kaiser-Meyer-Olkin Measure of Sampling Adequacy.

Table 10. **Factor loading of scale items: Rotated Component Matrix[a]**

Item	Components Loadings					Communalities Extraction
	1	**2**	**3**	**4**	**5**	
B1	0.102	0.087	0.202	0.782	-0.239	0.727
B2	-0.064	0.038	-0.077	0.751	0.040	0.576
B3	-0.129	0.137	0.844	0.223	0.107	0.810
B4	0.190	0.094	0.853	0.104	0.172	0.814
B5	0.279	-0.203	0.336	0.621	-0.099	0.627
B6	0.058	0.831	0.074	0.058	0.253	0.766
B7	0.158	0.733	0.340	-0.077	-0.155	0.707
C1	0.783	-0.029	0.110	0.013	0.074	0.631
C2	0.745	0.435	-0.019	0.098	-0.048	0.756
C3	0.584	0.492	0.104	-0.107	-0.160	0.631
C4	0.514	0.618	-0.058	0.043	0.246	0.712
C5	0.410	0.213	0.515	-0.364	-0.012	0.612
C6	0.785	0.093	0.066	0.146	0.281	0.729
C7	0.084	0.267	0.036	-0.178	0.793	0.741
C8	0.105	-0.80	0.178	-0.039	0.778	0.656
Sum	**4**	**3**	**3**	**3**	**2**	**-**

*Extraction Method: Principal Component Analysis /Rotation Method: Varimax with Kaiser Normalization / Rotation converged in 8 iterations

Table 11. **Factors based on the nature of loaded items – Refinery model**

No	Item	Extracted Factors
C1	Widespread unemployment in the agricultural sector	**Employment**
C2	Shifting of manpower from the formal sector to the informal employment sector (informal economy)	
C3	A glut of unskilled workers	
C6	Inefficient pension system	
B6	Poorly developed local economy	**Centralized State Economy**
B7	Extensive state regulation and control in the agricultural economy	
C4	Limited social assistance offered to people who have lost their main source of income	
B3	Strong decrease in prices of agricultural products	**Economic Instability**
B4	Sharp rise in prices of grain and cereals	
C5	Agrarian overpopulation	
B1	Low level of profitability in the agricultural sector	**Production Cost**
B2	Strong increase in prices of agricultural inputs (fertilizers, pesticides, stock feed)	
B5	High production costs in the agricultural sector	
C7	Slower social development in agricultural areas	**Social Instability**
C8	High levels of rural poverty, inequality and social disparities	

Conclusions

Identifying the vulnerability profile is an essential factor for state, local and regional development. The vulnerability profile identifies the main internal and external shocks that affect the agricultural economy of rural areas. The Southern Federal District of Russia is vulnerable to agricultural disasters, production and socio-economic risks.

Drought, unusual hot weather and crop pests were identified as the most important characteristics of vulnerability in the south of Russia from the viewpoint of agricultural risks. Extreme weather events are becoming more common, and the drought of 2012 confirmed this trend and drought has become the norm in Russia with increasing frequency [*Ukhova* 2013]. The risks of disasters in the region are further aggravated by factors of increasing vulnerability related to demographic changes, socio-economic conditions, and the lack of proper institutions in rural and agricultural areas. With regard to production risks, it should be noted that production costs are a challenging issue in Russian agriculture. All this contributes to situation when Russia's economy, its population and sustainable development are at risk.

Unemployment and rural poverty increase vulnerability risks as a whole. Small-scale farmers in the southern regions of the country are especially vulnerable to the decrease in agricultural revenues and rising poverty. Lunze et al. [*Lunze, Yurasova, Idrisov, Gnatienko, Migliorini* 2015] point out that the increase in income inequality resulting from the economic transition added to the vulnerability of affected households. The country's macroeconomic growth over the past 10 years contributed to a reduction of poverty and narrowed this gap by reducing poverty rates from 2.1% in 2005 to 1.0% in 2013 [*Lunze, Yurasova, Idrisov, Gnatienko, Migliorini* 2015], but certain socio-economic groups remain food insecure. Those who do not have coping mechanisms such as private land plots (dachas), and the unemployed, lost the purchasing power to maintain a healthy diet. Research by Antwi et al. [*Antwi, Boakye-Danquah, Owusu, Loh, Mensah, Boafo, Apronti* 2015] showed that livelihood diversification, an off-farm income source and access to social services are major indicators of reduced socio-economic vulnerability.

As noted by Philip and Rayhan [*Philip, Rayhan* 2004], vulnerability and poverty are comprised of economic, social, cultural, political and environmental factors. The high vulnerability of the rural community in Rostov region to employment and economic situation is attributed to low livelihood diversification in the agricultural sector, a poorly developed local economy, extensive state control over rural economies, overpopulation in agriculture, and a glut of unskilled workers. Based on the results of this study, we found that the state of agricultural production vulnerability in the Rostov region brought about by natural disasters such as drought and unusual hot weather is intensified by employment issues, the centralized state economy, economic and social instability and production costs which act independently or are interconnected. This explains the importance of participatory approaches and community-driven projects for policymakers, specialists in agriculture and development agents. As concluded by Wegren [*Wegren* 2012], institutional impact differs across regions because each region has its own constellation factors that impinge upon the functioning of institutions.

Nevertheless, Russia still lacks specific measures to adapt agriculture to growing risks. Kreidenko and Mironova [*Kreidenko, Mironova* 2012] showed that the correlation

between indicators of small business development and state support in the Russian regions proved the low efficiency of measures taken. According to Skulskaya and Shirokova [*Skulskaya, Shirokova* 2011], it is crucial to emphasize the need for additional state support of agriculture in remote regions of Russia, in particular, in Siberia and the Far East, border areas, and outposts of sparsely settled territories through the import substitution strategy.

A positive step that could be taken by the Russian government in the current situation is a major review of measures to support domestic producers through the import substitution strategy. The development of modern infrastructure, support for agricultural production, training and advanced training are the most effective measures of agricultural sector development [*Kalugina* 2014]. Smirnov [*Smirnov* 2015] confirmed that the intensification of entrepreneurial activity and the reduction of excessive administrative pressure could help overcome the recession caused by Western sanctions, and especially by the radical drop in oil prices. Finally, as stated by Ukhova [*Ukhova* 2013], specific and well-designed adaptation policies could significantly mitigate the problems faced by the Russian agricultural sector, and they should be introduced as soon as possible. Kalugina [*Kalugina* 2014] asserts that the long-term development of Russia's agricultural sector is going to be increasingly influenced by global challenges and Russia's ability to address them with innovative agricultural policies and adaptation strategies for rural communities.

In Rostov region, Patrakeeva and Kryukov [*Patrakeeva, Kryukov* 2016] suggest that potential economic growth could be realized by taking successful active steps in economic policy. First, there should be no growth in private and public capital expenditures until 2020 and, second, the implementation of the growth model should be aimed at developing manufacturing facilities, the construction of roads, infrastructure and industrial facilities. When these measures are implemented, the average annual rate of GRP in Rostov region will be 4.8%. High growth rates of the Rostov regional economy could be retained by increasing domestic demand via an efficient policy of import substitution.

It will be a good opportunity for the Rostov region to realize its potential, particularly human capital and the rich culture of the society. Local government initiates and contributes to the expansion of their opportunities to achieve economic security and social integration through the development of new rural development programs.

This requires an access to land, infrastructure and services, the expansion of government support for the development of agricultural cooperatives, upgrading marketing channels, providing access to low interest agricultural and production loans, developing cooperation with socio-economic projects, mitigating the difficulties experienced by the unemployed and the poor, and initiating special programs to reach vulnerable groups. Moreover, the expansion of the capacity of local government allows municipalities to solve a wide range of issues for the development of rural communities.

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Оценка уязвимости экономики сельского хозяйства России (на примере Ростовской области, ЮФО)[2]

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Уязвимость (потенциал потерь) фермеров и сельского сообщества зависит от степени воздействия внешних изменений (включая экологическую составляющую или социально-политический стресс), от влияния экономического кризиса и способности сообщества к адаптации и к необходимым изменениям во избежание негативных последствий. Социальная неприспособленность выявляет группы населения, менее склонные адекватно реагировать и быстро справляться с кризисной ситуацией.

«Уязвимость» является термином, который часто используется в экономической политике для описания рисков, связанных с неустойчивостью урожайности и изменением климата. Россия обладает огромным потенциалом для расширения сельскохозяйственного производства – 10% пахотных земель во всем мире. В период 2006–2011 гг., несмотря на негативные тенденции в мировой и национальной экономиках, средний темп ежегодного роста сельскохозяйственного производства составил 4,4%. В 2011 г. благодаря благоприятным погодным условиям и эффективной государственной поддержке сельскохозяйственного сектора произошло увеличение профильного производства на 22,1%. Однако на следующий год, несмотря на некоторые позитивные тенденции в росте производства продукции животноводства, мясных и молочных продуктов, темпы развития сельскохозяйственного производства стали отрицательным. Тем не менее в 2013 г. сельское хозяйство России вновь продемонстрировало подъем на 6,2%.

Следует подчеркнуть, что в российских климатических условиях большинство популярных технологий и методов производства недоступны, что ограничивает хозяйства в возможностях минимизации высокой изменчивости урожайно-

сти, а также в повышении уровня диверсификации сельскохозяйственных культур и в целом сужает перспективы преодоления рисков в сельскохозяйственном производстве. Прогнозируемое увеличение негативных последствий глобальной нестабильности актуализирует проблему конкурентоспособности отечественного сельскохозяйственного производства и ряда подотраслей. Хотя многие россияне поддерживают снижение зависимости от Запада, возможности отечественного сельского хозяйства и рост производства в ближайшем будущем позитивными назвать сложно. Все эти обстоятельства делают важными исследования уязвимости сельского производства России в целом и Ростовской области в частности.

Ростовская область является крупнейшим производителем сельскохозяйственной продукции, обеспечивая примерно 5% всероссийского сельхозпроизводства и почти 20% общего объема сельхозпродукции Южного федерального округа (ЮФО). Почвенные и климатические показатели в регионе, несмотря на периоды засухи, благоприятны для производства сельскохозяйственной продукции. В то же время исследования показывают, что в условиях финансово-экономических реформ сельское хозяйство области сталкивается с ограничением сельскохозяйственного развития: сельхозпроизводство и ведение агробизнеса не только невыгодны, но и не работают в ряде ситуаций. В этой связи в качестве важнейших составляющих данного исследования выступили выявление ключевых характеристик риска изменчивости урожайности в зависимости от природно-климатических условий, определяющих восприимчивость сельскохозяйственного производства к внешнему воздействию, а также тестирование основных показателей уязвимости в регионе.

Исследование проводилось на основе поискового факторного анализа, был введен фактор структуры уязвимости в локальной экономике. Валидность исследовательской анкеты оценивали и уточняли 75 членов исследовательской группы Ростова-на-Дону, в том числе Южного федерального университета, а также ряд правительственных экспертов из администраций сельских районов Ростовской области. Полевой характер исследования реализован через интервьюирование фермеров, глав районных администраций, специалистов сельских хозяйств (агрономов, зоотехников), научных работников Мясниковского, Октябрьского, Сальского районов Ростовской области, п. Персиановка, Новочеркасска и Ростова-на-Дону. Исследование проходило в период с марта по август 2015 г.

Для объяснения причин уязвимости сельхозпроизводства региона набор параметров был уточнен на основе экологических, экономических и социальных характеристик области, также ставилась задача определить разницу между идеальной и реальной ситуациями. В связи с этим респондентам было предложено определить фактор, который в течение последних пяти лет оказывал наибольшее воздействие на экономику сельских районов. Точка зрения респондентов измерялась с помощью шкалы из 10 пунктов (1 = неважно или неэффективно, 10 = очень важно). Приоритеты вышеуказанных факторов устанавливались с использованием кросс-табуляции между биномиальным коэффициентом вариации, а их синтез свидетельствует, что сельскохозяйственный сектор в Ростовской области нестабилен вследствие низкого уровня рентабельности, снижения чистой прибыли, высокой стоимости производства и доминанты монокультурной экономики. На основе триангуляции между коэффициентом Фридмана, CV и биномиальных статистических тестов были выделены три наиболее значимых параметра производственных рисков:

– серьезное повышение цен на сельскохозяйственные удобрения, пестициды, корма для животных;

– высокие постоянные издержки производства в сельском хозяйстве;

– низкий уровень рентабельности в сельском хозяйстве.

Как показывает исследование, с точки зрения 73% респондентов, доминирующей проблемой сельского хозяйства в течение последних пяти лет является безработица. Далее респонденты называли перемещение рабочей силы из производственного сектора в теневую экономику, неэффективную пенсионную систему, высокий уровень бедности в сельских районах и социальное неравенство, что в совокупности усиливает социальную напряженность в регионе.

Определение профиля уязвимости – это существенный показатель, направленный на выявление основных внутренних и внешних потрясений, влияющих на показатели сельхозэкономики региона. В той или иной степени ЮФО подвержен сельскохозяйственным катаклизмам, производственным и социально-экономическим рискам, которые продолжают усугубляться ввиду социально-экономических преобразований и роста демографических изменений, а также из-за отсутствия необходимых институтов в сельских и сельскохозяйственных районах.

Корреляция показателей развития малого предпринимательства и его поддержки со стороны государства в регионах России показывает низкую эффективность принимаемых правительством мер. Предполагается, что конкретная политика адаптации может значительно смягчить проблемы, с которыми сталкивается российский сельскохозяйственный сектор, при том что аграрный сектор России долгое время будет находиться под влиянием глобальных вызовов, которые Россия способна решать посредством инновационной сельскохозяйственной политики и стратегии адаптации для жителей сельских территорий. Что касается Ростовской области, то потенциальный экономический рост должен быть использован в полной мере за счет успешных мероприятий в области экономической политики, одно из которых – реализация модели роста на основе развития производственных мощностей, строительства дорог, инфраструктуры и промышленных объектов. Когда вышеуказанные меры будут реализованы, среднегодовой темп роста ВРП Ростовской области может быть спрогнозирован на уровне 4,8%. Высокие темпы могут быть сохранены за счет увеличения внутреннего спроса посредством эффективной политики импортозамещения. Помимо этого, необходимо добавить, что общая экономическая динамика будет зависеть в конечном счете от уровня инвестиционной экспансии.

На основании результатов данного исследования выявлено, что уязвимость сельхозпроизводства в ЮФО перед стихийными бедствиями (засуха и необычно жаркая погода) усиливается недостатком занятости населения, централизованным государственным управлением, ростом цен, социальной нестабильностью. Важно, чтобы местные власти, аграрные специалисты и инвесторы уделяли больше внимания совместным подходам к решению поставленных задач. Наконец, следует подчеркнуть, что наиболее беззащитным слоям сельского сообщества (мелким фермерам и малообеспеченным семьям) должна быть оказана государственная поддержка на основе разработки новых программ развития сельских территорий. Для этого необходимо:

– обеспечить доступ к земельным ресурсам, инфраструктуре и услугам;

– расширить господдержку развития микропредприятий в аграрном предпринимательстве;

- создать сельскохозяйственные кооперативы;
- модернизировать каналы сбыта;
- обеспечить доступ к сельскохозяйственным и производственным кредитам с низкой процентной ставкой;
- развивать сотрудничество с фондами по социально-экономическим проектам, смягчающим трудности, которые переживают безработные и представители бедных слоев населения.

Кроме того, расширение потенциала местного самоуправления позволит муниципалитетам самостоятельно решать многие проблемы из перечисленных вопросов развития сельских сообществ.

Ключевые слова: факторный анализ, институты, анализ рисков, Ростовская область, сельское хозяйство, уязвимость

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