Agricultura 6: 18 - 26 (2008)

Food value chains in Slovenia and their risks assessment

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In the article, most important food supply chains and their characteristics, with emphasis on trade streams, are elaborated and the assessment of risks, as perceived by interviewed supply chain operators, is presented. Business risks were identified by stakeholders of different small and medium enterprises (SMEs) in fruit and vegetable, meat and cereal sector, aiming towards explanation of threat and assessment of its potential damage for the company, when (if) it occurs. Identification of main transaction risk was followed by assessment of their potential damage to the business. Small and medium enterprises, which create the majority of turn over in the agri-food sector, are reluctant to take up existing business to business (B2B) e-commerce technologies into their food supply of selling. The crucial barrier to adoption is that trust between companies is not mediated appropriately by existing e-commerce technology. Risk assessment of the analyzed supply chains indicates that from a cross-sector perspective, following common risk were identified: "Low quality", "Reliability of delivery", "Misunderstanding in communication" and "Unreliable supplier". Majority of most important risks, as identified and perceived by supply chain operators are connected to material flow and transport / logistic problems.

Key words: agri-food sector, supply chains, business risk, risk assessment

INTRODUCTION

Trade with sensitive agricultural and food products is a dynamic system, controlled by corresponding dynamically changing food networks. Consumers' acceptance of (imported or domestic) food is influenced by various factors. Among them, important factors such as trust into its place of origin or food traceability could be guaranteed through transparent food supply chains. The supply chain is configured by a set of discrete activities and processes, and as such creates value and delivers it to customers. Practice in efficient supply chain management has been characterized by the use of efficient suppliers, collaborative decision-making and effective balance of supply and demand in near past. Aggarwal and Ganeshan (2007) report, that in last decade, the emergence of business-to-business (B2B) trading exchange has transformed procurement strategies into online markets where buyers and sellers trade products in cash (spot markets) or through instruments such as options, futures or forward contracts.

This paper shows part of the results, obtained in the framework of the 6 FP project e-Trust. The vision of the e-Trust project is to provide consumers with high quality food they do trust and can afford. The combination of trust and affordability can be reached through improvements in trade processes and in the communication of trustworthiness between trading partners along the chain. Trade relationships that would combine actual e-commerce developments with trust mediating functionalities would support both, improvements in consumers' food supply situation and the competitiveness of the European food sector (e-Trust, 2006). The competitiveness issue of agri-food industry is well elaborated in the study of European Commission (2006) and state that European industry is lagging behind in productivity, and unless there is a continued focus on value-addition there will be a worsening of Europe's competitive position in the future. The unfavorable state of Slovenian agri-food sector competitiveness on international markets was recently described by Majkovič (2007), Majkovič et al. (2007), Kovač and Majkovič (2008).

In recent years, the availability of sophisticated B2B e-commerce technology has improved tremendously. Recent research show, that only large multinationals exploit the potentials of B2B e-commerce in the food sector for their supply chain management with their business partners. SMEs however, which create the majority of turn over in the European food sector and therefore create jobs and welfare in Europe, are reluctant to take up existing B2B ecommerce technologies into their food supply of selling. The crucial barrier to adoption is that trust between companies is not mediated appropriately by existing e-commerce technology. Currently, the barrier for food sector SMEs towards B2B e-commerce come from the:

- Difficulty to examine the quality and safety of food products. This refers to all kinds of transactions in the food sector, whether supported by e-commerce or not. However, when it comes to e-commerce, the difficulty of physical product examination plays a much larger role as physical product inspection is not possible;

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- (Perceived) risk of performing a transaction via e-commerce. This includes concerns regarding secure transfer of data, or the possibly unknown transaction partner (e-Trust 2006).

MATHERIALS AND METHODS

After elaboration of main characteristics of respective food supply chain, an analytical tool for risks assessment was employed (see also Figure 1). The nature of threats in business was described by interviewers (first row in Figure 1), aiming towards explanation of threat and assessment of its potential damage for the company, when (if) it occurs. The results of this step were elaborated within the risk portfolio diagrams for respective supply chain (likelihood of occurrence versus potential damage effect). 14 interviews were held during the summer 2008 with stakeholders of different SMEs in fruit and vegetable, meat, olive and cereal sector. During the interviews, their opinion on most frequent risks, connected with transactions and their significance in each supply chain were obtained. Identification of main transaction risk was followed by assessment of their potential damage to the business. Answers were provided on scale from 1 (maximum damage) to 5 (minimum damage) and likelihood of their occurrence, with a scale from a (maximum probability of occurrence) to e (minimum probability of occurrence).

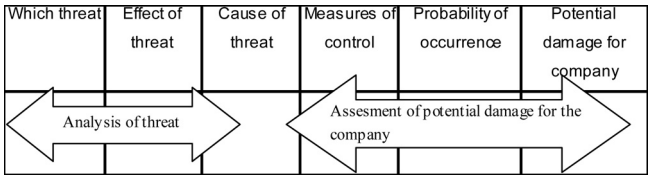


Figure 1. Risk assessment – basis for interviews

In second step, the interrelationship of stated risks was investigated. Interdependence among them was assessed by pair wise comparisons, with a scale from 0 – no interrelation to 3 – strong interrelation. The answers about the degree of the interrelationship of risks were used for building the risk interdependency diagram, with the two dimensions:

- active sum (AS): degree of influence of one risk on the other stated risks stated by the interviewer (domino effect, first stone in the row),
- passive sum (PS): degree of influence of a set of risks to the each respective risk, according to the perception of individual interviewer.

Interviewees were asked to indicate a maximum number of 5 risks that they considered as crucial in business relationships. For each risk AS is a number included in the range 0 to 12 expressing the influence of that specific risk to influence the likelihood of occurrence of the other 4 risks. The maximum number 12 represents a situation in which a specific risk shows the maximum level of influence (3) on all the other 4 risks. PS, situated in the same range (0, 12) indicates the influence of the other 4 risks on the likelihood of occurrence of the risk considered. The maximum number 12 is obtained when the interviewee expresses the perception that a set of 4 risks strongly affects the likelihood of occurrence of an analyzed risk. So in case when the identified risk holds with the specific point in the diagram (AS = 12, PS = 12), an interviewee shows the perception that that risk strongly influences and is strongly influenced by the rest of stated risks (see also Canavari et al. 2008; Fritz 2008). Transaction risks may arise from (Fritz 2008):

a) Information flow
   - Buyer has wrong or low quality information about product
   - Information system interruptions (e.g. IT damage due to virus)
   - Misunderstandings in communication, e.g. due to social & cultural differences, language barriers
   - Missing willingness of information exchange
b) Material flow
   - Bad product quality
   - Missing product safety (legal food safety standards)
   - Scarcity of raw materials & inputs on sourcing market (natural disaster - damages due to fire, hail, earthquake, storm, iciness, heat, landslide, dam failure, avalanche, flood; labour conflicts / strike; seasonal supply differences)
   - Trade barriers (import or export controls may lead to supply interruptions, delays)
c) Cooperation
   - Purchasing company becomes dependent on supplier (e.g. monopoly, technology, property rights, contractual agreements, changing costs, investments …)
   - Contractual agreements not followed
   - Political decisions restrict collaboration with suppliers (e.g. tax, custom, embargos, infrastructure and environmental issues)
d) Logistics / transport
   - Product contamination during transportation
   - Delivery not at the right time (transportation failures of transporting partners, transportation route are blocked, strikes occur, trouble with logistics service provider)
   - Delivery not to the right place
e) Finance
   - Illiquidity of buyer
   - Currency fluctuations
   - Price changes
   - Raising transport costs (fuel prices)

Regarding the data sources, both, quantitative and qualitative data have been collected and analyzed. The main sources of the quantitative data are data from Slovene National Statistics (SURS), various reports from Agricultural Institute of Slovenia (AIS), Ministry of Agriculture, Forestry and Food (MAFF), Office for macroeconomic analysis and forecasting of Republic of Slovenia (UMAR) and annual reports of individual firms. Supply chain analysis of agribusiness was elaborated also with several meetings with various experts in each of analyzed chains (for figures on the supply chain by levels see Majkovič et al. 2008) to gain a broad and updated insight of

the situation in the field. Experts come from agricultural and food processing companies, trading companies, cooperatives and certification bodies. Supply chains, analyzed in the framework of the research, were: meat sector, cereal sector, fruits and vegetables sector and olive sector. For the risk assessment, interviews were also conducted with different players from each sector (for details see Majkovič et al. 2008).

RESULTS AND DISCUSSION

1. Cereal sector

While in nineties, the area under cereals has decreased, it has increased again after 2000, probably due to direct payments to cereal producers. Average production in 2000-2004 comprises 58 % of arable land, with area under cereal production around 100.000 ha. In cereal production the largest proportion goes to maize-grain (46 %), wheat (36 %), and barley (13 %). Production of some other cereals (e.g. oats) increases, but still remains relatively small (AIS 2005). Majority of cereals in Slovenia is used for fodder (on average 64 % in period 2000-2005). Domestic use in 2005 was 897.000 tones, among which fodder use 538.000 tones. In fodder use maize represented 65 % (356.000 tones). Feed use of wheat increased for 6 % in this year. Domestic use of cereals overcomes domestic production. Slovenia has in 2000-2005 imported in average 509.000 tones of cereals (flour, grains, products), among which 80 % in the form of grains. Cereal export reached 11.000 tons in average in five years period (MAFF and AIS 2006). Degree of cereal self sufficiency is around 53 % in 2000-2004. In 2005, due to favorable weather conditions, it increased to 64 %. Per capita consumption of wheat is relatively stabile, 78 kg in flour equivalent.

Table 1. Import structure with cereals share 2001-2006

Year	Commodity group	Import (in mio €)
2001	Cereals	53.9
2001	Products of milling industry	23.8
2001	Preparation of cereals	43.9
2005	Cereals	45.2
2005	Products of milling industry	19.9
2005	Preparation of cereals	68.6
2006	Cereals	61.3
2006	Products of milling industry	19.3
2006	Preparation of cereals	74.1

Source: own computations based on data from SURS.

Slovenian cereals are in terms of value exported mainly to Croatia (9 mio €), Italy and France. Also important are ex-Yugoslav markets (among which Bosnia and Herzegovina leads).

Table 2. Export structure with cereals share 2001-2006

Year	Commodity group	Export (in mio €)
2001	Cereals	2.1
2001	Products of milling industry	1.5
2001	Preparation of cereals	13.3
2005	Cereals	4.2
2005	Products of milling industry	1.3
2005	Preparation of cereals	11.6
2006	Cereals	7.3
2006	Products of milling industry	1.2
2006	Preparation of cereals	12.8

Source: own computations based on data form SURS.

Trade on different cereal supply chain levels was performed in the following extent:

a) Among cereals, the most important products, which are internationally traded, are wheat and maize on import side, while on the export side maize predominates. The most important trading partner is Hungary (see also tables 1 and 2).
b) Among cereal preparations, the products, most exported in 2005 (in value terms) are:
   - cereal preparations for children's food (exported to Russia, Ukraine)
   - malt (exported to Croatia).
c) Among cereal preparations, the products, most imported in 2005 (in value terms) are:
   - malt (from Germany),
   - preparations for bakery (Italy)
   - cookies (from Austria)

Transaction risks in cereal sector are graphically shown in the risk portfolio (Fig. 1) and risk interdependency diagram (Fig. 2). The study for risks assessment in cereal sector has been performed by their identification by cereal supply chain operators: company 12 and 13 as processors (number associated in diagrams 12 and 13 respectively) and company 14 as producer (cooperative) with number 14 associated in diagrams.

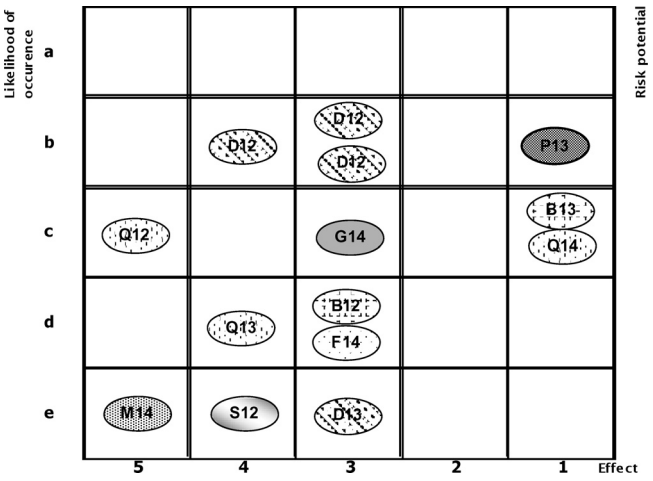
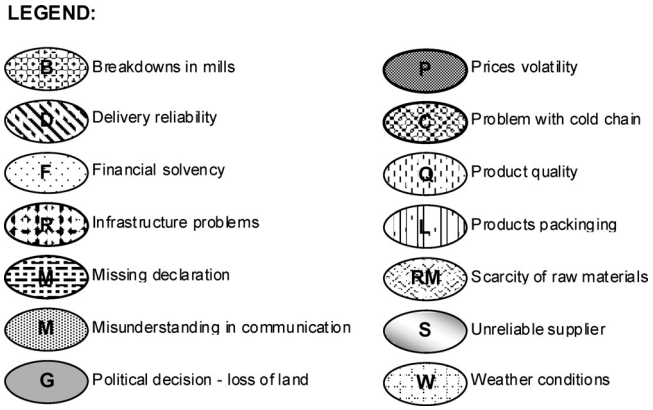


Figure 1. Risk portfolio diagram for products and chain levels in cereal sector

Note: on the X axis, the perception of interviewers on effect of stated risk is extended on scale from 1 (very large) to 5 (very small). On the Y axis, likelihood of risks' occurrence is referred as from a (very likely) to e (very unlikely).



The risk portfolio presents stated risks and in addition their effect to the business and their likelihood of occurrence (risk potential for the respective company). Due to more efficient readability of the analysis results, interviewer's responses regarding type of the risk were merged together, when necessary:

- Financial solvency includes answers on »financial problems«, »terms of payments«
- Delivery reliability includes »disregard of delivery time«, »delivery is too late«, »no delivery«, »delivery has not occur at all«
- Bad quality includes »low quality«, »infected flour«, »low quality of raw materials«
- Unreliable supplier includes also »inefficient preliminary choice of supplier«

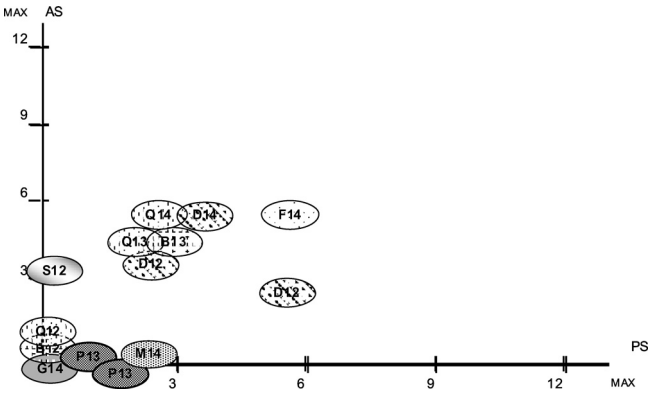


Figure 2. Risk interdependency diagram – cereal sector

As evident from Figure 1, the likelihood of risks' occurrence and their potential damage is fragmentized. Risk, associated to prices volatility (although stated by only one of company) is perceived to be as the one associated to the highest likelihood of occurrence and potential damage for the company, which seems understandable due to the recent crisis in cereal prices. The most frequent risks in cereal sector are: delivery reliability, low quality and break down in mill. Delivery reliability, shows as risk, which is likely to occur, while its potential damage for the company is estimated as of middle importance. Risks connected to the interruptions in production process are "breakdowns in mill" are perceived as the ones with large effect on the business, but with medium likelihood of occurrence. As sector-specific risk, "breakdowns in mill", "political decision-loss of land", and "price changes" were identified. Regarding the interrelation of risks, no operators defined them as strongly interrelated. The existence of interrelation perceives as the most evident for delivery, product quality, financial solvency and breakdown in mills.

2. Meat sector

Meat production is the most important branch of Slovene agriculture. Among meat, production of beef is the most dominant due to the large proportion of grasslands in Slovenia. In the production of meat, 44.100 tones of carcass weight of beef meat was produced at home, 61.400 tones of carcass weight of pig meat and 55.000 tones of poultry meat in 2005 (MAFF 2007c).

Beef production accounts around 15 % of whole value of Slovene agricultural production and comprises around 452.000 animals in 2006. Degree of self- sufficiency is around 90 %, and the consumption 24 kg per capita (MAFF 2007b). Pig production can be divided into two types: production on big farm enterprises and production on private farms. Pig production represents around 10 % of gross value of Slovene agriculture. Degree of self sufficiency was 85 % in 2003. Slovenia imported mainly pig meat and exported mainly processed pig meat products (MAFF 2007d). The poultry production is highly specialized industrial type. Main players are big enterprises and often it is organized as cooperation production with private farms (on the basis of individual contracts). On the

smaller farms which have no contracts it is organized mainly as a supplementary activity. In year 2006, the poultry production was 69.000 tons, which represents around 6 % proportion of the whole agricultural Slovene production. Farm production has decreased to 50.000 tons (10 % less than in year 2005), which represents the smallest amount after year 1994. Production reduction is mainly the consequence of preventive sanitary measures due to the threat of aviary influenza. Majority of poultry meat is gained by slaughtering in slaughter houses (97 % in 2005). In the structure of poultry slaughter chicken meat is predominant (80 %), with the rise also in the turkey meat (18 % in 2004). Consumption per capita has increased since the 1990s. The average consumption in recent years is 25-26 kg/capita, while in year 2006 it decreased to 23 kg/capita. Poultry production is the most significantly export oriented among all meat productions. Despite the increase in consumption, there is a constant surplus in a poultry trade balance. Degree of self-sufficiency has due to intensive re-structuration process decreased, while after year 1997 it became stabile among 110-115 %. In year 2006, it was 107 %. Among exported products, the poultry meat prevails and processed poultry products follow (MAFF 2007a).

Table 3. Import of live animals and meat

	Import (mio €)	Top 3 importers
Live animals		
Beef	14.8	Hungary, Romania, Poland
Pig	2.9	Austria, Italy, Hungary
Poultry	2.1	Austria, Great Britain, Hungary
Meat		
Beef	8.8	Austria, Poland, Germany
Pig	67.6	Austria, Netherlands, Italy
Poultry	12.8	Hungary, Italy, Austria

Source: own computations based on data from SURS.

Table 4. Export of live animals and meat

	Export (mio €)	Top 3 export partners
Live animals		
Beef	5.96	Austria, Italy, Bosnia and Hercegovina
Pig	0.6	Croatia, Hungary, Albania
Poultry	0.6	Austria, Croatia, Bosnia and Hercegovina
Meat		
Beef	8.9	Italy, Netherlands, Germany
Pig	2.53	Italy, Croatia, Austria
Poultry	15.8	Austria, Macedonia, Italy

Source: own computations based on data from SURS.

Meat trade on different processing stages has the following characteristics in 2005:

a) Among live animals, most frequently Slovenia imported beef (from Hungary, Romania, Poland), and mostly exported to Austria, Italy and Bosnia and Herzegovina (BH)
b) Among meat, pig meat is prevailing in import and it is coming from Austria, Netherlands and Italy. Poultry prevails in export and is mainly oriented to Austria, Macedonia and Italy.
c) Among meat preparations, in 2005 most important products on import side were:
   - conserved tuna fish (from Italy and Spain)
   - sausages (from Italy, Hungary and Austria)
d) Among meat preparations, in 2005 most important products on export side were:
   - conserved poultry meat (to Austria and BH)
   - sausages (to Croatia, BH)

Transaction risks in meat sector are presented in the risk portfolio (Figure 3) and risk interdependency diagram (Figure 4). Risks assessment in meat sector has been supported by interview with meat sector supply chain operators as shown in Table 5.

Table 5. Interviewed companies as basis for risks assessment in meat sector

Company Number	Sector	Chain level
Company 1	Meat	Processor, retailer
Company 2	Meat	Processor, retailer
Company 3	Meat	Processor, wholesaler, retailer
Company 4	Meat	Producer and processor
Company 5	Meat	Producer

Main business activity of companies 1-3 is meat processing. Mostly they sell their products along the supply chain to distributors (retail chains, supply according to different public tenders, e.g. schools, etc.) and in their own specialized shops (butcheries). Company 4 is meat producer and processor, while company 5 is a pig farm. Numbers of the companies in Table 5 are corresponding to annotations in meat sector diagrams bellow.

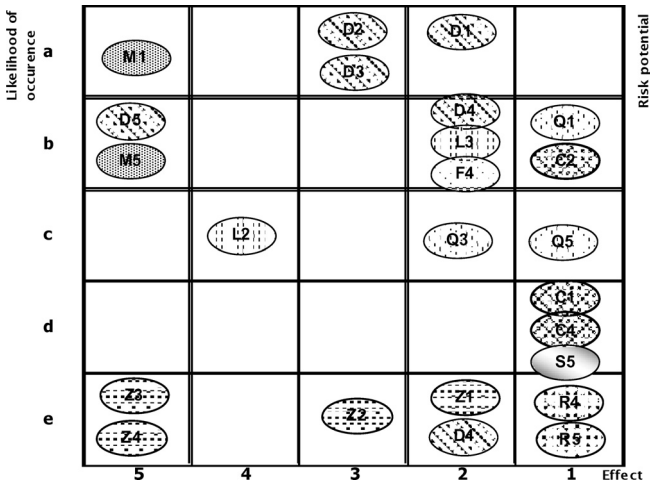


Figure 3. Risk portfolio diagram for products and chain levels in meat sector

Note: on the X axis, the perception of interviewers on effect of stated risk is extended on scale from 1 (very large) to 5 (very small). On the Y axis, likelihood of risks' occurrence is referred as from a (very likely) to e (very unlikely). For the legend, see the legend under the Figure 1.

Due to more efficient readability of the analysis results, interviewer's responses regarding type of the risk were merged together, when necessary:

- Financial solvency includes (no payments, terms of payments)
- Delivery reliability includes (delivery is too late, no delivery, delivery has not occur at all, animals' transport problems)
- Faults in packed products includes (damaged packing, ullage)

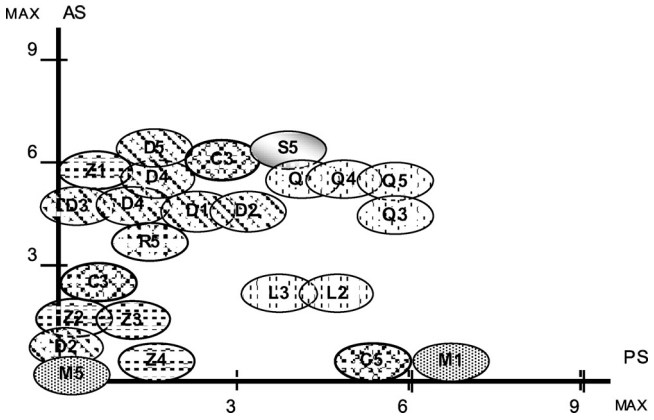


Figure 4. Risk interdependency diagram – meat sector

The most frequent risks in Meat sector are "Delivery reliability", "No declaration or missing information on declaration", "Low quality" and "Insufficient cooling of raw materials". "Delivery reliability" is risk, connected to transport problems. Appointed risk (see Fig. 3) is showing high risk potential with evident likelihood of occurrence and potential damage for the business. "Insufficient cooling of raw materials" and "product quality" are perceptible as the ones with high damage for the business, while theirs likelihood of occurrence is dispersed. "Misunderstanding in communication" and partially "Missing declaration" are perceived as risks, very likely to occur. When analyzing risk interdependency (Fig. 4) no risks are placed in the north-east portion of the diagram, but are grouped in a very limited area, indicating medium to low level of correlation. Among sector specific, "low quality", as material flow risk appears as the most prominent one.

3. Fruits and vegetable sector

Last year was a less favorable year for fruit production in orchard plantations as total production of 99.000 tons was 5.9 % lower than a year before. Lower total output was to a large extent the result of lower output of two most important fruit species in orchard plantations, namely apples (by 5.4 %) and peaches and nectarines (by 18.4 %). Worse than a year before was also production of strawberries and other berries, while production of early stalk fruit – apricots, cherries and sour cherries – improved over a year before. Worse production was achieved by olive producers, since total output was more than a third (34.3 %) lower than in 2005, which was a very good year for olive production. According to data on the production of vegetables, in 2006 about 79.000 tons of vegetables were produced in Slovenia, of which 45.000 tons or 57 % for sale. Total production of vegetables – market and non-market – was 10 % down compared to 2005, mostly due to worse harvest. This is shown also by data on average yield for most vegetables. Compared to a year before, total area of market vegetables decreased by 4.6 %, while total area of vegetables was up by 13.1 % due to a large increase in total area of non-market vegetables (by 29 %). The production area of vegetables covered 1.630 ha, 516 ha are intended for cole crops, 373 ha for salad crops, 250 ha for root vegetables, 237 ha for fruit vegetables, 137 ha for bulbous vegetables, 43 ha for perennial plants, 40 ha for legumes, 19 ha for spinach vegetables and 16 ha for other crops (SURS 2007).

Majority of Slovenian fruits' exchange is taking place with EU15 (in year 2006, 66 % of trade). Regarding EU partners, fruits are mainly imported to Slovenia (import in 2006 68.7 mio €, export only 9.3 mio €). On the market of ex Yugoslavia, fruit trade balance is positive (import to Slovenia 5.6 mio €, export to ex Yu 8.4 mio €. The most important trading partner is neighboring Italy (41 % of fruit trade) with highly negative trade balance of 36.6 mio €. Main products that are imported from Italy are citrus fruits, apricots, cherries, peaches, plums and grapes. Important part of trade is taking place also with Austria, Croatia, Macedonia, BH. Trade flows with most important fruit products at different chain levels in 2005 (in value terms are briefly described above:

a) Among imports of fruits, the most important products (in value terms) in 2005 are:
   - bananas (from Columbia, Ecuador, Italy)
   - mandarin oranges (from Italy, Spain, Croatia)
   - oranges (from Greece, Italy, Spain)
b) Among fruit export, the most important products and partners in 2005 are:
   - bananas (to Italy, Austria, Hungary)
   - apples (BH, Austria)
c) Among imports of fruit preparations, the most important products (in value terms) in 2005 are:
   - mixtures of different dried fruits (from Italy, Austria and Germany)
   - fruit juices (from Austria, Poland, Hungary)
d) Among exports of fruit preparations, the most important products (in value terms) in 2005 are:
   - apple juice (to Croatia and Germany)
   - other fruit juices (to BH, Croatia and Czech Republic)

Most important trading partners in vegetable sector are in period 2001-2006 on import side Italy, Netherlands, Austria, Spain and Hungary and on export side Italy, Serbia and Montenegro, Austria, France and Croatia. Trade streams with most important vegetable products at different chain levels in

2005 shows went to and from:

a) Among imports of vegetables, the most important products (in value terms) in 2005 are:
   - tomato from Italy, Turkey and FRY Macedonia
   - paprika from Italy, Spain and FRY Macedonia
b) Among imports of vegetable preparations, the most important products (in value terms) in 2005 are:
   - preparations from potato (flour, flakes, groats) from Austria, Hungary and Germany
   - preparations from potato (cooked, pre-fried potato) from Netherlands, Poland and Belgium
c) Among vegetable export, the most important products and partners in 2005 are:
   - mushrooms and other vegetables to Italy, France and Germany
   - potatoes to Italy, BH and Croatia
d) Among exports of vegetable preparations, the most important products (in value terms) in 2005 are:
   - preparations from potato (flour, flakes, groats) to former Yugoslavia, Slovakia, Hungary
   - vegetable mixtures and spices to Germany, Croatia, Italy and Austria

For the fruit and vegetable sector' risk identification and assessment, four companies were interviewed at different chain levels (see Table 6).

Table 6. Interviewed companies as basis for risks assessment

Company Number	Sector	Chain level
Company 6	Vegetables	Processor (cooperative)
Company 7	Vegetables	Producer, retailer
Company 8	Fruits	Producer, wholesaler, retailer
Company 9	Fruits and vegetables	Retailer

Numbers of the companies in Table 6 are corresponding to annotations in fruits and vegetable sector' diagrams bellow.

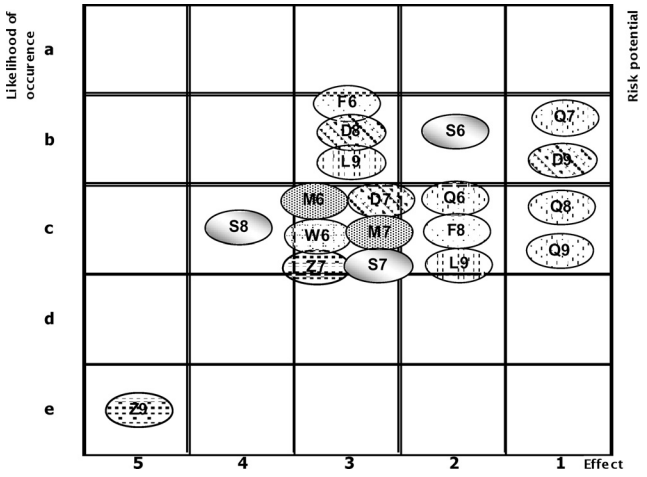


Figure 5. Risk portfolio diagram for products and chain levels in fruits and vegetable sector

Note: on the X axis, the perception of interviewers on effect of stated risk is extended on scale from 1 (very large) to 5 (very small). On the Y axis, likelihood of risks' occurrence is referred as from a (very likely) to e (very unlikely). For the legend, see the legend under the Figure 1.

Due to more efficient readability of the analysis results, interviewer's responses regarding type of the risk were merged together, when necessary:

- Financial solvency includes (no payments, terms of payments)
- Delivery reliability includes (disregard of delivery time, delivery is too late, no delivery, delivery has not occur at all)
- Faults in packed products includes (damaged packing, ullage)
- Unreliable supplier includes (bad preliminary choice of supplier, supply transparency, complaints of customers)

The most frequent risks in fruit and vegetable sector are: "Low quality", "Delivery reliability" and "Unreliable supplier". Less frequent risks in fruit and vegetable sector however still pointed out, are "Misunderstanding in communication", "Financial solvency", "Faults in packed products" and "No declaration". As sector-specific, the risk, associated with dependency of production to the weather conditions "low yield", is identified.

The risk portfolio diagram shows a concentration of the interviewers' perception on the likelihood of their occurrence and also rather similar finding regarding the potential damage for the business. Similar as in meat sector, risk associated low quality (material flow risk) shows to be the one with high potential damage for the business and identified by all respondents. In general, all stated risk in fruits and vegetables sector seem to have substantial effect on the ongoing business, and their likelihood of occurrence is estimated as relatively high.

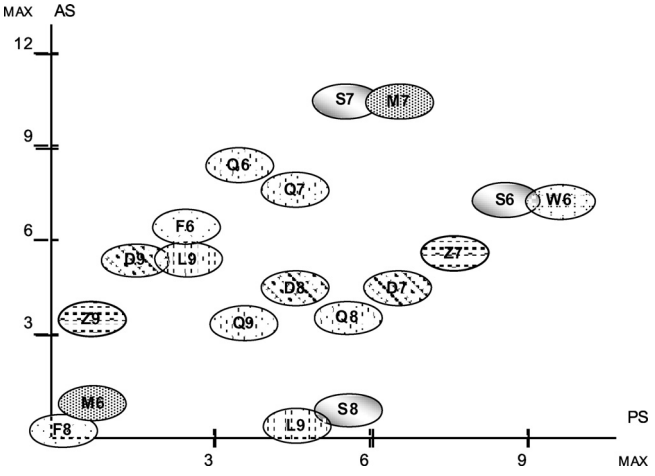


Figure 6. Risk interdependency diagram – fruits and vegetables sector

Comparison of risk interdependency diagrams across sectors shows the most scattered picture in the case of fruits and vegetable sector. This shows that the degree of risk interdependency is the highest among all sectors. To recall, degree of influence of one risk on the other stated risks stated by the interviewer (domino effect, first stone in the row), as seen in Y axis and degree of influence of a set of risks to the each respective risk, according to the perception of individual interviewer (on X axis) seems to be the most prominent one among analyzed sectors and companies.

CONCLUSIONS

Common agribusiness B2B transactions (for example buying, selling, trading, delivering, and contracting) could be a subject of conversion to e-commerce. Leroux, Wortman and Mathias (2001) name possible benefits of spreading e-commerce in several spheres:

- promotion of information flow, market transparency, price discovery,
- facilitation of industry coordination,
- reduction or elimination of transaction costs.

Mainly all of above named sensitive business areas have been identified as possibly problematic by Slovene respondents which come from small and medium enterprises (SMEs) in agri-food sector. These point out an extra room for likely increase in efficiency of supply chains, which lead to increasing competitiveness of the whole agri-food sector.

The most frequent risks in cereal sector (as perceived by suppy chain operators) are: »Delivery reliability«, »Low quality« and »Break down in mill«. »Delivery reliability«, shows as risk, which is the most likely to occur. As sector-specific risk, "breakdowns in mill", "political decision-loss of land", and "price changes" were identified. The most frequent risks in meat sector are "Delivery reliability", "No declaration or missing information on declaration", "Low quality" and "Insufficient cooling of raw materials". "Delivery reliability" is risk, connected to transport problems. Among sector specific, "low quality", as material flow risk appears as the most prominent one. The most frequent risks in fruit and vegetable sector are: "Low quality", "Delivery reliability" and "Unreliable supplier". Less frequent risks in fruit and vegetable sector however still pointed out by interviewers, are "Misunderstanding in communication", "Financial solvency", "Faults in packed products" and "No declaration". As sector-specific, the risk, associated with dependency of production to the weather conditions "Low yield", is identified.

Risk assessment of the analyzed supply chains indicates that from a cross-sector perspective, following common risk were identified: "Low quality", "Reliability of delivery", "Misunderstanding in communication" and "Unreliable supplier". Majority of most important risks, as identified and perceived by supply chain operators are connected to material flow and transport / logistic problems.

ACKNOWLEDGEMENTS

The research is financed in the framework of e-Trust project. European Commission funded initiative within the Sixth Framework Programme Specific Support Action Contract No. FOOD-CT-2006-043056.

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Received: July 21, 2008
Accepted in final form: November 12, 2008