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FARMERS' CHOICES IN THE VEGETABLE SUPPLY CHAIN: PROBLEMS AND POSSIBILITIES

ABSTRACT

The dynamics of the agri-food systems plays an important role in the development and the fast increase of the number of modern retail stores. Several driving factors contribute to this situation such as industrialization, globalization and multinational systems, foreign direct investments. The purpose of this paper was to investigate the marketing relationship type of small vegetable farms and to find out the marketing choice of the farmers. In this regard, a qualitative and quantitative analysis was employed using Williamson's governance structure and probit models. The results confirm that the marketing choice is very limited especially with regard to their participation in retail chains. The obtained coefficients have the expected signs and show that small farmers prefer to sell individually due to several constraints: high entry costs, scale factors and even price mechanisms.

Key words: testing hypothesis, vegetable farms, retail chains.

JEL Classification: Q13.

1. INTRODUCTION

The food industry and the agri-food sector are getting industrialized and globalized at a fast rate (Cook *et al*., 2001). Boehlje (1996) defines agriculture industrialization as a process where the modern industrial processing, production, procurement, distribution and coordination processes are applied throughout the chain. In a similar way, Reardon and Barrett (2000) associate agro-industrialization with the following: 1) changes in the distribution and processing of production and agricultural inputs, 2) changes in the institutional and organizational relations with impact upon vertical coordination, 3) changes in the production, technology and market structure composition. From the micro-analytical point of view, agro-industrialization implies changes in the organizational management and the governance structure of the agri-food systems (Cook, 2001). As a result, together with the industrialization, there is an adaptation of the requirements of the retail chains that are getting oriented towards products with specific characteristics, coming from reliable suppliers that can provide them with quality production, in the specified quantity, frequency and timing.

2. THE CONTEXT AND RESEARCH PROBLEM

The increase of buyers' requirements practically transforms the traditional spot market into an inadequate supply source, thus encouraging the contractual relations between farmers and processors/retailers (Nadvi and Waltring, 2004). In Romania, the emergence of modern retail formats coincided with the accession to the European Union, which practically also led to the adoption of food safety and quality standards required by the EU legislation. However, according to the information from the main players that operate along the vegetable chain, it can be mentioned that there are differences with regard to the food safety and quality between the modern formats of retail type and the traditional shops that are obviously subject to the same EU regulations.

The globalization and the multinational system also have great institutional implications upon the agri-food systems. The globalization practically determines an increase of the capital and information flow, technological changes, foreign direct investments, global economic integration, thus facilitating agriculture industrialization and the vertical integration of the agri-food systems (Pinstrup and Anderson, 2002).

In the last years the foreign direct investments (FDI) in the Romanian agri-food system significantly increased, from 86 million euro in 2003 to 467 million euro in 2008. Although this growth can be considered significant, the agricultural sector benefited from less than 1% of total foreign direct investments in 2008. However, if we also take into consideration the agricultural upstream and downstream sector, the processing and retail sector respectively, this percentage is significantly higher, namely: the foreign direct investments in the processing industry accounted for 5% in 2008, while in the wholesale and retail trade foreign direct investments reached 12%. Practically, the direct foreign investments increased from 935 million euro in 2003 to 2226 million euro in 2008, while in the retail sector these increased from 1106 million euro in 2003 to 5959 million euro (this means an annual growth of 88%). This tendency was also noticed in other Central and East-European countries, yet it is more noticeable in Romania; this situation can be explained by the fact that in our country the FDI level in the year 2003 was lower than in countries such as the Czech Republic and Hungary. The fast FDI growth in the retail sector is also reflected in the FDI growth in the total grocery sales. Thus, while in 2005 FDI accounted for 13% of total groceries sales in 2009 these reached 35%. In spite of this, the FDI level in Romania's agri-food system is quite low; for instance, in Romania the FDI per capita in the processing industry and retail sector represented 125 euro and 277 euro respectively in 2008. Thus, while in 2004 the modern store chains accounted for only 16% in total grocery sales this percentage was up to 42% in 2009, and the sales via supermarkets and discount stores prevailed. In the year 2009, the modern retail formats were on the first place for buying groceries products for a significant part of the urban population in Romania (70%).

Ongoing developments of supply chains imply a significant bias towards large farms. This makes collective action among individual farmers a further step to improve their situation. The problem is not only to concentrate supply and give producers a prerequisite necessary to start interacting within modern supply chains, but also to undertake contractual or co-ownership arrangements in order to successfully coordinate with packers, wholesalers and large retailers, with the purpose of optimizing operations, so that production will comply with demand, in particular with regard to quality attributes of the products (Fischer *et al*., 2007; Camanzi *et al*., 2009).

In 2011, the importance of modern trade is higher for Bucharest (73%), the hypermarkets being the most important channel for buyers, with a market share of 45% in value. While at the country level the traditional trade formats, namely stalls, general stores, boutiques, are maintained at the same level, in Bucharest these decreased in importance at a faster rate. Furthermore, the market share of boutiques was down by half compared to 2005, to reach 13%. At the same time, in rural areas consumers prefer the modern trade only for 20% of the purchases of consumer goods.

Globalization also led to the consolidation of multinational companies. The high concentration of the number of processors and retailers in the United States and European Union has practically altered the traditional structure of the marketing systems along the agricultural chains, creating structures of oligopoly type that result in the creation of vertical integration relations based on contractual relations between the small producers and their customers.

According to THE agricultural statistics data in the vegetable sector, the farms with areas under 3 ha prevail, 90% of these being administered by individual entities. The high land fragmentation and dispersion of cultivated land areas, following land restitution according to Law 18/1990 and the following land laws, create significant limitations with regard to the adoption of new technologies (agricultural works, production and marketing structure, updating farmers' knowledge and information) and contribute to the increase of production and transaction costs. At the same time, due to the lack of experience in using the insurance instruments and to the lack of trust in the modern retail system and of the involved transaction costs, any unfavorable weather phenomenon, the infestation with pests and diseases result in direct losses for farmers. At the same time, the existence of a very high number of farmers who produce for self-consumption but at the same time sell part of production at the farm gate or through intermediaries do not allow for a clear delimitation of the commercial farms and the subsistence farms and consequently constrain the adoption of adequate and coherent fiscal policies. All these factors directly impact the farmers' incomes, the price fluctuation, the promotion of environmental measures, the increase of sector competitiveness and the market orientation of this sector.

3. DATA COLLECTION AND METHODOLOGY

Although several studies were carried out in order to investigate the type of contractual relationship and the vegetable commercialization channel at the European level, there is no empirical evidence about Romania. The analysis is necessary to asses the needs and constraints of the stakeholders involved both at farmer-wholesaler-processor level and at farmer-retailer level.

As far as it concerns the contractual relationships, there is a typology of relationship produced by a matrix of different strategic options of vertical co-ordination and relationship-specific characteristics (e.g., independence, exclusivity), (Gorton 1999). Gorton shows that relationships become more complex with increasing level of formality and of vertical co-ordination. While price, supply and demand are at the core of spot market relationships, property rights, trust and negotiations increase with growing vertical collaboration.

The paper uses Williamson's governance structures, and accordingly two relationship types, formal and non-formal are described:

- Non-formal relationship types:
  - Spot or 'open' markets (immediate transaction at actual prices),
  - Repeated market transactions with the same buyer/supplier with non-formal, non-written contracts.
- Formal relationship types:
  - Formal (written) bilateral contracts (contract terms and obligations are legally enforceable).
  - Financial participation arrangements (both parties are legally independent entities).

In the last 20 years, the vegetable supply chain in Romania experienced a dramatic evolution following the destruction of the former fruit and vegetable commercialization companies which led to the year-round domestic vegetable supply failure and production fragmentation.

Moreover, stricter quality requirements imposed by modern retail chains are hardly met by small scale farmers but even though when these requirements are met by larger farmers the contractual terms are not respected, or even worse the hypermarkets avoid concluding the contract. Also, the main problem the farmers have claimed that they have to face is the non-execution of concluded contracts.

In contrast with producers in industrialized countries who benefit from appropriate infrastructure, effective institutional systems and agricultural policies that facilitate a widespread adoption of good agricultural practices and environmental standards, producers in emerging economies may encounter severe difficulties in complying with increased levels of quality standards. These difficulties generally result from idiosyncratic market failures characterizing the vegetable production (Swinnen and Vandeplas, 2007) and the informational, financial and educational

constraints of producers in these countries. In Romania, for instance, some farmers claimed that these constraints could be mitigated through increased vertical integration, i.e. production-processing-commercialization.

The objective of this paper is to study the contractual relationships type in Romania and to assess the main vegetable commercialization channels by farmers.

The paper is based on data provided by 64 farmers and 6 processors located in the S-E region of Romania following a survey conducted in this region in 2011. In total, 64 semi-structured questionnaires were applied to farmers and 6 questionnaires to processors. The analysis is both qualitative and quantitative and takes into consideration stakeholders' answers to the questions regarding the type of existing contractual relationship along with a set of questions regarding their main commercialization channels. An open comment has been also introduced in the questionnaire.

The description of the methodology and the data collection methods were structured as a set of criteria and questions that were answered and analyzed by employing the structure proposed by Williamson's governance structures. In addition, binary logit/probit models were used in order to perceive the determinants of the farmers' market selling preference. The questionnaire included questions about socio-economics, farm and household, marketing and organizational characteristics of farmers. In the analysis of dependence when the dependent variable is discrete the most used models are the choice or probability models. In this study I used the main market channel (spot market or supermarket) as a dependent variable. Independent variables were used to determine the probability of the market channel used by farmers. Logit and probit regression are associated with the estimation of the probability of choice (Greene, 2000) and are based on the idea of maximizing the utility of an individual.

According to Jula (2011), the probit and logit models are different with regard to the specification of e_i error distribution in the regression equation. In this type of model we admit the existence of a latent (unnoticeable) variable for which we can notice only the dichotomic achievement. For instance, if the noticed y_i^* dummy variable can be defined as *desire* or *ability* to sell at the supermarket. The probability of the event can be described as:

$$P_i = \text{Prob}(y_i = 1) = \text{Prob}\left[e_i > -\left(a_0 + \sum_{j=1}^{k} a_j x_{ij}\right)\right] = 1 - F\left[-\left(a_0 + \sum_{j=1}^{k} a_j x_{ij}\right)\right]$$

where F is the cumulated error distribution function. If the error distribution is symmetrical

$$P_i = F\left(a_0 + \sum_{j=1}^{k} a_j x_{ij}\right)$$

The verosimility function is written as:

$$L = \prod_{y_i=1} P_i \prod_{y_i=0} (1 - P_i)$$

The functional form of F depends on the adopted hypothesis with regard to the errors from the regression equation. If the cumulated error distribution is a logistic function it results a model of *logit* type. In this case:

$$F(Z_i) = \frac{\exp(Z_i)}{1 + \exp(Z_i)}$$

where from:

$$\log \frac{F(Z_i)}{1 - F(Z_i)} = Z_i$$

The model becomes

$$\log \frac{P_i}{1 - P_i} = a_0 + \sum_{j=1}^{k} a_j x_{ij}$$

Logit model can be written as:

$$p_i = \frac{1}{1 + \exp\left[-\left(a_0 + \sum_{j=1}^{k} a_j x_{ij} \right) \right]}$$

Probit model can be written as:

$$p_i = \int_{-\infty}^{a_0 + \sum_{j=1}^{k} a_j x_{ij}} \frac{1}{\sqrt{2\pi}} \cdot \exp\left(-\frac{t^2}{2} \right) dt$$

If the e_t errors follow a normal distribution, the *probit* model is obtained. In this case:

$$F(Z_i) = \int_{-\infty}^{Z_i} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2} \right) dt$$

The normal and logistic cumulated distributions are quite similar as regards their form (when the sample size is large enough), being different only with regard to size. That is why the parameters estimated by the two methods are not directly comparable. A common measure of goodness of fit in choice probit/logit models is the Pseudo R^2, which is estimated as:

$$p2 = 1 - (LLF/LLO)$$

where LLF denotes log likelihood of the full model and LL0 denotes the log likelihood function of the intercept only (Lattin, 2003). Pseudo R^2 rarely reaches

values as high as those of R^2 in linear regression; therefore, models with p2 values between 0.2 and 0.4 are considered to have an extremely good fit (Louviere *et al*., 2003).

The likelihood ratio (LRT) can be estimated as:

$$LR = -2(LLR-LLF)$$

where LLF is log likelihood of the full model and LLR is the log likelihood function of the restricted model (which can be restricted to the intercept only).

4. RESULTS AND DISCUSSIONS

4.1. CONTRACTUAL RELATIONSHIPS

The relationships types as described by Williams are classified into 2 categories, namely formal and non-formal. Respondents were asked to present which type of contractual relationships they use in their business and further, they were asked to choose more than one of the four relationships, i.e. spot market, repeated market transaction, formal-written contracts, and financial participation arrangements.

Table 1
Percentage of formal relationship

	Farmer–buyer (wholesaler)	**Farmer–processor**	**Farmer–retailer**	**Processor–retailer**
Formal relationship %	4/64 6%	6/64 9.3%	7/64 10.9%	4/6 66%

Source: Field survey, 2011.

Table 1 reveals the relationship type for the four chain stages. The answers show that the percentage of formal relationship is extremely low both at farmer-wholesaler level and farmer-processor stage. A higher percentage of formal relationship can be noticed in the case of farmer-retailer level. The formal relationships include formal written contracts and financial participation arrangements, including prices, qualities, quantities and any other financial support. Retailers tend to choose more formal relationships with processors, in comparison with farmers, showing that downstream businesses are more likely to coordinate and organize their relationships more systematically and in a standardized way. Similar findings are also presented at the European level (Fischer *et al*., 2007), with the difference that the percentages are much lower in Romania's case, especially at the farmer-buyer and farmer–processor level.

As far as the relationship and contractual aspects are concerned, the respondents were asked to rate on a scale from 1 to 4 (1: extremely poor to 4: very good) their opinions on the following aspects concerning: the quality of the relationship, trust, contractual terms and the level of enforcement of the contracts.

Table 2 reveals the answers of the interviewed stakeholders.

Table 2
Farmer–client relationship and contractual aspects

	Very good	Good	Poor	Extremely poor
The history relationship with the buyer is	7%	13%	33%	47%
The respect of contractual terms is	1%	13%	45%	41%
The trust in the partner is	3%	14%	34%	49%
The enforcement of this contract is	0%	10%	40%	50%

Source: calculations based on the field survey, 2011.

The enforcement of the contract is seen as the biggest problem the farmers have to face, 53% of them answering that the enforcement of the contract is extremely poor. The level of trust in partners and the history relationships are seen as poor and extremely poor.

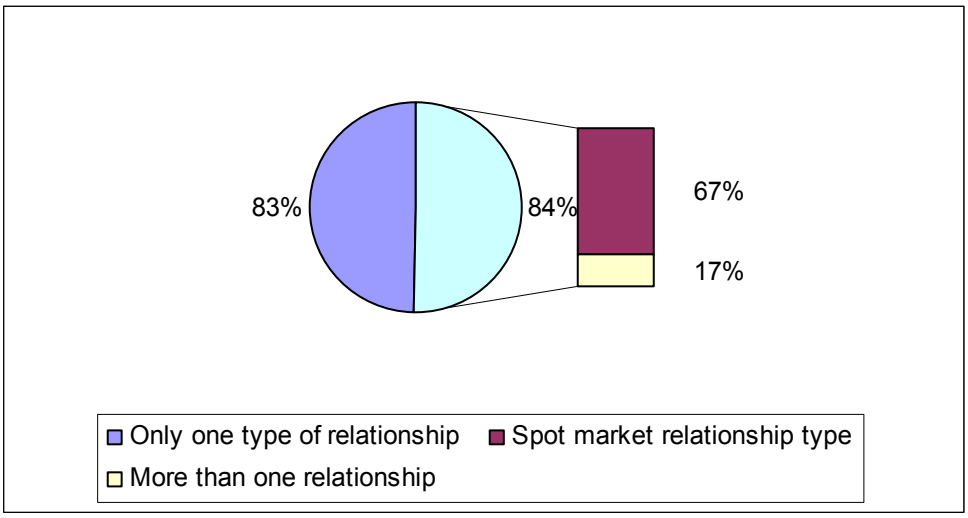

Figure 1. Relationship types.

Another problem reported by the respondents is represented by imports, the quality of which is not rigorously checked at present. For many vegetables, production has a seasonal nature, and the products have to be consumed immediately after harvesting. That is why the prices greatly fluctuate throughout the year. In general, immediately after harvesting begins, prices go down fast. For example, the prices of tomatoes, eggplants and peppers may decrease by up to 50% in 2 weeks. As long as the area under heated glasshouses is low, the producers cannot benefit from the high prices during the winter; in this period of the year, most vegetables come from imports, mainly from Greece, Netherlands and Turkey.

4.2. DETERMINANTS OF THE FARMER'S CHOICE OF THE MARKETING CHANNEL (MARKET PREFERENCE)

In order to see the determinants of the farmers' market preference, and the chance of the small farms to sell trough supermarkets, the respondents were asked to scale from 1 to 4, where 4 represents the highest importance, the following statements: "the price of the product is satisfactory when selling in supermarkets", "the frequency of delivery is good", "quality and grading of my production is satisfactory", "selling individually is satisfactory", "the level of cost entry is acceptable", "the institutional framework and selling trough an organization is satisfactory". For this analysis, binary logistic and probit models were used, where market preference, the dependent variable taking the value 1 = yes and 0 = no was tested.

The general form of the model used was:

$$\text{Market choice} = \alpha + \beta_1 X_1 + \beta_2 X_2 + ...B_6 X_6 + \varepsilon_i$$

The results of the binary probit models are presented in Table 3:

Table 3
Binary probit regression results

Variables	M1	M2	M3
Price	0.068 (0.95)	0.03 (0.86)	0.45 (0.76)
Frequency of delivery	0.59 (0.63)	0.65 (0.48)	
Quality and grading	0.24 (0.55)		
Selling individually	0.77 (1.77)	0.69 (0.97)	0.37 (0.89)
The level of the entry cost	–0.22 (0.27)	–0.34 (0.24)	-0.39 (0.24)
Institutional framework (Membership in an organization)	0.019 (0.28)	0.13 (0.25)	0.15 (0.25)
Log likelihood	–13.58542	–14.14167	–15.21545
McFadden R-squared	0.371448	0.359909	0.311307

Source: own calculations in Eviews based on farm survey 2011.

The results reveal the importance of selling individually rather than by a modern retail chain especially in model M1 and M2. Negative (positive) estimates indicate that an increase of the value of the independent variables corresponds to decreasing (increasing) probability of choosing a formal marketing channel versus selling individually. The negative sign of the variables are in line with my expectations, the level of entry cost for selling in supermarket being considered prohibitive. The frequency of delivery also plays an important role in the selling decision. The model M1 classifies correctly 100% of choice of market preference

of small farmers for selling individually, while model M3 predicts correctly 98% of the market preference of small farmers to sell individually. Te results also suggest that farmers prefer to sell individually as this does not require significant investments, but also as members in an organization, nevertheless to a less extent.

4.3. DISTRIBUTION AND SALES ANALYSIS

In value terms, in 2010, the production of vegetables accounted for 24% of the total crop production value. Nevertheless, following the EU accession, the vegetable supply chain seems the most negatively affected sector, due to the high share of imports and the farmers' impossibility or incapacity to maintain stable contractual relationship within the chain. In addition, many of them are not able to enter or form producers' groups either because of lack of trust or willingness to cooperate. The land area under vegetables accounted for 3.3% of total cultivated arable area in the year 2010. At the European Union level, the share of the area under vegetables is quite similar; the difference is that currently in Romania the consumption needs are not fully covered by the current domestic supply.

The interviewed farmers stated that the former vegetables and fruit enterprises are considered very important, but these are spaces to rent at present for any other type of commodity except vegetables. The storage is very difficult and there are few storage premises. At present there are only a few storage units, which are not sufficient to cover the needs. As a result, it is extremely necessary to build up glasshouses and cold storage facilities for a specialized production.

The sale of production is the most difficult problem as no specific markets for the sale of vegetables production have been established. The farmers who produce low quantities of vegetables are obliged to lower the prices very much, which represents a disadvantage for those whose main activity is vegetable farming and earn a living from the sale of their production. The production is directly sold at the market place or directly at the farm gate (spot market) through wholesalers.

The vegetable farmers feel threatened by the large retail chains as well as by the massive imports. On one hand, the great chain stores refuse to buy the products at a correct price, and on the other hand the imports represent an unjustified competition for the domestic production. "In the hypermarket chains we can see many fresh fruit and vegetables. Just imagine how many of these products come from other countries and include the financial support that the respective countries provide to producers in their selling price" (farmer from Galati County). "The lack of firm contracts and the production sale through wholesalers are the main problems we have to face. In this way both farmers and the consumers are disadvantaged" (farmer from Braila). The distribution/sale of fresh vegetables also implies the fruit and vegetables stores, the distribution activities of the private processors, a great number of private traders (wholesalers) as well as the supermarkets, to which unfortunately the producers declare that they do not have access.

Referring to the products traded through different channels, no accurate measurement can be made of the volume of commodities that are operated through different channels. The verbal information can only indicate certain approximate estimates. It is estimated that more than half of the traded quantity of vegetables is sold to a great number of intermediaries (Figures 2 and 3). In general there are two ways: farm gate sales (that is mostly common) and the sale by the road side (street trade).

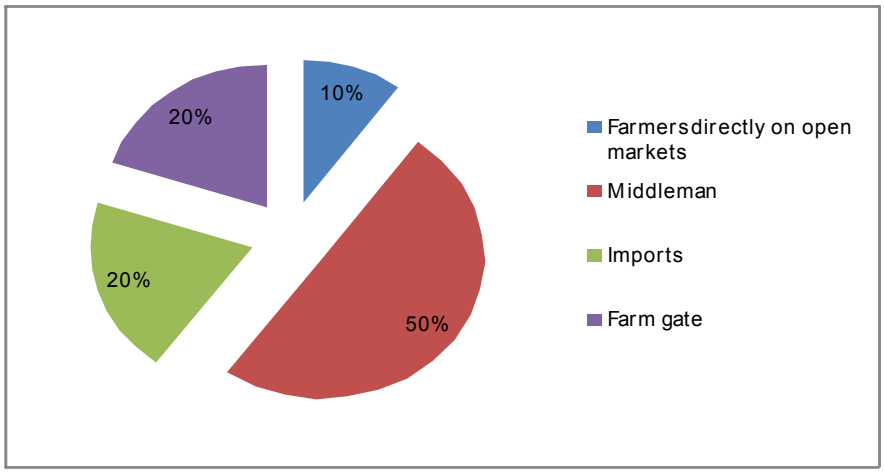

Figure 2. Vegetable sold on traditional marketing channels.

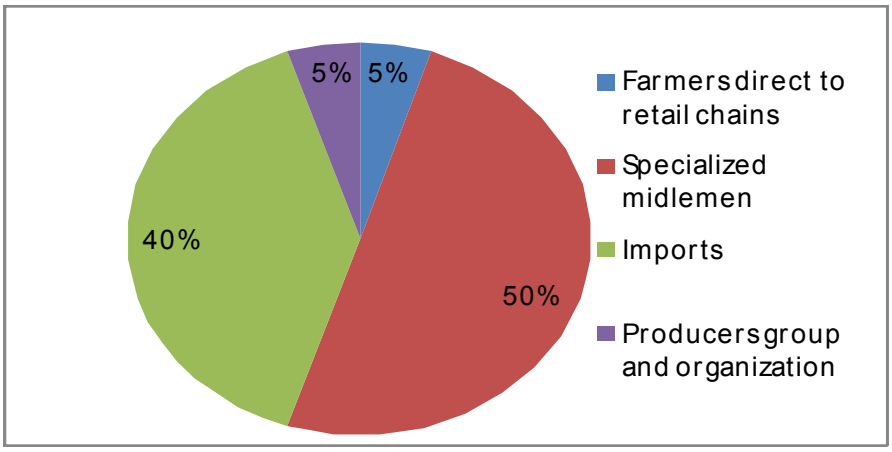

Figure 3. Vegetable sold on retail chains.

Another problem the vegetable farmers are facing is the absence of a reliable production-marketing channel. Bucharest wholesale market was initially built up in order to support the small farmers to sell their products and to distribute the

production at the production price. "At present, imported products are sold on the Wholesale Market (any kind except vegetables) and the rent fee is extremely high for the Romanian producers, i.e. about 2000 euro/month/stall".

Another sale modality is the direct sale to stores and supermarkets. This marketing modality is based upon the daily demand from the retail modern formats. Usually, as the analysis has already shown, very few formal contracts are concluded with the retail chains. As regards the hypermarkets, only few farmers can sell their products through this channel. It is estimated that less than 5% of the traded vegetables are sold in this way. The hypermarkets ask for quality products in large quantities. Even when the farmers comply with these conditions, some supermarkets/hypermarkets refuse to conclude contracts. "We even signed the contract with the hypermarket, accepting all their terms and conditions, and we have been waiting for a year to have this contract signed back. There is a slavery type of relation between the farmer and supermarket" (farmer from Braila). Most of the active traders in vegetables sell vegetables on the local markets themselves. Others act as intermediaries between the farmers and the sellers on the local markets. As a result, the marketing structure is highly fragmented.

5. CONCLUSIONS

The obtained results reveal that in Romania's case, there is a high degree of uncertainty among stakeholders both in terms of contractual relationships and contract enforcement. The share of contractual relationship is higher at the processing-retailing level which is in line with the EU findings, but much lower than in the EU both for the farmer-buyer and the processor-retailer level.

In this paper I also tried to test the hypothesis of small farmers' participation in the retails chains seen as a possible opportunity to increase their revenue and to adapt to the agri-food system dynamics, using probit models. The obtained coefficients have the expected signs and the results show that small farmers prefer to sell individually due to several reasons: high entry costs, scale factors and even price mechanisms. Factors associated with scale have also important implications. One the one hand, for a small scale farm it is very difficult to establish a direct relationship with a supermarket chain due to the quantity required and frequency. For retailers, it also seems inconvenient to negotiate with a large number of small farmers. Thus, for the time being, only large farms and producers' organization can benefit from this opportunity. On the other hand, however, small farmers can be integrated into new marketing systems by being part of producers' organizations which might allow farmers to pool produce in order to guarantee frequency, quality and quantity required by retail chains. Nevertheless, the level of the estimated coefficient for the organization variable is very small especially in model 1 and 4, which shows that farmers still bear in mind negative memories related to

participating in different organizations. Due to high price fluctuations, there is also a strong tendency of selling aside. Prices in the supply chains are more stable, permitting farmers to forecast their revenues, which help them planning their activities. Selling individually seems motivating during a short period in a season, determining contracted farmers to sell aside instead of delivering to retail chains as set in contracts. Nevertheless, some farmers recognize that these short-term benefits usually result in long term losses if they lose the new retail market chain as a sanction imposed by buyers. Selling aside is also a consequence of the need to obtain immediate and cash payments as farmers receive their payment three weeks after delivering their products to retail chains. For farmers, who are new in the retail chains this is a constraint, due to their urgent need of working capital. Practically, for the time being, the obtained results confirm the fact that the marketing choice of farmers is very limited due to the lack of scale, bargaining power and willingness to cooperate.

6. ACKNOWLEDGEMENTS

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