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Mycotoxin Standards along Cereals Value Chain in Russia and their impact on EU-Russia trade

Nune Edwards, Heinrich Schüle, Khachatryan Armen

Content

Abstract

Global trade liberalization increased the flows of agricultural products also from transition countries. Particularly Russian Federation has become one of the world leading exporters of wheat, which however, due to major deficits in the national food safety regulations, do not always meet the stringent food safety standards of the developed countries.

The quantitative estimation of trade impact of food standards on exports from transition countries, conducted through econometric analysis during the first phase of the current research, resulted in a statistically highly significant 4,33% decrease in value of wheat

exports, in case of 1% stricter standards. The second phase of the study presents the investigation of Russian national food safety regulations along cereal value chain, and aspires to evaluate the possible compliance of Russian norms with EU standards, aiming to increase the exports of Russian wheat to EU countries.

Keywords: SPS regulations, Gravity model, Russian wheat value chain analysis, Stavropol region

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Introduction

Food safety issues in the global trade policy

Globalisation and the current stage of trade liberalization enabled also many transition countries to penetrate the international market of agricultural products. Particularly Russian Federation has become one of the world leading wheat exporters. On the other hand globalisation raised the importance of food safety and quality concerns, because the vast technological differences do not always allow the producers in transition countries to meet the stringent food standards set by developed countries. Therefore many EU countries implement precautionary food regulation policies to protect their affluent consumers from unsafe food imported from transition countries. However, these policies are increasingly being interpreted as a simple protectionism (Roberts et al., 2000), due to alarming number of trade disputes at WTO evidencing cases of abuse of such policies. Many researchers consider them as non-traditional (technical and regulatory) barriers, "substituting" the traditional trade protection measures that had been eliminated throughout the1990s (Maskus and Wilson 2000; Baldwin, 2000; Dohlman, 2003, etc.).

Irrelevant whether the goal of EU policies is a "genuine protection" of its consumers or "disguised protectionism" for its producers, the reality is that many exporters confronting the cases of blocked shipments are from transition countries, some of which are partners of EU, especially in the market of wheat and processed products. Thus, about 45% of notifications to the EU's Rapid Alert System for Food and Feed (RASFF) in 2006 concerned products from third countries, the 12% of which constituted cereals and bakery products, originating from transition countries[1].

Nevertheless, the claims on protectionist nature of food regulations could be valid in principle. Yet, there is little empirical evidence about their quantitative economic effects, which challenges policy decision makers with the dilemma of finding "trade off" between food quality and cost effectiveness. For that end the research methods of economic assessment are underdeveloped. Besides, systematic information on regulations themselves is lacking. The questions of 1) quantification of trade impact of food standards and 2) investigation of national food regulation systems are absolutely essential for the new trade agenda.

The problem becomes more accentuated with the future completion of the process of harmonization of aflatoxins[2] standards in certain foodstuffs, subject to full implementation since 2007. The internationally acknowledged standards on aflatoxin (suggested by Codex Alimentarius) are significantly more relaxed than those in several EU countries. Within the EU the aflatoxin maximum residual limits (MRL) are not yet completely unified[3]. This variety of aflatoxin standards within the EU allowed many transition countries, which already comply successfully with international standards, to send their wheat shipments to EU countries with less stricter standards. The current stage of EU harmonization of aflatoxin

[1] RASFF, Annual report, 2006

[2] Aflatoxins, from the family of mycotoxins, are naturally occurring metabolites produced by certain species of moulds during the phases of growing or after harvesting at storage or processing stages. Whilst the moulds can be considered as plant pathogens, the ingestion of the toxin can result in disease in animals and humans. Mycotoxins like aflatoxins and ochratoxin A are known to be carcinogenic.

[3] E.g. Austria set the standard for aflatoxin B1 at 1 ppb, while Portugal had its standard at 20 ppb.

standards has already tangible outcomes. Thus, out of 874 alert notifications on mycotoxins received in 2006 (RASFF report), 802 concerned existence of higher than allowed levels of aflatoxins in different products, including cereals.

What impact the complete harmonization will have on agricultural exports from third countries is a highly concerned matter, which is not exhaustively investigated for transition countries till now, even though there are quite prominent studies for the case of developing countries.

Because wheat is a strategic export product for transition countries at the EU market, the question of stricter aflatoxin standards is especially relevant for trade flows of wheat from transition countries.

Research Objectives and Hypotheses

The proposed research aims at assessing the role of EU aflatoxin standards in transition countries' export dynamics by quantification of trade effects of those standards and by investigation of their impact on food regulations for cereals value chain in Russian Federation.

The main objectives of the research are:

1. Quantification of trade effects of EU aflatoxin standards on agricultural exports from transition countries
2. Investigation of Russian national SPS regulations on aflatoxin in cereals, their enforcement and monitoring mechanisms along cereal value chain
3. Estimation of the implication of compliance with EU standards for the case of Stavropol region of Russian Federation.

The following two hypotheses were to be tested:

1. Stringency level of SPS regulations of EU on aflatoxin in food is negatively associated with trade flows from transition countries,

2. The compliance of aflatoxin standards in Russia with EU standards is in the long run more cost efficient and profit generating than the non-compliance is.

Methodologies applied

The study area is Stavropol region of the Russian Federation, as the major agricultural region of the country.

To test the first hypothesis we have applied the methodology of Gravity equation addressing the first objective, i. e. the quantitative estimation of impact of EU aflatoxin standards on transition countries' exports (objective one).

The second hypothesis is being tested

- through employment of methodologies of value chain and cost-benefit analysis addressing the second objective - the assessment of Russian food regulations for cereal value chain, their enforcement and monitoring mechanisms; as well as,

- through implementation of the methodology of comparative advantage analysis based on DRC approach to meet the third objective – evaluation of the potential of compliance of Russian norms with EU standards.

Empirical Model for Estimation of the Impact of Aflatoxin Standards on Cereals Exports from Transition Countries

Gravity Analysis - Conceptual presentation of the model

Following the latest developments in the use of gravity models in estimating the trade effects of standards, we employ an econometric approach using the maximum allowable aflatoxin B1 levels in wheat as a direct measure of the stringency of food safety standards, which attract large interest in recent policy discussions and economic disputes.

This methodological approach has been constantly further developed especially in the studies of a World Bank research group investigating various impacts of food safety standards (Otsuki, Wilson and Mann, 2003)[4]. Wilson and Otsuki (2002)[5] employ the gravity model to analyse the effects of pesticide residue standards on bilateral trade flows.

When a measure of stringency of a food standard is available, an econometric approach has really an explicit advantage in measuring the statistical relationship between standards and trade flow, without prior imposition of the sign of the effect. Wilson and Otsuki (2001)[6] discuss the impacts of food regulations on trade flow among 15 importing and 31 exporting countries in the world.

Using a gravity model, Moenius, Otsuki and Wilson (2002) have regressed bilateral trade flow on the stock of standards along with Gross National Product (GNP) and population, and geographical distance between variables countries. The results generally support the conclusion that the gravity model is well suited to examine all product groups in the analysis.

Otsuki and Wilson (2004) found that aflatoxin B1 standards in importing countries have a negative effect on trade flows in the cereals and nuts regression.

[4]T. Otsuki, J. Wilson, C. Mann "Trade facilitation and economic development, Measuring the impact", p.19, 2003

[5]J. Wilson, T. Otsuki "To spray or not to spray, Pesticides, Banana exports and food safety", p.21, 2002

6J.S. Wilson, T. Otsuki, "Global trade and food safety, Winners and losers in a fragmented system", p.19, 2001

Otsuki, Wilson and Sevadeh (2002)[7] employ a gravity-equation model to estimate the impact of changes in differing levels of protection based on the EU standard and those suggested by international standards, using trade and regulatory survey data for 15 European countries and 9 African countries. The result suggests that cereals, dried fruits and edible nuts trade are negatively affected by stringency of aflatoxins standards in Europe.

The current research adopts the principles of the model developed by Wilson et al. (2004), Khachatryan et al. (2005, 2006) and Hakobyan (2007). Our purpose herewith is to quantify the effects of aflatoxin B1 standards on the bilateral trade between countries considered in the dataset.

Our specification of gravity model is the following:

$$\ln(wheat_{ij}) = b_0 + b_1 \ln(pcgdp_i) + b_2 \ln(pcgdp_j) + b_3 \ln(pop_i) + b_4 \ln(pop_j) + b_5 \ln(dist_{ij}) + \\ + b_6 \ln(afla_i) + b_7 rta_j + b_8 year + \varepsilon_{ij} \quad (1)$$

where:

- $wheat_{ij}$ - denotes value of wheat trade from exporting country to importing country in the dataset,
- *b's* - parameters are respective coefficients, in this case, as we have a log-log specification, *b's* represent elasticities,
- *pcgdp* - is per capita GDP in the *i* importing and *j* exporting country, respectively,
- *pop* - is the population again in the *i* importing and *j* exporting country,
- *dist* - is the geographical distance between countries *i* and *j*,
- $afla_i$ - is self-explaining denoting the maximum allowable aflatoxin B1 level in the imported wheat,
- rta_j - represents the affiliation to a regional trade agreement of an exporting country,
- *year* - is time dummy responsible for capturing the effects of technological change over time. Such a so-called year dummy is included for each of the dataset years, except that for 1999, which is taken as a reference year: $year_{1999}$ is omitted from the model because otherwise we would have a perfect collinearity problem.
- ε_{ij} - represents the error component which is assumed to have a normal distribution with mean zero.

[7] T. Otsuki, J. Wilson, M. Sewadeh "Saving two in a billion: A case study to quantify the trade effect of European food safety standards on African exports", p.17, 2002

For some years and countries (in different combinations) we either did not have data on wheat trade value or no trade (zero value) has taken place according to COMTRADE database. For those cases, we add 1 to avoid losing observations when taking logarithms of wheat trade value (missing values would be otherwise generated). The value of wheat trade is regressed on the variables listed above.

Introduction to data

Our dataset encompasses trade, economic and demographic data on 14 importing and 7 exporting transition countries over a period of 7 years from 1999 to 2005, which are obtained from secondary sources. The data on wheat export value, prices and quantities are compiled from UN COMTRADE.

Database as well as from World Bank's Trade and Production Database. The data on MRL of aflatoxin B1 of importing countries are obtained partly from literature, and partly from the EU Food Safety Regulations, as well as the official homepage for mycotoxin MRL-s. Distances between countries are taken from http://www.mapcrow.info/ and as well as calculated using ArcGlobe Version 9.2 from ArcGIS 9. GDPs as well as population data are obtained from List_of_countries_by_GDP_(nominal). Econometric analyses have been done using Stata 9.2.

Elaborations into the data

The countries included in the analysis in the group of importing countries are Germany, Greece, Spain, Italy, Albania, Algeria, Morocco, Egypt, Israel, Tunisia, Turkey, Georgia, Russia and Ukraine. The exporting countries are 7 in number: Poland, Hungary, Bulgaria and Romania, as well as Kazakhstan, Ukraine and Russia. These are the most important wheat exporting transition countries.

Descriptive statistics

Table 1 provides some summary statistics on the model variables. Except for the logarithm of wheat value, which is the dependent variable on left side of Equation 1, other variables have small standard deviations. For wheat, the variation is considerable due to sometimes large differences between values of traded wheat between various exporting and importing countries presented in above paragraphs.

Table 1: Summary descriptive statistics, model variables

Variable	Observations	Mean	Std. Dev.	Min	Max
logwheat	651	8.69	7.55	0.00	19.68
logpcgdpimp	651	9.13	0.71	8.16	10.28
logpcgdpexp	651	9.05	0.31	8.42	9.68
logpopimp	651	17.01	1.11	15.06	18.80
logpopexp	651	17.07	0.92	15.83	18.80
logdist	651	7.50	0.59	6.08	8.65
logafla	651	2.03	0.60	0.69	2.71

Source: Own calculations based on the data compiled from UN COMTRADE database.

Results of Econometric Analysis

Base run of the gravity model and the results of model estimation

A fixed-effect model for exporting countries as cross-sectional units is used. The error term is considered to represent the common features within a group of observations related to each country.

Table 2: **Fixed-effects (FE) cross-section time-series regression results (*logwheat* is the dependent variable)**

Variables	Coefficient	Std. Err.	t-value	P>t	[95% Conf. Interval]	
logpcgdpimp	3.58	0.77	4.68	0.00	2.08	5.09
logpcgdpexp	6.37	5.38	1.18	0.24	-4.20	16.93
logpopimp	0.82	0.24	3.34	0.00	0.34	1.30
logpopexp	-60.35	38.98	-1.55	0.12	-136.91	16.20
logdist	-4.01	0.73	-5.52	0.00	-5.43	-2.58
logafla	4.33	0.95	4.55	0.00	2.46	6.20
rta	0.65	0.92	0.71	0.48	-1.15	2.45
dt2000	-2.27	1.11	-2.05	0.04	-4.44	-0.09
dt2001	-1.17	1.35	-0.87	0.39	-3.81	1.48
dt2002	1.27	1.69	0.75	0.46	-2.06	4.59
dt2003	-1.44	2.21	-0.65	0.52	-5.79	2.90
dt2004	-3.40	2.60	-1.31	0.19	-8.50	1.71
dt2005	-3.69	2.93	-1.26	0.21	-9.44	2.07
_cons	957.46	667.57	1.43	0.15	-353.46	2268.39

Source: Own calculations

The coefficients represent respective elasticities in relation to wheat value because of double-log model specification. The results in Table2 indicate that a 1% increase in regulatory stringency, i.e. tighter restrictions on the contents of aflatoxin B1 in wheat, would lead to a decrease in wheat exports by 4,33%. This is a highly elastic and very significant impact on trade with particular relevance to transition countries. The positive sign of the coefficient suggests that wheat exports are greater to a country that has looser standards on aflatoxin B1 contents. In the model, an importing country's per capita GDP is positive and significant, and economically large. Translating into numbers, 1% increase in per capita GDP would result in 3,58% increase in wheat imports (in monetary terms). Consistent with general logic, per capita GDP of an exporting country should not have significant impact on wheat imports.

The sign (negative) of population of an exporting country (logpopexp) is as expected suggesting that exporting countries would be lowering their exports following a large increase (of course not happening at once) in their populations. One should however treat the very large coefficient (60,35) with extreme caution. Geographic distance is negative and

statistically highly significant (at 1% level) as a priory assumed. Appealing evidence so far is that the stringency of standards and the exports have negative relationship suggesting the exporting countries incur costs to comply with tighter standards whether they spend money or time needed for adjustment, or both. None of the time dummies, except that for 2000, is significant. For those years, it is not clear if the dynamics of changes is properly captured or not. The coefficient of year 2000 is significant at 5% level, and is negative suggesting that, compared to the base year 1999, imports sunk by 2,27%. The affiliation to a Regional Trade Agreement (RTA) is not significant: a not readily interpretable result implying RTA does not play a major role (also the magnitude shows a low responsiveness of wheat exports).

Sensitivity analysis and interpretation of the results

In addressing possible developments, we considered four alternative scenarios and compared each of them to the situation under the pre-harmonisation status. The latter we considered as our base model. The four alternative scenarios are: (1) all importers decide on following the standard of aflatoxin B1 at 2 ppb which is being currently strongly promoted by the EU (however not yet in force in all EU countries); (2) all importers follow the standard of aflatoxin B1 at 10 ppb recommended by the CODEX; (3) while the EU member countries adopt the standard of aflatoxin B1 at 2 ppb, others prefer maintaining the status-quo; (4) the EU countries follow the standard of aflatoxin B1 at 2 ppb, whereas others adopt the CODEX standard at 10 ppb, heavily encouraged by WTO.

We have used regression estimates to arrive to predicted values for the base model. These are then compared to results obtained changing values for standards under alternative scenarios.

Scenario 1: all importers set standard of 2 ppb of aflatoxin B1 promoted by the EU.

Under the scenario 1, the group of importers as a whole import less because of the more stringent standard of 2 ppb for aflatoxin B1 suggested by the EU. Under the base model, the

countries import wheat in value of 940 million USD: the MRL of aflatoxin B1 at 2 ppb adopted in all countries would result in the dramatic decrease in value to only 136 million USD: a decrease by 800 million USD.

The comparison of the results of the scenario 1 with those of the base run, i.e. the reference situation, demonstrates that these are quite plausible. Thus, the total import value of Germany under the current situation and under the scenario 1 remains unchanged, because aflatoxin B1 MRL in Germany is already 2ppb currently and therefore will remain the same also under the scenario 1. The situation is different in other EU importers like Greece, Italy or Spain. All the three countries set the aflatoxin B1 MRL at 5 ppb currently. The scenario 1, setting aflatoxin B1 MRL at 2ppb, results in a sharp decrease by about 65% of the total import values of wheat for Greece and about 95% of the total import values of wheat for Italy and Spain (e.g. for Italy representing a fall from 86 million USD to only 4 million USD and for Spain a fall from 54 million USD to 2 million USD).

The 7 exporting transition countries experience a sharp decrease of total export value under scenario 1. Thus the total export value in the base run for one of the reference years 2005 amounting in 1,8 billion USD demonstrates a dramatic fall under the scenario 1 amounting to 148 million USD (Fig. 5.12).

Scenario 2: all importers follow the CODEX standard of aflatoxin B1 at 10 ppb.

When the standard of aflatoxin B1 MRL at 10ppb, recommended by CODEX, is taken, which is much more relaxed than the one suggested by the EU, this immediately gets translated into increase in import values. The total import value under this scenario increases by from 940 million USD to 3,8 billion USD. The 7 exporting transition countries experience a considerable increase of total export value under the scenario 2. Thus the total export value in base run for one of the reference years 2005 amounting in 1,8 bill. USD demonstrates a dramatic raise under scenario 2 amounting to 2,6 bill. USD

Scenario 3: all EU countries adopt aflatoxin B1 at 2 ppb, others maintain the status-quo.

In fact, this policy option obliges the three EU importers (Greece, Italy and Spain) to change their norms of aflatoxin B1 from 5ppb to 2ppb living the rest of countries at status-quo. As could be expected, the total value of wheat shipments under this scenario would diminish from that of the base run by an amount which is equal to the reduced imports by Greece, Italy and Spain together. Indeed, the total import value of 940 million USD in the base run has reduced to 770 million USD in this scenario. Similarly, the total export value in the base run for one of the reference years 2005 amounting in 1,8 billion USD demonstrates a fall under the scenario 3 amounting to 918 million USD. All exporting transition countries of the model demonstrate a tangible decrease in their export values under the scenario 3.

Scenario 4: EU sets aflatoxin B1 at 2 ppb and others adopt the CODEX standard at 10 ppb.

The scenario 4 makes it clear that to have a positive net effect the adoption of the CODEX standard, whether alone or in combination with the EU standard (the latter valid only for the EU countries), is necessary. On the contrary, if only the EU-recommended 2ppb standard is adopted, the net effect is negative, i.e. a sharp decrease in imports is unavoidable. Trade flows of wheat from transition countries will behave themselves almost similarly as under scenario 1, demonstrating a rash raise in total import value.

Investigation of Russian national food safety regulations along cereal value chain

Value chain analysis techniques, based on expert surveys

Techniques of value chain analysis are applied to assess the actual situation in the region. This is aimed at revealing the existence and the extent of actual enforcement of the regulations on aflatoxin standards. Special relevance is given to the food standards system (regulations, their enforcement and monitoring) along the whole value chain, beginning with wheat breeding, seed supply industry, cereals production, post harvest processing, grain handling, storage and transportation, milling/processing and merchandizing/marketing (Titus and Dooley,1996). Thus the officially set B1 aflatoxin maximum residual limit in Russia for cereals, flour, meals and other food is 5μg/kg[8], but there is a big doubt, whether this limit is strictly observed by the firms. Also the enforcement and controlling mechanism and respective institutional arrangements are being examined.

The joint research conducted by University of Hohenheim (Stuttgart, Germany) and State Agrarian University (Stavropol, Russia) in 2007-2008 resulted in the identification of the principal actors along the wheat value chain in Stavropol region. Regional-level key expert surveys have been conducted involving the minister of agriculture, and his deputies; state authorities for food safety, surveillance and control, as well as large wheat producing companies, processing enterprises, elevators, intermediary wheat traders and broker companies, international private consulting companies, and other actors of the wheat supply chain with the purpose:

- to attain information on cereal value chain, regarding the linkages between activities,
- to compare the existing different types of cereal value chain,
- understand food safety regulations (rules, standards, MRL-s) for cereal value chain,
- understand monitoring / control mechanisms and responsible bodies / institutions.

[8]For comparison – B1 aflatoxin maximum residual limit in Germany is 4 μg/kg in food and 0,05 μg/kg in child food.

Descriptive analysis of the state regulation system of wheat and its processed products

The preliminary results of the surveys and analysis allow a general insight into the certification system as follows. The interpretation and analysis of the normative documentation, laws and decrees in the field of food safety show, that there is a rather developed legislative basis in Russia. The quality and safety of wheat and wheat products (WWP) is regulated by the so-called GOST, i.e. state standards, which, however, are not compliant internationally. Yet, there are state norms which regulate allowable mycotoxin levels, as well as define the detection methods.

At the same time, the newly reformed quality control system lacks a clearly defined division of responsibilities among different quality control and monitoring agencies. This results in confusion, contradictions and uncertainty in the wheat sector of the country. Until 2004, overseeing the quality of wheat and wheat products was under the responsibility of the State Bread Inspection (SBI), which besides acting as a watchdog for quality, also conducted analysis of wheat samples through its own accredited laboratories. In addition, SBI worked out criteria for determination of quality. Its mandate was foreseeing also issuing of certificates on quality and safety in accordance with GOST and other normative documents. Thus, this only organisation was endowed with great many different functions and responsibilities giving it a monopolistic power. For grain, flour, and bread, among other products, the certification was obligatory in order trade as well as transportation take place (Regulation N 4 of 17.04.96, GOST Russian Federation).

This kind of monopoly was not in compliance with WTO rules: looking ahead to joining WTO the Government broke SBI down (governmental decree nr. 708 of December 1, 2004) establishing instead several new agencies and institutions which had to share those many functions and responsibilities of SBI. However, until present, the new structure of wheat quality control is not functioning well.

At present, state control and monitoring of wheat is being conducted by the Federal Agency of Veterinary and Phytosanitary Control (FAVPC-Rosselkhoznadzor) of the Ministry of Agriculture. The control of quality of other products, such as flour, bread, etc., is under the responsibility of Federal Agency of Consumer Protection and Human Welfare (FACPHW-Rospotrebnadzor) of the Ministry of Health and Social Welfare.

In the following the general overview of state control of wheat quality will be given considering all the segments of the chain wheat-flour-bread.

Main criteria for quality soft wheat (suitable for producing flour and bread), such as humidity, breed, etc. are defined for every sample according to GOST P52554-2006. According to this standard grain is divided into 5 classes. The certificate of quality is then issued, which confirms conformity of grain to this or that class of the standard. Other parameters, such as the pesticide residues, heavy metals and mycotoxins, are adjusted by sanitary and hygienic norms and rules, namely by SaNPiN 2.3.2.1078-01. Today, this document establishes maximum permissible concentration (maximum residual limit) in the Russian Federation for mycotoxins concerning food wheat: Don, Toxin T-2 and Aflatoxin B1. The latter shall not exceed 0,05 mg/kg.

According to the article 12 of Federal Law N 183 from the December, 5th, 1998 the quality control should occur at all stages of a grain chain by carrying out laboratory analyses, in other words, each party of grain and grain products should be accompanied by certificates of safety and quality at transportation stage as well as when traded.

However, according to Federal Law N 184 from 27.12.2002, in the Russian Federation quality of grain is acknowledged in two ways: by means of voluntary and obligatory certification. FAVPC and FACPHW have powers to check, according to the Governmental order 305 from 23.05.2006, only those wheat products which are a subject to obligatory certification. These are:

- products for export/import,

- products to cover state needs,

- products for replenishing state reserves.

All other production must go through voluntary certification. However, it does not mean, that the grain producer can do the certification when and if he likes. According to the same law, each producer should apply independently to the centre of certification to acquire a certificate of safety. At the same time, FAVPC has no powers to check up, whether the producer is in possession of the required certificate, and, hence, to check up the quality of the wheat.

This paradox in the Russian legislation allows selling the produce in the domestic market without the certificate of safety, as no organisation can punish for its absence. For this reason participants of a grain chain are not interested in certificates of safety, and hence in defining the content of mycotoxins in their production. They consider the application process as an additional burden which will inevitably raise production costs.

In fact, only the exporters of Russian wheat are genuinely interested in acquiring such certificates of safety. The domestic actors would apply for them only if the buyer demands such a certificate.

Picture 1. illustrates the structure of the state system of certification in wheat sector Certificates are issued by the Federal State Centre for Grain Safety and Quality Assessment (FSCSQA), which operates under the auspices of FAVPC. Regional representations of FSCSQA, one of which is situated in Stavropol, have control labs accredited by FAVPC to conduct analysis in accordance with GOST. At the same time, certificates of safety are given out by the Centers of standardization and metrology, which operate under Federal agency on technical regulation and metrology (Gosstandart of the RF).

Interestingly, the laboratories of the both systems apply the same methods and equipment of analysis, but the prices of their services are not equal.

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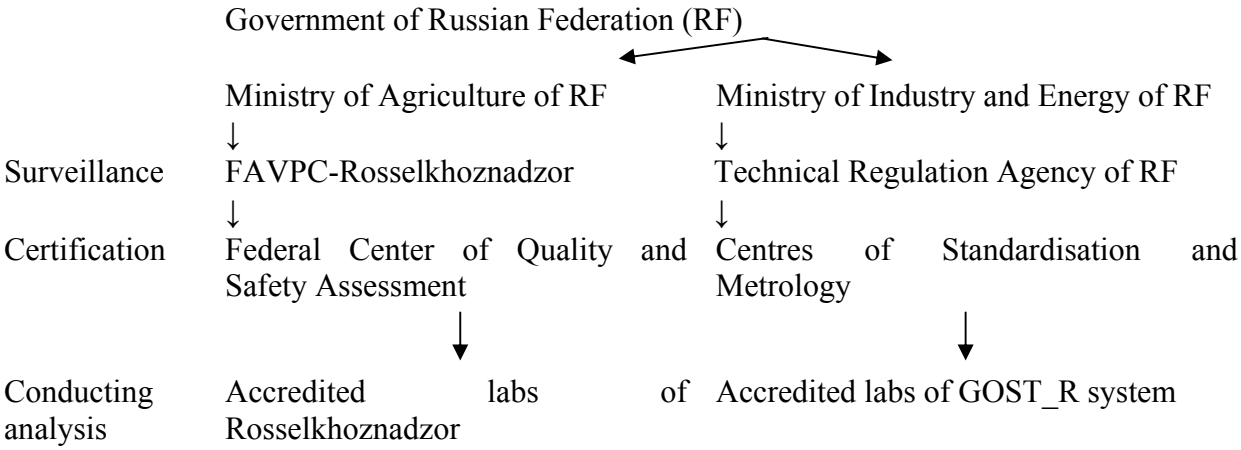

Figure 1. Structure of the state control of quality of wheat and wheat products

The officials at FAVPC have serious reasons to doubt the quality of the analysis in several such labs, stating that these do not perform any SPS analysis at all, but do only the analysis of quality characteristics. Hence, the certificates issued by these labs are fictions. At the same time, GOST has no motivation to control its own labs more tightly.

In their turn, customers, in particular exporters of grain are not interested in these certificates, as they do not trust the results of the analyses. More important is to obtain the certificate of safety as soon as possible, thereby spending as less as possible. Therefore, the Russian certificates of quality and safety are not quoted abroad, they are necessary only for registration of the customs declaration. Yet, the foreign importer organisation, buying the wheat form the Russian exporters, uses the services of international organisations of quality analysis acting in Russia to get a quality and safety certificate. These organisations start the analysis right after production, at the storage facilities of the producer. This double certification system increases the value of wheat for all the actors of the value chain. The certificate itself is interesting for the foreign importers merely for protection their national market from low quality Russian wheat. Nevertheless, while preparing these certificates the Russia-based international agencies are interested mainly in their profits and do not care about the safety issues, therefore their certificates are also not safety, but only quality certificates. They analyse only those characteristics, for which their client pays. The expert survey of

several such organisations revealed only very rare cases that the foreign importers of Russian wheat order the checking of SPS characteristics, e.g. for aflatoxin content. This fact evidences that the majority of Russian wheat importers are countries with even looser food safety standards than Russia itself.

Availability of analytical information on quality

Aside from the immature system of certification, there is a very little analytical information is available for quality assurance and safety of grain and grain products in Russia. At present, the majority of laboratories use inefficient methods for the control of mycotoxin contamination. On the other hand, the methods and devices developed and registered in the country for the express analysis are not demanded, as supervising bodies are not ready yet to large scale work on quality and safety check of grain, flour and bread.

Besides, the accuracy of results of the analysis of mycotoxins is connected with the correct choice of the average sample and its handling, the reason for about 90 % of all mistakes. This is important as distribution of toxins in average sample is non-uniform, and their concentration in kg of grain is measured in milligrams or micrograms. Among other important points, it is possible to allocate also clearing of extracts of accompanying impurities, the quality of the standards available in laboratories are also to mention (A.Gogin, 2005).

Description of the wheat sector

The wheat production system of the region includes a number of sectors and sub-sectors of agriculture, industry, the procuring, trading and other organizations providing production, transportation, storage, processing of grain and grain products, which have technological, organisational and economic relations (Dzhantotaeva E., 2003).

On the whole, grain sub-complex can be divided into three blocks. The first is the production of grain, the second - harvest, storage, transportation and processing of grain, and the third

block includes the utilisation of grain for food, fodder and technical needs. In the following each stage of the value chain will be treated separately paying special attention to questions quality and safety.

Wheat production plays the leading role in the agriculture of Stavropol region. Total harvest of grain crops in 2006 was 6,4 mio t with average productivity of 3,2 t/hectare. With 2004,3 thousand hectares , grain occupies 71 % of available agricultural land. In 2006, 5012,7 thousand tons of winter wheat was harvested by all types of farms (600 agricultural enterprises and 15 thousand farmers). The primary market of in the value chain is characterised by the dominance of the large-scale producers. The share of farmers in production and sale of grain makes up only 17%[9]. The large agricultural enterprises are more stable and effective. Therefore a priority direction of development of agrarian sector of economy is consolidation of agricultural enterprises (Veretennikov, 2003). The lion's share of the grain grown up in region is of class 4 (food) with 10-12 % of protein, i.e. wheat which is demanded in foreign markets. Wheat of class 3 with 12-14 % of protein is expensive to produce and therefore has little demand. Resources of grain available in Stavropol region in 2006 were distributed as follows: 48,0 % were taken out of the region (including export), 24,7 % remained in stocks, 11,5 % were used in industrial consumption (for forage, and as seeds), 15,5 % were used for processing in flour, groats, mixed fodders, etc. and, 0,3 % constituted losses at various stages of production. Grain production has an increasing tendency (Tab. 2), and continues to strengthen the position in the international grain market. The region exports more than half of the grain harvested in the region.

Table 2. Dynamics of grain production in Stavropol region

	2000	2001	2002	2003	2004	2005	2006
wheat (after processing), 1000 t.	3676,2	4773,5	6122,2	3744,4	6197,9	6872,2	6426,4

Source: www.stavinvest.ru

[9] www.stavinvest.ru

The production growth is achieved not through effective production technologies, but through simple extension of territories under wheat production. Thus, growth of production of grain crops in 2007 is provided due to expansion of the areas under crops by 8,2 % and increase of average per hectare productivity by just 3,2 %.

The general situation of wheat sector faces a lot of problems. Firstly the production enterprises have poor technical equipment level, comprising only the 55-60 % of the need on machinery (Veretennikov, 2003). Today, the 80 % of available machines are obsolete, and more than 40 % of collected grain is stored in outdated facilities thus making the stored grain prone to illnesses (Ushakov, 2005). Also fertilisers, chemicals, fuel and lubricants are deficient (Skljarov I.J. 2006). Technologies of cultivation, harvesting and storages are not modernised during last 30 years and a wheat sector of Russia depends on 70 % on weather, only on 25 % - from material resources and on 5 % - from human factor.

The extensive and non-efficient production technologies are in contradiction with the scientifically-proved cultivation modes (crop rotations) that leads to an aggravation of phytosanitary conditions in the fields despite the fact that the basic technical characteristics of wheat grown in Stavropol region is of good quality. Safety characteristics increasingly cause problems. The following illustrates food safety considerations at every segment of the wheat value chain

Seeding. The production of wheat starts with a choice of a breed which possesses the greatest adaptability to local soil-climatic conditions of cultivation. If seeds were bought from specialized firm mycotoxins contamination at this stage of the value chain is excluded. Seed-growing facilities pass rigid certification and if they had cases of disease in seed crops, the wheat cannot be sold as seed. Besides, seeds are treated with pesticides to prevent illnesses. In cases when grain producers use own seeds, there could be mycotoxin concentration cases.

Wheat post-harvest and supply channels. The major cause of occurrence of aflatoxin B1 is poor storage technology. Favourable conditions for development of microorganisms are

increased humidity and impurity. The situation is aggravated, if producers have no suitable equipment for clearing and drying grains, do not control the condition of grain during storage, and warehouse facilities do not protect grain from being hit by moisture and sharp fluctuations of temperature.

Fungi are everywhere - in air, ground and water, therefore measures taken during the vegetation of wheat, and also the use of various methods of cultivation do not render essential influence on the contamination of grain with fungi. As the prices for grain during the harvest are low, farmers keep grain in the warehouses until the prices in the market stabilise. In storage facilities which are not adequately equipped and are in worn out condition, the accumulation of mycotoxins is inevitable. Nevertheless, in these farms there is no control over the content of aflatoxins in grain at all stages of grain production. Only the enterprises which directly export the grain, and also the grain for state needs or for the state reserve, carry out the laboratory analysis of tests of grain in the accredited laboratories. But the share of such enterprises is insignificant. In the primary grain market channels, only large production volumes play important role: direct deliveries to the procuring organizations or to large private intermediaries. As these transactions concern the internal market they are not accompanied by the certificates of safety, and sometimes also by the certificate of quality if these certificates are not explicitly demanded by the buyer.

The share of other trade channels of grain, such as the city market, through a retail network, sale to the population is very insignificant. The participants of these channels fare farmers-producers, and also workers of collective agricultural enterprises. In the latter case, the secondary market is meant as those workers do not produce the grain independently, but sell that grain which they received in the form of a loan payment. These are alternative supply channels, but they are not significant.

Instead, direct deliveries of grain to processing (to flour-grinding and combined fodder enterprises) have quite significant share.

In 2006 in Stavropol region there were sold 3129,8 thousand tons of wheat through various channels: 78 % was sold to the processing enterprises and to the organizations of wholesale trade, 14 % went to the population (including paid to the workers as a loan payment); 7,3 % were barter transactions; 0,7% were procured by the enterprises and the organizations which are carrying out purchases for the state needs.

Wheat storage and elevator sector. The main meeting point of the seller and buyer is elevator, where large amounts of wheat accumulate. Elevators perform operation of filling, completion, storage and loading of grain on truck or a railway transport, carry out mediator-functions between the grain producers and consumers. As a matter of fact elevators play a role of "Bank" of grain. There are 26 elevators in the region. All of them are private ownership; however the state possesses various share holdings of each of them. A small amount of big exporters of regional grain, which are the affiliated organizations of international corporations - traders of grain like "MZK", "GLINKOR", "KARGILL", "SILVERSTONE", play a major role in the region.

The questions of quality at this segment of the chain are presented on the example of “Luis Dreifus Vostok” company, which possesses 6 elevators. During operations of filling, storage and loading to transport the company bears the responsibility for quality. Such large elevators are being controlled on a yearly basis and are granted certificates. Before letting the wheat in, the elevators of this company control the documentations of the producer or the mediator and are allowed to take only grain which has quality and safety certificates. While shipping the grain from the elevator to millers or to other intermediary segments no safety certificate is required: only wheat quality is important. Only the exporters need safety certificates, for which they request additional analysis at loading points in ports.

Production of flour and bread. Processing of grain in flour is carried out mainly at large milling factories. However there are increasingly emerging alternative channels in the wheat sector: small-processors of grain and flour (so called mini-mills, mini-bakeries).

Development of the milling branch was chaotic, uncontrollable during the last fifteen years. The number of the milling enterprises in Russia has increased from 388 up to 2212, almost 6 times, while the flour production has decreased from 18,8 up to 10,8 million tons. Only the 38 % of available capacities are used (Orehova, 2006). Mainly the mini-mills are to be blamed for non-standard low quality flour, while such cases are 30 times less at large factories. Our investigation of the operations of small mills revealed, that the small producers are concerned only with quality, but never with safety (microbiological) characteristics of flour they produce. Also, the consumers are not informed about the cases of mycotoxin contamination.

Bread. The baking industry is one of the successful branches in the region. In 2007 the bakeries in the region produced 160,9 thousand tons of bakery products of over 620 varieties. The system of certification at this stage was similar to the above mentioned. Consumers did not complain, because there was no awareness about mycotoxin problem. The 65 % of flour at bakeries were of rather bad quality. This is because the 60 % of flour was produced by private mini-mills. More than 70 % of all bakery products are baked in private mini-bakeries. Besides, there are no control mechanisms for these commercial structures. According to rough estimations the 3,79% of bakery production in Russia does not meet the chemical and the 6,58% microbiological requirements (Monastirski, 2007).

Summary

Table 3 summarizes the sectors of storage, processing, transporting and trading of wheat and bakery products on the example of one representative form of each of the sectors.

Chain segment/ attribute	Storage and wholesale trade of wheat	Producers of flour	Producers of bakery products
Study objects	Company Luis-Drejfus Vostok Ltd	Private mini-mill of Joint-Stock Company	"Baker", a mini-bakery
Production capacities	250 000 t/year	60 t/day	30 t/day
Relative importance	One of the largest exporters of region, with to 40 % of produced in the region.	small local mill	small local bakery, the only producer of bakery products in the location
Suppliers	60-70 % of wheat come form intermediary traders, 30-40 % are direct deliveries from agricultural producers. The second way of supply is functioning only during the periods of peak sales	Wheat delivered from elevator makes about 75 % of all wheat and 25 % come from private intermediaries agricultural producers	The bakery has 2-3 constant suppliers, they are small farmers, grains engaged in mini- processing. While choosing supplier the product price has major importance
Product market	Almost all grain goes for export to Egypt, Bangladesh, Azerbaijan, Georgia, etc., only small part (5 %) is consumer at the internal inter-regional national market.	No constant customers, market channels are spontaneous, oriented by price options. The main buyers are wholesale private intermediaries, otherwise - retail trade to local population.	30 % of products are sold through retail trade in territory of the region. The rest is traded wholesale to schools, hospitals, kindergartens) of the nearest regions.
Quality concept	**Export:** Quality and the price of production is dictated by importers and the world market. The grain going on export is a subject obligatory certification. There is a double estimation of product quality: local system of certification and independent foreign company allocated in Russia. **Internal operations** the price of production is formed according to parameters quality parameters	Only the basic parameters of quality matter, because they are important for the flour consumer	Only the basic parameters of quality matter, because they are important for the test, volume, form and other consumer relevant characteristics of bakery products.
Awareness of Mycotoxin Problem	The personnel of elevator and the export organization are well informed about mycotoxin, however they think, that the problem is overstated o with the purpose to reduce the price of Russian wheat at the world market	A very low general understanding and awareness of mycotoxin problem However their certificate of safety assures them in absence of mycotoxin in their products.	Some general awareness of mycotoxin problem However the yearly certification of the enterprise assures them in absence of mycotoxin in their products.

Research Results and Conclusions

Intermediary outcomes of the research

Gravity analysis

This study allows understanding the magnitudes and directions of trade flows under the IS-situation and under different alternative scenarios which are currently being heavily debated and may come into force in foreseeable future. The results of gravity analysis provide evidence on the substantial negative impact of strict aflatoxin standards on the exports from transition countries. Not only the hypothesis is proved, confirming that that stricter EU aflatoxin standard has a high significance for the value of wheat exports from transition countries, but also the quantitative value of this significant impact is calculated - a 1 % stricter aflatoxin B1 standard is reflected in a statistically highly significant 4,33% decrease in value of wheat exports from transition counties. This causes surely a justified concern. On the other hand, it is estimated that health risk is by approximately 1,4 deaths per billion a year lower if the EU standard for total aflatoxin contamination were adopted (Otsuki et al, 2001). Hence, many questions remain, so that the economic considerations should be weighted against the health risk that may be imposed by less stringent standards on consumers.

We believe that a larger study would probably add new insights to what is reported in this study. For example, we do not investigate possible benefits for exporting countries if they are able to comply with tighter standards at low cost. It is possible that these benefits offset the export losses. This and few other aspects are beyond the scope of this study.

Russian national food safety and certification system on the example of wheat value chain

The detailed description of wheat value chain in Stavropol region, with special reference on food national standards, their enforcement, surveillance, monitoring and controlling and

mechanisms in all segments of the chain has allowed to obtain major data necessary for the qualitative analysis of a chain.

The results of the analysis show, that the current situation of quality and safety issues of wheat represents an urgent problem in Russia and needs a close attention. At the moment the Russian economy is at transition stage. A large number of intermediaries act in the market of grain, the prices for flour and bakery products grow independent from the fluctuations of wheat prices. In such conditions the structure of food wheat chain cannot be characterised as stable, because the flour and bakery products producers are constantly looking for new consumers and markets.

The WTO accession of Russia raises the necessity of revision of the economic system, as well as the quality and safety regulations in the food industry in general and, in wheat sector, of all the segments of the value chain in particular.

The general consciousness of mycotoxin hazard is not equally matured in different segments of the wheat value chain. The reason is that mycotoxin presence in Russian wheat has a kind of hidden character.

Among internal segments of the value chain and in the domestic market, this is explained with the absolute absence of certification on phyto-sanitary norms and control of microbiological and safety characteristics at all the stages of the wheat supply chain. All the actors of the wheat value chain are interested merely on quality characteristics of wheat and on cheapness of any operation along its way from producer to consumer. No single segment along the chain is interested or even aware of the existence of food safety hazards.

More surprisingly the problem remains unsolved very often also during the external market relations, even though wheat flows designated for export pass through a double certification system and possess certificates of both quality and safety. These certificates are granted from the national certified and accredited laboratories according to the request of the domestic

exporters. But also the foreign country importers need certificates of quality and safety, which they request at internationally established laboratories, having branches allocated in Russia.

The explanation is that, firstly, the major exporters of Russian wheat are non-EU countries (e.g. Egypt, Turkey, Azerbaijan), which have very loose SPS norms, and the existing residual quantity of e.g. aflatoxin B1, which is usually a lot more than 5 ppb, does not matter for them. Secondly, those importers are more interested in importing Russian wheat for fodder production. But the export of wheat for fodder requires stricter and more complex paper work. It is a lot simpler to export food wheat. That is why wheat of classes 3 and 4 is exported as fodder with respectively lower prices (Monastirski, 2006). The safety and microbiological (e.g., mycotoxin residue) characteristics of Russian wheat produced for food is apparently equivalent with the safety requirements of fodder wheat of the importing countries. This is why the only registered contaminated cases of Russian wheat until now are those which are confiscated at the EU boarder. Apparently this is the only instance, where mycotoxin problem is addressed seriously.

By exporting food wheat to meet the fodder requirements of animal husbandry sector of foreign countries, the Russian food exporters do additional harm to the local consumers of food wheat. Local market lacks then food wheat, and instead fodder wheat of a lower quality class (5^{th}) is being delivered for bakery production (Monastirski, 2006).

This fact even lessens the chances of local consumers to have access to good quality and safe wheat and wheat products. On the one hand, the available best quality food wheat, having passed the certification and control, leaves the country to meet the food demand of foreign consumers. On the other hand, the worse quality food wheat is exported as well, as fodder. The consumers in Russia have no other choice, but to cover food demand by consuming fodder wheat.

Expected results

The research is expected to have qualitative and quantitative results.

The detailed description of wheat value chain in Russian Federation with special relevance to national food safety regulations, their enforcement, monitoring and control mechanisms is one important qualitative outcome of the study.

The social price, as the cost of compliance of Russian SPS norms with EU SPS regulations, will be one major quantitative outcome of the research. It is expected that additional social gains will be generated due to increased price of agricultural and food products for their premium quality. Also decreased amounts of rejected exports and hence increasing exports of agricultural and food products (predominantly wheat) from Russian Federation will contribute to those social gains.

Moreover, based on the results of the analysis, conclusions will be drawn on alternative or complementary policy options. Sensitivity analysis will enable to undertake further assessment I) reconstructing the whole sector in the country to comply with international standards, II) rebuilding only a small special export-oriented sub-sector, III) considering the potential of harmonization of standards between trading partners.

Beneficiaries

The final results of this ongoing research will assist 1) international policy makers in having quantitative evidence for designing global trade agenda, 2) researchers in their efforts to solve the problem of how to approach the trade-off between appropriate levels of risk to human health and compliance costs, 2) Russian producers, exporters and decision makers in improving cereal value chain, 3) Russian policy makers in introducing internationally compliant SPS standards towards Russia's WTO accession; and 4) consumers in enjoying safe and high quality food.

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