Original Research Article

Moldovan Tomato Market Analysis through Use of the Agricultural Marketing Information System

Alexander Kandakov[1], Bohumil Havrland[2]

[1]Department of Economic Development, [2]Department of Sustainable Technologies, Czech University of Life Sciences, Prague, Czech Republic

Abstract

The vegetable production is one of the few agricultural profit-generating sectors based on cash crop growing and marketing. Its tomato sector of the Republic of Moldova has a huge potential to become an important income generator within the national economy. It is obvious that the success of this sector development depends on an efficient marketing system and access to information sources in Moldovan rural areas. The lack of information on tomato markets is a major problem for the Moldovan tomato producers thereby limiting their ability to profitably access new markets. The situation is particularly acute for farmers who reside in rural areas where the information flow is much slower and less reliable once it reaches the farmer. Most of producers and processors lack even basic information on fundamental issues like the market demand on product quantities and quality parameters, towards which markets they should address and what distribution channels choose. Usually they do not know who and where their competitors are and how to compete with them.

The paper reports the Moldovan tomato market analysis that was done using the Agricultural Marketing Information System (AMIS). The AMIS is a support tool for agricultural (including tomato) and food product market assessment and access to the information on commodity markets by main producers, production inputs and marketing services in the Republic of Moldova.

Keywords: The Republic of Moldova; Agricultural Marketing Information System; tomato market; market trends; database.

INTRODUCTION

The Moldovan tomato market is of great importance for a part of Moldovan vegetable producers and tomato production is the main branch of the Moldovan vegetable production sector. The tomato business (production, processing and marketing) plays a major role in some districts, especially on river meadows and plains in the South and Central regions of the country. Supervision, analyses and advice in the above sector are important tools (service) for tomato farmers and help Moldovan farmers find up-to-date information is of utmost importance. In order to make it more effective in the scope of the whole Moldovan agricultural and food production sectors an idea to create an information system was evolved in 2007 in connection with a Czech Republic development project. The leading concept was creation of a Marketing Information System easily accessible for users (especially famers) anywhere in the Republic of Moldova that would be simple, reliable and would provide bilateral or multilateral communication with potential for future development. It should enable to answer the following questions of its potential user: **what** – product, **where** – market, **how much** – price, **how** – marketing.

As Kotler and Keller's (2007) definition says, a Marketing Information system is more than a system of data collection or a set of information technologies. It is rather a continuing and interacting structure of people, equipment and procedures to gather, sort, analyze, evaluate, and distribute pertinent, timely and accurate information for use by marketing decision makers to improve their marketing planning, implementation and control (Kotler and Keller, 2007).

Nowadays the new information technologies and technological advances in computer based information systems (Herver et al., 2004) play an extremely important role. This argument is followed by Harmon (2003) who explains that the Marketing Information System is a computerized system designed to provide an organized flow of information to enable and support the marketing activities of an organization, which serves collaborative, analytical and operational needs, designed to be comprehensive and flexible in nature and able to integrate with each other.

Such an above described system was made available for the agricultural and food sectors in Moldova as Agricultural Marketing Information System (AMIS); it enables providing an operative access to the information concerning productive instruments and products, marketing services, business environment, trade outlets, agricultural producers, advisers and operators engaged in agricultural industry. According to the FAO definition the AMIS is a service usually operated in the public sector, which involves on a regular basis collection of information

on prices, quantities of widely traded agricultural products from rural assembly markets, wholesale and retail markets, as appropriate, and dissemination of this information on a timely and regular basis through various media to farmers, traders, government officials, policy makers and others, including consumers (Shepherd, 1997).

The agricultural sector is the most important economic sector of the Republic of Moldova but it is not supported by proper services, especially those which would mediate (on regular basis) marketing information for the agricultural producers. It is why the "business decisions" are taken by small farmers usually on a hazardous basis and local level market information mediated by oral communication.

Creation of an operational information system in the field of agricultural marketing in Republic of Moldova was determined and enforced by a certain amplification of increasing and diversification of agricultural production capacities of local agro-food operators. It is easy to deduct that the rural areas, small-scale farmer and his business are exactly the target areas and groups needing most marketing assistance. Special focus of this article is on so-called "vegetable business" within which the tomato production and marketing plays a very important role by its 84.068 tons of yearly production in 2009 sold inside as well as outside the country for some 2.489.000 USD (FAOSTAT, 2012). The tomato farmers are usually fully dependent on traders and transport providers and have no chance to improve their incomes through storing or processing their production.

MATERIALS AND METHODS

The idea and following conception of the Agricultural Marketing Information System (AMIS) was elaborated and, later on, implemented in the Republic of Moldova. Two originally separate databases of First "Production", and Second "Producers" were completed with the Third one, "Market Research", set into one system and put on the official AMIS web site.

The database production part was conceived so that it could flexibly register a huge amount of information on many agricultural and food commodities. A total of 128 products from more than three hundred items produced in Moldova were selected to register by the AMIS Production D-base.

Creation of the *D-base Production "Tomatoes" Module* section was important for tomato farmers (their number in Moldova is up to 2 700 persons). Mapping their operations and collecting main marketing data were the main activities which created the ground for working out their characteristics and assessing their potential on both the domestic and foreign markets. The main information sources were: official data provided by the Moldovan Ministry of Agriculture and National Agency for Rural Development ACSA. The data were fed into the (above-mentioned) D-base which works with MySQL programming. The data processing was so programmed that a classification of a respective commodity is possible according to: place (producer) and conditions (circumstances) of production, production amount and price, export potential and logistic parameters.

Creation of the *D-base Producers "Tomatoes" Module* section was also necessary. It was done through mapping and collecting data about characteristics of farmers´ production and processing portfolio and future possibilities for tomato export orientation. Again the D-bases at the Ministry of Agriculture and Food Industry of Moldova and at other institutions were used. The program enabled to classify tomato producers according to the location of their operation, area of their business, processing and export potentials and logistic parameters.

The AMIS provides important data through its official websites thanks to data analyses done by the "*Market Research Module"*. For this article, data from the past three years on tomato market tendencies and dynamics of prices were gathered and further statistically processed. Tomato market analyses were carried out twice a month and other information based on interviewing tomato producers and traders was gained. The information from six major markets from the Republic of Moldova has been included into this article: Central and Wholesale Market in Chisinau and agricultural retail markets in Edinet and Soldanesti (north), Calarasi and Hincesti (center) and Causeni (south).

The information provided by AMIS was then statistically processed by use of regression models, represented by regression functions with special focus on dynamics of the main production factors (input parameters). By using the method of least squares we estimated the regression curve for the main tomatoes production factors:

$$b_0 = \frac{\sum y_i \sum x_i - \sum x_i y_i \sum x_i}{n\sum x_i^2 - \left(\sum x_i\right)^2},\ b_1 = \frac{n\sum x_i y_i - \sum y_i \sum x_i}{n\sum x_i^2 - \left(\sum x_i\right)^2}$$

In the case of tomatoes monthly prices variability, we chose regression analysis with incorporation of d*ummy variables* for the more detailed seasonal analysis (following an impact of particular months, quarters and years).

To verify explanatory power of the model and to estimate tomatoes prices in subsequent years, the regression function for seasonal tomatoes prices was used as follows:

$$\mathbf{Y=B_0+B_1*Month+B_2*QT_1+B_3*QT_2-B_4*QT_3+B_5*QT_4+B_6*T_1+B_7*T_2+B_8*T_3+B_9*T_4} \quad (2.2)$$

Where:

Y…….. = price;

B_0…….. = coefficient for the intercept;

B_{1-9}…..... = coefficient for the slope;
QT_{1-4}…. = quarters;
T_{1-4}…… = current year.

RESULTS

Agricultural Marketing Information System

The AMIS was developed and launched on the market of consultancy. Its final shape which determines its operational properties and capacity is displayed in Fig. 1. Principally it is composed of three modules and links among them: Product D-base, Producers´ D-base and Market Research D-base.

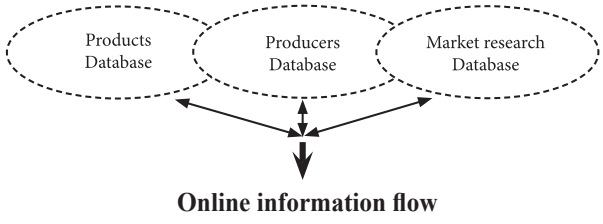


Figure 1. The final conception of Agricultural Marketing Information System

The information system setting (Fig. 1) allows a continuous flow of information and goods to support especially rural primary producers, however, it also helps the agricultural and food commodity traders. But the AMIS is also a facilitator in the field of offer and demand of agricultural products and inputs, informer on technology packages as well as analytic site for market prices and sales opportunities. In the field of the tomato business it creates unique opportunity for tomato producers and traders to establish both the growing strategy and sale approaches and flexibly response on the quickly changing situation on tomato markets (it creates so called "virtual market of tomatoes products").

Analysis of main parameters of tomato market

For the analysis the main market parameters were selected according to their importance (impact) onto the tomato farmers´ decision-making target which is "net margin generation". Based on the above suggestion the following main parameters were chosen: prices on selected markets, production quantities and production costs.

Tomato price analysis on main Moldovan markets

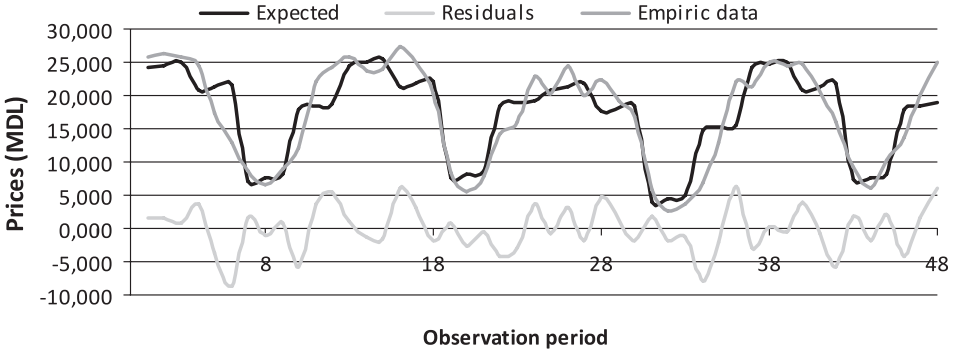
As shown in Fig. 2, the tomato market prices vary considerably in dependence on the year period. Two year periods can easily be distinguished: the growing season (May – October) and out-of-growing season (November – April). The variation amplitude between both of them is 28 – 30 Lei.kg^{-1}; its magnitude is more extended at minimum prices than at maximum prices while the average values are stable. Better climatic conditions in 2009 made the prices lower than the years before. However, there is an apparent trend for average price growth which can especially be in prices behavior since 2010 and 2011 (not displayed).

The data on tomato monthly prices were statistically processed by the use of regression analysis with incorporation of *Dummy (logical) variables* as the best suited model for seasonal analysis (months, quarters and years) of tomato prices variability from 2007 to 2010.

We observed the development of tomato prices over 48 months based on parameters and its coefficients: 1. *Months* $_{(1-12)}$, 2. *Quarters* $_{(1-4)}$, 3. *Years*$_{(1-4)}$.

Index of determination $\mathbf{R^2 = 0.88}$ was detected, so we can determine what percentage of tomato monthly prices changes will be explained by the estimated model.

Empirical data of tomato prices were compared with theoretical values of expected prices (Fig. 2.) during seasonal period. For predictions of seasonal tomato prices trends on local agricultural markets the data were coined into regression function, based on which the Agricultural Marketing Information System will be able to provide



Source: Tomato market research 2007-2010 (The Agricultural Marketing Information System)

Figure 2. Empirical and seasonally adjusted data on tomato price over 2007-2010 (in MDL/Kg)

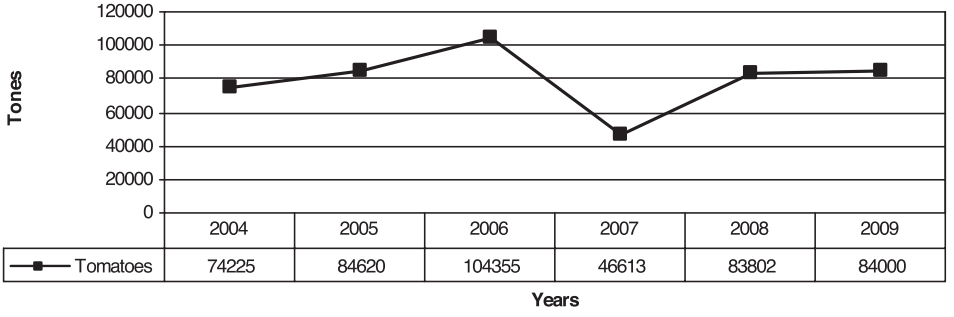
statistical data to its users about theoretical values of expected prices in subsequent months or years:

Price = -2.9693 + 0.4547***Month** + 10.3078***QT_1** + 5.6349***QT_2**-9.2931***QT_3** + 0***QT_4** + 16.2933***T_1** + 11.3303***T_2** + 2.2065***T_3** + 0***T_4**

Together with tomato prices estimation according to explanatory power of regression analysis with incorporation of *Dummy (logical) variables* as the best suited model for seasonal analysis of tomato price variability, the Agricultural Marketing Information System could provide important information for tomato producers and consumers, that the stage of tomato price increase starts, as a rule, in October and lasts until June, which, in fact, is the period of tomato *Extra-season* and is characterized by augmentation of tomato import and, respectively, of tomato price in the market.

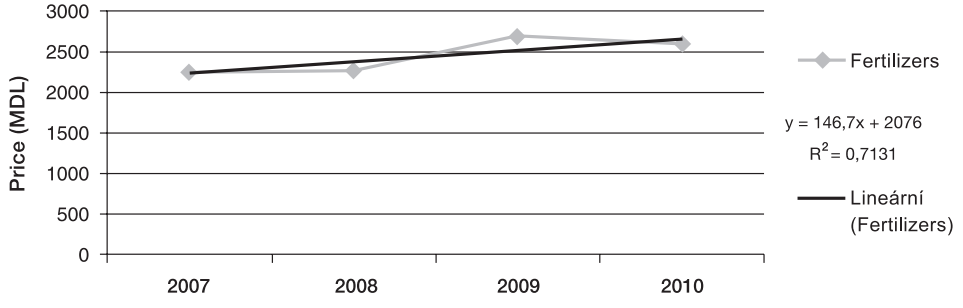
Tomato production quantity analysis on main Moldovan markets

The Moldovan tomato production quantity varies around 80 000 tons a year; however, its potential is much higher. During the last years the climatically favourable year 2006 permitted to increase the tomato production up to 100 000 tons whilst the totally inappropriate year 2007 reduced the production down to 45 000 tons. The tomato production trend is slightly growing which is quite optimistic for the Moldovan tomato producers. They should compete with their growing competitive producers abroad by a proper



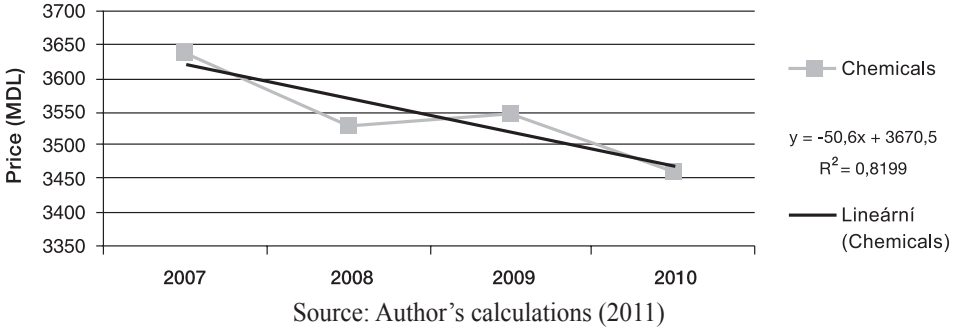
Source: FAOSTAT, 2011

Figure 3. Production quantity of tomatoes (tonnes) in 2004 - 2009.



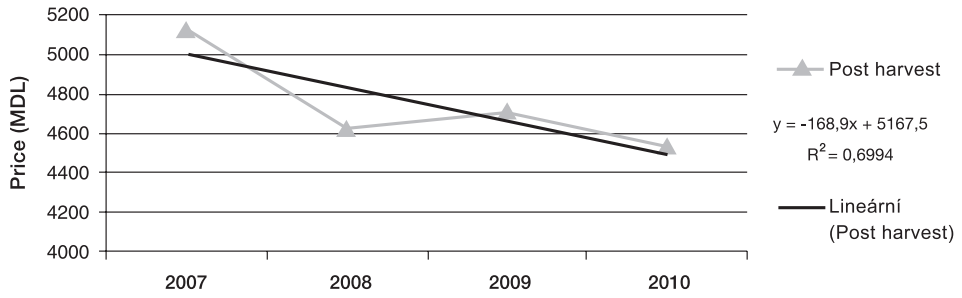
Source: Author's calculations (2011)

Figure 4a. Trend of fertilizers cost development (in MDL) 2007 – 2010.



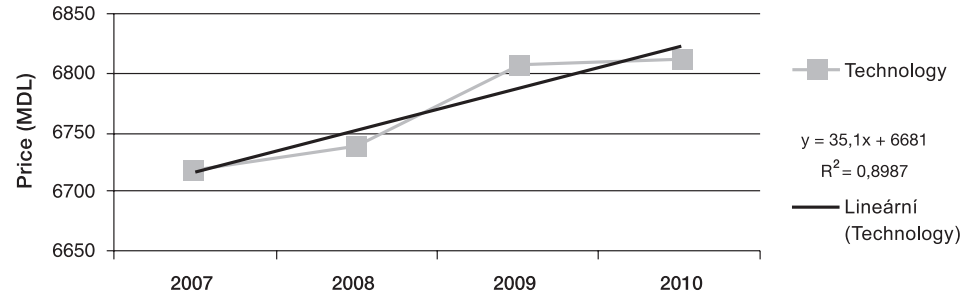
Source: Author's calculations (2011)

Figure 4b. Trend of agro-chemical cost development (in MDL) 2007 - 2010.



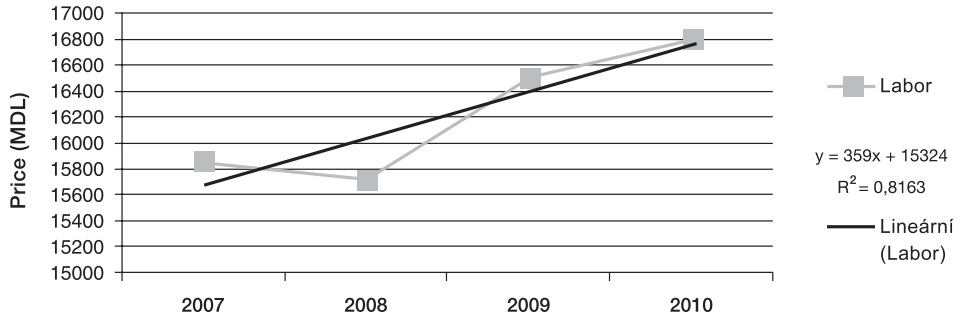
Source: Author's calculations (2011)

Figure 4c. Trend of post-harvest treatment cost development (in MDL) 2007 - 2010.



Source: Author's calculations (2011)

Figure 4d. Trend of technologic operational cost development (in MDL) 2007 - 2010.



Source: Author's calculations (2011)

Figure 4e. Trend of manual labor cost development (in MDL) 2007 – 2010.

choice of tomato varieties and increased production in the out-of-season period.

Tomato production costs of the main inputs parameters

The development of average costs trend of seven major inputs from 2007 to 2010 was statistically evaluated. The costs of individual input parameters in local currency were used as taken from AMIS database and processed by linear regression model.

The parameter cost development over four years is found in Fig. 4 a, b, c, d, e, f, g as parameter average values courses as well as processed by the above regression model. It was not possible to show parameter monthly courses for absence of proper data. If they were available, interesting parameter of price variations during the year could have been found and discussed. But, by analogy, we can assume that their average values have been following an alternative course (near to sinusoid curve) with maxima in the growing period and minima close to and in the out-of-season period.

Fertilizer prices. The fertilizer prices (total) are represented by organic and inorganic fertilizers containing main biogenic elements N, P, K and showed an alternative course over the analyzed period. The linear model, represented by regression function $y = 146.7x + 2076$ with index of determination

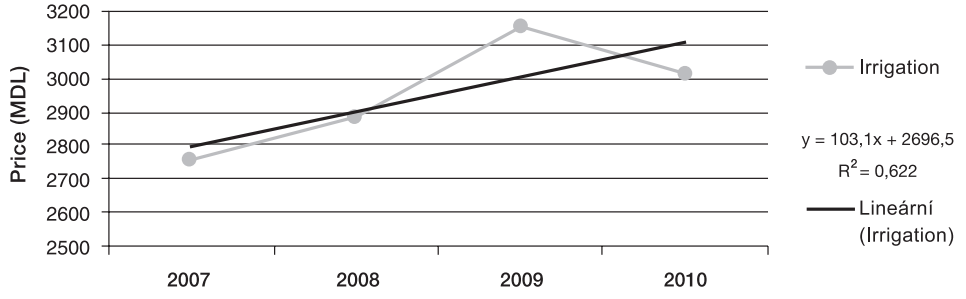
R^2 = 0.71, shows a growing trend - this corresponds to general trends in increasing prices of fertilizers, especially those containing N, P, K, which are mostly imported by Moldova from Russian Federation, Netherlands and Ukraine and these prices have also been heavily influenced by the crisis situation in Europe during recent years.

Agro-chemical prices. The average agro-chemical prices, represented by herbicides, pesticides and insecticides tended to decrease over the analyzed period as indicated by the linear model and regression function *y = -50.6x + 3670.5* with index of determination **R^2 = 0.81,** that gives a high possibility (81%) of forecasting future price developments for the following years. However, their real course is alternative. The decreasing tendency was in 2008 very strong, followed by a certain increase in 2009 and 2010. The price situation had a similar tendency to the fertilizer prices, where the majority of agro-chemicals are exported from Eastern and Western European countries due to lack of local agro-chemical production in Moldova.

Post-harvest treatment prices. The post-harvest treatment prices represented by packing and storage copies the agro-chemical price trend. They fell sharply in 2008 recuperated in 2009 and continued to slightly fall in 2010. The linear model, represented by regression function *y = -168.9x + 5167.5* with index of determination **R^2 = 0.69** shows a decreasing trend - this corresponds to a crisis situation and farmers´ tendency for reduction of production costs.

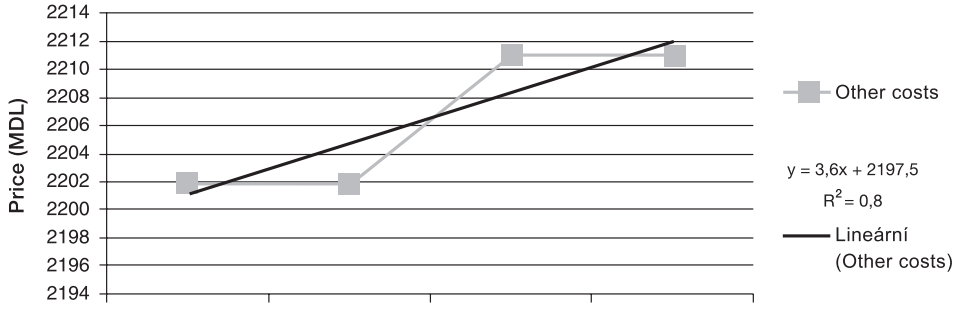
Technologic operational prices. Their course is not similar to the previous parameters because they show a slight growth up to 2010. The prices for technological operations are mainly associated with renting of agricultural mechanisation, equipment and transportation. The linear model, represented by regression function *y = 35.1x + 6681* with index of determination **R^2 = 0.89,** shows a slightly increasing trend of prices which is especially influenced by year 2010 - this corresponds to a crisis situation and farmers´ tendency for reduction of production costs.

Manual labour costs. They have a remarkably growing tendency although with sinusoidal variations and peak values in 2010. Statistical regression analysis show relatively stable level of costs increase, represented by linear regression function *y = 359x + 15324* with **R^2 over 81%**. Manual labor costs are usually represented by planting (33 man-days per hectare), cultivation (44 man-days per hectare) and harvesting operations (82 man-days per hectare) and belong to the second most expensive input parameter during tomato production process. Both the crisis impact and salary



Source: Author's calculations (2011)

Figure 4f. Trend of irrigation cost development (in MDL) 2007 - 2010.



Source: Author's calculations (2011)

Figure 4g. Trend of other cost development (in MDL) 2007 - 2010.

growing are reflected in the above course. The decreasing tendency in 2008 was very strong and a sharply increasing started from 2009 as the sector was under the crisis pressure. It is important to mention that young people migration from rural areas abroad has also a significant share in the case of manual labor costs increasing tendency.

Irrigation costs. They have a very similar tendency as the agro-chemicals cost course. They grew remarkably up to 2009 and, then were slowly falling in 2010 but the overall tendency was growing. This level was analyzed by regression linear model, represented by linear regression function $y = 103.1x + 2696.5$ with index of determination

Annex

6.1. Tomato monthly prices with incorporation of Dummy (logical) variables

			QT 1	QT 2	QT 3	QT 4	T 1	T 2	T 3	T 4
	Y	MONTHS	Months 1-3	Months 4-6	Months 7-9	Months 10-12	Year 1	Year 2	Year 3	Year 4
January	25.7	1	1	0.0001	0.0001	0.0001	1	0.001	0.0001	0.0001
February	26.25	2	1	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001
Mach	25.75	3	1	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001
April	24.5	4	0.0001	1	0.0001	0.0001	1	0.0001	0.0001	0.0001
May	17.5	5	0.0001	1	0.0001	0.0001	1	0.0001	0.0001	0.0001
June	13	6	0.0001	1	0.0001	0.0001	1	0.0001	0.0001	0.0001
July	8.75	7	0.0001	0.0001	1	0.0001	1	0.0001	0.0001	0.0001
August	6.625	8	0.0001	0.0001	1	0.0001	1	0.0001	0.0001	0.0001
September	9	9	0.0001	0.0001	1	0.0001	1	0.0001	0.0001	0.0001
October	12	10	0.0001	0.0001	0.0001	1	1	0.0001	0.0001	0.0001
November	22	11	0.0001	0.0001	0.0001	1	1	0.0001	0.0001	0.0001
December	24.25	12	0.0001	0.0001	0.0001	1	1	0.0001	0.0001	0.0001
January	25.75	13	1	0.0001	0.0001	0.0001	0.0001	1	0.0001	0.0001
February	23.75	14	1	0.0001	0.0001	0.0001	0.0001	1	0.0001	0.0001
Mach	24	15	1	0.0001	0.0001	0.0001	0.0001	1	0.0001	0.0001
April	27.25	16	0.0001	1	0.0001	0.0001	0.0001	1	0.0001	0.0001
May	25	17	0.0001	1	0.0001	0.0001	0.0001	1	0.0001	0.0001
June	20.25	18	0.0001	1	0.0001	0.0001	0.0001	1	0.0001	0.0001
July	8.5	19	0.0001	0.0001	1	0.0001	0.0001	1	0.0001	0.0001
August	5.5	20	0.0001	0.0001	1	0.0001	0.0001	1	0.0001	0.0001
September	8	21	0.0001	0.0001	1	0.0001	0.0001	1	0.0001	0.0001
October	14.25	22	0.0001	0.0001	0.0001	1	0.0001	1	0.0001	0.0001
November	16	23	0.0001	0.0001	0.0001	1	0.0001	1	0.0001	0.0001
December	23	24	0.0001	0.0001	0.0001	1	0.0001	1	0.0001	0.0001
January	20.25	25	1	0.0001	0.0001	0.0001	0.0001	0.0001	1	0.0001
February	24.5	26	1	0.0001	0.0001	0.0001	0.0001	0.0001	1	0.0001
Mach	20	27	1	0.0001	0.0001	0.0001	0.0001	0.0001	1	0.0001
April	22.25	28	0.0001	1	0.0001	0.0001	0.0001	0.0001	1	0.0001
May	19.25	29	0.0001	1	0.0001	0.0001	0.0001	0.0001	1	0.0001
June	16.75	30	0.0001	1	0.0001	0.0001	0.0001	0.0001	1	0.0001
July	5.875	31	0.0001	0.0001	1	0.0001	0.0001	0.0001	1	0.0001
August	2.75	32	0.0001	0.0001	1	0.0001	0.0001	0.0001	1	0.0001
September	3.75	33	0.0001	0.0001	1	0.0001	0.0001	0.0001	1	0.0001
October	6.875	34	0.0001	0.0001	0.0001	1	0.0001	0.0001	1	0.0001
November	13	35	0.0001	0.0001	0.0001	1	0.0001	0.0001	1	0.0001
December	22	36	0.0001	0.0001	0.0001	1	0.0001	0.0001	1	0.0001
January	21.25	37	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
February	25	38	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
Mach	24.5	39	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
April	24.75	40	0.0001	1	0.0001	0.0001	0.0001	0.0001	0.0001	1
May	20.5	41	0.0001	1	0.0001	0.0001	0.0001	0.0001	0.0001	1
June	16	42	0.0001	1	0.0001	0.0001	0.0001	0.0001	0.0001	1
July	9.25	43	0.0001	0.0001	1	0.0001	0.0001	0.0001	0.0001	1
August	6	44	0.0001	0.0001	1	0.0001	0.0001	0.0001	0.0001	1
September	10.25	45	0.0001	0.0001	1	0.0001	0.0001	0.0001	0.0001	1
October	13.75	46	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001	1
November	20	47	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001	1
December	25	48	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001	1

R^2=0.62. In general, if we liked to predict the future irrigation cost development we would meet problems due to climate changes. The regression linear model could help us somewhat by its relatively high future estimation of irrigation costs with **R^2 over 62%.** Especially the crisis impact can be considered because the sector was under the crisis pressure. Also climate changes mainly due to drought in 2009 were having the effect on irrigation costs increasing tendency in Moldova.

Other costs. Other costs like interest on credit or own finances, insurance, etc. were considered, too. They grew remarkably up to 2009 and remain on the same level in 2010. The crisis in 2009 – 2010 did not impact them too much (they are typical fixed costs). The linear model, represented by regression function $y = 3.6x + 2197.5$, has a very good tightness to the experimental data. The overall tendency is growing and index of determination **R^2=0.80** shows a high probability of other costs estimation trends.

CONCLUSIONS

Creation of the *D-base "Tomatoes"* in both AMIS modules was necessary and permitted mapping and collecting data about characteristics of farmers´ production and processing portfolio and future possibilities for tomato export orientation. Data from the past three years on tomato market tendencies and dynamism of prices have been gathered and further statistically processed. On the basis of information provided by AMIS and further statistically processed in the field of market prices, volume of production and production costs we can formulate the following conclusions.

1. The Agricultural Marketing Information System provides a large number of data and is a decisive information tool for agricultural and food producers in Moldova;

2. The tomato market prices vary considerably in dependence on the year period - two year periods can easily be distinguished: growing season (May – October) with its lower tomato prices and out-of-growing season (November – April) with higher tomato prices (more time higher). Generally the prices grow but it is not in tune with the input cost growing.

3. The Moldovan tomato production quantity varies around 80 000 tons a year while its potential is much higher. Its yearly amount is dependent on the year (see differences between 2006 and 2007) as shown by lack of irrigation facilities and other inputs.

4. The tomato production costs vary over the year and over the researched period. They have mostly a growing tendency, their peak (highest values) were in 2009 followed by a sharp decrease in 2010. Influences of crisis and farmers´ tendency to reduce costs are quite evident.

5. It can be recommended to tomato farmers to enlarge their variety menu and thus make the tomato maturing spectrum much wider to overlap a part of the out-of-season period when they are not competitive on (even) domestic markets.

6. It can also be recommended that multifactorial regression be calculated for market prices because they carry multifunctional character. Dependence of market prices on production volumes (or vice versa) is also evident and should be analyzed.

Annex continued

6.2. Regression Statistics of tomato price analysis on main Moldovan markets

Regression Statistics	
Multiple R	0.882792316
The value of reliability R	0.779322273
The set value of reliability R	0.690703671
Standard Error	3.791346841
Observations	48

ANOVA

	df	SS	MS	F	Significance F
Regression	9	2030.51224	225.6124711	20.17997	6.76E-12
Residual	40	574.9724349	14.37431087		
Total	49	2605.484674			

Parameter	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-2.9693	31.53972787	-0.094143899	0.925465	-66.7134	60.77489	-66.7134	60.77489
MONTHS	0.4547	0.670221765	0.67841351	0.501416	-0.89988	1.809256	-0.89988	1.809256
Months 1-3	10.3078	6.228037426	1.655064173	0.105738	-2.27953	22.89513	-2.27953	22.89513
Months 4-6	5.6349	4.309354027	1.307606304	0.198473	-3.07459	14.34447	-3.07459	14.34447
Months 7-9	-9.2931	2.537672418	-3.662063214	0.000725	-14.4219	-4.16429	-14.4219	-4.16429
Months 10-12	0	0	65535	0	0	0	0	0
Year 1	16.2933	24.17999664	0.673833675	0.504293	-32.5763	65.16289	-32.5763	65.16289
Year 2	11.3303	16.16123599	0.701078785	0.487313	-21.3328	43.99338	-21.3328	43.99338
Year 3	2.2065	8.191064366	0.269375328	0.789026	-14.3483	18.76123	-14.3483	18.76123
Year 4	0	0	65535	0	0	0	0	0

Annex continued

6.3. Theoretical and empirical prices on the regional markets

Observation (Months)	Expected	Residuals	Empiric data
1	24.088	1.612	25.7
2	24.542	1.708	26.25
3	24.997	0.753	25.75
4	20.779	3.721	24.5
5	21.234	-3.734	17.5
6	21.689	-8.689	13
7	7.217	1.533	8.75
8	7.671	-1.046	6.625
9	8.126	0.874	9
10	17.873	-5.873	12
11	18.328	3.672	22
12	18.782	5.468	24.25
13	24.581	1.169	25.75
14	25.036	-1.286	23.75
15	25.491	-1.491	24
16	21.273	5.977	27.25
17	21.728	3.272	25
18	22.182	-1.932	20.25
19	7.710	0.790	8.5
20	8.165	-2.665	5,5
21	8.620	-0.620	8
22	18.367	-4.117	14.25
23	18.821	-2.821	16
24	19.276	3.724	23
25	20.915	-0.665	20.25
26	21.369	3.131	24.5
27	21.824	-1.824	20
28	17.606	4.644	22.25
29	18.061	1.189	19.25
30	18.516	-1.766	16.75
31	4.044	1.831	5.875
32	4.498	-1.748	2.75
33	4.953	-1.203	3.75
34	14.700	-7.825	6.875
35	15.155	-2.155	13
36	15.609	6.391	22
37	24.165	-2.915	21.25
38	24.619	0.381	25
39	25.074	-0.574	24.5
40	20.856	3.894	24.75
41	21.311	-0.811	20.5
42	21.766	-5.766	16
43	7.294	1,956	9.25
44	7.748	-1,748	6
45	8.203	2,047	10.25
46	17.950	-4,200	13.75
47	18.405	1,595	20
48	18.859	6,141	25

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Corresponding author:

Alexander Kandakov
Czech University of Life Sciences Prague
Institute of Tropics and Subtropics
Kamýcká 129, 165 21 Prague
E-mail: kandakov@its.czu.cz