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#### Research Report

# Agri-food business: global challenges - innovative solutions

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**Studies on the Agricultural and Food Sector  
in Central and Eastern Europe**

**Agri-food business:  
Global challenges – Innovative solutions**

Edited by

Thomas Glauben, Jon H. Hanf, Michael Kopsidis,  
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## **PREFACE**

The rise of a western-style middle class in many successful emerging economies like China currently is inducing deep structural changes on agricultural world markets and within the global agri-food business. As a result of both higher incomes and concerns over product safety and quality the global demand for high-quality and safe food products is increasing significantly. In order to meet the new required quality, globally minimum quality standards are rising and private standards emerging. All over the world these developments cause adjustments at the enterprise, chain and market levels. At the same time, the tremendously increasing demand for renewable energy has led to the emergence of a highly promising market for biomass production. This has far-reaching consequences for resource allocation in the agri-food business, for the environment, for the poor in developing countries and for agricultural policy reforms. The challenges increase with ongoing liberalisation, globalisation and standardisation, all of which change trade patterns for agricultural and food commodities, and influence production costs and commodity prices.

The objective of the IAMO Forum is to show opportunities as well as risks for all participants of the food economy in the ongoing globalisation process: for small peasants in developing countries, farmers in Europe and globally active food enterprises and retailers. The success of enterprises depends on the ability to find innovative solutions with regard to the organisation of enterprises, chains, and markets, as well as future policy design. Concerning bio-energy strategies has to be identified to combat global warming most efficiently and concurrently attenuate the competition between "tank and table" on farmland.

IAMO Forum 2008, as well as this book, would not have been possible without the engagement of many people and institutions. We thank the authors of the papers, as well as the referees. Furthermore we are highly indebted to MARLIES LOHR, NADINE GIEMSA and RONNY RECKE who in an outstanding way contributed to the organisation of the Forum. This is true as well for the IAMO administration, whose work we gratefully acknowledge.

Many sponsors has funded the IAMO Forum 2008. We are very grateful to the German Research Foundation (DFG), The Federal Ministry of Food, Agriculture and Consumer Production in Germany, The Ministry of Cultural Affairs of the Federal State Saxony-Anhalt, Germany and last but not least the City of Halle. Further Conference sponsors are the BIONADE Corporation, Gaensefurther

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Halle (Saale), November 2008

*Thomas Glauben, Jon H. Hanf, Michael Kopsidis, Agata Pienadz, Klaus Reinsberg*

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## ON THE POLITICAL ECONOMY OF FOOD STANDARDS

JOHAN F. M. SWINNEN, THIJS VANDEMOORTELE\*

### ABSTRACT

This paper presents a general political economy model of standards. We use the model to derive politically optimal standards and then analyze how various factors affect this political equilibrium. The paper analyses the impact of trade and development on the political equilibrium; as well as the role of the media. We also analyze the impact of the nature of food standards (in particular food safety standards compared to other types of food standards) on a country's choice of the standard and its implications.

**Keywords:** Political economy, standards, food markets.

### 1 INTRODUCTION

Food standards are increasingly important in global markets (FULPONI, 2007). While these developments occur globally, there is a wide variety in standards across countries, and in particular between developing ("poor") and developed ("rich") countries (HENSON, 2004). One explanation is that this is socially efficient as these differences reflect differences in preferences of populations which vary with economic development and incomes, as well as with geography and culture. However, several studies argue that many standards that we observe in reality are not socially optimal (BOCKSTAEL, 1984; FISCHER, SERRA, 2000).<sup>1</sup> The literature provides different reasons why actual standards may differ from those that would be socially optimal: one argument is that standards are used as non-tariff barriers to trade (BALDWIN, 2000; OECD, 2001). A second argument states that standards are suboptimal because they are part of a "race to the bottom", for example to attract foreign investors (WELLISCH, 1995; KUNCE, SHOGREN, 2005), or a "race to the top" (see JAFFE et al., 1995).

In this paper we develop a general political economy model of standard setting. We use the model to derive politically optimal standards and then analyze how various factors affect this political equilibrium. We also analyze the impact of the

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<sup>1</sup> In a very interesting survey and discussion, GARDNER (2003) reviews costs and benefits of standards in food markets and comes to more nuanced conclusions.

nature of food standards (in particular food safety standards compared to other types of food standards) on a country's choice of the standard and its implications. This paper presents the general framework and key results of the formal analyses which are in SWINNEN and VANDEMOORTELE (2008a), SWINNEN and VANDEMOORTELE (2008b), and SWINNEN and VANDEMOORTELE (2008c). We refer to these papers for more details.

## 2 THE MODEL

A key issue is obviously how to model standards. The approaches in the literature differ importantly. Some (such as BOCKSTAEL, 1984) assume that consumers can costlessly observe product characteristics *ex ante*, while others (such as LELAND, 1979) assume that consumers are *ex ante* uncertain about the characteristics of the product. In the latter case standards can improve upon the unregulated market equilibrium by reducing the asymmetric information between consumers and producers. Yet other studies (such as COPELAND, TAYLOR, 1995; FISCHER, SERRA, 2000; ANDERSON et al., 2004; BESLEY, GHATAK, 2007) model the effect of standards as their impact on consumption externalities. This could relate to, for example, minimum standards on catalytic converters in cars or GM foods. Most studies consider that the introduction of standards implies compliance costs for producers, and this holds both for domestic producers and those in countries (interested in) exporting to the country that imposes the standard (HENSON, JAFFEE, 2007; SUWA-EISENMANN, VERDIER, 2002).

Consider therefore a small open economy with one import competing sector, and one numéraire good (good 0). All consumers have identical tastes represented by the following quasi-linear utility function

$$U = c_0 + u(c(p, \lambda^c s)) \quad (1)$$

where  $c_0$  is consumption of the numéraire good,  $c$  is consumption and  $p$  the price of the good produced in the import-competing sector.  $s$  is the standard imposed in the import-competing sector.  $\lambda^c$  is a variable which measures the bias in perception of the consumer.  $\lambda^c$  is equal to 1 if the consumer's perceptions of the standard's effects are unbiased. A higher  $s$  refers to a more stringent standard. A standard which guarantees certain quality/safety features of the product induces to consume more of the product, *ceteris paribus*. For example consumers who perceive health problems with certain (potential) ingredients or production processes may increase consumption if they are guaranteed the absence of these elements. We call this the "consumption effect".

At the production side, we assume that the numéraire good is produced with labor alone ( $l_0$ ); that the sector has constant returns to scale and an input-output ratio of 1. Production in the other sector is a function  $q = f(l, k)$  of the production factor labor  $l$  and of a sector-specific input factor  $k$  that is inelastic. All profits made in the sector accrue to the specific-capital owners. The cost function  $g = g(q, s, w)$

depends on the standard: higher standards increase production costs. We assume that when the country imposes a standard, the production costs of the imported goods also rise as the standard is also imposed for imported goods – and is equally enforced. We discuss the implication of (relaxing) this assumption later (see also SWINNEN and VANDEMOORTELE, (2008b) for a more extensive discussion).

### 3 THE POLITICAL OPTIMUM

The government's choice problem is modeled as an extension of the political economy model of GROSSMAN and HELPMAN (1994). In setting the standard, the government maximizes an objective function which consists of a weighted sum of contributions from lobbies and social welfare. In our generalized model, there are three lobby groups, which in Grossman-Helpman terms are all organized and effectively participate in the lobby game. Unlike many applications of the Grossman-Helpman model who consider that only producers are organized (e.g. ANDERSON et al., 2004; CADOT et al., 2004) we consider it more realistic to assume that the rest of society is also politically organized.

In our model therefore, producer and consumer lobbies try to influence government policies on standards. Producers and consumers are assumed to be politically organized and lobby simultaneously. The "truthful" contribution scheme of the producers is equal to the function  $C_p(s) = \max\{0; \Pi_p - b_p\}$ , with the constant  $b_p$  the part of the profits  $\Pi_p$  that producers want to keep. Similarly, the 'truthful' contribution scheme of the consumers is  $C_c(s) = \max\{0; \Pi_c - b_c\}$ , with  $\Pi_c = u(c) + w(l + l_0) - pc$  the aggregate consumer surplus. The constant  $b_c$  can be interpreted in the same way as in the contribution schedule of the producers. The government's objective function  $V(s)$  can then be written as a weighted sum of the contributions of producers (weighted by  $\alpha_p$ ), the contributions of the consumers (weighted by  $\alpha_c$ ), and the overall social welfare, where  $\alpha_j$  ( $j = p, c$ ) represents the relative lobbying strength:

$$V(s) = \alpha_p C_p(s) + \alpha_c C_c(s) + W \quad (2)$$

The politically optimal standard,  $s^*$ , is determined by:

$$\begin{aligned} (1 + \alpha_p) & \left[ \frac{\partial p}{\partial s} \left[ q + \frac{\partial q}{\partial p} \left( p - \frac{\partial g}{\partial q} \right) \right] - \frac{\partial g}{\partial s} \right] + \\ (1 + \alpha_c) & \left[ \frac{\partial p}{\partial s} \left[ \frac{\partial c}{\partial p} \left( \frac{\partial u}{\partial c} - p \right) - c \right] + \lambda^c \frac{\partial c}{\partial s} \left( \frac{\partial u}{\partial c} - p \right) \right] = 0 \end{aligned} \quad (3)$$

The first term in equation (3) captures the impact on producers weighted by their lobbying strength; this impact may be positive or negative. Producers will lose from higher standards when the increase in costs is larger than the price effect and subsequently contribute less. When the marginal change in production costs

is smaller than the price effect, the producers will contribute more to support this standard that eventually will be higher.

The effect of a higher standard on consumer surplus weighted by the consumers' lobbying strength is also uncertain. Consumer surplus of the representative consumer will increase if the marginal "consumption effect" is larger than the "rice effect" resulting in higher contributions from consumers. Vice versa, if the negative price effect on consumers outweighs the beneficial consumption effect, consumers will contribute less such that the standard in the political equilibrium will be lower.

#### 4 THE NATURE OF STANDARDS

In our theoretical analysis we distinguish between two types of standards: food safety standards (FSS) and food quality standards (QS). This categorization of food standards is based on BROM (2000).

The first category of standards is food safety standards (FSS). In the analysis of BROM (2000), this is the type of standards that matters to all consumers. The main purpose of FSS is to provide consumers with safe food. Examples of such standards are the limitation of pesticide residues on vegetables, or more generally the prohibition of dangerous substances in any food.

The second category is quality standards (QS). These standards ensure certain product characteristics to the consumers. These product characteristics do not include safety, but rather concern consumer preferences about other aspects of nutritional quality, taste, color, size, etc. These standards may be linked to personal life style choices (e.g. vegetarians).

We further distinguish between the consumption effects of FSS and QS. Empirical evidence indicates that consumer reactions to food safety problems may be very strong. There are studies documenting that in several cases of (perceived) food safety crises consumers reacted very strongly to such crises. For example after the outbreak of BSE ('mad cow') disease in 1996 in the UK, meat consumption in France declined dramatically (LATOUCHE et al., 1998). Similarly, with the dioxin crisis in Belgium in 1999 consumer reactions were dramatic (SWINNEN et al., 2005; VERBEKE, WARD, 2001). Although there are no formal statistical tests comparing consumer reactions to changes in safety and quality of food (or standards), case evidence does suggest that consumer reactions are stronger in the case of food safety issues. We therefore assume that the consumer reactions, measured by  $\lambda^c \frac{\partial c}{\partial s}$ , to FSS are larger than for QS, ceteris paribus. For simplicity we make the assumption that the producer implementation cost for all types of standards (FSS and QS) is identical.

We should point out that this categorization is a theoretical separation which is useful for our analysis and which allows to trace the impact of these different effects, but that many of the standards which one observes in reality may have



characteristics including more than one standard category. For example organic food standards which one finds in many countries may capture several of these categories. Consumers may consider food labeled as organic as safer because of the absence of pesticides in its production (a food safety aspect in our classification), but also more tasteful (a quality standard in our classification), and society may, in addition, benefit from reduced pesticide use (which would be a social and environmental standard in our theoretical classification). However, for the purpose of this paper this mutually exclusive classification is useful. Obviously, it is important to take these considerations into account when drawing implications for empirical work.

We now consider how the nature of standards will affect the political economy of public standards. Using (3) we can analyze how the type of standards may affect the political equilibrium and thus the level of the public standard. Differences in the level of standards according to which category the standard belongs may arise for different reasons, captured by the two terms in the first order condition of the government (equation (3)) which determines the politically optimal public standards. More specifically, the political optimal level of the different standards will depend (a) on the (exogenous) relative lobby weights of the different political groups (captured by the relative values of  $\alpha_p$  and  $\alpha_c$ ); (b) on the lobby contributions by the different groups, which in turn reflects, among other things, differences in the impact of the standards; and (c) on whether the various standards differentially affect other variables, such as the perceptions of the effect of the standards.

A first result is that public food safety standards will be higher than public food quality standards. The implementation cost effects of standards are the same for FSS and QS and foreign producers are also required to introduce the standard (at least for imports which are relevant for our analysis). In a small open economy this implies that the net impact on domestic producers for QS and FSS will be identical. With the ‘consumption effect’ of FSS stronger than that of the QS, *ceteris paribus*, it follows that the equilibrium standard will be higher for FSS than for QS.

Second, if perceptions are biased in a certain way this would also affect the outcome. For example if consumers perceive food safety hazards as more dangerous to their welfare than quality problems (i.e. if  $\lambda^c(FSS) > \lambda^c(QS)$ ) this would reinforce the earlier result and further increase the gap between food safety standards and quality standards. While there is little evidence on these issues, ANSELL and VOGEL (2006) argue that exaggerated negative perceptions are particularly important in food scare cases. If so, this would imply that such factors would lead to a further relative increase of food safety standards compared to other standards.

## **5 THE ROLE OF TRADE**

Trade affects the politically optimal standards in (at least) four ways. First, trade will affect the net impact of standards on producers and consumers as reflected in equation (3) and hence their political contributions. For a given level of consumption, with relatively large imports and less domestic production, the producer effects will be smaller and hence producer contributions lower. Vice versa, for a given level of domestic production more imports and higher consumption levels imply that the effects on consumers will be larger and therefore consumer contributions higher. Second, standards may affect the comparative cost advantage in production between domestic and foreign producers. Third, standards may also affect comparative advantage through implementation costs of standards. Countries with high production costs (importers) may be more efficient in implementing standards. In such cases, standards will give an advantage to domestic producers over foreign producers and will increase contributions in favor of the standard. Fourth, enforcement of standards may be different between domestically produced and imported goods. If the country has enforcement problems in its domestic market (for example if producers are dispersed) domestic producers benefit from a higher price without the costs of compliance. This would increase producer contributions of the sector in favor of a standard. However consumer contributions will be lower because they benefit less from poorly enforced standards. The reverse scenario is also possible.

## **6 CONSUMER PERCEPTIONS, DEVELOPMENT AND THE MEDIA**

Perceptions of consumers are an important factor in the political economy of standards. Studies find that consumer perceptions are functions of the level of consumer trust in government regulators, attitudes toward scientific discovery, and media coverage (KALAITZANDONAKES et al., 2004). Consumer perceptions (and attitudes) may also represent rational reactions to differences in costs/benefits. The public is most negative towards GM foods in most of the developed countries, especially in the European Union and Japan (with the US an exception). In poorer countries consumer attitudes toward GM foods are less negative and in many cases positive (see CURTIS et al., 2008 for a review). Consumers in rich countries have less to gain from GM induced farm productivity improvements compared to developing country consumers who have much to gain from cheaper food.

Information flows also play a role. A study by MCCLUSKEY et al. (2003) finds that people associated with agriculture or consumers living in rural areas are more in favor of GM crops than urban consumers. It is likely that consumers associated with agriculture have a better idea of pesticides used on non-GM crops than urban consumers; and hence of the benefits from GM (such as pesticide resistant crops).

Mass media is the main source of information for consumers to form attitudes regarding many issues, including food (FREWER et al., 1998). Commercial media is more likely to highlight potential risks associated with biotechnology in its reporting (MCCLUSKEY, SWINNEN, 2004). The increased cost of media information in developing countries leads to lower media consumption and to a proportionately stronger reduction in negative stories. In addition, government control of the media is stronger in poor countries. This may lead to a more positive coverage of biotechnology (CURTIS et al., 2008).

## 7 DEVELOPMENT AND THE POLITICAL ECONOMY OF STANDARDS

Our analysis suggests several reasons for the wide variety in standards across the world, and in particular between developing ("poor") and developed ("rich") countries.

The most obvious factor is that lower income levels imply relatively lower consumer preferences for nutrition and health standards, and stronger consumer preferences for lower food prices. These differential consumer preferences for standards are reflected in differences for the marginal values of  $\partial c/\partial s$  and of  $\partial c/\partial p$  in equation (3). As a consequence, consumer contributions in favor of standards will be lower in poor than in rich countries and this leads to a lower politically optimal standard level, *ceteris paribus*.

Another factor is the enforcement of standards, which is likely to vary among countries. Studies find that the quality of institutions (including institutions for enforcement of contracts and public regulations) is positively correlated with development. Consumer contributions in favour of standards will be lower with poor enforcement, and therefore is less strong in poor countries because of this factor.

Related to this, while poor countries with low wages and relatively less urban pressure on land use may have a cost advantage in the production of raw materials in agriculture and food markets, producers in rich countries may have lower implementation costs. Lower implementation costs could result from better higher education and skills of producers, better public infrastructure, easier access to finance, etc.

As we explained above, the media structure and information provision is likely to induce a more pro-standard attitude of consumers in rich countries than in poor, as increased access to media will increase attention to risks and negative implications of low standards.

In combination these factors will shift the political equilibrium from low standards to high standards with increases in development. In the extreme cases, the variations in the mechanisms identified here may result in a pro-standard coalition of consumers and producers in rich countries (where producers may also support standards as they enhance their competitive position against imports) and an

anti-standard coalition in poor countries (where consumers may oppose standards as they are less aware of possible health and nutrition problems, as the enforcement may be ineffective, and as they are more concerned with low food prices than food standards).

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## AN ANALYTICAL FRAMEWORK FOR THE STUDY OF DEVIANT BEHAVIOUR IN PRODUCTION

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### ABSTRACT

Production misbehaviour increases the risks of adverse outcomes for buyers and consumers. Such outcomes represent negative externalities caused by the breaking of rules designed to prevent them. The probability of misbehaviour increases with the benefits for its authors. It decreases with the probability and level of sanctions as well as with effective social norms that back up the rules. This paper aims to contribute to a better understanding of behavioural risks by developing an analytical framework for the study of economic misconduct. It also discusses how this framework can be applied in a performance analysis of institutional "solutions" that have been found for behavioural risks.

**Keywords:** Asymmetric information, behavioural economic analysis, moral hazard, protective factors, subjective expected utility.

### 1 INTRODUCTION: BEHAVIOURAL RISKS IN ECONOMIC RELATIONSHIPS

Risks stemming from production may be caused by *technological hazards*, i.e. a genuine lack of knowledge or safety breakdowns and technical failures. They may also be caused by *deviant economic behaviour* (including white collar crime, cf. ENTORF, SPENGLER, 1998; FRIEDRICH, 2003; SUTHERLAND, 1949, 1979) of self-interested actors who break contractual and/or legal rules such as those aimed at protecting consumers' health and the environment. Food producers might, e.g., exploit the fact that, due to *information asymmetries*, neither their production activities nor the resulting food properties can be directly observed by buyers (be they downstream food businesses, consumers or other stakeholders). Price spreads for different quality categories and/or the *costs of compliance* with public and/or

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private quality and safety standards may tempt self-interested producers to exploit such information asymmetries.

From an informational economics point of view, asymmetric information with regard to a product's properties and attributes can be described by the term *credence quality*. Credence qualities do not only refer to *quality risks* of being deceived regarding the underlying production processes or a product's properties and contents (e.g. deer vs. kangaroo meat). They also refer to *safety risks* that are caused by the use or consumption of products containing contaminants or pathogens. While entailing irregular technological practices and while leading to downstream diseconomies or social damages (*negative externalities*) such as consumers' exposure to increased residue levels, the threat of self-interested, *opportunistic malpractice* has been labelled *moral hazard* by game theorists (cf. e.g. KREPS, 1990), stressing both the original cause of these risks and the direction of potential countermeasures.

The probability that undesired production outcomes are caused by malpractice rises with the profits that can be earned through opportunistic acts. HENNESSY et al. (2003) posit that *misdirected incentives* are a major source of food risks, and that there are relevant constellations where *intransparent markets* and malfunctioning regulation make non-compliance more profitable than compliance (see also HIRSCHAUER, MUBHOFF, 2007; HIRSCHAUER, ZWOLL, 2008). This, in conjunction with opportunism, gives rise to negative externalities and the *failure of markets* if deviant agri-food firms can outperform rule-abiding competitors. However, individuals may react differently to economic temptations due to different levels of *protective factors* (bonds to social norms such as values, emotions, community pressure etc.) that back up the rules (cf. LÖSEL, BENDER, 2003). Protective factors can be seen as limiting the actors' freedom to break the rules (TITTLE, 1995, 2000), or as forming the non-economic components of the actors' preferences (e.g. ones influenced by notions of fairness or altruism).

Infringements of production-related rules have not attracted a high level of systematic attention in the social sciences so far. This gives rise to the question whether their prevalence is low or whether they are simply insufficiently covered by the agenda of economists and social scientists. When interpreting business crime statistics in this respect, the essential features of economic crimes should be recognized: unlike "traditional" crime which itself is evident, business crime frequently remains covert. Its adverse effects are often widely dispersed over time and space, and thus "relatively invisible" (CROALL, 1993). Furthermore, the (criminal) status of an economic offence is often ambiguous and the responsibility is frequently diffuse.

The relative *invisibility of economic misconduct* in conjunction with its *ambiguous criminal status* and the *diffuse responsibility* allow offenders to see themselves as honest/respectable persons by rejecting that they are personally



responsible or that a harm is done (cf. SZWAJKOWSKI, 1992). Hence, social norms that could back up the formal rules and that could act as protective factors tend to be weak. This applies especially to corporate misconduct if none of the executives is individually accountable. The lack of protective factors is enhanced if misconduct causes "only" an increased probability of adverse outcomes, and if these outcomes are disputable or if they constitute "only" fraud without anybody suffering a "real" damage (e.g. mislabelling regarding a product's geographic origin or its weight).

Despite a growing societal awareness regarding crimes against consumers, the complexity of such behaviour is rarely considered in empirical analyses. Consequently, knowledge gaps persist regarding effective governance and regulatory strategies. In other words, *behavioural analyses* (cf. GAROUPA, 2003) are lacking which consider the *individual's multiple goals*, i.e., his selfish *and* altruistic preferences and the trade-offs between them. Understanding the phenomenon requires that the actors' options of choice are assessed and that their calculi are reconstructed according to their subjective preferences, perceptions and evaluations. "These need not necessarily represent the physical rules of the world (RUBINSTEIN, 1991: 910)". Instead, one should use a *bounded rational choice* model which reflects behaviour as a result of what the individual sees as procedurally reasonable in the light of the available information and his information processing capacities (cf. e.g. MACLEOD, 2003; SIMON, 1986).

Given this background we outline in section 0 a conceptual starting point by providing a definition of governance and regulation. In section 0 we develop an *analytical framework* for the study of economic misconduct. The framework represents a theoretical development which is based on a *subjective expected utility* perspective in a broad sense in that bounded rationality and multiple goals are considered. Section 0 finally concludes with an outlook how this framework can be used to contribute to institutional performance analysis in the food sector.

## 2 GOVERNANCE AND REGULATION – A CONCEPTUAL DEFINITION

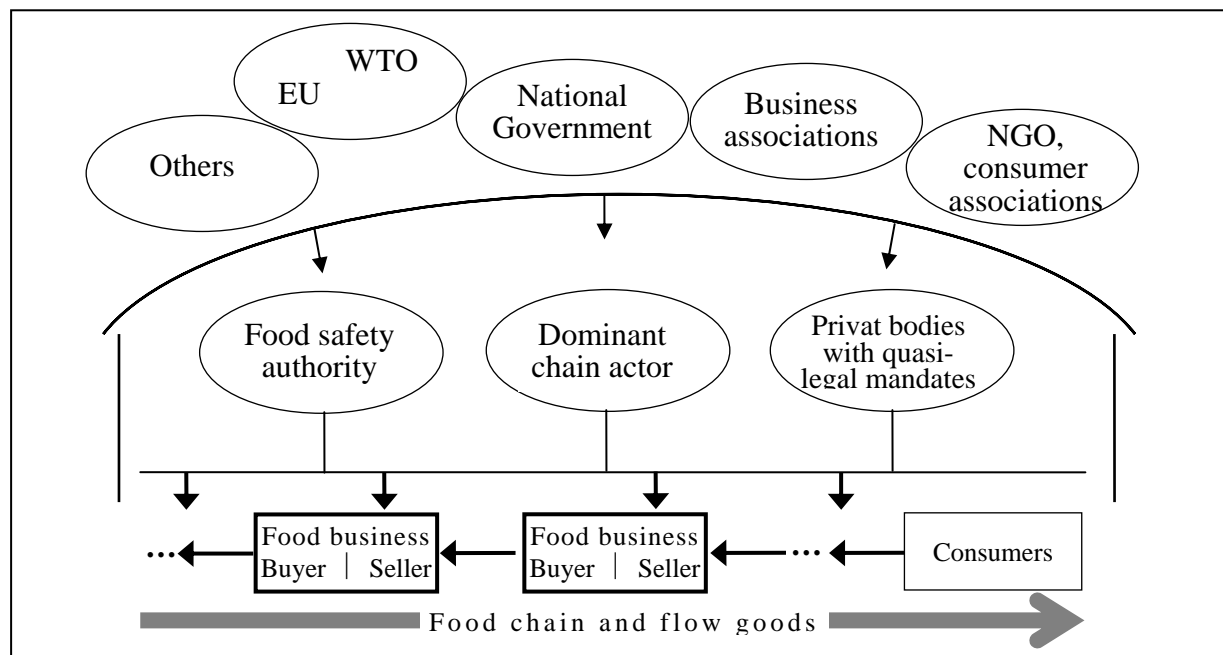
In the words of BRAITHWAITE (2007: 1) we may state that "few projects are more central to the social sciences than the study of regulation and regulatory governance". However, neither a uniform set of questions nor a consistent set of definitions are associated with these terms across social science disciplines such as microeconomics, management sciences, political sciences, criminology, social psychology, sociology etc. This has led to a conceptual confusion which impedes interdisciplinary cooperation in this central social science project.

Avoiding an inevitable piecemeal discussion of historical developments and conceptual differences that exist between different social science disciplines concerned with regulation, we provide a hopefully integrative conceptual definition that outlines the subject and the aims of this social science project. To do so, we distinguish, first of all, governance from regulation. Following BRAITHWAITE (2007)

we conceive of **regulation** as a narrower term than **governance**. Whereas governance is about providing, distributing *and* regulating, "regulation can be conceived as that large subset of governance that is about steering the flow of events and behaviour, as opposed to providing and distributing (BRAITHWAITE, 2007: 3)." While reference could be made in principle to the regulation of any kind of social behaviour, the term regulation is more particularly used in relation to economic activity (PICCIOTTO, 2002). This includes efforts to influence the behaviour of economic actors by "making failing markets work". Based on this definition, we can distinguish three **regulatory dimensions**: the regulator-regulatee relationship, the regulatory regime, and the regulatee's behavioural determinants.

Regarding the **regulator-regulatee relationship**, we leave behind a perspective that focuses exclusively on actions by governments. Instead, we see economic actors as being regulated by a mix of public-private **co-regulation** which is brought about by a **regulatory network** of various governmental agencies and non-governmental actors including market participants, corporate business associations, NGOs and other special interest groups (cf. OSTROM, 2005).

**Figure 1: A simplified structure of regulation in the food industry**



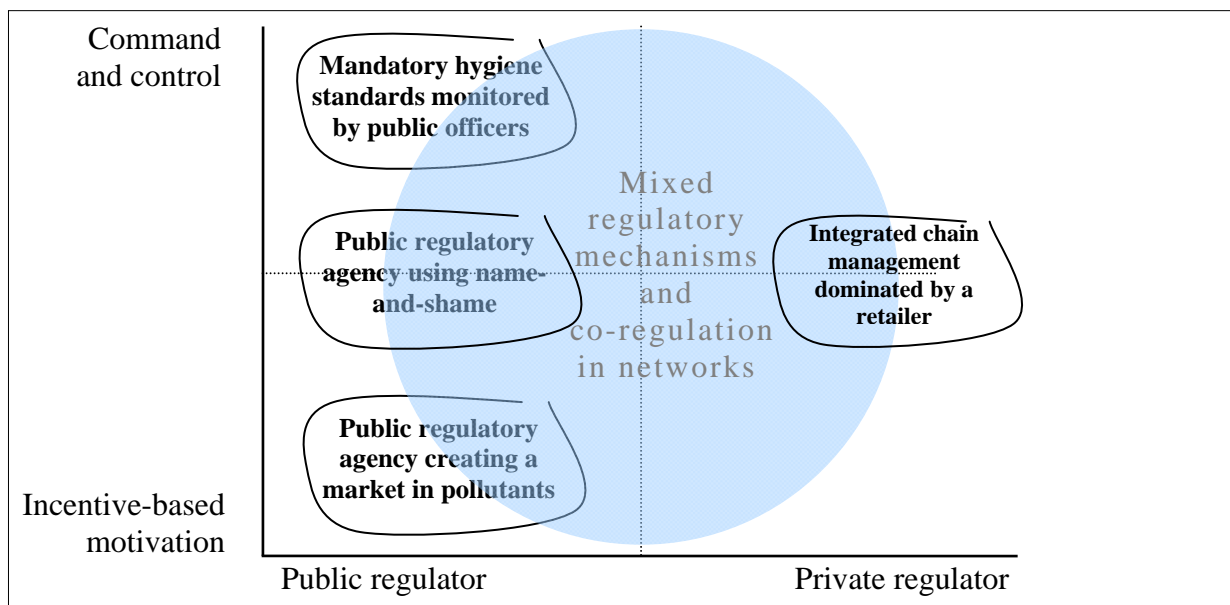
Source: Own representation.

Abstracting from complex interdependencies, Figure 1 provides a simplified picture by focusing on a seller-buyer dyad in a food chain. The arrows indicate the direction of the regulatory influence: food safety authorities aim to ensure business behaviour along the chain which adheres to public standards and does not produce negative externalities. Additionally, food businesses who buy inputs want their suppliers to adhere to specified private standards. In some cases, an integrated chain management and a "dominant" chain actor (e.g. a retail chain) may aim to regulate the behaviour of all actors along the supply chain through private standards

in order to obtain a competitive advantage on the market (e.g. through a premium label signalling high-quality processes and high-quality products). There may also be private bodies (e.g. certification and testing institutes) who have public (quasi-legal) mandates. Finally, all the chain actors including consumers are interlinked with business and consumer associations as well as bodies which are concerned with the harmonization of production and trade standards on the cross-national and international level (e.g. EU, WTO).

The **regulatory regimes** that are in force to steer the behaviour of economic actors can be systematized according to whether these regimes primarily aim to impact on the actors' set of choices or their expected utilities. We understand regulatory regimes as a mix of steering mechanisms that can best be described by the extreme types **command and control** of rule-abidance as opposed to **incentive-based motivation** (cf. Figure 2).

**Figure 2: Regulator types and regulatory regimes**



Source: Own representation.

No exclusive relationships link certain regulatory regimes to certain regulator types. Public regulators, e.g., regulate through hierarchical command and control as well as through incentives. An example of the former are mandatory hygienic standards that are monitored and enforced by public officers. An example of the latter is the recent creation of a market in pollutants. An example of a mixed regulatory regime are name-and-shame measures that combine public inspection with reputational sanctioning through transparent markets. Mixed regulatory mechanisms are also used by private firms. While private businesses are mostly seen as relying on hierarchical command and control mechanisms within the firm, and on the market for inter-firm transactions, regulatory mixes are used in both contexts: in firms, incentive-based payment schemes complement command and control, and, in the presence of product quality uncertainty, inter-firm transactions are often characterized by regulation mechanisms that are located somewhere

on the range between the extreme types control-based and incentive-based. The shaded area in Figure 2 is meant to indicate that economic actors are always co-regulated by a mixed group of regulators (networks) both from the public and the private sphere all of which rely on a mix of regulation mechanisms. However, regulatory contexts differ with regard to the relative impact of diverse regulators and regulatory regimes.

The regulatees' *behavioural determinants* are the expected utilities they subjectively associate with their choices. Even though the probability of malpractice can be conceptualized as varying with its expected economic benefits, there are different individual reactions to economic temptations due to different levels of protective factors. This corresponds with the broad utilitarian view that human behaviour is shaped by a mix of motivations including altruism and other non-wealth maximizing preferences (cf. NORTH 1990). Depending on the situation, utility gains from complying with rules may (or may not) outweigh temptations to break them (cf. PINSTRUP-ANDERSEN, 2005).

From a normative point of view regulators aim to impact on the behavioural drivers of the actors they want to steer by (i) changing the regulatees' physical opportunity sets (e.g. through the introduction of new technologies), (ii) by changing their material incentives (e.g. through a change of record keeping requirements and control, enforcement and sanctioning practices), or (iii) by shaping their codes of conduct and bonds to social norms (e.g. through persuasion and education). NOOTEBOOM (1996) labelled these three generic strategies of mitigating relational risks as "opportunity control", "incentive control" and "propensity control". A complete physical enforcement of rules is hardly possible as the measures needed to eliminate all physical opportunities to break rules are too costly and/or legally disproportionate. The way out seems to be to search for complete contingent contracts which "get the (economic) incentives right" (cf. e.g. STIGLITZ, 1987), with incentives hinging on parameters such as the costs of compliance, the detection probabilities and the sanction levels. Such *incentive-compatible contracts* would account for the existence of rule-breaking opportunities but eliminate all economic temptations to use them. That is, the "right" economic incentives would supersede any need for bonds to social norms.

Despite all efforts to reduce both rule-breaking opportunities and temptations, most economic relationships are characterized by incomplete contracts: i.e. the prescribed behaviour is neither completely (physically) enforceable nor are the action situations fully incentive-compatible. Without norm-based voluntary compliance, misdirected incentives, which cannot be reduced to zero at reasonable costs, continue to induce rule-breaking. Efficient prevention of economic misconduct thence requires *smart and responsive regulation* (BRAITHWAITE, 2003; GUNNINGHAM et al., 1999). Smart regulation can be seen as a regulatory strategy which aims to "*get the subjective expected utilities right*" by consistently combining measures that reduce misdirected incentives with measures that strengthen the actors' bonds to social

norms. The conception of economic man underlying the change from the famous "get the incentives right" to the more adequate "get the subjective expected utilities right" is the key to the understanding of what behavioural economic analysis and the regulatory issue are essentially about.

### 3 DEVELOPMENT AND DISCUSSION OF THE ANALYTICAL FRAMEWORK

Being an intriguing, wide-spread and multi-faceted subject, the study of economic misconduct and opportunistic practices has spawned large and growing, but quite separated bodies of work by micro-economists and game theorists, management scientists, institutional economists, criminologists, social-psychologists and others. Their common denominator is that they consider *rule-breaking as a relevant behavioural option of economic actors* which, in turn, causes *relational (or behavioural) risks* for their business partners and other stakeholders who might be adversely affected. While having different contextual foci and methodical toolboxes, they explicitly view people's choices as being motivated by both material and normative motivations (cf. e.g. COLEMAN, 1987, 1988; PINSTRUP-ANDERSEN, 2005).

The analytical framework is aimed at integrating these approaches. It essentially understands the actors' subjective expected utilities as their motivational drivers (or behavioural determinants), and specifies which factors are potentially of interest in a behavioural economic analysis aimed at understanding the mental models and facts as subjectively perceived by the economic actors. The proposed framework is basically a synthesis of two streams of literature: on the one hand, the new institutional economics concept by OSTROM (2005) which adds so-called delta parameters to the material payoffs of an individual to account for the perceived immaterial costs and benefits of breaking and obeying rules, and on the other, the criminological conceptions of criminogenic (crime producing) factors and protective factors in conjunction with control theories (cf. TITTLE, 1995, 2000) which understand deviance as a social fact, the emergence of which is due to the "natural" human inclination towards self-interested behaviour and the (inevitability of) gaps within the system of social control.

Table 1 illustrates the rationale of the framework: the actor can save 190 in costs ( $\Delta u_c = -190$ ) by disobeying some rule. Since sales are identical in both cases and since the expectation value of the sanction is only  $u_l^d = -110$ , his expected net material loss caused by complying amounts to  $\Delta u_a = -80$ . If the actor had the exclusive objective to maximize his material benefits, the perceived situational incentives of the contract would not be "right". In the depicted example, the actor is assumed to be of a "mixed type", however: he is assumed to experience immaterial utilities  $u_b^o$  tantamount to 30 for obeying the rules. He is also assumed to experience immaterial disutilities  $u_b^d$  tantamount to  $-60$  for disobeying. Given net immaterial utility  $\Delta u_b$  tantamount to 90 for obeying the

rule, he resists the material temptation of 80 to break it; i.e., our illustrative actor has a total utility differential of +10 in favour of rule-abidance.

**Table 1: Systematization of behavioural determinants in an analytical framework**

	$u^o$ (expected utility for obeying the rule)	$u^d$ (expected utility for disobeying the rule)	Balance $\Delta u$ ( $\Delta u = u^o - u^d$ )
<b>Utilities resulting from material motivations</b>			
<b>c:</b> costs (various sources)	-200	-10	-190
<b>p:</b> sales	+1,000	+1,000	0
<b>l:</b> sanctions	-	-110	+110
<b>k:</b> non-monetary effort	-100	-100	0
<b>a:</b> Net utility from material preferences	<b>+700</b>	<b>+780</b>	<b>-80</b>
<b>Utilities resulting from immaterial motivations</b>			
<b>i<sup>+</sup>:</b> intrinsic psychological rewards (self-esteem)	protective factors +30	criminogenic factors -	+30
<b>e<sup>+</sup>:</b> extrinsic social rewards (respect)			
<b>i<sup>-</sup>:</b> intrinsic psychological costs (e.g. guilt)	Criminogenic factors -	protective factors -60	+60
<b>e<sup>-</sup>:</b> extrinsic social costs (exclusion)			
<b>b:</b> Net utility from immaterial preferences	<b>+30</b>	<b>-60</b>	<b>+90</b>
<b>Total utility</b>	<b>+730</b>	<b>+720</b>	<b>+10</b>

Source: Own representation.

Relating the framework to the criminological discourse, one could say that immaterial rewards for obeying rules and immaterial costs for disobeying represent the utility-relevant consequences of protective factors. Accordingly, immaterial costs for obeying rules and immaterial rewards for disobeying can be seen as representing the consequences of criminogenic factors. Since deviant economic acts are mostly located in otherwise legitimate bona fide organizations and carried out by respected members of the professions and the business community, the immaterial gains from disobeying are assumed to be zero in our example. This means that – contrary to other offences such as street violence – economic deviance is conceived as being caused by economic temptations that coincide with lacking protective factors rather than by the prevalence of criminogenic factors.

## 4 CONCLUSION

Institutional performance analysis is commonly associated both with transaction cost economics and agency theory. Economizing on transaction costs (including

agency costs and the ex post costs of processing disputes) through an adequate choice of governance structures is seen, on the one hand, as the reason why transaction-cost efficient governance structures evolve and survive in a natural selection process. On the other hand, allowing for the temporal existence of inefficient solutions, economizing on these costs is understood as the organizational imperative for a judicious choice of governance structures (cf. WILLIAMSON, 1988).

Many institutional analysts which conceptually rely on transaction cost and agency theory link observed institutional phenomena such as governance structures and contract designs, on the one hand, with the degree of asset specificity and uncertainty, on the other. In contrast to that, the analytical framework proposed in this paper focuses on the action situation of the agent (the regulatee) engaged in a certain transaction: using the framework means attempting to reconstruct the regulatee's action situation according to his subjective perception. This includes *all* the payoffs expected by the regulatee (those that are directly resulting from the contract as well as the share of the ex post dispute settlement cost which he expects to have to bear in the case of disclosure). A behavioural economic analysis based on the framework means opening up the black box of the regulatees' action situation by incorporating the subjectively perceived material incentives as well as reputation effects, social norms and community pressure into the analysis. With regard to agri-food chains, such a behavioural economic analysis would improve our understanding of the interactions between various stakeholders. Using the framework for institutional performance analysis implies that situations where existing opportunities and temptations to break rules are not neutralized by protective factors are understood as being the consequence of a less-than-optimal institutional arrangement regarding the solution of the moral hazard problem.

In a normative sense, the identification of less-than-optimal institutional arrangement calls for the search for a better "opportunity control", "incentive control" and "propensity control". From a regulatory point of view, the choices that have to be made in this regard represent ill-structured and complex decision problems which cannot be supported by formal optimization procedures. The complexity associated with these choices arises from the fact that, besides the design of a specific contract, institutional arrangements on several other levels (i.e. the governance structures as well as the generic institutional environment) impact simultaneously on the regulatee's behavioural determinants and the strategies available to the regulator.

In this context, it should be noted that the methodological contribution of the framework is limited: it is neither able to predict institutional changes which are likely to occur in the future nor is it able to indicate optimal simultaneous changes in the institutional arrangements on different institutional levels. It generates, however, methodological support for the identification of existing behavioural problems by providing a systematic classification of behavioural determinants in terms of expected utilities from various sources. The framework's main contribution

for future analyses is that it shows *what* needs to be studied in a behavioural economic analysis. It consequently has the potential to inform us better about how successful existing institutions are in getting the subjective expected utilities right, i.e. how successful they are in reducing deviance and avoiding negative externalities by shaping the regulatees' economic and social environments and perceptions. Appreciating the framework's crucial methodological contribution, whilst admitting to its limitations, provides a point of departure for empirical studies on institutional performance which identify institutional "hot spots" with a less-than-sufficient performance.

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## NETCHAIN INNOVATIONS FOR SUSTAINABLE PORK SUPPLY CHAINS IN AN EU CONTEXT

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### ABSTRACT

This paper aims at providing insight in the need for innovations in the European pork sector for construction of sustainable pork supply netchains. It provides an overview of sustainability pressures on netchain actors such as societal conformity, environmental impact, and economic sustainability. The paper shows that close relations between netchain and non-netchain actors is critical in order to create and adopt innovative solutions to meet these challenges. The focus is on the development of pork netchains that aim at the high quality production in regional and organic niche markets.

**Keywords:** Innovation, supply chain networks, sustainability, niche markets.

### 1 INTRODUCTION

During the past two decades the agri-food sector in Europe has undergone profound changes, with specifically the pork sector being confronted with many and diverse challenges. Revolutionary advances such as innovations in products and processes at the production and processing end of the chain do not match well with differentiated market demands. Therefore, a sustainable cross-chain approach becomes a precondition to tackle such challenges.

Due to public and societal concerns there is a growing need among pork netchain actors to work towards sustainable supply chains. The paper will view a pork net chain as being sustainable when it integrates aspects related to Planet (public concerns), People (societal concerns) and Profit (commercial concerns). The paper will focus on those chain actors with relatively powerful positions, such as organized producers, meat processing industries and supermarkets, which will have an important role to play in anticipating and acting on new developments in pork netchains. Effective cooperation and network building between European chain actors is crucial for developing innovative approaches that answer to public and societal concerns, as well as to their own business concerns. With developments

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of more sustainable production coming their way, European pork netchain actors will need to work towards innovative approaches to answer to these public, societal and business concerns.

The main objective of this paper is to develop a framework which will enable the definition of critical success factors (CSFs) that support successful adoption of netchain innovations for the construction of sustainable pork supply netchains in a European context. The paper makes use of two case studies to support the development of this framework, namely The Iberian cured ham chain in Spain, and the Organic pork chain in The Netherlands. These cases derive from the "Inventory of the European pork sector", which is performed as part of the EU funded Integrated Q-Porkchains project, in the context of the 6<sup>th</sup> Framework Programme Priority Food.

The paper is divided into eight sections. In section 2 theoretical and empirical considerations in the field of sustainable netchain innovations are described. Section 3 provides a description of the conventional fresh pork meat chain in Europe, while in sections 4 and 5 a detailed description of the two selected cases in Spain and The Netherlands is given respectively.

Section 6 combines and analyzes the major innovations that are observed in both cases and section 7, concludes with a suggestion of further research which will be used in additional and similar cases of niche market pork chains.

## **2 THEORETICAL AND EMPIRICAL CONSIDERATIONS**

This paper builds on the first results of the Work Package 4.1 "Inventory of pork chains" of the EU integrated Q-Porkchains Project. In the effort to arrive at the typology of pork chains and research agenda, extensive investigation has been performed by five European countries including The Netherlands and Spain. Expert interviews have been conducted with key players, as well as in-depth secondary material has been used.

### **Sustainability in the pork chain**

In a review which covered public concerns about modern pork production in Western Europe, it was concluded that some of the main issues among the public were food safety and health, animal welfare and animal health, environmental impact, sensory quality, and the price of pork. The report concluded that there certainly is public demand for more sustainable production, and not only for inexpensive pork. (STERN, 2005). Sustainable development is about meeting the needs of the present without compromising the ability of future generations to meet their needs. It is based on three important elements: environmental quality, social responsibility and justice, and economic viability (IGD, 2007).

Such and other sustainability aspects that affect pork chains can also be categorised by making use of the "People, Planet, Profit (3-P) approach"; by integrating the

sustainability factors such as emissions and pollution (Planet), animal welfare and food safety (People), and chain efficiency (Profit). This paper will use the "3-P approach" and pays special attention to the elements of "Societal Conformity, Environmental Impact, and Economic Sustainability" at farm level, as has been defined in the "Inventory of Sustainability Tools" Report, Work Package 2.1 of the Q-Porkchains Project. The paper views these three aspects as drivers for innovations in pork (niche) markets, requiring new relations between chain actors and non-chain actors in such niche chains.

### **Niche chains in the pork sector**

In this changing environment of societal pressures an economically viable and market-driven niche market is thus seen by many producers as a feasible next step. Within the context of the key concerns this paper will analyze the results of research recently carried out on two cases: that of the regional Iberian Cured Ham pork chain in Spain and of the organic pork chain in The Netherlands. Although the latter derives from societal concerns related to a bad image of the pork sector in general, and the first is based on societal concerns related to a bad image of the quality of the pork product itself, this paper suggests that there are many similarities, and thus lessons to be learned. In both cases, societal and public concerns resulted in "space" for a growing niche market. In The Netherlands the niche is an organic product, while in Spain the niche is a regional quality product. Both answer to societal concerns, and both aim at, from a business point of view, improving the image of the pork product within the society. At the same time, both niches show economic potential: in The Netherlands to stimulate improved social acceptance of eating pork meat in general, and in Spain to increase domestic consumption of pork meat per capita.

At the same time, with the pork sector facing increasingly high costs of production (e.g. as a result of higher costs of feed and other inputs, as well as due to stricter legislation), the niche of regional and/or organic pork production may show improved business opportunities. For example, producers that are active in these niches often use different (local/regional) types of feed and other production inputs than conventional pork producers do, making them less dependent on global increases. While being less dependent on fluctuating input costs and/or increasingly strict legislation, regional and/or organic high-quality producers will at the same time target the growing demand for such produce.

### **Netchain innovation in the pork chain**

Looking at sustainable production from the chain perspective, some argue (BINNEKAMP and INGEBLEEK, 2006) that it is the supermarket that should be the leading chain actor. In research related to the societal issue of animal welfare for example, a constructive attitude of retailers is seen as crucial due to the hourglass shape of the pork supply chains. (BRACKE, 2004). Although much literature agrees with this idea, this paper argues that in niche chains other key chain actors are

just as crucial, such as slaughterhouses and producers; and that only through joined anticipation chain actors can prepare for cross-chain innovative measures. This perspective demands a better appreciation of how firms and innovation work, and highlights the need to better understand all the organizations involved – the policy makers, consumers, firms, institutions, and other stakeholders that can influence the rate and direction of innovation.

Theory recognises a number of different types of innovations including product, process, organisational, business model, and marketing innovations. SCHUMPETER (1934) defined innovation as "the creation of new combinations". These innovations can be new products, new methods of production, new sources of supply, the exploitation of new markets, or new ways to organise business (SCHUMPETER, 1934; BATTERINK et al., 2006). Innovation is not a solo act but a multiplayer game, which raises questions between organisations that have to develop and make use of increasingly wide networks. As the innovation becomes more complex, so the networks have to involve more different players, many of whom may lie outside the firm (BESSANT-TIDD, 2007). This paper will analyze different types of innovations at the product, process, market and organizational level within each of the two niche chain cases. It shows that innovations take place at multi-actor level, both chain and non-chain actors, and that relations between the two are important. Thus the "netchain" gets introduced : a set of networks comprised of horizontal ties between firms within a particular industry or group, such that these networks (or layers) are sequentially arranged based on the vertical ties between firms in different layers' (LAZARRINI et al., 2001).

### **National versus regional innovation**

In formulating and executing their innovation strategies, organisations cannot ignore the national systems of innovation in which they are embedded. (TIDD et al, 2006). Through their strong influences on demand and competitive conditions, the provision of human resources, and forms of corporate governance, national systems of innovation both open opportunities and impose constraints on what organisations can do. However, a far-reaching consensus can be seen, whereby analogue to the two interdependent processes of globalisation and regionalisation, regional innovation systems (STERNBERG, 2000; BRACZYK et al, 1997) exist next to national innovation systems (NELSON 1993; LUNDVALL 1992). The regional innovation systems require region-specific policies in innovation in order to achieve "collective learning" among the participants in innovation (STERNBERG, 2000; LUNDVALL, 1997). Although it is argued that the "local production-local consumption" model is no longer reality, there is currently strong political desire observed at both European and national scales to "re-localise" food production and supply. Less than a decade ago, a new kind of European agro-food geography started to emerge with a topography shaped by the "quality turn" in food production and typified by various strategies to valorise local and/or regional food products (MAYE, 2006; MURDOCH, 2000; MARDSSEN, 2002; GOODMAN, 2004; ILBERY, 2005).

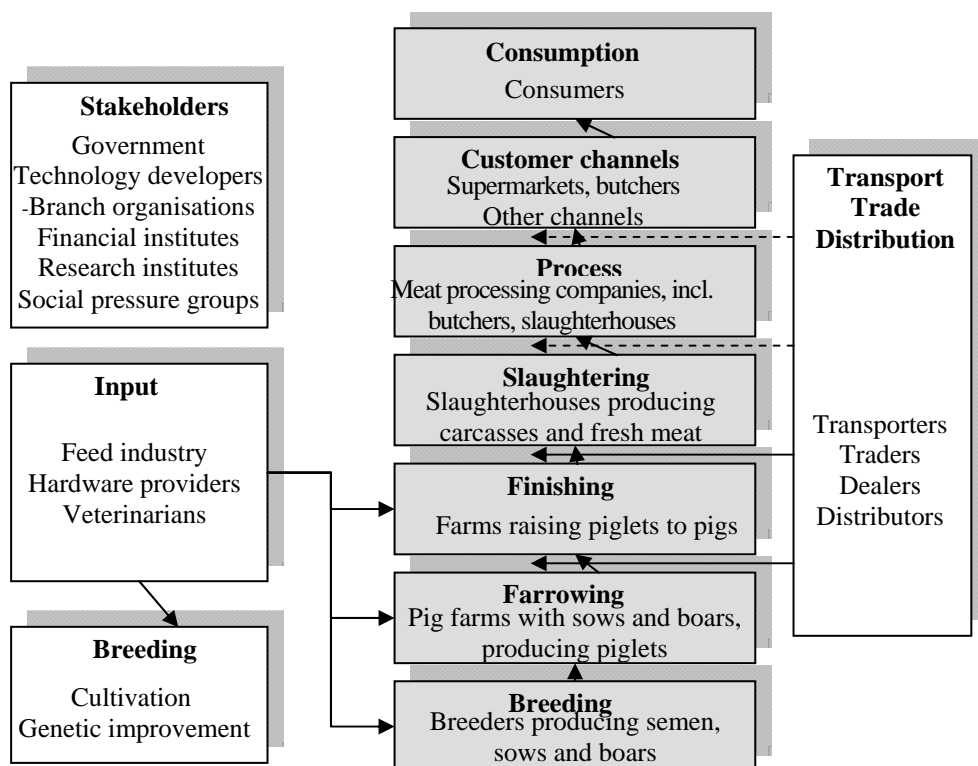
A representative illustration of this new vision is Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) quality status awarded to dedicated regional foods and, various efforts to encourage economic growth through the production of specialty / niche market foods (MAYE, 2006; PARROTT, 2002; ILBERY, 2000). This implies that local businesses in a region can turn from producing standard products to producing specialised products and can construct suitable food supply chains to pass this quality products to dedicated (niche) markets inside and outside the region (MAYE, ILBERY, 2006). This assumes a new kind of regional economic space, built around specialist dimensions of the food economy, including organic, local and regionally branded food products.

### 3 FRESH MEAT PORK CHAIN

Although the focus of this paper is on the similarities between innovations in the niches of high quality organic and regional pork chains, it is important to first explain the nature of the conventional fresh pork meat chain in Europe.

The fresh pork meat chain is lengthy and involves a number of actors and types of processes. Production commences with the production of piglets, flows through fattening and finishing, slaughterhouses and meat processors, to retailers and consumers during a time period of six months, as it is illustrated in Figure 1.

**Figure 1: The fresh pork meat chain**



Source: Q-Porkchains Project – Inventory of European pork chains.

The chain of activities in the process from farm to fork, including governance, quality management, regulations, and information exchange, differs from one country to another and from one stage of the pork chain to another. Actors involved in the fresh pork meat chain are pig producers, slaughterhouses, processors, distributors, sales channels, consumers and various non chain actors such as transport and trade, veterinarians, feed industry, and government. Moreover differences in consumer demands lead to differences in organizing and managing the supply chain.

The fresh pork meat chain has experienced a number of developments. Professionalism in the chain has increased, and while the size of chain actors is increasing, the number of pigs in the chain is not allowed to grow. Scaling-up of the primary production has occurred, due to the rigid cost structure in the chain. Production intensification has contributed to a critical attitude of society towards the pork sector. Specialization has been observed of the primary production process of farrowing and finishing. Mixed cattle breeding has moved into specialized pig breeding. Production control has increased, especially in the areas of hygiene and animal disease, leading to higher productivity within limits set by environmental requirements. Changes in consumer behavior have led to pork products sold mainly through the retail channel. In addition, product diversity has increased with a growing contribution of convenience products. Genetic improvements have led to healthier and more efficient animals (amongst others with regard to food-conversion). Moreover consolidation in the retail channel has led to further consolidation in the pork sector, such as up-scaling of slaughterhouses has occurred to counter-balance retail power.

#### **4 SPAIN: REGIONAL NICHE OF IBERIAN CURED HAM CHAIN**

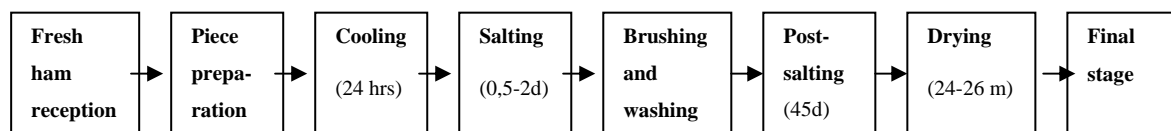
The Iberian pork sector is a very important and traditional regional production chain in Spain. One obvious difference with the chain of fresh pork meat is the breed of the animal; usually in intensive farms the animals used are crossbreeds of Pietrain, Large white, Landrace or Duroc. In the case of the Iberian sector the breed is the Iberian pig among which there are different indigenous breeds.

The production cycle has several differences compared with fresh pork meat production. The weaning period counts since the birth of the piglet until weaning. Feeding is based on milk and concentrates. The farrowing period takes eight weeks and weaning period takes ninety days. There are three modalities of breeding Iberian pig: camping, the functional system with boxes in a building and small yards, and modern system similar to production system of fresh pork meat. The growing period takes about ten months. Feeding is based on concentrate and organic resources of the farm if available. The fattening and finishing period is the last stage of the animal. Its length depends on the fattening program, whether is intensive or extensive. This is a crucial stage for the final quality of meat. Fattening modalities are varied, pigs can be fattened in closed buildings with concentrates, or they can

be fattened in yards where animals can freely move or they are fattened by using the resources of a "dehesa" (an open ecosystem). There are four classifications for the pork products based on the regulations on quality for Iberian meat and Iberian cured meat products. Weight plays an important factor as well, and in this case the animal reaches 160kg live weight. The cured ham process can take from 6 to 26 months, as it may be seen in Figure 2, depending on the type of meat whether is Iberian or other breed and the weight.

Depending on the length of the process as well as environmental conditions of temperature and humidity in the warehouse the ham will develop the characteristic flavour and aroma of cured ham.

**Figure 2: The Spanish cured ham chain**



Source: Q-Porkchains Project – The Inventory of European pork chains.

In Spain a number of Protected Designations of Origin (PDO) exist for cured ham – for Iberian pig: Huelva, Dehesa de Extremadura, Guijuelo and Valle de los Pedroches, as well as two for non Iberian pig, namely Jamón de Teruel and Trévelez. These PDOs play a role of control and certification for the respective quality. They provide cattle certification for the farms and cured ham certification for the processing industries.

However it has been argued that PDOs are not the main focus of leading industries as they prefer to create their own well known brands and quality standards. This is the case of Navidul, one of the most important industries in production of cured ham or Sanchez Romero Carvajal one of the most famous brands of Iberian cured ham of high quality.

## 5 THE NETHERLANDS: NATIONAL NICHE OF THE ORGANIC PORK CHAIN

The organic chain differs from the fresh pork meat chain in particular with respect to the primary process of farrowing and finishing, as shown in Figure 3.

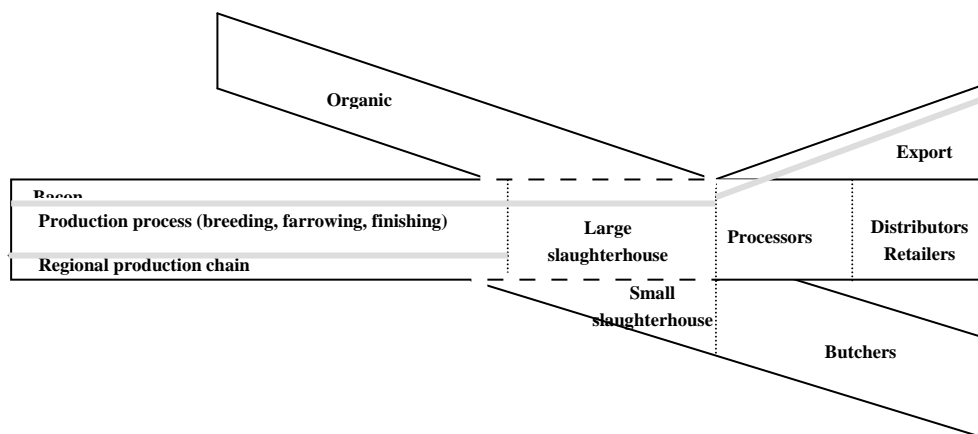
In organic agriculture no chemical-synthetic fertilizers or pesticides or herbicides are being used. Pastures, for grazing or production of organic feed, may not be fertilized with chemical fertilizers. Instead, animal fertilizers, natural fertilizers, compost and minerals are used. In general, the focus is on prevention of diseases by using disease-resistant plant material and by ensuring crop rotation which results in organically produced meat containing lower levels of pesticides and herbicides. In organic pig production animals lead a natural way of life. Yet the organic production also results in problems. For instance, more piglets die directly



after birth than in non-organic production, because the mother sow is not placed between metal bars resulting in more sows laying on top of their piglets. Another problem is that organic sows have a higher risk of lung and liver disease as a result of breathing-in dust and straw particles.

The organic pork sector encompasses about 5% of total pork meat production, and there is an intension to grow to about 10%. In general, organic pork products are 40 to 50% more expensive than fresh meat products. Reasons for this price premium are : animals live longer, they get more space, they get more expensive organic feed, while organic farming is labour intensive. Sector growth depends to a large extent also on willingness of consumers to pay the higher price for organic products. While in general the market share of the retail organic sales is increasing (in the UK has exceeded the 80%), in the rest of Europe accounts to 51%. The supply of organic meat is highly concentrated in Europe, with about 15 companies having a significance presence – European market share 50%. (Source: *Biological Monitor*, 2007).

**Figure 3: The Dutch organic pork chain**



Source: Q-Porkchains Project – The Inventory of European pork chains.

The major player in organic pork meat in the Netherlands is The Groene Weg, fully owned by the Dutch-German Vion Food Group. The concept De Groene Weg is, since 1981, the only franchising formula in the organic slaughtering sector in The Netherlands, with a substantial growth and strong position in supplying supermarkets and export. Tasty, honest and natural meat are the most important pillars of its formula. This is translated into the concept "Meat from a Healthy Source". The Groene Weg sells a variety of organic fresh products through their own brand Bio+ , as well as developing private label concepts together with large retail partners nationally and internationally.

## 6 KEY INNOVATION ISSUES OBSERVED PER CHAIN ACTOR IN BOTH NICHE MARKETS

When analyzing the regional high-quality pork case in Spain and organic pork case in The Netherlands, a number of similar key innovation issues are observed. In both countries, the main chain actors in both niche pork chains adapt their business strategies according to societal and/or public concerns (product innovations in accordance to People and Planet issues), while also professionalizing the efficiency of the chain according to economic sustainability (the Profit issue). The similarities between the seemingly different niche market chain actors are summarized below.

**Breeding:** Among chain actors involved in breeding, in both cases innovations in genetics were identified which focus on producing improved breeds. Within such programs, the focus is on further professionalizing the market-oriented production of the high-quality niche pork products while at the same time adapting to the societal and public concerns.

**Feeding:** Also among the chain actors involved in the feeding sector certain innovations can be found. Here, the main focus is on the sourcing of the feed, thereby reducing the costs of all purchasing activities, and by developing strategic relationships with key suppliers. In the production of the feed, health, quality and social responsibility aspects are gaining in importance, like transition in the feed concept for sows in these niche markets, to reduce the occurrence of stillborn piglets, and to reduce piglet mortality.

**Health management:** Related to chain actors involved in the aspects of health management, and especially within the strict Dutch organic sector, continues adaptations in the processes to meet changing legislative requirements regarding animal welfare and health can be found (such as new guidelines and methods for tapping blood and monitoring of salmonella). Also a broadening of scope of activities of the cooperative purchase organization of veterinarians is seen, now also including distribution, marketing, and consultancy for its members.

**Producers:** Among producers of regional and organic pigs innovations in the organization of farms due to the regulations on animal welfare and/or high product quality standards can be observed. These are mainly technical innovations related to housing quality standards, as well as to meeting changing legislative requirements regarding quality, animal welfare, health & environmental demands.

**Transporters:** Also the transportation sector within the niche chains shows similar innovations, with improvements mainly focusing on animal well-being regulations, such as trucks with mechanical ventilation, automatic drinking-water installations, mechanical refrigeration to maintain constant temperature, with airlocks to optimize the circulation of air. In both cases – countries chain transportation is improving by a focus on obtaining HACCP and relevant ISO certificates to meet market (and legislative) requirements for health and quality management.

**Processors:** The processing actors in both chains shows continuous innovating activities on adapting installations to meet international safety requirements as well as for convenient and healthy food consumption. In the Dutch sector there is a growing focus on benchmarking of plants, internal information flows and decision making processes to secure food safety. The Dutch organic sector also shows a trend towards a reduction of market concepts to just a few key concepts with critical mass. In both countries, there is an increased focus on markets with a stable demand, both national and international export markets.

**Retailers:** In the retail segment of the chain, where major players dominate the market by offering homogeneous, easy-to-consume products, major players in the niche sectors are engaging in selling through own brand. This includes developing private label concepts together with large retail partners (Netherlands) and improved logistical platforms towards these retailers (Spain). Here also regional associations are established that protect and promote regional products; for example one association established a meat school where butchers can attend in order to improve and/or learn relevant techniques.

**Government:** In the Netherlands, the government, as a non-chain actor, considers organic production as a major issue and provides financial support to large scale (and exporting) organic producers, to those that produce specialty products, and to organic farmers that produce for local markets. Its support especially aims at promoting the organic sector to the consumers, with media campaigns, in the context of stimulating demand and chain linkages. It also financially supports integrating sustainability aspects in logistics and energy consumption.

## 7 DISCUSSION – CONCLUSION

While sustainability in European pork supply chains is an increasingly important issue, niche chains such as regional or organic pork production are viewed as a sustainable business model. Both niches presented in this paper are a reaction to identical societal and public demands and face similar economic challenges. Especially the development of new methodologies to identify critical success factors for adoption of innovative responses by niche netchain actors is seen as a crucial element in creating sustainable pork supply chains. This paper therefore suggests further and more detailed research on innovations in regional and organic niche chains to derive at these critical success factors.

The purpose of such research will be to create a good understanding of how firms and innovations work in their efforts of meeting societal conformity, reducing environmental impact, and improving economic sustainability (People, Planet, Profit). The more complex innovations become, the more actors (both chain and non-chain) will need to be involved in order for the innovation to be successful.

Lessons can be learned by comparing challenges and innovative responses per chain actor in such niche markets, and critical success factors for successful implementation of such innovative responses can be developed.

## ACKNOWLEDGEMENTS

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## INCLUSION OF DAIRY FARMS IN SUPPLY CHAIN IN BULGARIA – MODES, EFFICIENCY, PERSPECTIVES

*HRABRIN BACHEV\**

### ABSTRACT

This paper gives insights on problems, forms and prospects of market inclusion of dairy farms in Bulgaria. Firstly, it summarizes evolution and challenges of dairy farms during transition and EU integration. Next, it presents a business model for effective market inclusion of dairy farms from Plovdiv region. Finally, it assesses prospects and forms of inclusion of dairy farms in conditions of EU CAP implementation.

**Keywords:** Agricultural markets and marketing; cooperatives; agribusiness.

### 1 INTRODUCTION

Bulgarian post-communist dairy farming is a typical example for domination of small-scale farms with no or little commercialization opportunities (BACHEV, 2006). Moreover, a rapid development of markets and institutional environment during transition and EU integration put serious challenges for the adaptation of most dairy farms and processors. This paper tries to give insights on problems, forms and prospects of market inclusion of dairy farms in Bulgaria. Firstly, it summarizes evolution and challenges of dairy farms during transition and EU integration. Next, it presents a business model for effective market inclusion of dairy farms from Plovdiv region. A framework of analysis suggested by BERDGUE and PEPPELENDOS is incorporated, and content of business innovation and evidence, drivers and efficiency of inclusion specified. Finally, we assess prospects and forms of inclusion of dairy farms in conditions of EU CAP implementation. Institutional analysis is applied (BACHEV, 2006), and adaptation potential of different farms and comparative efficiency of various modes for farms inclusion evaluated. The study is based on official as well as surveys data collected from 112 livestock farms nationwide and 34 dairy farms from Plovdiv region.

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## 2 EVOLUTION AND CHALLENGES OF DAIRY FARMS IN BULGARIA

Post-communist transition has been associated with a fundamental change in Bulgarian dairy farming. After 1990 the majority of dairy animals has been reared in small-scale (subsistence, semi-market) holdings<sup>1</sup> accounting for the biggest portion of dairy farms (Table 1). Besides, only a tiny part of milk producing farms are specialized – e.g. for cow holdings that is less than a quarter of farms as 77% out of them is smaller than 1 European Size Unit (MAF, 2005).

**Table 1: Number and size of dairy holdings in Bulgaria (November 2007)**

Type holdings	Share farms heads		Share farms heads		Share farms heads		Share farms heads		Average heads
	<i>1 - 2</i>		<i>3 - 9</i>		<i>10 - 19</i>		<i>20 and &gt;</i>		
Cows	79,8	36,1	16,0	25,2	2,5	11,8	1,6	26,8	2,7
Buffalo cows	69,9	19,0	17,7	13,0	7,2	15,5	5,2	52,5	5,1
	<i>1 - 9</i>		<i>10 - 49</i>		<i>50 - 99</i>		<i>100 and &gt;</i>		
Ewes	85	37,1	12,0	24,5	2,0	15,0	1,0	23,4	8,6
She-goats	97,1	75,3	2,7	17,4	0,2	4,1	0,1	3,2	2,8

Source: MAF Agro-statistics 2007.

There was a considerable decline in number of cows, buffalo cows and ewes which in 2000 were 62%, 46%, 27% of the pre-reform levels (NSI, 2001). After 2000 the process of diminution of dairy animals continues with a general reduction holdings and a slight concentration of heads per farm (Table 2).

In most dairy farms primitive technologies and low productivity dominate, and no modern (safety, eco, animal-welfare) standards applied (BACHEV, 2006). More than 80% of holdings with milking cows have no milking installations and 0.1% of dairy farms are with safe manure sites (MAF, 2005). A great portion of produced milk is consumed by households while surpluses are sold to processors, intermediaries, customized and street market. As much as 42% of farms sell "only surpluses of produced milk" while 44% report regular "sells through intermediaries", 12% "direct sells and intermediaries", and 2% "direct sells" (MAF, 2005).

There have been significant problems for small-scale dairy farms to sell out their output, meet increasing (quality, safety) demand, and integrate into rapidly evolving markets (BACHEV, MANOLOV, 2007). These farms are entirely ignored by large processors since they are not able to meet quantity and quality requirements, and command high (transportation, transaction) costs<sup>2</sup>. Furthermore, smaller farms

<sup>1</sup> Almost all livestock farms are unregistered "physical persons" concentrating the dairy heads in the country.

<sup>2</sup> Many processors increasingly work with imported powder milk in order to meet tough EU standards.



often experience price discrimination and delayed payments by a (semi)monopoly buyer, and hardly can break-even the production costs.

**Table 2: Dynamics of dairy animals and holdings in Bulgaria (thousands)**

Type of dairy	2000	2003	2005	2007
Cows	376	378,2	359,3	335,9
Cow farms	168,9	194,2	153,6	122,2
Buffalo-cows	5,2	4,5	4,7	5,1
Dairy-buffalo farms	2,2	2	1,4	1,0
Ewes	1347	1278,8	1314,4	1292,2
Ewe farms	222,5	214	180,4	149,2
She-goats	575	592,6	505,9	431,9
She-goat farms	186,9	224,2	195	153,0

Source: MAF Agro-statistics.

Collective (marketing, processing) organizations of milk producers have not emerged because of diversified interests of farmers (different age, specialization, type of operations); huge transaction costs for development; lack of appropriate legislation and incentives for association (BACHEV, 2006). There are two milk producers associations but they have not attracted many farmers due to inefficiency in protecting members' interests. Neither sporadic attempts for "collective" actions (protests, milk poring, road blocking) have given any positive results.

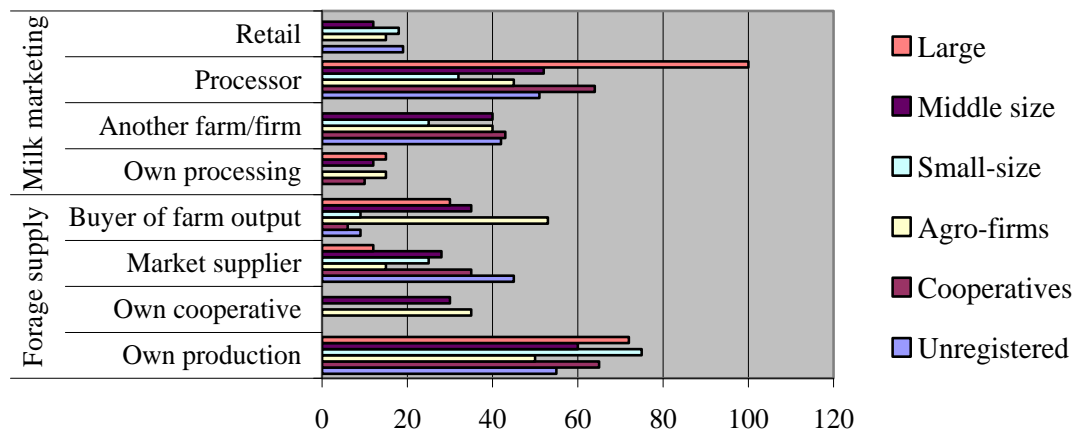
Until 2000 the Aggregate Level of Support to Livestock was close to zero or negative (OECD, 2000). There is a progress in public assistance in recent years but it affects a tiny proportion of dairy farms (BACHEV, 2007). Cow milk production quotas were also introduced but they improve little income situation of producers (10% surpass national quota prevail).

Consequently, there is a huge income variation for different farms, regions, and years. Many farms have not been able to adapt to ever increasing competition, industry requirements, and institutional (hygiene, animal welfare, environmental) standards. Since 1994 the number of livestock farms decreases and presently only 900 farms with 50000 cows meet EU standards for raw milk (0.5% of cow farms and 13% of cows) (ASSOCIATION OF MILK PRODUCERS). Out of 840 dairy processors in 1990s only a portion adapted to modern requirements. That adversely affected demand for fresh milk and sustainability of many dairy farms. Currently there are 230 milk processors and merely 44 have a license for EU export (MAF, 2008).

In order to mitigate existing problems a number of effective modes for governing outside relations of dairy farms have emerged (BACHEV, NANSEKI, 2008). *Delivery contracts* are extensively used to govern bilateral trade between bigger suppliers and processors. Often production of milk is highly specific to a particular

buyer and both sides are interested in securing transactions (cite, capa-city, freshness, origin dependency). Larger farms to a greater extent practice direct marketing to a processor since frequency of trade and mutual dependency is bigger (Figure 1). *Interlinking* supply of critical *inputs* (forage, cooling tanks) and *funding* (delayed/no payment) *with marketing* of milk is also employed (Figure 1). The latter minimize uncertainty, restrict opportunism, improve coordination, build trust, intensify transactions, mitigate funding difficulties, stimulate specific investment and farms enlargement, and lead to inclusion of dairy producers in the vertical chain.

**Figure 1: Governing of forage supply and milk marketing in commercial livestock farms in Bulgaria (percent of farms)**



Source: Survey data.

### 3 MODEL FOR EFFECTIVE MARKET INCLUSION OF DAIRY FARMS

We have identified and studied out a new business model for effective inclusion of numerous dairy farms developed by a private entrepreneur. "Dimitar Madzarov" LTD established a modern dairy processing enterprise for locally produced fresh milk. For 10 years milk processing extended 20 folds (50t/day) involving 1000 livestock farms from Plovdiv region. Most suppliers are small-scale holdings a half having less than 5 cows and 40% between 5-10 cows. Milk supply and processing quality has been modernized up to top EU standards (including a modern system of laboratory and on-spot quality controls; separated line for purchasing and processing "euro milk"). A Company Mark for high quality and original products is established as 60% of output is marketed to biggest food chains, 10% sold on wholesale markets, and 30% exported.

An effective system for governing relations with individual farmers is put in place. *Good reputation* for a reliable partner has been built which gives farmers sense of security and willingness to maintain bilateral trade. That is additionally enhanced by *formal delivery contracts* with each supplier. High frequency of relations facilitates transactions, develop trust, stimulate cooperation and restrict opportunism. The Dairy Manager is responsible for *communications* with farmers, and available to discuss goals and problems any time. Twice a month are held *group discussions*

and *training* of farmers on new Dairy's and institutional requirements, prospective standards, problem identification and resolution, public support opportunities etc.

Significant on *farm (cite)specific investment* have been made consisting of milk collecting, cooling, and controlling facilities and staff in neighborhood to small-scale farms and within individual or groups of farms. These highly specific to farms material assets are *provided (rented) for free* as Dairy carries the *maintenance*. Existence of common and group collecting capacity nearby small farms (having little or none alternatives for milk commercialization) let them become a major supplier. *Group organization* of milk collection also increases farmers incentives for cooperation (restricting opportunism), and save costs for quality and quantity verification. All that creates possibility and/or gives strong incentives for farms to trade with that particular dairy since it makes milk marketing feasible saving considerable investment and maintenance costs. Group tanks encourage the group organization increasing common interests and mutual (self) control. Moreover, the Dairy processes *all type* (cow, sheep, goat, buffalo) *milks* which let keeping and extension traditional livestock productions in the region.

Efficient *system for verification and registration* of quality and quantity of delivered milk by each supplier is introduced guaranteeing precise quality control, traceability and avoiding conflicts with farmers. *Punishment* is applied for cheaters of milk quality (e.g. antibiotics use) or quantity. A *regular payment* brings about a stable income of farm households and incentives to keep relation. *Differential prices* are used to stimulate the extension of livestock operations and milk supply as bigger suppliers get a premium. In winter period (deficient milk supply) *advance payment* is employed interlinking "interest-free credit" against "milk marketing". That guarantees cash-flow for farms, secure carrying out production, and stabilize milk delivery. The Dairy also provides *assistance* to farms *in construction* of new facilities and *preparation of projects* for public support. That is essential since small-scale farmers have no capacity to execute these operations or hire a market provider. The interlinking facilitates trade, increases efficiency and intensifies relations, keeps smooth/increases milk production and supply.

The model has evolved significantly over time. Milk suppliers have increased more than 5 folds along with the expansion of processing capacity and type of milks being purchased. Involvement in trade relations with the Dairy has affected positively most farms. A great portion of them have got an increase in milk production and marketing. Comparing to the year of commencement of milk production and marketing the average growth is 195% and 115% accordingly as most farms indicate a boost in marketed milk to the Dairy and no one a decrease. All but one farm report selling milk to a single buyer with less farms with an insignificant segment sells in the output than in region. These confirm that trade relations with the Dairy has been an important factor for commercialization of milk production in surveyed farms, a bigger commercialization comparing to the rest farms, and

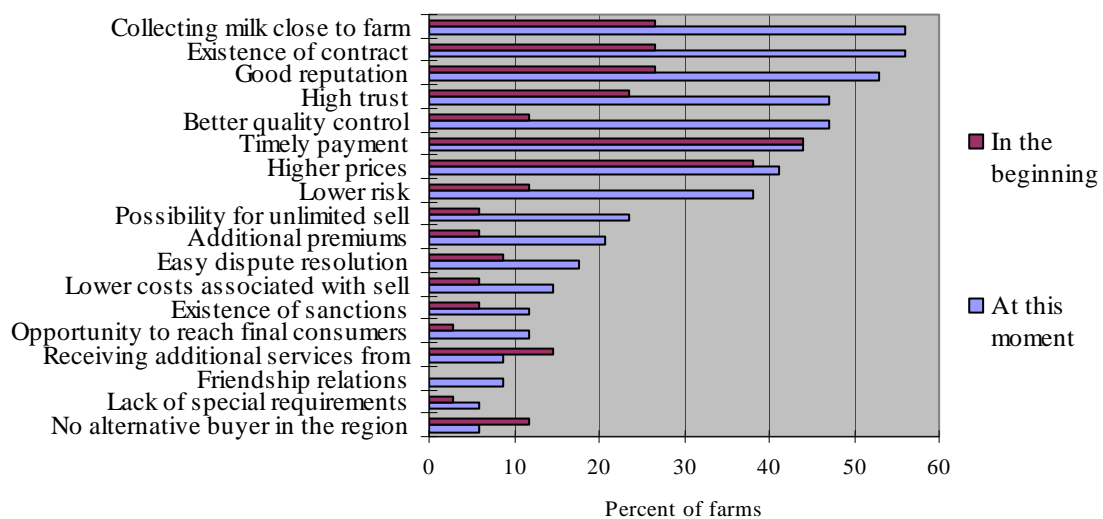
high efficiency and extension of bilateral trade in contrast with negative tendencies in evolution of dairy farming nationwide.

The main reasons for selling milk to the Dairy are reported as "existence of contract", "collecting milk close to farm", "better quality control", "good reputation", "high trust", "timely payment", "higher prices", and "lower risk" (Figure 2). All they facilitate and intensify bilateral trade and decrease transaction costs. The close integration (communication, coordination and stimulation mechanisms) let the Dairy introduce effectively new requirements for suppliers (quality, time and mode of milk delivery). That facilitates farmers' adaptation to new standards and increases the commercialization and effective inclusion in the big food chain.

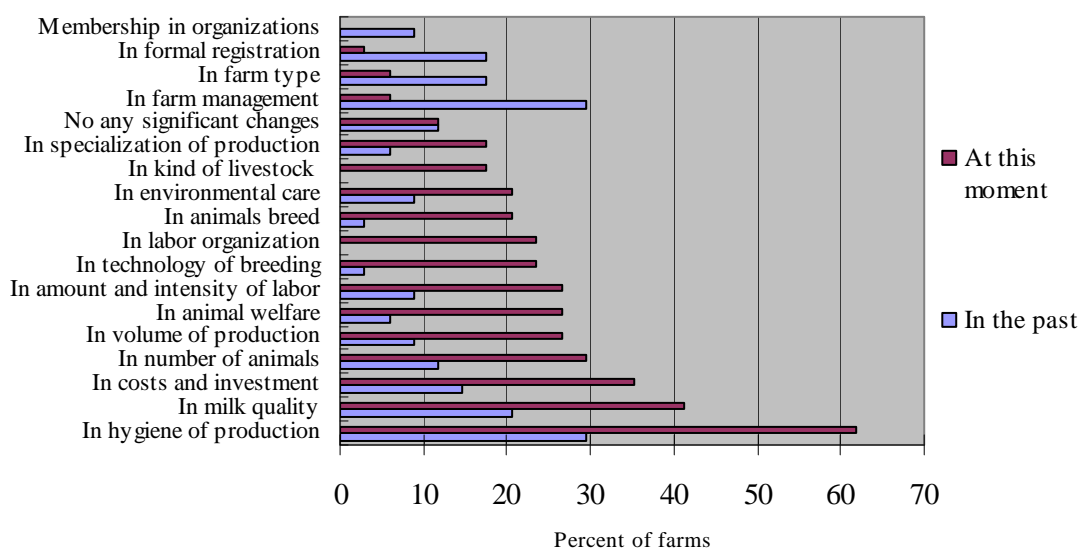
Most common changes farmers had to make to start selling milk to the Dairy were in "hygiene of production", "farm management", and "milk quality" (Figure ). In order to carry on selling milk to Dairy a good number of farms must improve "hygiene of production", "milk quality", "increase number of animals", "volume of production", "improve animal welfare" and "environmental care", and that is associated with additional costs, investment, and labor.

There has been a significant evolution of the contract relations and now a written form is commonly used as long-term mode, fixing quality, quantity, pricing, sanctions are wider (than before) applied. More than before farmers negotiate (higher than market) prices, get long-term stable prices, and see sanctions (linked to milk quality, safety) included in price terms. Contract governance improves coordination, let easy adaptation to evolving market conditions, gives security for both sides, facilitates (decreases costs) of relations. The written mode allows clarity of provisions, possibility to specify more details, easy verification and control, incentives to meet negotiated terms, and facile dispute resolution (through a third party).

**Figure 2: Main reasons for selling milk to "Dimitar Madzarov" LTD**



Source: Survey data.

**Figure 3: Changes to be made to sell milk to "Dimitar Madzarov" LTD**

Source: Survey data.

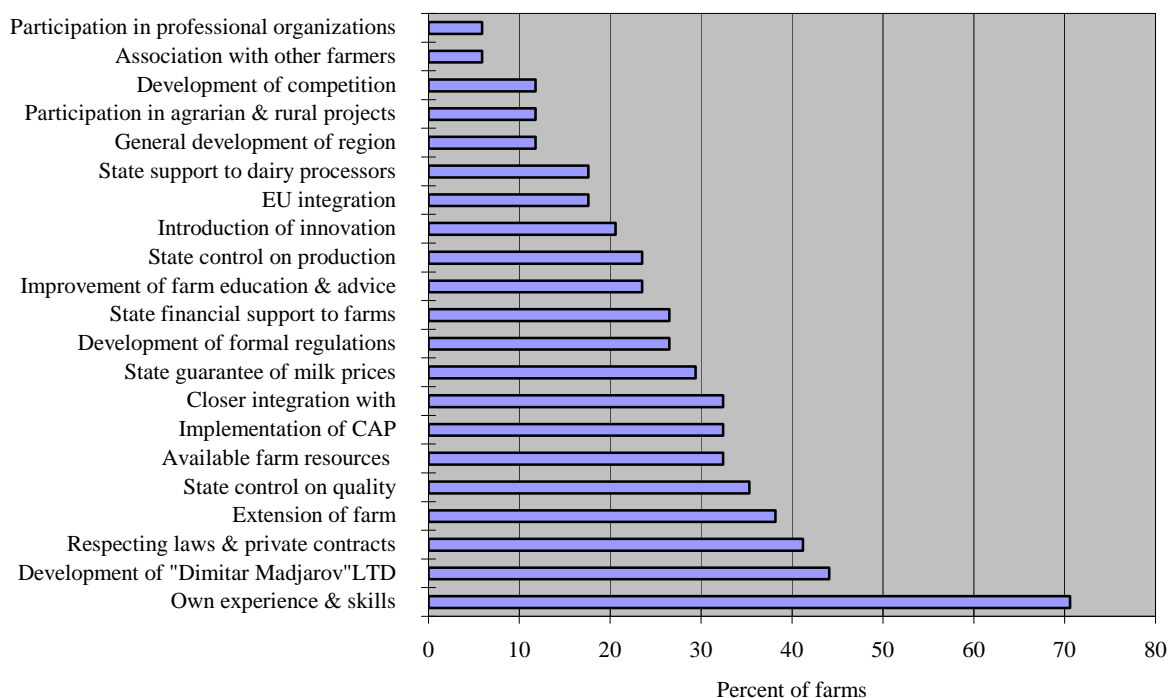
In addition to farmers experience and skills the "development of "Dimitar Madzarov" LTD" and "closer integration with the Dairy" are identified as major factors for the evolution of surveyed farms (Figure 4). Dairy establishment and expansion increases significantly demand for locally produced milk providing incentives for increasing production, commercialization, and quality. Integration with the Dairy has led to enlargement of size of participated farms (having bigger number of heads than in region). Moreover, majority of farms enjoy a higher income, better quality of production, greater stability of sells and prices, better possibility for modernization and adaptation to formal requirements, and care for animals and environment, than other farms in the region (Table 3). Integration has also led to improvement of relative situation of farms – holdings feeling they are better-off now are more then it was in the past. Improvement is to be judged even higher on the background of lack of progression in dairy sector nationwide. The status of a bulk of farms corresponds to other similar holdings but they still benefit carrying on and extending commercialization though integration with the Dairy.

**Table 3: Status of your farm comparing to other similar farms in the region not supplying to "Dimitar Madzarov" LTD (percent of farms)**

Indicators	In the past			At this moment		
	Better	Same	Worst	Better	Same	Worst
Level of income	23,5	26,5	11,8	41,2	26,5	2,9
Level of expenditures	14,7	26,5	11,8	20,6	26,5	5,9
Level of production	20,6	17,6	8,8	38,2	17,6	0,0
Quality of production	29,4	20,6	0,0	47,1	20,6	0,0
Possibility for modernization	17,6	23,5	5,9	32,4	26,5	5,9
Level of risk	5,9	20,6	14,7	2,9	14,7	26,5
Stability of sells	17,6	29,4	2,9	44,1	20,6	2,9
Stability of prices	14,7	29,4	8,8	29,4	29,4	8,8
Care for animals	11,8	26,5	0,0	32,4	23,5	0,0
Care for environment	11,8	20,6	5,9	23,5	26,5	2,9
Social status	8,8	29,4	0,0	17,6	26,5	0,0
Possibility for adaptation to formal regulations and standards	14,7	14,7	0,0	26,5	5,9	0,0

Source: Survey data.

**Figure 4: Most significant factors for development of dairy farms**



Source: Survey data.

#### 4 PROSPECTS FOR DEVELOPMENT OF BULGARIAN DAIRY FARMS

Implementation of CAP puts new challenges for most dairy farms in the country. There is an increasing pressure and sanctions on dairy farms both by the processors and state authorities to comply with new requirements. A transition period until 2009 is given for milk producers and processors to adapt to the new EU (quality, safety, building, manure) requirements.

We have found that only 12% of "Dimitar Madzarov" LTD suppliers have no considerable changes to make in order to sell milk in the new conditions. Different type farms have unequal capacity for adaptation to the EU standards. A great number have no sufficient potential for adjustment which is particularly truth for the small-scale unregistered producers (Table 4). Merely a third of farms believe their production capacity corresponds to modern requirements of competition, productivity, eco-performance and animal welfare, and only one-seventh have potential (internal capacity, access to outside sources) to fund necessary investment for adaptation to new norms.

**Table 4:** Share of farms assessing as big and good their capacity for adaptation to new EU requirements for dairy sector (per cent)

Farms capacity	Unregistered	Firms	Coope-ratives	Total
Extend of knowledge on new requirements	22.7	63.6	100	38.2
Available skills and knowledge for adaptation	22.7	54.5	100	35.3
Available production capacity	27.3	45.4		32.3
Quality and hygiene standards improvement	36.4	72.7	100	50
Improving animal welfare	31.8	72.7		44.1
Improving environmental performance	31.8	54.5		38.2
Finding necessary investment	9.1	27.3		14.7

Source: Survey data.

Since 2007 a significant public support to farms is envisaged in forms of direct support, investment subsidies, and market orientation. However, applied area base direct payment would affects little dairy farming because of the small holding size – ineligibility for payment (1 ha requirement)<sup>3</sup> or insignificant level of subsidy (5 Euro/ha). What is more, the legitimate national top up for milk producers for 2008 was utilized by May at re-negotiated by producers level of support.

Most dairy farms have insignificant potential to win public projects for modernization because of their little experience, capability to meet formal criteria (minimum size, match investment), and lobbying power. Specific support to "semi-market" farms would have no considerable impact on dairy sector because of the

<sup>3</sup> Only 79 050 farms – the biggest operators, comprising less than 15% of farms receive direct payments (MAF).

insufficient level and focus on less prospective structures (small semi subsistence holdings) with low potential for adaptation to volume, quality, safety, animal welfare and environmental requirements of processors. Widespread market orientation of huge (semi) subsistence farming is not feasible since the high costs for farm enlargement and adjustment (no entrepreneurial capital available, low investment and training capability of aged managers etc.).

Finally, lack of readiness, experiences and efficiency in authorities would require some time lag until "full" implementation of CAP in Bulgaria (BACHEV, 2007). Besides, most farm managers have no capability (training, skills) or are old in age with a small learning and adaptation potential. Thus, there will be inequalities in the application of new standards in diverse farms and regions.

Our survey has proved that a great part of the unregistered farms believes that CAP will have a "neutral impact" on their income, volume and technology of production, investment level, product quality, access to public programs, improvement of environmental and animal care, development of infrastructure, possibilities for new income generation, and social status of farm households (Table 5). On the other hand, a bulk of firms expects a "positive" effect in all above directions. The cooperatives are merely optimistic for the CAP affect on improvement of animal welfare while expectations for its impact on income and access to public programs are negative.

**Table 5: Expectation for impact of EU CAP implementation on your farm (percent of farms)**

Impact on:	Unregistered		Firms		Total	
	+	-	+	-	+	-
Volume of production	22.73	9.09	36.36	27.27	26.47	14.71
Income of farm	22.73	9.09	45.45	18.18	29.41	14.71
Technology of production	13.64	4.55	54.55	9.09	26.47	5.88
Investment	18.18	4.55	45.45	18.18	26.47	8.82
Products quality	18.18	0.00	45.45	0.00	26.47	0.00
Access to public programs	9.09	4.55	54.55	9.09	23.53	8.82
Improvement of animals care	13.64	0.00	45.45	9.09	26.47	2.94
Improvement of environment care	9.09	0.00	54.55	9.09	23.53	2.94
Development of infrastructure	9.09	0.00	54.55	9.09	23.53	2.94
Opportunities for new income	18.18	9.09	36.36	9.09	23.53	8.82
Social status of your household	13.64	4.55	45.45	27.27	23.53	11.76

Source: Survey data.

Notes: (+) – Positive impact; (-) – Negative impact.

Low market prices have been a significant problem for sustainability of most dairy holdings. According to our survey the majority of farms want to see market milk price raised as 10% consider 50% increase enough to allow an effective adjustment to new market and formal requirements while the rest wish much higher augmentation averaging 125% and reaching 275%.



Thus, a great portion of dairy farms would not adapt to new institutional and market environment and cease legal commercial activity by 2009. On the other hand, there will be practically (technically, politically) impossible to enforce the official standards in enormous informal sector, and huge (semi)subsistence farming (excluded from market chain) will continue to exist in years to come.

Our survey has found that more than a half of farms have intention to "extend activity", 30% to "keep activity unchanged", and no farm to "decrease farm size, concentrate on crop production, or change type of farm". Besides, only few farms plan to focus on subsistence farming in future. Furthermore, a considerable number of farmers envisage a "closer integration with "Dimitar Madzarov" LTD". The Manager of the Dairy also sees a further integration with chief suppliers as a probable direction for development. All these suggest a high sustainability of studied mode and participating farms. Nonetheless, cow milk quota system would direct expansion of dairy farming into sheep, goat and buffalo milk productions where no quantities restrictions exist.

We have found out that all 22 dairy processors in Plovdiv region apply some form of vertical integration with milk suppliers as similar modes for farmers' inclusion are typical in other regions as well. At the same time, other feasible alternatives for market inclusion of dairy farms demonstrate no comparative (production and transaction) advantages to presented model. *On farm processing* is restricted to few cooperatives serving predominately members needs and local communities. Besides, *cooperative form* has failed to organize effectively service, processing and marketing activities in Bulgaria due to conflicting interests of members, low investment potential, and widespread mismanagement (BACHEV, 2006). Milk Producers Association efforts to establish *milk collecting groups* have brought no positive results (1 emerged). Thus industry driven mode for market inclusion of dairy farms will dominate in near future due to high governance efficiency, adaptability, big potential to mitigate problems of small-scale producers etc.

According to the Manager of "Dimitar Madzarov" LTD most important factors for future development of the model are: "own experience", "implementation of CAP and EU integration", "closer integration with suppliers", "enhancement of competition", "state control on production", "state control on quality", "state financial support to farms", "state support to processors", "extension of the Dairy", "modernization of the Dairy", "farmers training", "farms enlargement", "farmers association", "participation in bigger projects for agrarian and rural development", "general development of region", "taking part in professional associations", "improvement of formal regulations", and "respecting laws and private contracts". For participating farmers in addition to "own skills" and the "development of and integration with the Dairy", the perfection of institutional environment (improvement and better enforcement of laws and private contracts, state control on quality and support to milk producers) are perceived as crucial factors for farming development (Figure 4). Despite its potential to resolve most problems (volume

requirement, member orientation, economy of scale/scope on production, eco and transacting activities) participation in producers cooperative or association is planed by 3% and 18% of the farms.

## 5 CONCLUSIONS

Bulgarian dairy sector has been one of the most affected by the post-communist transition and CAP implementation most farms being unable to adapt to evolving market and institutional environment. We have shown that industry driven forms have been an effective mode for inclusion of dairy farms in modern market chain having significant governance (transacting) advantages for the specific farming structure and conditions of high uncertainty and instability. Our comparative institutional analysis has also demonstrated that industry driven vertically integrated forms will remain the major mode for an effective inclusion of dairy farms in modern markets chain. However, the extend of adaptation and further inclusion of most farms would depend on their effective access to various public support instruments and the successful implementation of CAP.

## ACKNOWLEDGEMENTS

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## THE EFFECTIVE TRACEABILITY ON THE EXAMPLE OF POLISH SUPPLY CHAIN

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### ABSTRACT

This article analyses the settlements of the traceability instruments and the design of the collaborations among food companies and farmers in the Polish food chain. The empirical part uses evidence from 30 farms and 125 companies, surveyed in spring 2008. The degree of traceability has been estimated and its reasons investigated by means of a cluster analysis. The factors that determine the effective traceability of the products at the first step of the supply chain are: education level and age of farmers.

**Keywords:** Supply chain, traceability, food quality, farmers, food companies.

### 1 INTRODUCTION

In the last years, many food affairs occurred, which lowered the consumer's protection and his trust in food quality. The reaction of the European legislator was to emit many regulations, among others: Regulations No. 178/2002 and 1831/2003, which equalize product safety and food legislation throughout Europe. The traceability of products gains meaning in all branches. If tracking and tracing (T&T)<sup>1</sup> have counted some years ago as an optional achievement sign, today the term has a compulsory character (PARLIŃSKA, BEZAT, 2007). Above all, when farmers wish to become suppliers in the more demanding retail market, either locally or globally, they need to adapt to market requirements. Legislation also contributes to this development. The requirement 178/2002 should guarantee the full traceability of food demanding from each stage of the supply chain, collecting data about the products. It obliges companies in the food chain to guarantee the traceability of their products, as well as to recall of unsafely products

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<sup>1</sup> Tracking and Tracing (T&T): tracking calls the inquiry of the current status of a delivery, a piece good etc.; tracing calls ex post reconstructable history of delivery (KLAUS, KRIEGER, 2002).

(products recall actions). In this way, tracking and tracing of food from producers to industry and logistic services to final costumers will be possible.

Basis of the development of traceability systems is the linking of defined product unities with the accompanying parameters relevant for the product and the access possibilities to the suitable information (BLL, 2001). The central condition is the chains-wide coordination of the data exchange and the tracking and tracing of the data (BLL, 2001). The T&T efficiency is dependent on the simplicity of the system, the integration and joint responsibility of all steps of the chain, as well as the compatibility of the internal and external interfaces (BLL, 2001).

To be able to minimise the insecurity along the chain, all potential risk factors on all chain steps must be identified (SCHIEFER, 2004).

Two of the main stages of the food supply chain are farmers and food companies. They are obliged to fulfil all lawful requirements. The documentation and information management between the farmers and the next stage of the supply chain, which is the focus of this article, should be effective to guarantee the traceability.

The aim of this article is to check if farmers and food companies fulfil requirements of traceability, more precisely if they keep and change documentation and information regarding to product flow. In the article, there was made an attempt to estimate the traceability score for farmers. There is also checked which factors have the biggest influence on the traceability of the products. Results of this research should give a good overview of traceability's fulfilment in two first steps of the Polish food supply chain.

In the area of traceability some research gap can be noticed, namely there is no method which would allow for assessment fulfilment of traceability's requirements.

## **2 THEORETICAL CONSIDERATIONS**

### **2.1 Material studied**

The first (farmers) and the second (food companies) stage of the supply chain were analyzed. It is significant that producers immediately appear at the beginning of the chain. It is assumed that farmers, due to their position in food supply chain, have a big influence on the quality of final products which are bought by consumers.

The data were collected with the help of questionnaires in March-April 2008. The sample of the first food chain's step covered 30 farms from the Łódzkie and Mazowieckie voivodeship. The survey was conducted personally with each farmer. The data from 125 companies of the food branch were polled in whole Poland (the questionnaires were sent via mail, rate of return 20%).

The cluster analysis was applied for grouping the farms. The data come from the survey. Four variables were taken under consideration in this method, namely:

age of farmer, level of education, area of farm and labour. The characteristic of analysed farms is very diverse; e.g. both small and very big farms were included into research. The cluster analysis allows to organize the data into meaningful structures and to interpret results of the point assessment analysis, which was the main reason for the choice of this method.

In the literature, no method was found which would allow estimating the traceability's fulfilment. For calculating this score on the level of the first step of the food supply chain, the point assessment technique was used. The proposed formula includes questions from the survey with an answer YES/ NO, which from the authors' point of view represents the strength of the technique.

## 2.2 Methods

For the data interpretation the econometric method, namely cluster analysis, and the point assessment technique were used.

The goal of applying the cluster analysis is to organize the observed data into meaningful structures. The analysis is made by using Statistica 8.0 Software.

The term cluster analysis (first used by TRYON, 1939) encompasses a number of different algorithms and methods for grouping objects of a similar kind into respective categories. The cluster analysis is a method for automatic classification of objects, workload items into a number of groups, using a measure of association or similarity distance so that the objects in a group are similar and the objects in two different groups are not similar (STATSOFT, 2008). The most straightforward way of computing distances between objects in a multi-dimensional space is to compute Euclidean distances (LUSZNIEWICZ, SLABY, 2001).

The analysis is carried out with regard to four variables, namely: age of farmers (expressed in years), level of education (expressed as: 1 – primary school, 2 – vocational education, 3 – secondary school, 4 – higher school), area of farms (expressed in ha) and labour (expressed as a number of employees). These variables were chosen because they differ very strongly among the analyzed farms. Acreage influences the number of plant production's lots, which determines directly the traceability. It was suspected that education's level and age of farmers could influence knowledge of traceability's requirements.

The correlation coefficients are rather low (see table 1). A middle level of correlation can be observed in the case of the age and education level of farmers (value -0,66) and in the case of education's level and area of farm (value 0,57).

**Table 1: Pearson's correlation coefficients between all variables**

	Age	Education	Labour	Area of farm
Age	1	-0,66	-0,29	-0,43
Education		1	0,24	0,57
Labour			1	0,05
Area of farm				1

Source: Own work.

Before the cluster analysis was conducted, the data has been normalised (in order to exclude the influence of some variable) by using the following equation:

$$X'_{jk} = \frac{X_{jk} - \text{Min}(X_j)}{\text{Max}(X_j) - \text{Min}(X_j)}$$

where

j is one of the variables: age of farmers, level of education, area of farms and labour;

$X'_{jk}$  is a new value of the variable j from interval [0,1] in farm k;

$X_{jk}$  is a current value of variable j in farm k;

$\text{Min}(X_j)$  is the lowest value for the variable j;

$\text{Max}(X_j)$  is the highest value for the variable j.

Normalisation of data is performed for age of farmers, level of education, area of farms and labour. The variables are bigger than 0 or less than 1. The results of the cluster analysis were shown in the next part of the article.

For calculating the degree of the traceability's fulfilment, the point assessment method was used. The level of traceability's fulfilment was estimated for all farms in each of three clusters. The farms were assessed in 2 categories, namely stock and plant production, regarding to documentation of the products' flow. The own consumption of the products was included. For stock and plant production three control points were chosen. For each farm the results of calculation can be more than -3 and less than 3. The scale results from the used calculation formula (see following equation):

$$T \& T = P_{plant} [(1 - C_p) * (Q_{p1} + Q_{p2}) + Q_{p3}] + P_{stock} [(1 - C_s) * (Q_{s1} + Q_{s2}) + Q_{s3}]$$

where

T&T is a level of traceability's fulfilment;

$P_{plant}$  is a share of plant production in total farm's revenue;

$P_{stock}$  is a share of stock production in total farm's revenue;

$C_p$  is a share of plant products' own consumption in total plant production;

$C_s$  is a share of stock products' own consumption in total stock production;

$Q_{p1}$  is an answer on the first question regarding plant production (1. control point)

$Q_{p2}$  is an answer on the second question regarding plant production (2. control point);

$Q_{p3}$  is an answer on the third question regarding plant production (3. control point);

$Q_{s1}$  is an answer on the first question regarding stock production (1. control point);

$Q_{s2}$  is an answer on the second question regarding stock production (2. control point);

$Q_{s3}$  is an answer on the third question regarding stock production (3. control point); (answer "yes" gives 1 point, answer "no" gives -1 point, no answer gives 0 points).

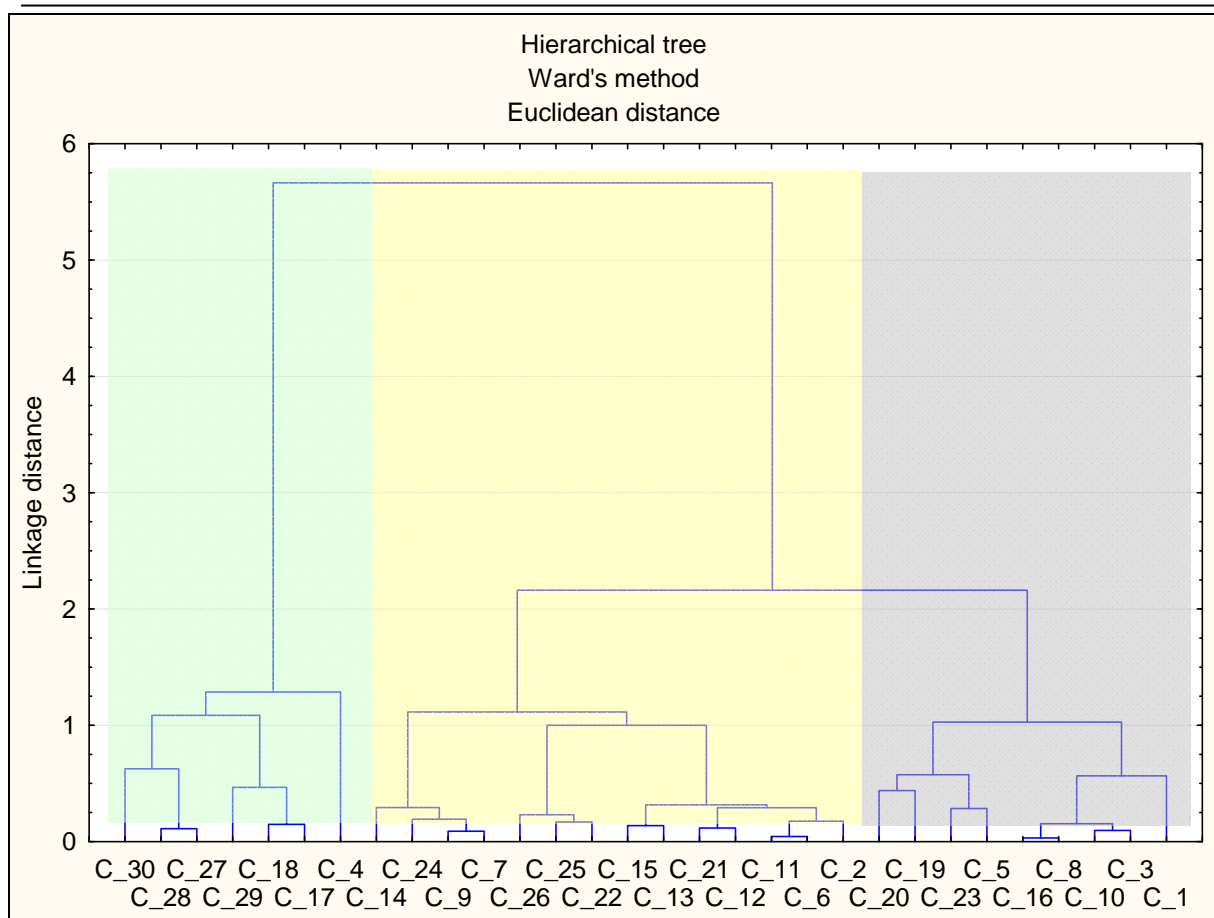
The results of the calculation are shown in the next part of the article.

In the case of 25 analysed food companies, which come from several regions of Poland and are active in several branches of the food industry, it was difficult to develop some general formula for calculation the traceability's fulfilment. The companies were assessed regarding to 5 critical control points. Documentation regarding products' flow, including documentation about suppliers is kept on the level of each control points in all of the analysed companies. It means that the requirements of traceability are fulfilled.

### **3 RESULTS**

#### **3.1 Cluster analysis**

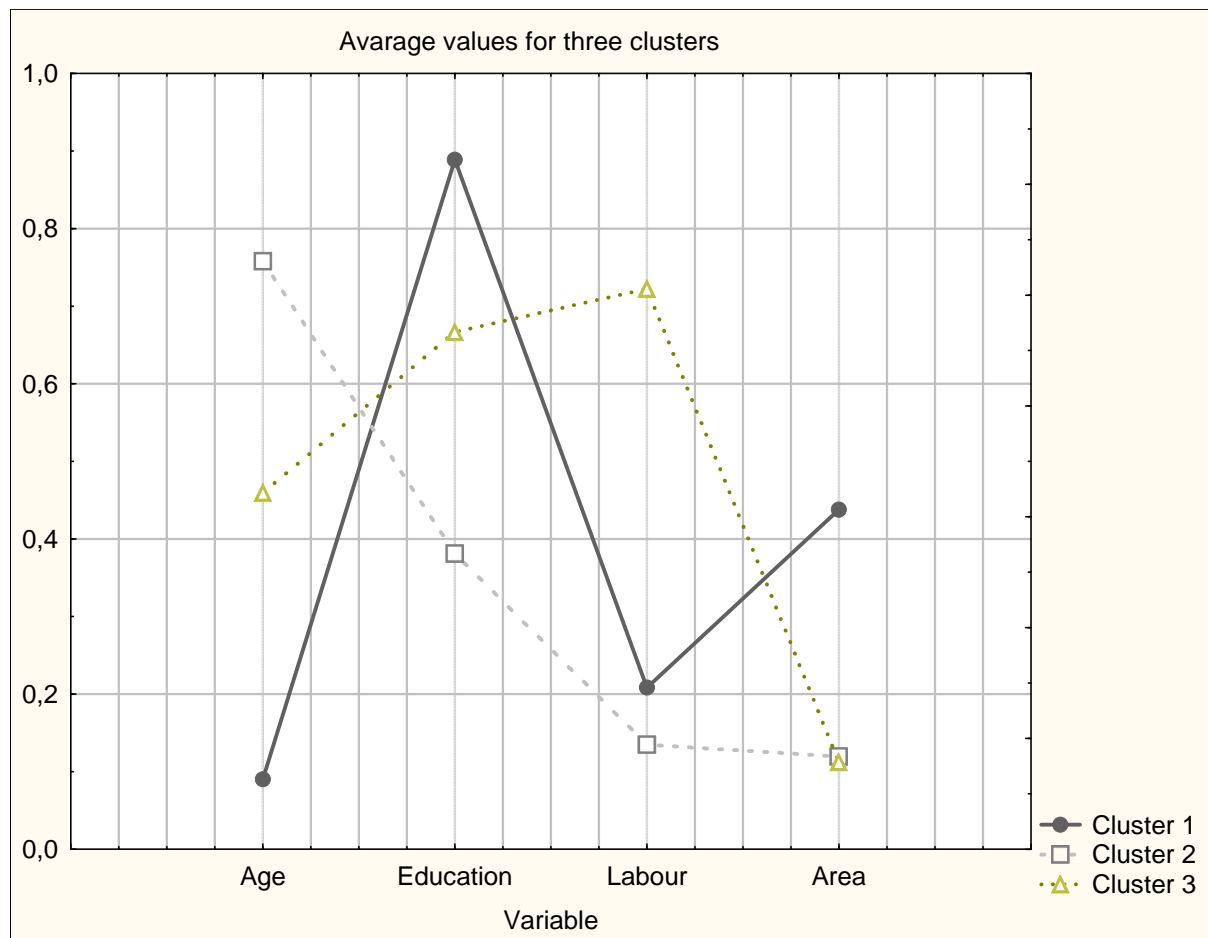
A cluster analysis for the farmer was performed on the 30 observations, with dissimilarities defined as the raw Euclidean distances (the most popular type of distance). The results are shown in the Figure 1 (dendrogram). There are several forms to interpret the results of a dendrogram. One of the alternatives is the visual analysis of the observations. The visual analysis of the dendrogram (see Figure 1) suggests the formation of 3 clusters. Using the visual criterion of interpretation, one can say, that the first cluster 1 is formed by farms number 30, 28, 27, 29, 18, 17, 4, the cluster 2 by farms number 14, 24, 9, 7, 26, 25, 22, 15, 13, 21, 12, 11, 6, 2 and the cluster 3 by 20, 19, 23, 5, 16, 8, 10, 3, 1.

**Figure 1: Results of cluster analysis**

Source: Own work.

For the interpretation of the different clusters, it can be more helpful to argue on the basis of median values. The average values for the three clusters are shown in Fig. 2.



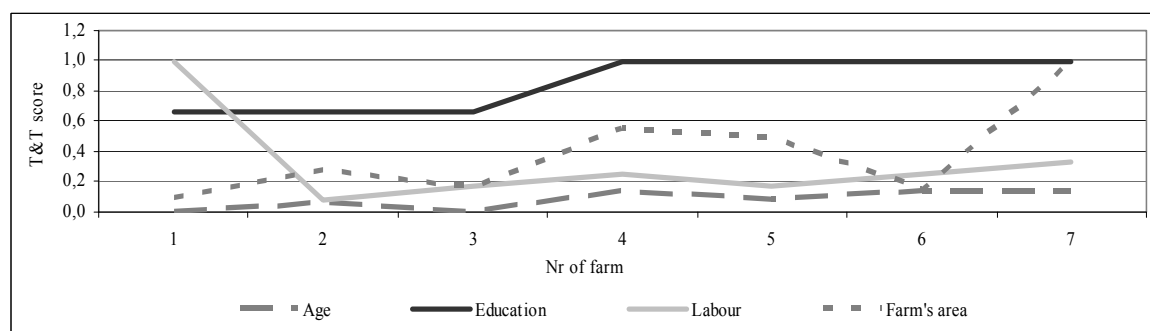
**Figure 2: The average values for three clusters**

Source: Own work.

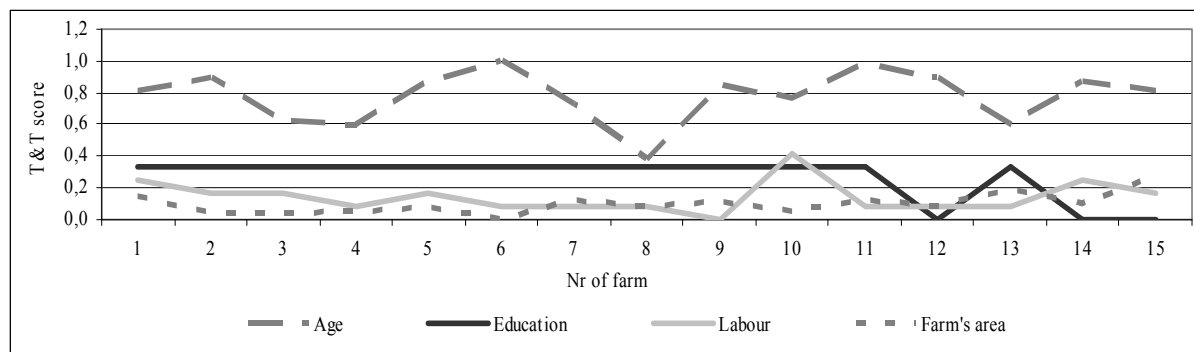
The first cluster is built from farms which are managed by the youngest farmers (see Fig. 3). Their age averages 25 years. Those farmers have the highest level of education (secondary school and higher school).

The second cluster is characterized by small farms (about 10 hectare) with low labour (see Fig. 4). The farms in this group are managed by the oldest farmers, having primary or vocational education.

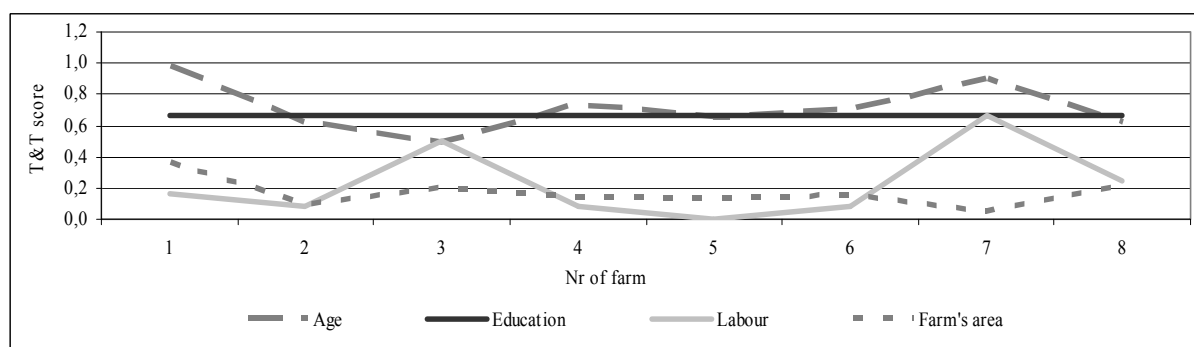
In the third cluster, the small and the middle farms (about 17 hectare) were grouped. The farmers in this group have secondary school education (see Fig. 5).

**Figure 3: A characteristic of farms in the first cluster**

Source: Own work based on cluster analysis.

**Figure 4: A characteristic of farms in the second cluster**

Source: Own work based on cluster analysis.

**Figure 5: A characteristic of farms in the third cluster**

Source: Own work based on cluster analysis

Using the survey's data, it was analyzed whether the traceability is guaranteed in each of the groups (clusters). The results of fulfilment of the traceability requirements are shown in the following part of the article.

### 3.2 Assessment techniques

In table 2, the results of a point assessment technique are shown. The validation of T&T score is based on a formula, which was presented in the part 2.3. For each farmer the indicator of the fulfilment of traceability settlements was calculated.

Above a level 0, it can be assumed that the traceability is at least partially fulfilled. It is the case of 18 farms which belong to all three groups (in the first cluster 7 farms – 100%, in the second cluster 8 farms – 53%, in the third cluster 3 farms – 37%).

A biggest value of the traceability's score T&T can be observed in the first group (cluster) of farmers. Regarding Fig. 3, indicators that determine the level of traceability's fulfilment in this cluster are age (average age amounts 20 years) and the education of farmers (secondary school and higher school). It can be also observed that the level of traceability's fulfilment is not depending on the number of employees and on the farm's area.

**Table 2: The results of cluster analysis and point assessment technique**

Nr of farm	No of cluster	Age	Education	Labour	Area of farm	Traceability's score T&T
4	1	0,0	0,7	1,0	0,1	3,00
17		0,1	0,7	0,1	0,3	2,27
18		0,0	0,7	0,2	0,2	0,71
27		0,1	1,0	0,3	0,5	2,98
28		0,1	1,0	0,2	0,5	1,00
29		0,1	1,0	0,3	0,1	1,00
30		0,1	1,0	0,3	1,0	1,00
2	2	0,8	0,3	0,3	0,1	-1,10
6		0,9	0,3	0,2	0,0	-2,90
7		0,6	0,3	0,2	0,0	-0,02
9		0,6	0,3	0,1	0,0	-0,90
11		0,9	0,3	0,2	0,1	-1,95
12		1,0	0,3	0,1	0,0	-1,00
13		0,7	0,3	0,1	0,1	2,80
14		0,4	0,3	0,1	0,1	0,90
15		0,8	0,3	0,0	0,1	-0,43
20		0,8	0,3	0,4	0,0	0,10
21		1,0	0,3	0,1	0,1	1,76
22		0,9	0,0	0,1	0,1	0,98
24		0,6	0,3	0,1	0,2	0,96
25		0,9	0,0	0,3	0,1	0,90
26		0,8	0,0	0,2	0,3	0,92
1	3	1,0	0,7	0,2	0,4	-0,30
3		0,6	0,7	0,1	0,1	0,00
5		0,5	0,7	0,5	0,2	-0,53
8		0,7	0,7	0,1	0,1	1,98
10		0,6	0,7	0,0	0,1	-0,20
16		0,7	0,7	0,1	0,2	0,37
19		0,9	0,7	0,7	0,0	-1,00
23		0,6	0,7	0,3	0,2	0,98

Source: Own work.

Based on point assessment technique it can be stated that only 60% of the analysed farms have fulfilled the traceability's requirements (at least partially) by keeping documentation about activities which occur during production processes (products' flow). With regard to the questionnaire's results on the companies side, all of the 25 analyzed food companies fulfil these requirements (see table 3). A great number of companies have regular suppliers which are collecting all information about the delivered raw product. One can say, based on the questionnaire that on the level of food companies, cooperation with the previous step of the supply chain is working very well. On the farmers' side, one can observe a problem with finding regular buyers (38% of farmers). Regarding table 3, 40% of analysed farmers do not fulfil the traceability's requirements what could be one of the reasons for the problem with regular buyers.

**Table 3: A comparative analysis of the traceability's fulfilment among the farmers and food companies**

ON THE FARMERS' SIDE			ON THE COMPANIES' SIDE	
60%		Fulfilment of traceability's requirements	100%	
50%		Ability to get/pay more many for the traceability		28%
62%		Number of regular buyer/suppliers		95%

Source: Own work based on questionnaire's and point assessment technique's results.

28% of the companies would be able to pay more for delivery if farmers would be able to guarantee the traceability (to provide information) at the first step of production.. 70% of them say that the exchange of product information between the first and the second step of food production should be a standard. On the farmers' side one can see that only 50% of them are able to keep documentation regarding the traceability if they would get a better price for their products (based on the questionnaire's results).

## 4 CONCLUSIONS

In the Polish food sector issues addressing food safety and quality, including traceability, are gaining importance. Thus, in order to meet the increasing requirements, all stockholders engaged in a food chain have to adjust their co-ordination mechanism, i.e. by altering the access to the systems of products' information provided by the suppliers. The introduction of traceability instruments has become a competitive necessity for the farmers, if they wish to stay on the market.

In the study, the fulfilment of traceability's requirements among Polish farmers and food producing companies were analyzed. The degree of traceability has been estimated by using point assessment technique and its reasons were investigated using a cluster analysis.

The results show, that all analysed companies fulfil the settlements of traceability. However, only a half of the analysed farmers keep traceability's documentation. The findings suggest that the lack of knowledge about traceability is one reason for not keeping documentation of the products' flow. At the same time, it was shown that the young and good educated farmers achieve the highest level of traceability's fulfilment. Thus, it is recommended to reduce the knowledge gap by providing professional training or by increasing farmers' access to information regarding traceability's fulfilment.

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## **GEOGRAPHICAL INDICATIONS IN TRANSITION COUNTRIES: GOVERNANCE, VERTICAL INTEGRATION AND TERRITORIAL IMPACT. ILLUSTRATION WITH CASE STUDIES FROM SERBIA**

*MARGUERITE PAUS\**

### **ABSTRACT**

In Western Europe, registered Geographical Indications (GI) present hybrid forms of governance structure with a high diversity in territorial dynamics. In transition countries, hierarchies emerge within GIs. This article addresses the question of whether territorial strategy of a GI is possible when processors source themselves a large part of the production. Two Serbian case studies of GIs are analysed with regard to the advantages of concurrent sourcing. The potential effects of this strategy on small producers and governance strategy are balanced. One potential positive effect is a transfer of technical innovations from processors to producers.

**Keywords:** Geographical indications, governance, vertical integration, territorial impact, transition countries.

### **1 INTRODUCTION**

Geographical Indications (GIs) are defined by the TRIPs (Trade-Related Aspects of Intellectual Property Rights) Agreement as indications that identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographic origin. With the TRIPs agreement (1994), the issue of protecting GIs expanded worldwide. Simultaneously, economic development is very welcome in rural areas which are facing depopulation and land abandonment.

This article focuses on the question of whether territorial strategy of a GI is possible when processors source themselves a large part of the production, illustrated by Serbian case-studies.

The first part of this article deals with the concept of governance structure and strategy with regards to GIs and the implicit link made between the organizational

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form of the GI and its strategy (sectoral *vs.* territorial). Second, the factors which give a processor the incentive to partly vertically integrate the production are discussed. Third, we present two case studies analysis conducted in Serbia: kajmak of Kraljevo and fresh raspberries of Arilje. In both cases a vertical integration strategy is initiated by some operators.

In the last part, we first analyze the reasons for the concurrent sourcing of the products investigated. Second, we discuss whether vertical integration might have positive territorial effects.

## **2 GEOGRAPHICAL INDICATION'S GOVERNANCE FORMS**

Two fields of application of the term "governance" are commonly used in the literature related to GIs food chains analysis. Hence, it is necessary to specify this concept.

### **2.1 Governance structure and hybrid forms**

The first use of the term "governance" refers to the "governance structure" proposed by Williamson and is embedded in the New Institutional Economic, which focuses on transactions between a buyer and a seller. WILLIAMSON (1991) identifies two polar forms of governance structures – markets and hierarchies – and identifies intermediate or hybrid forms. Hybrid forms are characterised by a bilateral dependence without going as far as integration. MÉNARD (2004) identified four types of hybrid forms.

Research has shown that European Protected Designation of Origin (PDO) and Protected Geographical Indications (PGI) come under the hybrid forms type with a diversity of vertical co-ordinated systems (PERRIER-CORNET, SYLVANDER, 2000; ALLAIRE, SYLVANDER, 2000; BARJOLLE, 2001, RÉVIRON et al., 2004). Vertical integration is rarely observed in PDO and PGI supply chains.

### **2.2 Territorial governance strategy *vs.* sectoral governance strategy**

The second use of the term "governance" appeared in the late 90s in the French literature on quality products. ALLAIRE and SYLVANDER (1997) opened the field with a reference to the "governance" definition of BENKO and LIPIETZ (1992), as a "territorial political structure". This definition is different from the one proposed in Transaction Cost Theory and comes from an analysis of territorial dynamics and regional institutions. PDO supply chains are not systematically linked to territorial governance strategy, and present a high heterogeneity of situations (BARJOLLE et al., 1998; SYLVANDER, MARTY, 2000). SYLVANDER (2004) proposed the following gradation: "territorial governance" is observed where decision-makers are supported by local institutions and share a common interest with local actors; "sectoral governance" where an inter-professional body holds power but where actors are driven by pure market logic while coordinating with

each other; and "corporate governance" which includes enterprises which do not fundamentally adhere to origin labelled products' ideology and culture.

### 2.3 Organizational forms and governance strategy

A link between the structure of governance (hybrid form) and the governance strategy (territorial vs. sectoral) is made in the literature (RÉVIRON and CHAPPUIS, forthcoming). Inter-professional association is mostly associated with territorial governance, whereas professional association with sectoral governance. Although the structure of governance might have effects in terms of rural development, the choice of the organization does not guarantee territorial effects (BARJOLLE et al., 2005; RÉVIRON, PAUS, 2006).

To summarize this section, GIs in Western Europe come under hybrid organizational forms with sectoral or territorial governance strategy. In transition countries, hierarchies emerge within GIs and have to be replaced in a context of transition to market economy. Next section highlights the reasons for choosing vertical integration rather than supply outsourcing.

## 3 WHY VERTICALLY INTEGRATE?

There is a large literature on the "to buy or to make" choice and a great number of possible motives for vertical integration exist (PERRY, 1989).

### *Reasons to vertically integrate from the Transaction Cost Theory*

COASE (1937) underlines that integration is depending on the relation between costs of production and transaction costs. Coase defines the "integration" when the organization of transactions which were previously carried out between the entrepreneurs on a market become organised by one. According to WILLIAMSON (1971) the hierarchy form is developed when transactions are frequent, incertitude prevalent and investments specific (asset specificity). Integration is set as a response to contractual incompleteness and asymmetry of information.

### *Advantages and disadvantages of vertical integration*

DEN OUDEN et al. (1996) classified the advantages and disadvantages according to achievement of economies (cost savings) and market power (summarized in Table 1).

Production sourcing uncertainty may also provide incentive for vertical integration (see HENNESSY, (1996) for asymmetry of information about quality). Concurrent sourcing i.e. simultaneously make and buy the *same* good is a strategy discussed in a recent article by PARMIGIANI (2007). Early work mentioned in this paper suggested that firms concurrently source in times of demand uncertainty or in order to gain an increased understanding of the production process and thus better monitor suppliers (benchmark). The author concludes that concurrent sourcing



is a distinctly different choice, rather existing along a make/buy continuum, and chosen by firms when conditions warrant.

**Table 1: Summary of potential advantages and disadvantages of vertical integration**

Advantages	Disadvantages
<b>Economies</b>	
Reduction of transaction costs when incertitude is prevalent and investments specific (asset specificity)	High capital investment requirements
Technological economies	Unbalanced throughput because of differences in efficient scale
	Diseconomies of scale
Better opportunities for investment and enhanced ability for differentiation growth through reduced uncertainty	Reluctant independent suppliers/buyers
Economies of Internal Control and Coordination (Synchronization of supply and demand, reduce the uncertainty on supply)	Differing managerial requirements
Economies of Information (market partners, prices, quality etc.)	Increasing likelihood of entrepreneurial mistakes (diversified activities)
Economies of Stable Relationships	Dulled or attenuated incentives and bureaucratic distortions
	Possibly missing advantageous external opportunities
	Reduced flexibility to change partners
<b>Market Power</b>	
Elevate entry barriers and mobility barriers	Higher overall exit barriers
Raise rival costs by foreclosure	
Practise price discrimination	Foreclosure of access to supplier or buyer research and /or know-how
Offset bargaining power and input price distortions	
Defend against foreclosure	

Source: Adapted from den OUDEN et al., 1996; completed with WANDEL, 2000.

### *Vertical Integration and Institutional Environment*

Governance structures change in response to disturbance in the institutional environment (WILLIAMSON 1991). According to NORTH (1994), formal and informal constraints (i.e. rules, laws, norms of behaviour) play a determinant role in the organizational choice: the organizations that come into existence will reflect the opportunities provided by the institutional matrix.

We assume that the transition context gives an advantage to vertical integration (WANDEL, 2000; GORTON, WHITE, 2006; SWINNEN, 2007), which is not *a priori* the case in the EU and Switzerland (BARJOLLE, CHAPPUIS, 2000). In the next sections, we investigate the reasons that may convince entrepreneurs to make a part of the raw material production, with regards to two Serbian GI case studies. The case-study research aims at testing the theoretical results and enriching them (EISENHARDT, 1989).

## **4 PRESENTATION OF THE CASE STUDIES AND COMPARISON**

Two Serbian GIs were selected according to two criteria: emergence of initiatives among local actors to register the product under the new Serbian law on Indication of Geographical Origin and emergence of a strategy among processors to partly vertically integrate. Therefore, the objective of the case-study approach is to confront the empirical results to the theoretical framework on governance structure within GIs and the "to buy or to make" choice presented in section 2 and 3. Field research consisting of 52 semi-structured interviews, observations and archives was conducted in summer 2007. Informants (actors of the supply chain, local and national stakeholders) were asked about basic activity characteristics, organization of the supply chain, key stakeholders in the initiative for protection, rural development vision and stakes.

### **4.1 Kajmak of Kraljevo**

Kajmak is a dairy product made from the layer of fat created when milk is boiled and then cooled. In Serbia, it is defined in a by-law and it is one of the traditional products whose quality and reputation are linked to its geographic origin. The traditional area of kajmak production spreads over South-West Serbia, some regions being particularly famous (Zlatibor, Kraljevo). The kajmak of Kraljevo is currently the object of a registration procedure as PDO product. The initiative is being led by a local NGO which plays the role of facilitator.

Almost every household with cows produces kajmak, most of which is produced for self-consumption. In the municipality of Kraljevo, the estimated number of producers marketing their kajmak is around 600. The classical unit of production is a household with 2 to 10 cows. The kajmak is marketed either on the green market or through one cooperative or traders. Nevertheless, sanitary norms are putting the household producers under pressure and the structure of the production system is rapidly changing. Short term, it is expected that many small household producers will stop producing kajmak and deliver their milk to small-scale dairies. Indeed, small-scale dairies are flourishing. They produce (or plan to produce) kajmak in an artisan way with often a strategy to partly collect milk from small producers and partly produce milk themselves.

### **4.2 Raspberries of Arilje**

Raspberries of Arilje are growing in the Moravica valley. Raspberries production is one of the two economic pillars of the Arilje Municipality. Due to the specific conditions (soil, climate), raspberries of Arilje are said to have different taste, aroma and content (dry matter and pectin) from other raspberries (even though the varieties are not local). 95% of the raspberries production is dedicated to the frozen channel for food industry with about 30% of the world market share. Some processors and producers have started to develop a new activity with fresh raspberries to be sold in Serbian urban supermarkets.

Diversification in fresh raspberries requires investments and innovation at the level of both producer (technical knowledge, investments in seedlings and materials) and processor (storage, packaging and transport logistics). This diversification choice of the processors is accompanied by a partly vertical integration, i.e. they invest in land and plantations. In this case, processors have an agreement with a reduced number of producers, and offer 10% premium in comparison with the frozen outlet.

Additionally, the production of raspberries for fresh outlet increasingly has to meet private standards introduced by retail chains implemented in Serbia. The requirements are following the trail to the processor level and finally the production level.

### 4.3 Comparison of the cases

We now analyze in both cases the processors' incentives for concurrently sourcing their production, i.e. to simultaneously making and buying their raw material.

#### Advantages of the concurrent sourcing

In both cases, we observed partly vertical integration, at different levels of the supply chain and by *emerging small-scale entrepreneurs firms*. Initiators of vertical integration are large producers, processors or former traders. Three advantages of the concurrent sourcing are underlined. 1) *Monitoring of the quantities* of the raw material. It is particularly the case for kajmak, where uncertainty about quantity is high due to opportunistic behavior, and numerous and rapid changes in the supply structure. Moreover small-scale farmers are often poorly organized and risks and transaction costs of involving them in coordinated supply chains are relatively high (VAN DER MEER, 2006). 2) *Management of the quality* of the products. Fresh raspberries are fragile fruits and the incentive for processors to partly integrate the production is high in order to avoid bad quality deliveries which could be refused by retailers. In the case of kajmak, the quality of the milk is determinant to achieve a high quality kajmak and a good productivity. For these reasons, uncertainty about quality plays a key role in the strategy of integration. Maintaining the reputation associated to GI product and its particular quality is crucial, and all steps involved in the production process are concerned, from the production of the raw material to the transport of the final product. 3) *Technical improvement and innovation* is observed in both cases (for instance in genetics for cows and new material to conduct the seedlings for raspberries). These innovations that small farms can often not afford due to a lack of investment capacities are bound to be made by the largest farms and processors.

## **Role of the environmental context**

In European GIs, hybrid forms help circumventing the market failures (BARJOLLE, 2001; RÉVIRON et al., 2004). Thus we investigate why vertical integration appears in transition countries and why the European model is not applicable as such. As WILLIAMSON (1991) underlined, the institutional environment plays a key role in the determination of the governance forms. In transition countries, several difficulties hinder the direct emergence of hybrid forms. First, hybrid forms are based on implicit or explicit contracts. Nevertheless, explicit contracts between small producers and processors are not common in Serbia. Furthermore, implicit contract is based on trust. WILLIAMSON (1971) underlined that vertical integration would be more complete in a low-trust than high-trust culture. Trust is lacking because of traumatic experiences during both the communist and the transition period (SWINNEN, 2007). Second, uncertainty on quality is high due to the insufficiency of common rules concerning quality control and the monitoring of quality norms and standards. Moreover, enforcement of legal resource to punish opportunistic behaviour is inadequate (DRIES et al., 2007) and the GI legal basis and its implementation are under construction. In this post-communist context, vertical integration and concurrent sourcing in GIs are an answer to circumvent the market failures and the lack of institutions and their enforcement.

In the last section, we discuss the potential benefits and risks for the producers, as well as the potential territorial impact.

## **5 DISCUSSION**

Several studies on GIs outside Europe underlined new forms of vertical coordination, including reverse leasing (tequila in Mexico – see BOWEN, GERRITSEN, 2007) and vertical integration (sea buckthorn in Mongolia, RÉVIRON, TSEELEI, forthcoming). BOWEN and GERRITSEN (2007) investigates the tequila case and identifies negative impacts for producers of blue agave as well as negative environmental impacts. However, in our case studies, the potential effects are more balanced and positive effects in terms of rural development might be created under certain conditions.

### **5.1 Concurrent sourcing and market power**

In the case of fresh raspberries, the market is driven by retailers which have the power to return the goods if they do not fulfill the quality requirements. Concerning the kajmak, the major part of the production is still marketed through green markets and restaurants but the trend is rapidly shifting in favor of retailers. Moreover, the pressure in terms of sanitary requirements is very high and threatens small producers which lack of investment capacities and technical information.

According to these facts, it seems that the major driver in the exclusion of producers and household processors does not come from the pressure led on

prices by the emerging small-scale entrepreneurs, but from downstream the supply chain and institutional environment. Consequently the small-scale processing units might play an interesting role by positioning their product on differentiated segments, such as origin products. Hence, they offer an opportunity for producers to deliver small quantities of high quality raw material. These processing units know the retailers requirements, have higher investment capacities and have clearly chosen a quality strategy. In this context, managerial and technical innovations might be swapped between integrated production and suppliers. This learning process could be of major interest to maintain small producers due to an upgrading quality of their production.

On the other hand, the integration of a part of the production may lower prices. Consequently, non-integrated producers may be exposed to predatory pricing tactics, or even the refusal to supply. The system may be sustainable under the condition that processors share the rent of the quality product with producers which partly source them. Additionally, a growing number of newly established small-scale processors is an interesting balance in terms of market power, since the competition among buyers is increasing. The impact on kajmak household production is more balanced. Though they might benefit from a transfer of knowledge and technical information, they will lose a significant part of the market, and will have to negotiate the code of practices in the frame of a PDO application, as well as the potential building of a collective promotion.

## **5.2 Potential evolution of the governance**

According to the European experience, vertically coordinated systems with allied independent producers and processors are the most favourable governance structure in terms of value added creation and its distribution among commercial actors, as well as positive effects in terms of rural development. In transition countries, these hybrid forms face difficulties to emerge due to several factors at local and national levels. Processors had to implement their own procurement practices in an environment of poor legal enforcement of business relationships (SWINNEN, 2007). WILLIAMSON (1991) points, for instance, that an improvement in the contract law regime would shift the cost of hybrid governance down and consequently favour the apparition of hybrid forms. SWINNEN (2007) sets the question if vertical integration is a transition-specific phenomenon since there is less need for integration when markets start working better (enforcement of contracts by development of public institutions and new market actors). According to him, it looks likely that vertical integration will neither be reinforced, nor will retreat, but that a hybrid path will develop in the medium term. That is what we observe in the case of raspberries of Arilje which present both vertical integration strategy and an emergence of contracted purchasing.

In the studied GI cases, individual strategy of vertical integration is combined to emerging collective strategy (network with common explicit and implicit rules,

organizational innovation). Nevertheless, whereas vertical integration is market driven, the establishment of an inter-professional collective organization is operated with a top-down approach (local NGO for kajmak, municipality for raspberries). These external actors are playing an important role by increasing the awareness among operators of the quality and the reputation associated to their products and stressing the shared values. Consequently, despite the difficulties at local and national levels, collective organizations are emerging. At the local level, establishing such organizations requires overcoming the reservations of small farmers, who in part for historical reasons have been suspicious of co-operative arrangements (GORTON, WHITE, 2006). Enforcement of collective strategy needs specific management form, where common decisions can be negotiated: code of practices, control modalities, quality bonus, but also collective promotion and research and development programme. For the time being, in the kajmak initiative, a local NGO is playing the role of facilitator and (to a certain extent) conflicts referee. A working group composed of household producers has been established and negotiate about the code of practices. These technical decisions have crucial consequences on positioning the product on the market, the composition of the alliance and the effects on rural development. A critical point in the kajmak initiative is the participation of small-scale dairies. At the national level, the success of registered GIs depends also on the extent to which public regulations are credibly enforced (e.g. registration procedure, certification and controls).

## 6 CONCLUSION

In developing and transition countries, a large number of subsistence farms have to deal with new rules decreed by the institutional environment. Quality products and in particular protected GIs might offer an alternative for the shift from domestic production to market economy. In Serbia, subsistence agriculture faces former state agrokombinats, and emerging small-scale entrepreneur processors. These processors might sustainable the market access of small producers with a strategy of differentiation based on quality attributes, such as origin. Furthermore, regarding the rapid structural changes operated in the agricultural and trade sectors, these processors have incentives to partially vertically integrate the production. The greatest incentive seems to be the need to avoid uncertainty on quality about raw materials. This search for high-quality raw materials is coupled with technical changes and innovation in new way of production, which might be transferred to producers. Finally, the trends observed are lightly influenced by institutional context. The absence of relevant national and local institutions in terms of quality control and technical assistance for small producers are critical. Nevertheless, the development of vertical integration at the firm level might be a stage before other forms of governance structure appear at the supply chain level. This new forms of governance, based on a collective strategy and public-private partnerships, could empower small-scale producers and sustain their activity.

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## PROCESSING AND MARKETING FEASIBILITY OF UNDERUTILIZED FRUIT SPECIES OF RAJASTHAN, INDIA

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### ABSTRACT

The present investigation was carried out in the state of Rajasthan, one of the prominent producers of minor fruits in India, with the objectives to identify the processing and marketing feasibility of underutilized fruit species and to investigate existing marketing channels and potential market-related problems for processed products from minor fruits. The results revealed that the main products consumed by respondents in the survey were: fruit cordial, jam, ready-to serve (RTS) fruit drinks, chutney, candy, pickle and squash concentrate. Most of the processors sold RTS, cordial and jam through niche markets, such as the canteens of schools, hospitals and other government institutions. Of these, 75 percent were small-scale businesses. There was a seasonal pattern in the consumption as well as in the sale of these products, which increased during the popular festivals; whereas during the dry period higher sales of drink products were common. The survey also revealed that retail markets for processed products are concentrated and that there are many potential producers. The supply chain for processed underutilized fruit products consists of eight main categories of actors, namely: raw material suppliers, processors, company agents, distributors, wholesalers, exporters, retailers and consumers. Clearly, the supply of processed fruit aims at a niche market, at the high-income-earning part of the population.

**Keywords:** Minor fruits, processing, supply chain, marketing networks.

### 1 INTRODUCTION

Developing countries are being encouraged to diversify their food exports by developing new products and adding more value to existing products. Value addition and diversifying food exports depends not only on changing production

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and processing systems, but also on linking to appropriate marketing networks. A value chain perspective is used to identify various routes by which the value of food exports can be increased. An analysis of production, processing, marketing channels and upgrading strategies for fresh and processed fruit with development of niche markets for high-value produce, creates new opportunities for developing countries' producers and exporters that can meet the required standards. A value chain perspective is used to identify various routes by which the value of food exports can be increased.

Food exports account for approximately 10 percent of global trade. It is estimated that for developing countries food exports account for 60 percent of all non-fuel exports. Many of the poorer developing countries derive a substantial proportion of their total export revenues from one basic food commodity or a small number of such commodities. Particularly in marginal environments of developing agricultural economies, ethnobotanic surveys have documented that many less well-known species continue to be grown, managed and collected (IPGRI, 2002). Numerous terms have been employed to characterize them, including "minor crops," "underutilized" species, "neglected species" or "orphan crops," "under-exploited" and "underdeveloped" species. Keeping the above facts in view, the present investigation was carried out in the state of Rajasthan, one of the prominent producers of minor fruits in India with the objectives to identify the processing and marketing feasibility of underutilized fruit species and to identify existing marketing channels and potential market-related problems for processed products from minor fruits.

## **2 MATERIAL STUDIED AND METHODOLOGY**

Field level focus-group discussions and a semi-structured questionnaire were used to collect primary data, following the stratified random sampling and cluster sampling approaches. The survey questionnaire was developed by ICUC-Southampton (SHEPHERD, 2003) and was standardized to allow for eventual comparative analysis of the data from different regions. A total of 200 interviews were conducted, including 155 consumers, 6 processors, 25 retailers, 6 wholesalers, 5 company agents, and 3 exporters. These represent the key actors within the supply chain of the underutilized fruit industry. The fruits such as Ber, Bael, Jamun, Pomegranate, Karonda, Phalsa, Aonla, Mulberry, Soursop, Tamarind, Wood apple, etc. and their processed products were taken under investigation.

### **2.1. Data analysis**

For the data analysis, both qualitative and quantitative approaches were used. Tabular analysis was carried out to assess the production and marketing feasibility of underutilized fruits and to study the interfaces amongst the various actors in the processed fruit products supply chain. Preliminary analysis showed that in terms of production and marketing feasibility, regional differences were insignificant.

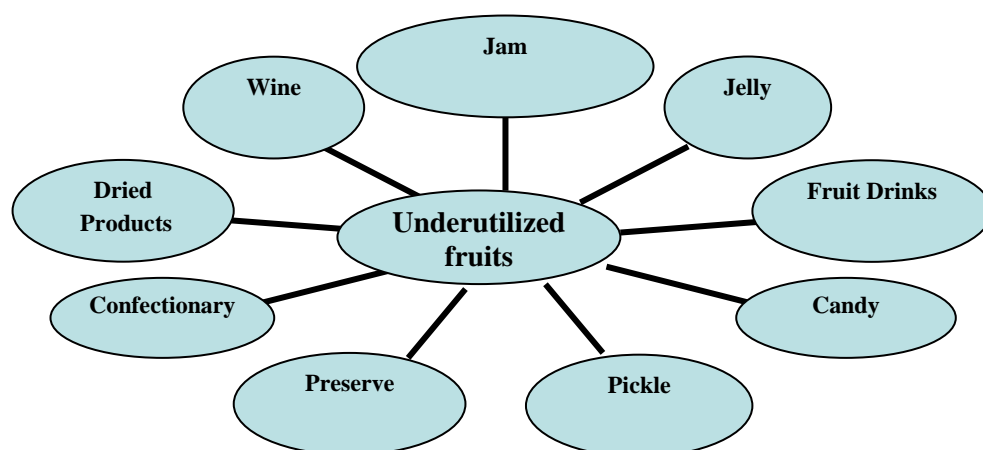
For this reason, the data from the different sources were gathered for this analysis. The overall feasibility of the agro-processing ventures was assessed in terms of production feasibility and marketing feasibility.

### 3 RESULTS

#### 3.1 The products

The survey yielded information about ten fruit products from different new brands of local producers along with products from popular well-established brands to provide points of comparison; as the emerging brands of processed products from underutilized crops have to compete with these products. The consumer survey provided information about the main products on the market and the fruit species from which they are made (Table 1). The major processed products which can be prepared from minor fruits (Fig .1) were as under.

**Figure 1: Chart for underutilized fruits**



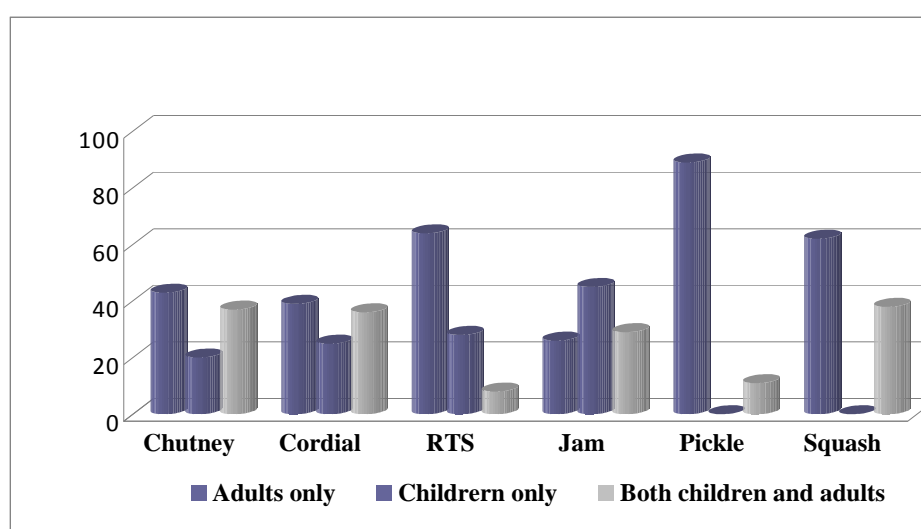
**Table 1: Major processed products which can be prepared from minor fruits**

Processed product	Fruits
<b>Jam</b>	Jamun, Karonda, Aonla, Mulberry, Soursop, Tamarind, Wood apple
<b>Jelly</b>	Tamarind, Jamun, Karonda, Tamarind
<b>Preserved</b>	Ber, Aonla, Ker, Sangri, Karonda, Bael , Karonda, Soursop
<b>Candy</b>	Aonla, Karonda, Tamarind
<b>Glazed fruits</b>	Tamarind, Annanas, Aonla
<b>Confectionary</b>	Amra, Aonla,Tamarind
<b>Juice/Syrup/ Beverag /Squash</b>	Aonla, Ber, Bael, Jamun, Karonda, Phalsa, Mulberry, Pomegranate, Soursop, Wood apple, Tamarind
<b>Wine</b>	Mahua, Jujube, Ber, Indian fig, Karonda,
<b>Chutney</b>	Karonda, Woodapple, Aonla ,
<b>Sauce</b>	Karonda, Tamarind, Woodapple, Pomegranate,
<b>Pickle</b>	Jujube, Tamarind, Ker ,Lasora, Gonda
<b>Dehydration</b>	Aonla, Karonda, Ker, Bael, Ber, Custard apple,
<b>Frozen Puree</b>	Bael, Karonda, Ker, Phalsa Tamarind, Custard apple
<b>Canning</b>	Ber, Aonla, Jamun, Ker

### 3.2 The consumers

Type of consumer: The main products consumed by the respondents in the survey were, in a decreasing order, squash, fruit cordial, chutney, jam, ready-to-serve (RTS) fruit drinks and pickle (Fig. 2). Although processors might sell their produce through company agents or wholesalers, they indicated that their ultimate consumer targets were women (mentioned by 45 percent of processors), children (25 percent), workers (16 percent), hotel guests (9 percent) and exporters (5 percent). The main consumers for pickle, squash concentrates and RTS were indicated to be adults, while children were the main consumers of jam (Fig: 2). It was mentioned that travelers and office workers bought RTS during their travel and work breaks.

**Figure 2: Main consumers of processed fruit products**



Preferred location: Most consumers preferred to purchase fruit products from ordinary retail shops, but they also purchase from supermarkets. In particular, RTS consumers were not bound to any particular type of shop, as they generally purchased the products during travel and work breaks. The main criteria for choosing a shop were proximity to home or office and good selection of produce (Table 2).

**Table 2: Common places where consumers buy processed fruit products**

Product	Retailer (%)	Supermarket (%)	Wholesaler (%)	Canteen (%)	Any other (%)
Chutney	60	38	0	0	2
Cordial	48	51	0	0	1
RTS	47	22	0	0	31
Jam	53	43	2	0	2
Pickle	62	33	5	0	0
Squash	58	42	0	0	0

Product quality and brand loyalty: Consumers indicated that they selected brands of chutney, RTS, cordial and jam based on the taste and quality of the product. In addition, they considered product appearance and brand image. The majorities of consumers were satisfied with the existing brands of chutney, RTS, cordial and jam, and rated them highly for product features such as color, sweetness, thickness and spiciness. Most consumers were satisfied with the quality and packaging of the products (86 and 95 percent positive responses, respectively). Although customers showed remarkably strong brand loyalty for most products, they indicated interest in testing new products. Lack of availability was mentioned as the main impediment to trying new products (Table 3).

**Table 3: Consumer's loyalty to existing brands, willingness to try new products, and constraints to higher consumption, by product**

Product	Brand loyalty (%)	Willingness to adopt new products (%)			Constraints to higher consumption (%)			
		Yes	No	May be	Family priorities	Product quality	Product availability	Price
Chutney	79	88	12	0	37	3	57	3
Cordial	93	66	17	17	37	10	53	0
RTS	98	73	11	16	48	11	41	0
Jam	96	75	12	13	42	14	60	0
Pickle	87	56	22	22	-	-	-	-
Squash	100	30	0	70	87	0	13	0

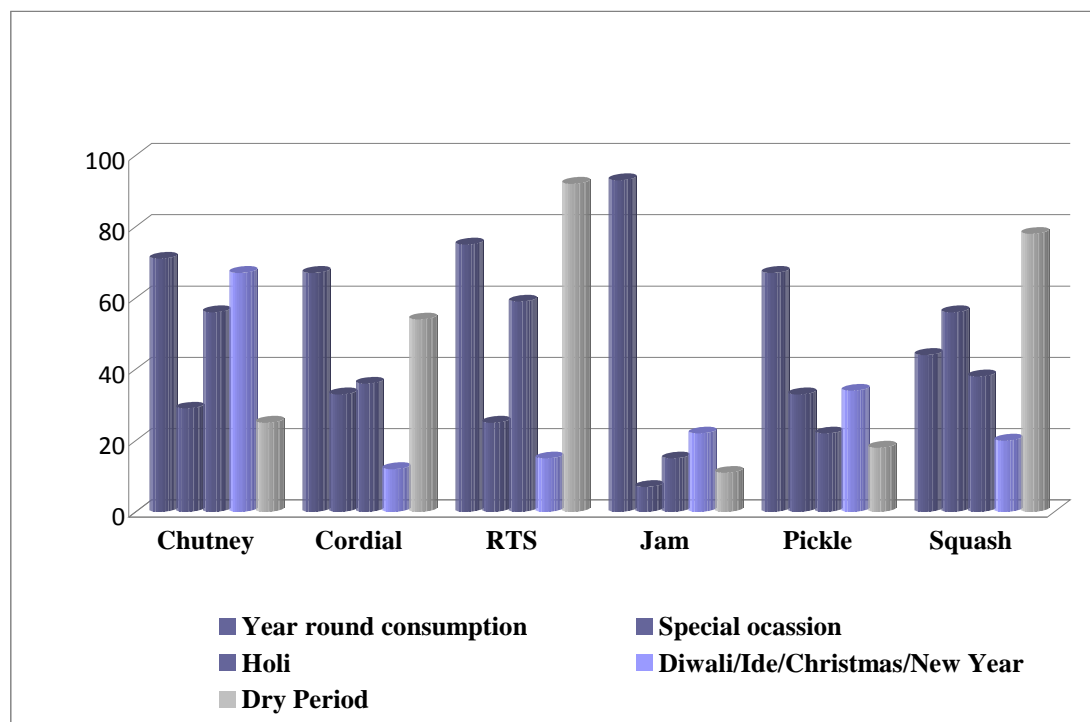
### 3.3 The marketers (wholesale and retail)

Main markets: The surveys indicated that 52 percent of the processors sold RTS, cordial and jam through niche markets, such as the canteens of schools, hospitals and other government institutions. Of these, 75 percent were small-scale businesses that had started less than two years prior to the survey. These processors catered to niche markets in order to avoid competition from popular brands. Another 38 percent of the processors sold their products to supermarkets, whilst 10 percent of the processors marketed their products at ordinary retail shops, such as grocery stores and co-operative shops. Retailers displayed the products on shelves, and 14 percent of the retailers also stored them in small warehouses. Just over half (57 percent) of the retail shops were considered suitable for selling processed fruit products in terms of cleanliness, space availability, shop arrangements, infrastructure, etc. Cooling facilities were available at 63 percent of the retail shops and kiosks, and were mainly used to store RTS fruit drinks. Among the retailers who marketed RTS fruit drinks, only about 8 percent did not have cooling facilities.

Seasonal variations in sales: Chutney, concentrated fruit juice, cordial, fruit drinks, jam and pickle were marketed and consumed throughout the year (Fig. 3). There was a seasonal pattern, however, in the consumption and sale of these products.

Sales for most of them increased, in particular, during the popular festivals Holy, Diwali and Christmas. In addition, during the dry period higher sales of drink products were common. The most significant trends of increasing sales were reported for RTS and dehydrated products.

**Figure 3: Seasonal variation (%) in consumption of processed fruit products**



Marketers' willingness to promote new products: The majority of the wholesalers (88 percent) and 43 percent of the retailers were reluctant to sell new brands as these tend to move slowly during their introductory phases which reduces the space utilization efficiency of warehouses and shops. Nevertheless, half of the retailers indicated that they would be willing to sell new brands of good-quality products from underutilized crops if a number of conditions were met; such as longer credit periods, higher discounts and acceptance of returns for faulty and expired products. The shops usually displayed all products in a category on their shelves. Nonetheless, 74 percent of the retailers indicated that because of the competition new products are usually displayed in less visible areas.

Availability of labor, raw materials and other ingredients: Almost all of the surveyed fruit processing enterprises under study reported that they had access to good unskilled labor along with raw materials. The seasonality of the raw materials, however, made scaling up and year round production prohibitive for 64 percent of the enterprises. Some 66 percent of the processors purchased from wholesalers at weekly fairs or from collectors/traders. Half of the processors bypassed wholesalers and collectors, purchasing their raw materials directly from the farmers. Amongst the cottage-scale business operators, 13 percent used fruit from their own home gardens for processing. Fruit was generally paid for directly, in cash, with a few

exceptions where both cash and credit were used. The credit period varied from one week to two months. Sugar, salt, pectin, sodium metabisulphite (SMS) and citric acid were widely used in most of the fruit processing enterprises. The processors bought sugar and salt from local markets. The majority of the processors bought pectin, SMS and citric acid from wholesale markets in the big cities.

**Infrastructure:** Almost half of the processors (53 percent) had access to adequate water for their enterprises. Nonetheless, 31 percent of them only had access to manually drawn well-water, and this was identified as a constraint to efficient operations, especially for cottage-level factories. In general, the surveyed fruit processors had access to electricity, although some reported that frequent power failures and voltage drops represented impediments to the successful operation of their enterprises. Storage capacity was a major constraint to enhancing the productivity of the new enterprises. Only 40 percent of the processors, mainly the established processors had constructed proper warehouses for storage. Of the start-ups, who stored the finished products for selling later, 20 percent did not have proper storage facilities.

**Packaging:** Amongst the processors, 92 percent had access to packaging materials, such as bottles, polythene bags, lids, labels, etc. The cost of packaging materials was one of the major barriers for small-scale processors. Half of the processors (53 percent) purchased packaging materials from wholesale markets, whilst the rest (mainly the cottage-level processors) purchased them from local markets to withstand competition on the open market. However, enterprises need to develop a marketing strategy.

## **4 DISCUSSION**

### **4.1 Main markets and potential for expansion/development**

The study confirmed that the underutilized fruits and fruit products produced in Rajasthan were sold primarily on domestic markets, and that the international market was not developed. Although the export market may offer potential for processed products, processors were reluctant to expand in this direction until the domestic market potential has been fully explored (AZAM-ALI, 2003). The majority of the small-scale start-ups interviewed in our survey adopted a risk-averse strategy, catering to niche markets. Since the customer base in the niche markets is relatively small, this strategy allowed the start-ups to develop their processing capacity and to gradually enter the market (AREND, WISNER 2003).

Although wholesalers were reluctant to promote new brands and products from underutilized crops, retailers showed more interest and could be encouraged to play a significant role in developing new markets, provided they receive incentives such as longer credit periods and lower initial prices. The survey analyzed the behavior of urban and peri-urban consumers. These consumers reported that they purchased processed fruit products mainly in retail shops, including supermarkets



(Table 2). Most consumers pointed to convenience (proximity) and a good selection of produce amongst their preferences. Nonetheless, they also showed a strong preference for familiar brand names (Table 3). Hotels and restaurants, not surveyed here, generate regular demand for fresh fruit throughout the year. These groups might function in a way that is comparable to the niche markets catered to by some of the start-ups (school and hospital canteens), i.e., the development of good personal relationships, based on reliability, quality and regular supply, might open new venues for underutilized fruit products amongst these enterprises (AGENT, 1994).

## **4.2 Constraints**

**Production:** The majorities of fruit species in Rajasthan are not cultivated on a large-scale or commercial basis, but are rather grown in the wild or at home gardens or field boundaries. Normally, the fruits are collected from the wild and sold fresh on a seasonal basis, with limited processing (AZAM-ALI, 2003). To plan the optimal utilization of their factories, processors must obtain the necessary amount of fruit and other inputs at reasonable costs (SHEPHERD, 2003). The weakly developed supply chain for fresh fruits may be one of the major issues inhibiting the development of profitable, year-round businesses. Lack of consistent market demand for the raw materials, scattered cultivation of underutilized fruit species in home gardens and unavailability of raw materials in large quantities are some of the barriers hampering the development of underutilized fruit species. High raw material and labor costs have reduced the profitability of enterprises.

**Storage:** Fresh fruits are highly perishable and their quality declines rapidly after harvest, especially if proper post harvest handling procedures are not followed. Desirable quality maintenance can be achieved by harvesting fruits at optimal maturity and storing fruits at the proper temperature, humidity and atmosphere. Good sanitation is also important in reducing losses caused by diseases (WANG, 1999). Nonetheless, small-scale processors lack the necessary facilities and knowledge. Whereas large processors often demonstrated that they had storage capacity and could purchase raw materials at low cost during the peak fruiting season, small-scale start-ups reported that one of their major constraints was unavailability of good-quality raw materials on a year-round basis.

**Seasonality:** Machinery for enterprises lies idle during the off-season because of the unavailability of raw materials, resulting in low profitability. In order to overcome issues of seasonality, micro-enterprises are encouraged to use their machinery and equipment to process several fruit species during the year. Likewise, fruit drink processors could be advised to diversify their production, or to include mixed-fruit products in their product range. Whilst the seasonality of fruit production poses one set of constraints – or opportunities – the seasonality of demand provides another. Higher consumption and sales of cordial and squash concentrates, used to make fruit drinks to offer to friends and visitors at festive occasions are reported. Sales of RTS for direct consumption are higher during the hot season (Fig. 3). To meet

these peaks in demand, processors either need to be able to produce on-demand or processors and store keepers to maintain sufficient stock. Few processors, however, had access to adequate cold storage for raw materials or semi-finished produce; also, few retailers were equipped with the necessary cooling facilities.

**Packaging:** Products that are packaged inappropriately or that has uninformative labeling, regardless of the quality have a lower selling potential. Dehydrated Ber and Aonla is packaged in polypropylene bags; jam, chutney, cordial and ready-to-serve fruit drinks are commonly packaged in glass bottles, while higher-volume fruit juices are packed in plastic cans as well. The market indicated a preference for standard, transparent plastic bottles. The use of attractive, internationally competitive packaging for local products would represent a successful marketing strategy. The size of the product is also important. Most consumers prefer single-serving products, or sizes that can serve 4-6 persons at the household level. In many countries, single-serving products are popular as they can be consumed at the sales point (NIRANJAN, GUNASENA, 2005).

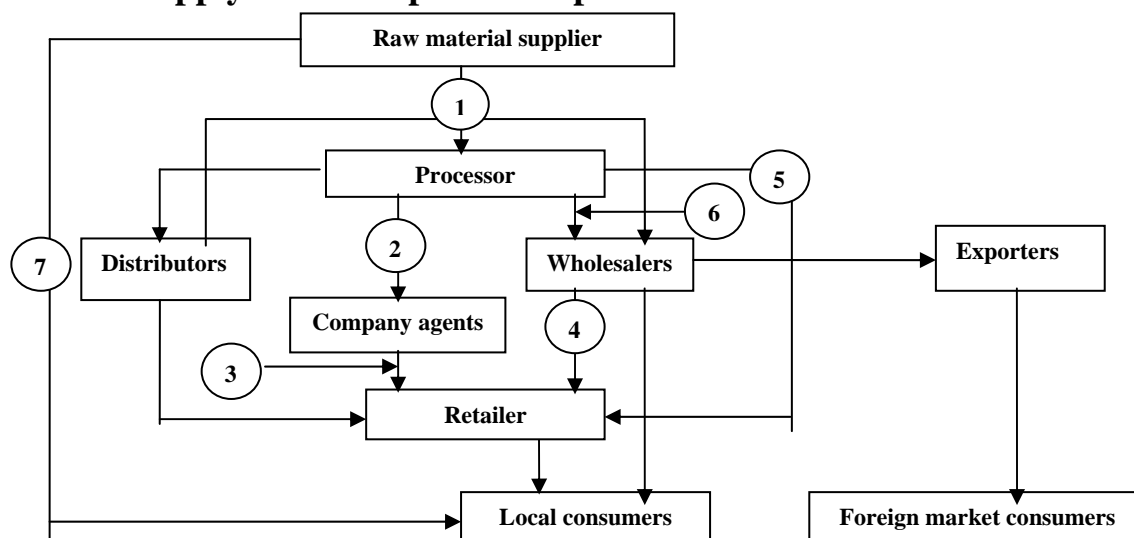
**Primary inputs:** Almost half of the processors surveyed by us had access to sufficient water for their enterprises and most of the fruit processors had access to electricity, although some suffered from frequent electricity shortages.

**Maintaining the standards of the products:** For small-scale processors of food products, one of the big obstacles to successful marketing is the need to adhere to quality and hygiene standards (WALKER, 2005). Maintenance of quality is compulsory for food items. All of the popular brands surveyed during this study have the necessary certification by Indian Standards Institute (i.e. ISI certification). Obtaining ISI certification is, however, a complicated, costly and time consuming activity for most of the small-scale and start-up processors.

**Other constraints to the development of small industries:** Unavailability of appropriate technology, inadequate development of entrepreneurship and lack of marketing skills amongst business operators, and social pressure amongst people with the necessary skills and training which induces them to move out of agriculture into office jobs, also pose constraints to the development of small industries (TAMBUNAN, 2005).

### **4.3 Supply chain of processed fruit species**

The information gathered through the survey can be used to extrapolate a supply chain for processed underutilized fruit products. The chain consists of eight main categories of actors, namely: raw material suppliers, processors, company agents, distributors, wholesalers, exporters, retailers and consumers (Fig. 4). Processors, company agents, distributors and wholesalers act as suppliers for retailers, whilst company agents and processors are the main suppliers for wholesalers. Similar facts were obtained by WOODS (2004), while dealing with the supply-chain management concept and its implications for agri-products in developing countries. A detailed account of the main interfaces of the supply chain is presented below.

**Figure 4: Supply chain for processed products from underutilized fruits**

Raw material supplier – Processor interface (1): The raw materials marketing system involves a large number of intermediaries. Collectors travel throughout the villages and gather materials from growers, and use these to supply retailers or wholesalers. The processors surveyed indicated that they purchased from all of these actors.

Company/processor – Company agent interface (2): Company agents are mainly used by large-scale processors (companies). Small-scale processors usually supply wholesalers/retailers directly. The company had an exclusive relationship with its agents, and transactions were conducted mainly on a credit basis. The credit period was usually from 21 to 35 days, rate varied from agent to agent. The most notable feature in this interface was that the company agent was required to provide a bank guarantee to the company in order to secure the credit-bound relationship.

Company agent – Retailer/wholesaler interface (3): Most of the retailers only kept a small stock of processed fruit products in their shops and relied on the company agent to deliver products frequently. Generally, the delivery frequency was once a fortnight. Almost all of the retailers reported satisfaction with supply level and delivery frequency. The company agents implemented diverse promotional activities in order to motivate retailers/wholesalers to push their products along the supply chain (WOODS, 2004).

Wholesaler – Retailer interface (4): The majority of wholesalers also engaged in retailing. Retailers received lower discounts from wholesalers than they did from companies or agents. Hence, retailers tended to bypass the wholesalers, opting to purchase products directly from company agents.

Processor – Retailer interface (5): The processors generally delivered products to the retailers once a fortnight. The retailers were given higher discounts by companies/processors than they received from agents. Retailers complained, however,

about the inconvenience of trading with processors, as compared to company agents, because of the remoteness of their locations.

Processor- Wholesaler interface (6): The processors also marketed their products directly to wholesalers. In some cases, specialized wholesalers purchased products from micro-enterprises and sold them to exporters.

Processor – Local consumer interface (7): Many of the small-scale start-ups sold their products directly to consumers through the canteens of schools, hospitals, weekly fairs, in social gatherings, other government offices and door to door selling, avoiding competition from popular brands. In doing so, these processors were able to maintain good relationships with their customers.

## 5 CONCLUSIONS

Developing the market potential for underutilized fruits will depend on better marketing and more reliable supply of the end product. Despite many limitations, the findings indicate that there is significant potential for the production and marketing of underutilized fruits in Rajasthan. To establish and strengthen small-scale underutilized fruit processing enterprises in the state there is an urgent need to identify the market and diversify the product range. Secondly, priority should be given to develop strong relationships within the market chain.

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## **FUTURE IMPACT OF NEW TECHNOLOGIES UPON FOOD QUALITY AND HEALTH IN CENTRAL EASTERN EUROPEAN COUNTRIES**

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### **ABSTRACT**

We investigate the likely future impacts of technology on food quality and health in six Central European countries using a key technology survey. We identify four common key technologies having a potentially large future impact on food quality and health. But we find considerable differences across countries and key technologies regarding their impact on food quality health. Our Key Technologies Survey overcomes the usual shortcomings of this method. First, the different types of impacts of the investigated technologies have been clearly separated. Second, our respondents have been asked to assess the impacts of certain applications (not broad technologies). Given these specific methodological features our results can potentially offer more useful assistance to decision-makers, both in the public and private sectors.

**Keywords:** CEE, food quality, health, key technology, foresight.

### **1 INTRODUCTION**

Quality and safety of raw and processed food production is becoming increasingly important both in terms of human health and competition. High expectations, especially compliance with food quality and safety standards in exports, appear as restrictions causing difficulty in entering markets in the European Union (EU) countries. Recent research focuses on various aspects of food quality including consumers' perception (GRUNERT, 2005), incentive systems to enforce food quality (HENESSY et al., 2003; KING et al., 2007) and trade policy (RAU and VAN TONGEREN, 2007). Food quality and health are crucial aspects of human life and therefore are prime policy objectives of the EU. Food quality has to be secured through regulations with regard to inputs, production processes, outputs, transportation, storage, labelling, documentation of origin and the like, for creating an adequate

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infrastructure for food markets and their smooth development. The food industries in the Central and Eastern European (CEE) countries are undergoing sweeping ownership, technological, organisational and financial changes. The evolving new decision-making processes should put a strong emphasis on meeting safety and quality standards.

A foresight process is highly instrumental to tackle these complex issues. By bringing together the relevant stakeholders with their wide range of expertise and accumulated skills, it is possible to identify emerging technological and market opportunities and threats, consider Science and Technology, (S&T) and socio-economic factors in their entirety, and thus devise appropriate policies and strategies, based on consensus among these stakeholders. Our paper is aimed at identifying future key technologies that are expected to have major impacts on food quality and health requirements in food production.

The paper contributes to this strand of literature in three ways. First, we investigate the likely future impacts of technology on food quality and health. Second, we employ foresight methodology widely applied for industrial technologies in recent years, but so far largely unexplored for the analysis of agricultural and food technology.<sup>4</sup> Third, contrary to common practice in most foresight projects, we apply a cross-country comparison instead of focusing on a single country.

The rest of the paper is organized as follows. Section 2 describes briefly foresight methodology and its relevance for policy-making. Section 3 describes the survey design and the variables. The results are presented in section 4. The last section summarizes the outcomes of our analysis and offers some conclusions on the impacts of future technologies on food safety and health in CEE countries.

## **2 RELEVANCE OF FORESIGHT**

The increasing number of foresight programmes – as systematic, participatory processes, collecting future intelligence and building medium-to-long-term visions, aimed at influencing present-day decisions and mobilising joint actions (EC DG RESEARCH, 2002) – suggests that foresight can be a useful policy tool in rather different national innovation systems. Emerging economies in the CEE region – faced with a number of similar or same challenges when trying to find their new role in the changing international settings, while still characterised by their own distinct level of socio-economic development, set of institutions, culture and norms – can also benefit significantly from conducting foresight programmes.

Foresight programmes do not have a single, all-encompassing theory to support them, and thus they rely on a range of – somewhat overlapping – theories and

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<sup>4</sup> The few exceptions include DIRECTION GÉNÉRALE DES ENTREPRISES (2006), HOLT et al. (2007), LAFOURCADE and CHAPUY (2000), as well as some national technology foresight programmes tackling this field, too (e.g. in Hungary, and the UK).

methods, including (i) evolutionary economics of innovation; (ii) sociology of science and technology; (iii) actor – network theories; (iv) political sciences analyses of policy processes; (v) communication, co-operation, and participation theories; (vi) decision-preparatory and future-oriented methods, techniques. This list is far from being exhaustive, and most likely disciples of these theories would change the grouping, the order of their own discipline or even the wording used here. That might be an interesting discussion in its own right, indeed, for theoretical purposes. Yet, the intention here is just to indicate the "eclectic" – and thus complex – nature of foresight programmes, rather than attempting to provide a meticulous, comprehensive treatise of these issues.

A number of technological, economic, societal, political and environmental trends affect all countries and most areas of policy-making, thus a new culture of future-oriented thinking is needed. Foresight can assist policy processes in various ways. It stresses the possibility of different futures (or future states), as opposed to the assumption that there is an already given, pre-determined future, and hence highlights the opportunity of shaping our futures. Further, it can enhance flexibility in policy making and implementation, broaden perspectives, and encourage thinking outside the box ("think of the unthinkable"). It can also contribute to (i) reduce technological, economic or social uncertainties by identifying various futures and policy options, (ii) make better informed decisions by bringing together different communities with their complementary knowledge and experience, (iii) obtain public support by improving transparency, and thus (iv) improve overall efficiency of public spending. (GEORGHIOU et al. (eds.), 2008)

Foresight is a relevant decision-preparatory tool in emerging economies, too, though not being in the forefront of technological development. CEE countries face a number of specific challenges, most importantly due to their transition processes (fundamental political, economic and social changes), as well as to major changes in their external environment. Given these specific factors, there are even stronger needs for strategic thinking in CEE than in the advanced countries (HAVAS, 2003, HAVAS and KEENAN, 2008).

### **3 SURVEY DESIGN**

Our survey covers 6 CEE countries: Croatia, the Czech Republic, Hungary, Romania, Slovakia, and Slovenia. We have devised a Key Technology Survey (KTS) to analyse the possible future technologies that might have a strong impact on food quality and health. In each country, a panel of experts has been selected, with R&D, governmental, and industrial background, respectively. Around 900 experts have been invited to fill in the on-line KTS, and 434 of them have replied. Answers were collected during a 3 month period in the second half of year 2007.



Table 1 shows the basic characteristics of respondents. In the region 43 percent of them have a PhD degree and work mainly at universities or other R&D organisations (53 percent), and less in business (30 percent) or government (11 percent).

**Table 1: Basic characteristics of the survey respondents**

	Total number	Distribution of respondents (percent)				
		Qualification	Affiliation			
		PhD	Business	Government	University or other publicly financed R&D organisation	NGO
<b>Bulgaria</b>	115	39.6	28.6	5.5	61.5	4.4
<b>Croatia</b>	68	42.4	18.6	22.0	52.5	6.8
<b>Czech Republic</b>	75	58.5	22.0	17.1	51.2	9.8
<b>Hungary</b>	53	33.3	39.4	9.1	48.5	3.0
<b>Romania</b>	63	81.6	5.3	5.3	81.6	7.9
<b>Slovakia</b>	60	8.3	77.8	5.6	8.3	8.3
<b>Region</b>	434	43.6	29.9	10.7	53.0	6.4

Source: Own calculations.

The online questionnaire has been organised as follows: after a brief introductory section focusing on the characteristics of the respondents, the experts have been asked to select those groups of technologies they are familiar with. We have defined 6 large groups of technologies: test and measurement, food packaging, biotechnology, nanotechnology, ICT and functional food. Within these groups, a total of 28 individual potential key technologies have been included. Questions focused on the global development of the technology, the level of development and practical applications in their own country, and expected impacts on employment, economic growth, food safety and quality, as well as health. In this paper we focus exclusively on four key technologies and their impacts on food quality and health.

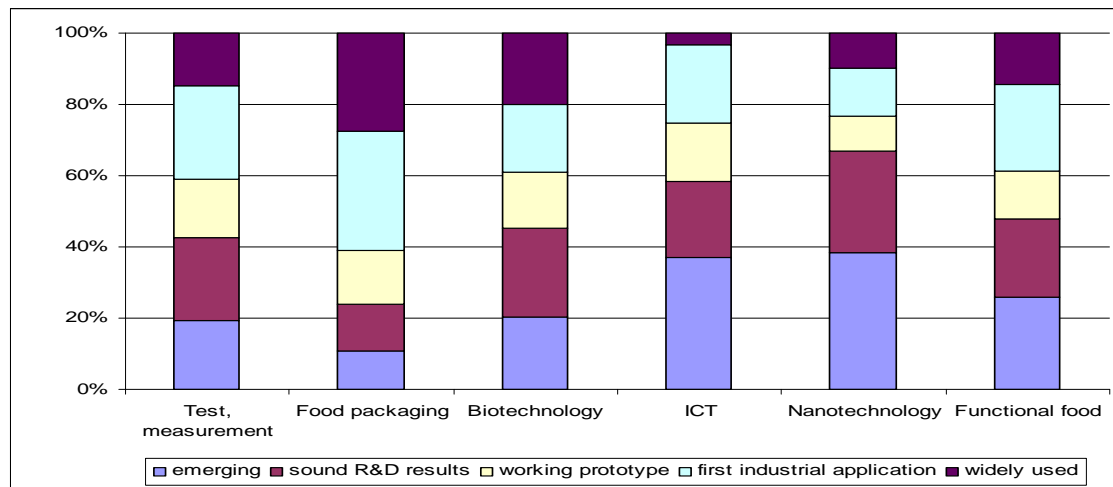
## 4 RESULTS

### 4.1 General findings

The data from the national KTS databases resulted from the on-line survey is used for the empirical analysis in this section. The results are presented on average by technology areas; that is, grouping the technologies and showing the results by the following categories: Test, measurement and diagnostic technologies; Biotechnology; Food packaging technologies; Nanotechnology; Information Communication Technology, (ICT); Other technologies; and Functional Food.

Figures 1 and 2 present the level of global development and the position of the region in the development of these 6 technology groups, respectively.

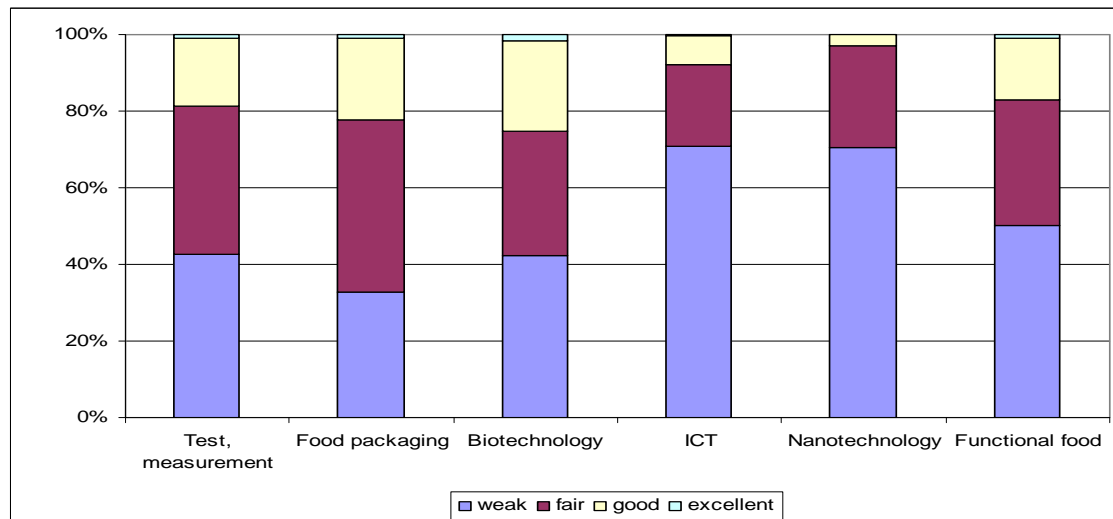
**Figure 1: Current level of global development**



Source: Own calculations.

These technology groups can be found at various levels of development. CEE experts believe that the most widely used ones are food packaging technologies, whilst the less developed, i.e. those at an earlier stage of development are the ICT and perhaps nanotechnologies. Test and measurement, biotechnology and functional food are in the middle level of development.

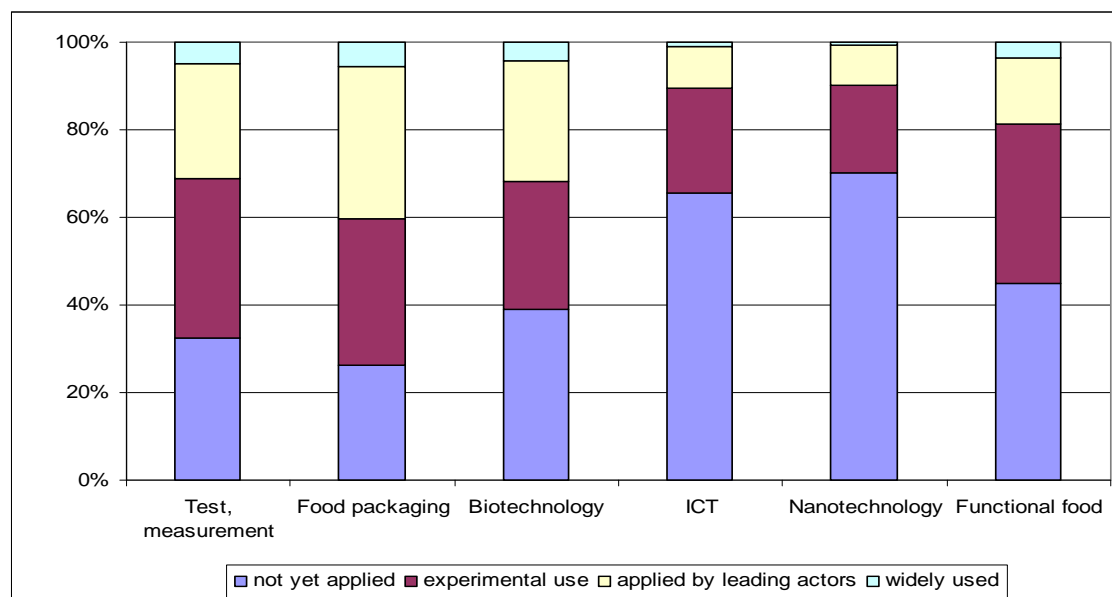
**Figure 2: Current position in the development of the technology at a regional level**



Source: Own calculations.

The current positions in the development of technology groups in the region show a rather different picture (Figure 2). The majority of these technologies are identified at a weak level of development (above 40 percent) except food packaging. As before, the least developed technology is ICT. The share of good or excellent level of development is above 20 percent only for food packaging and biotechnologies.

**Figure 3: Current position in the application of the technology at regional level**

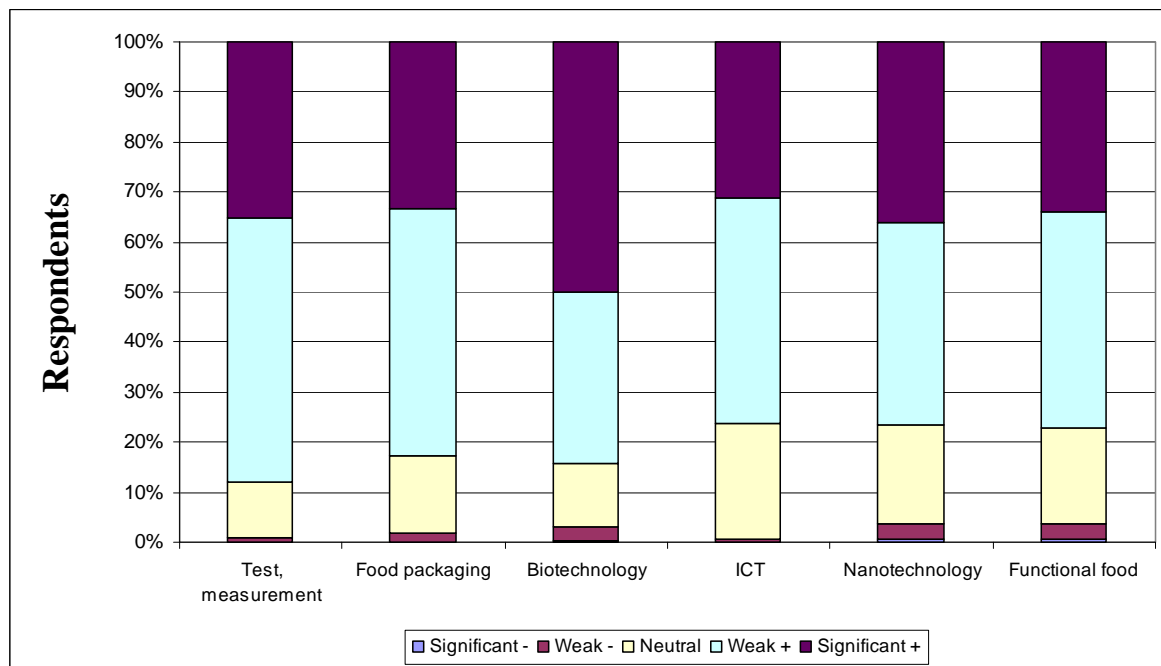


Source: Own calculations.

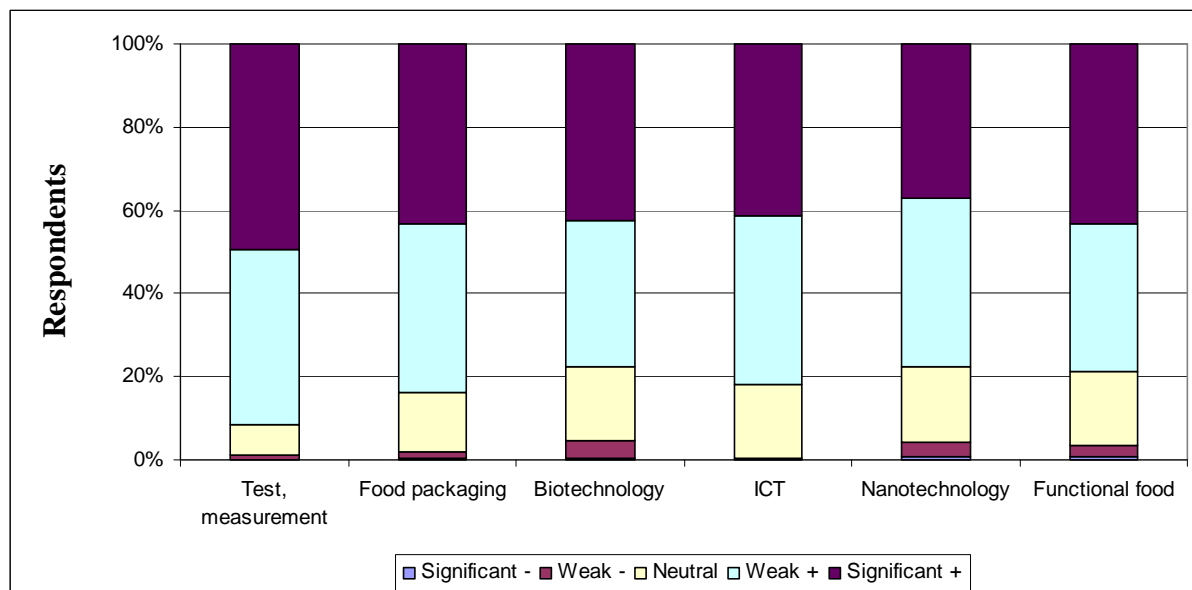
Current level of application of various technologies in the region exhibits a slightly favourable situation comparing to the level of development of these technologies (Figure 3). Combining the share of widely used technologies with the ones applied by leading actors, the ratio of these categories exceeds 30 percent except for nanotechnology, functional food and ICT. Interestingly, food packaging technologies have been assessed as being at the relatively highest level of development. The nanotechnology and ICT groups perform poorly both in terms of development and application.

## 4.2 Potential impacts

The results are presented for each topic separately, using average value of the different type of technology. The potential impacts of technologies on health show a rather similar pattern across technologies (Figure 4). Significant positive effects (the combined share of weak and significant impacts is above 50 per cent) are found for all technologies. Their share ranges between 50 and 90 percent. Interestingly, weak or strong negative effects do not play an important role within this category. The total weight of negative effects is below 5% for all technology groups. Moreover, a less important role of neutral effects for all technologies is observed.

**Figure 4: Potential impacts on health**

Source: Own calculations.

**Figure 5: Potential impacts on food quality**

Source: Own calculations.

The potential impacts of technologies on food quality show similar figures across technologies (Figure 5). Significant positive effects (the combined share of weak and significant impacts is above 50 percent) are found for all technologies. The share of significant positive effects exceeds 80% for all technology groups. Moreover, one can observe that the role of neutral effects is negligible for all technologies. Weak negative impacts amount for less than 5% for biotechnologies,

nanotechnology and functional food, being virtually unobservable for other technology categories.

### 4.3 Key technologies selection

To identify those technologies that are considered to be critical for the future development of the sector in terms of food safety, the following "three-input" graphs should be built:

- Current level of technological development vs. Position of your country in the development of the technology, taking into account the overall positive impact for each technology.
- Current level of technological development vs. Position of your country in the application of the technology, taking into account the overall positive impact for each technology.

We calculate (for each technology) the relative position of a given country, according to the following formula:

$$(*) \text{ Current position of your country} = (1 * N_W + 2 * N_F + 3 * N_G + 4 * N_E) / N_T$$

Where:

$N_W$ , the number of experts who have evaluated the position of their country as Weak,

$N_F$ , the number of experts who have evaluated the position of their country as Fair,

$N_G$ , the number of experts who have evaluated the position of their country as Good,

$N_E$ , the number of experts who have evaluated the position of their country as Excellent and

$N_T$  represents the total number of experts who have assessed the technology.

(\*) in relation to both, the development and the application of the technology

$$\text{Current level of technological development} = (1 * N_N + 2 * N_{R\&D} + 3 * N_P + 4 * N_{IA} + 5 * N_{WU}) / N_T$$

Where:

$N_N$ , the number of experts who believe the technology is at a nascent stage,

$N_{R\&D}$ , the number of experts who believe that there are sound R&D results in relation to the technology under study,

$N_P$ , the number of experts who believe a working prototype of the technology is available,

$N_{IA}$ , the number of experts who believe the first industrial applications of the technology are available,

$N_W$ , the number of experts who believe the technology is in widespread use and,  
 $N_T$  - the total number of experts who have assessed the technology.

In addition, for each technology included in the KTS, an average value of the positive impacts, which have been assessed, should be calculated, according to the following formula:

Individual impact for each topic (x):

$$I_X = [5*(N_{W+})_X + 10*(N_{S+})_X] / (N_T)_X$$

$N_{W+}$  = number of experts who believe the technology in question has a weak positive impact

$N_{S+}$  = number of experts who believe the technology in question has a significant positive impact

$N_T$  = the total number of experts who have assessed the technology,

$x$  relates to each of the topics the experts have been asked to evaluate. In order to obtain a more general result, not only the impact on food quality and health, but the impact scores for various socio-economic factors have also been considered. These are economic growth, employment, food safety by various types of hazards (physical, chemical, biological).

Then, the overall impact ( $I_T$ ) for each technology can be calculated as follows:

$$I_T = (I_1 + I_2 + I_3 + \dots + I_N) / N$$

Where:

$I_1, \dots, I_N$  are the individual impacts which have been previously calculated.

$N$  is the number of topics which have been assessed ( $N=5$ )

We applied these two selection criteria to identify the common key technologies for the region. First, technologies with higher than 5 overall positive impact were selected. Second, these technologies should be relevant key technologies for minimum three participating countries. In order to determine the importance of the technologies and their future prospects, i.e. if they are strategic or consolidated technologies, three input cipher graphs have been used. For each key technology selected, we present the position of all participating countries and the region in the development and application of the technology. According to these criteria, we have selected four common key technologies for the Central and East European region. These are: KT 2 (new in line non-destructive methods and control systems, integrated and pervasive sensor networks throughout factories for assessing the quality and safety, and recording their fluctuations during processing), KT 6 (active packaging capable of changing either package permeation properties or the concentration of various volatiles and gases in the package headspace during storage, or adding small amounts of microbial, anti-oxidative or other quality improving agents via packaging material), KT 8 (development and application

of new packaging systems allowing to fully utilise benefits of new food packaging technologies and better food packaging materials used in modern food processing) and KT 23 (nano and microsensors for detection of toxins, pathogens, pesticides, contaminants and antibiotic residues in food products throughout their production cycle and on the shelves). KT 2 belongs to the test and measurement technologies category. KT 6 and 8 to food packaging technologies, whilst KT – 23 to nano-technology. These results are pretty much in line with the results obtained in the previous section, where it was determined that the region has a relatively good position in the development and application of food packaging technologies. Table 2 presents the impact scores of selected key technologies on food safety and health.

**Table 2: Technologies' impact on food quality and health**

	Croatia	Czech Rep	Hungary	Slovakia	Romania	Bulgaria
<i>New in line non-destructive methods and control systems, integrated and pervasive sensor networks throughout factories for assessing the quality and safety and recording their fluctuations during processing (KT 2)</i>						
<b>Food Q</b>	8.9	7.9	5.6	7.5	6.7	6.9
<b>Health</b>	7.8	6.3	4.4	5.8	5.6	6.3
<i>Active packaging capable of changing either package permeation properties or the concentration of various volatiles and gases in the package headspace during storage, or adding small amounts of microbial, anti-oxidative or other quality improving agents via packaging material (KT 6)</i>						
<b>Food Q</b>	8.8	6.8	7.9	7	6.7	6.3
<b>Health</b>	7.3	6.1	3.6	5.5	5.8	6
<i>Development and application of new packaging systems allowing to fully utilise benefits of new food packaging technologies and better food packaging materials used in modern food processing (KT 8)</i>						
<b>Food Q</b>	8.6	7.7	7.5	7	5	6.7
<b>Health</b>	7.8	5.4	5	6	7.5	5.6
<i>Nano and microsensors for detection of toxins, pathogens, pesticides, contaminants and anti- biotic residues in food products throughout their production cycle and on the shelves (KT 23)</i>						
<b>Food Q</b>	7.4	6.00	5	7	7.5	6.2
<b>Health</b>	8	7.00	6.7	7	6.7	6.6

Source: Own calculations.

The results suggest significant differences across countries and key technologies. Croatian experts find the highest impacts on food quality and health regardless of technologies. In Hungary key technologies have the lowest effects on health, except KT 23 to nanotechnology. The impacts of key technologies on food quality are higher than on health except KT 23 (nanotechnology). KT 6 food packaging technology has the lowest effects on health for each country. KT 2 test and

measurement technology has the highest impact on food quality in all countries except Hungary.

In principle, we can identify two main groups of technology: consolidated technologies, referring to technologies at an advanced stage of development and a good position of the country in the development and/or application of the technology; and strategic technologies, referring to those technologies, in which the country seems to have a good/excellent position in the development of the technology which is at an early stage of development. Three input cipher graphs (not presented here but available upon request) have been used to determine the position of identified key technologies. Of the four key technologies identified, only KT 6 is a consolidated technology in all countries. KT 8 is a consolidated technology in four countries. KT 2 is a consolidated technology in three countries, whilst KT 23 is not a consolidated technology in any country of the CEE region. As pointed out before, it seems that the CEE countries focus more on the adoption of new, but readily available technologies rather than developing them. Thus, there is no identified key technology to be strategic in all countries. KT 2 is the technology that is considered strategic by most countries (3), followed by KT 6, and 23, respectively with one country selecting one of these two technologies as strategic. KT 8 has not been positioned as strategic technology by any of the participating countries. As it is shown in the previous section, when the position of groups of technologies is analyzed, it seems that the region has a relatively good position in developing, and mostly applying food packaging technologies. In the individual country reports, food packaging was also chosen by all participating countries as a developed and applied group of technology.

## **5 CONCLUSIONS**

The paper investigates the likely future impacts of technology on food quality and health in six Central European countries, using a key technology survey. Estimations identify four common key technologies having a potentially large future impact on food quality and health. However, we find significant differences across countries and key technologies regarding to their impact on food quality health.

There are two major, widely known shortcomings of the so-called key or critical technologies method. First, it is rarely defined that the identified technologies are "key" to achieve a particular objective. Second, as participants of key technologies projects are pressed to reduce the number of "key" technologies, they tend to aggregate technologies, instead of being actually selective. This is not surprising at all for two reasons: (a) it is a part of human nature to avoid tough decisions, whenever it is possible; (b) given the lack of clear-cut selection criteria – a technology can/ should be regarded as "key" to realise a well-defined objective – one simply cannot prioritise technologies.



Thus, the results of these types of exercises are not specific enough to assist decision-making. For example, to claim that ICT, biotechnology or nanotechnology are "key" technologies would say hardly anything to policy-makers, as these are really very broad categories. What would be needed is to identify which fields – or what kind of applications – of these broad technologies, are "critical" to achieve a certain objective, or a set of goals.

Our Key Technologies Survey has been designed to overcome both of the above-mentioned shortcomings. First, the different types of impacts of the investigated technologies have been clearly separated, namely we have asked our experts to specify the expected impacts on employment, economic growth, food safety (distinguishing three types of hazards), health and food quality. Second, our respondents have been asked to assess the impacts of certain applications (not broad technologies).

Given the specific methodological features of FutureFood6 projects, our results can potentially offer more detailed, more pragmatic, and hence more useful assistance to decision-makers, both in the public and private sectors. No doubt, currently these are preliminary results. First these outcomes have to be validated by the national expert panels via workshops. Then they have to be complemented by the results of the forthcoming WPs of the FutureFood6 project, namely "Future visions", "Road mapping", "Integration of results/ Policy recommendations".

## ACKNOWLEDGEMENTS

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## **ARE FOOD INDUSTRY COMPANIES INTERESTED IN CO-FINANCING COLLECTIVE AGRICULTURAL MARKETING?**

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### **ABSTRACT**

The paper focuses on the evaluation of the Hungarian collective agricultural marketing (CAM), the food industrial companies' relation to collective actions and their willingness taking part in improving the system. It has also been examined whether food industry businesses would undertake a larger amount of financing and a deeper involvement arranging CAM actions.

Representatives of food industrial companies, new-type co-operatives, associations and other agents were asked about their trust to business partners, collective actions and development of collective agricultural marketing. Arguments were supposed to be found concerning their willingness of cooperation, propensity of investing their own money and involvement in activities of collective actions.

**Keywords:** Collective agricultural marketing, trust, co-operation, co-financing.

## **1 INTRODUCTION**

### **1.1 Changes due to radical reforms**

Since political reforms dual farm structure has been developed in CEE countries. Besides large farms a number of small farms, at different level in different countries produce significant part of agricultural output. Trade relationships between agents in food chains have been destroyed in many countries in the region before a new well functioning system fit to market regime would have been established. This has resulted in higher transaction costs pushing many farms into difficult financial situation. To increase efficiency of primary producers in vertical chains demands further steps on deepening cooperation between market actors. In the Hungarian food industry, the multinational chains' market power is much stronger than that of the largest food processing companies. This unbalanced situation is noticeable in the poultry sector. The chicken fattening farmers carry 68-70% from the whole vertical-chains' costs, 20-27% belong to processing companies and only 10% is

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carried by retailers. Meanwhile from the profit the broiler fattening sector has only 3%, against the 50% of the retail sector. (ANIKÓ JUHÁSZ, GYÖNGYI KÜRTHY, 2008) It is evident for the agents of the food industry to find a market chain with lower transaction cost but demanding higher organization and cooperation for them (IMRE FERTŐ, GÁBOR G. SZABÓ, 2004). The role of trust and cooperation manifested most in the field of agricultural cooperatives. After the Hungarian political and economical changes the cooperatives' situation became very uncertain. Many cooperatives have gone bankrupt or broken up because of not being competitive under the new market conditions. At the beginning changes for the needed intention and trust towards cooperation were existed. From the 1440 Hungarian cooperatives only 127 couldn't meet the new requirements of the law which was passed for transformation of the cooperatives. Only 10% of the members decided to leave their cooperatives. The vast majority of members did not think of leaving the cooperative and farming on their own. People trusted in cooperative leaders and trust in the cooperative as an organization was, in general, high. (CSABA FORGÁCS, 2006) In some years the companies choosing the separate way of operation became more and more adverse situation with lower efficiency, many of them closed. The earnings of people living these rural areas couldn't be compensated by other income sources so they have become poor. That's why maintaining and supporting profitable cooperatives is really important. But evolving trust and incentive cooperations by state means is a great challenge. In Hungary the small farms cleared just very slow the needed cooperation and, they have deeply rooted negative practices of the formal political system so creating the new collective way of thinking is a really long term task. (CSABA CSÁKI, CSABA FORGÁCS, 2008) Fragmented farm structure needs a stronger cooperation not only between producers of primary production but between the agents in the food chains with special respect to food industries where collective agricultural marketing (CAM) has great importance and food industry is one of the driving factors in decreasing transaction costs. Beyond that, the CAM activity, as an indirect way of support helps to enhance the market expansion of food products by government-controlled means.

## **1.2 Collective agricultural marketing (CAM) in Hungary**

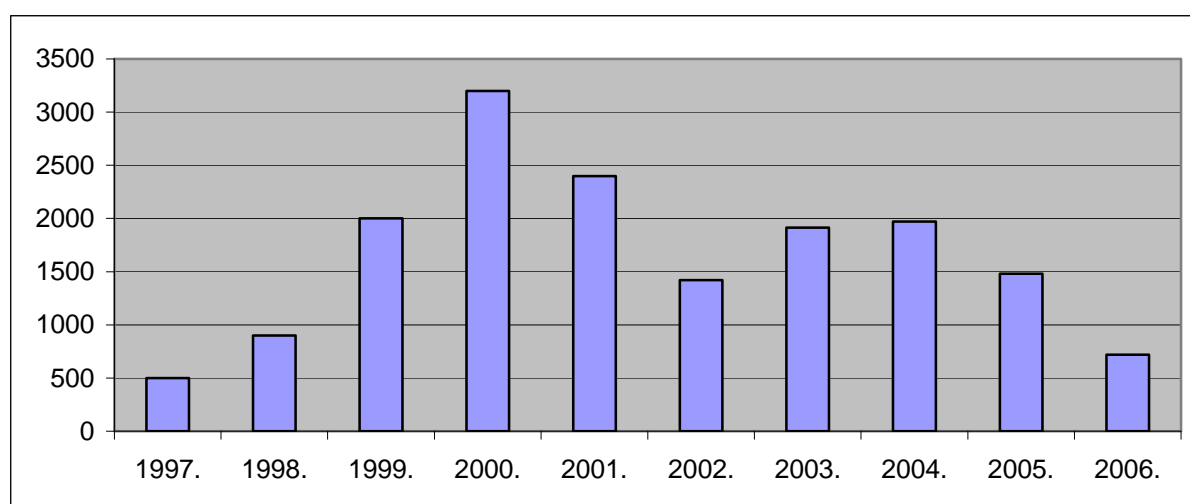
Roots of collective agricultural marketing in Hungary go back to 1984, the common program (named "Gutes aus Ungarn") of Agricultural and Food Ministry and Foreign Trade Ministry. Since terminating the program (1994), there have been parallel collective marketing programs under the competencies of different ministries till 1996 when, with German support, the Hungarian Collective Agricultural Marketing Centre (AMC) was established. During the last 10 years, there has not been any change in financing the activities of collective agricultural actions. Collective actions have been financed only from state budget. There are collective events when some financial contribution is needed, from the agents as well, but there's no regulation for their regular obligatory contribution.

The mission of AMC consists in the contribution to the enhancement the competitiveness of the Hungarian agriculture, with intensifying marketing orientation, giving of high standard, up-to-date and efficient marketing services. AMC Kht. is a public service company established with the aim of expanding the market of Hungarian agricultural and food industry products.

Today the collective agricultural marketing activity embodied in yearly programs. Product councils, institutions of representing the interests of producers give recommendations to the program, which are to be accepted by the agricultural minister. The owner of AMC is the Ministry of Agriculture and Rural Development. The company carries out various activities: product promotion programs (product presentations, trade events, information materials, market researches etc.), sales promotion activities (presentations in supermarket chains, restaurants, business meetings etc.), commercial, PR activity, exhibitions and brand management. (AMC Kht., CD ROM, 2004)

The AMC budget (Figure 1) is declining during the last six year, the budget of 2006 was only the tierce of that in 2001.

**Figure 1: AMC budget between 1997 and 2006 (million HUF)**



As far as different marketing means are concerned, largest part of them represent the domestic and foreign exhibitions, sales-promotion actions and B2B meetings and then PR actions and programs of the trademark "Quality Food from Hungary".

## **2 METHODOLOGY**

Data has been collected from questionnaires of three areas: food industrial companies (businesses), new-type cooperatives, and institutions of representing producers' interests. The aim was to survey the opinions of companies affected directly or indirectly by collective agricultural marketing. The food industry companies can take the advantage of collective agricultural marketing subsidy directly, they attend

exhibitions, sales-promotion actions etc. They can judge the best the efficiency of the collective marketing actions. They know the ways of using the collective marketing in a profitable way and also which are the areas to be developed. Knowing the new-type cooperatives' opinion is of great importance because in their work the cooperation is a real situation, where the aim is to develop marketing conditions and this way the competitiveness of the co-operative members. The members of co-operatives act together; represent their interests commonly, during their operation they have thought together and recognised the opportunities of joint actions. The third group – producers' associations, product councils etc. – can mediate the producer's conception of how to develop the collective agricultural marketing. Having their information one can see how much the producers are content to contribute to collective actions.

427 questionnaires were sent out to three different groups. 300 questionnaires were mailed to food industrial companies, 40 questionnaires to new-type co-operatives, and 87 to the producers' associations, product councils. The analysis is based on 108 fulfilled questionnaires. 53% of the 108 questionnaires were fulfilled by the first group (food industrial companies), 19% by the second (TÉSZ) and 11% by the third group (producers' associations, product councils). 17% of the questionnaires couldn't be identified. For the research of the food industrial companies we could use 57 questionnaires. According to their turnover of 2003 we distinguished 5 categories (Table 1)

**Table 1: Food industrial companies' categories**

Category	Turnover of 2003 (Thousand HUF)
Micro	Less than 100.000
Small	100.001-299.999
Medium	300.000-999.999
Large	1.000.000-2.999.999
Macro	Higher than 3.000.000

For processing data of the questionnaires we used SPSS program, making cross-tables, Pearson chi-square tests, and variance analysis. We worked mostly with structured closed questions and a few open-ended unstructured questions; we used interval scales and ordinal scales. We had 32 questions, 12 of them in connection with trust, interest representation, propensity of taking part in collective action, willingness of cooperation. Other questions referred to the Hungarian CAM activity: knowing, attendance, satisfaction, development intention. The questionnaires were sent out in 2005.

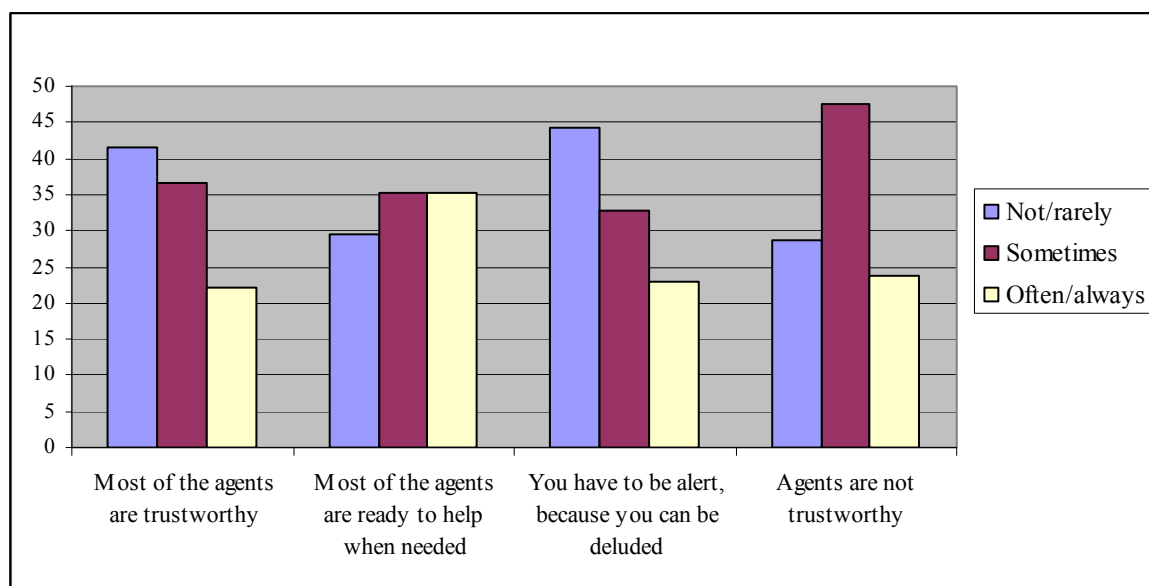
With the questions besides the willingness of co-operation we tried to estimate how the agents could use the CAM actions during their marketing and wanted to get evidence about the "strategic thinking" of institutions in using CAM. Results are represented in figures in this paper.

### 3 RESULTS

#### 3.1 Trust in collective actions and CAM actions

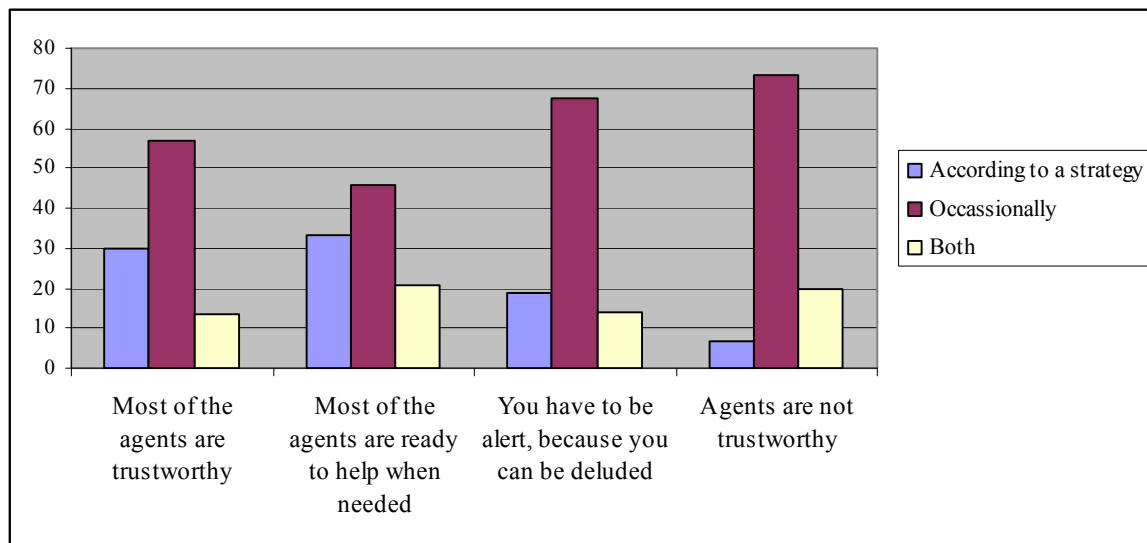
Trust is an important factor of representing food industrial agents in collective actions. We assumed that in case of higher levels of trust more company would take part in collective actions. According to our examination it can be said that it is not so obvious in either cases (collective actions, CAM actions).

**Figure 2: Relationship between trust and taking part in collective actions (%)**



We can assume that in the highest level of trust companies take part in collective actions most often. In the case of the lowest trust, it seems logical, that companies hold aloof from collective actions and they do not take part in these type of cooperation. As we see in Figure 2, it is not true. Figure 2 shows that in case of the highest level of trust the smallest is the level of taking part in collective action often and, the second largest of taking part is not/rarely. Unfavourable, the "Not/rarely" and the "sometimes" category are the highest in each level of trust.

Let's see what results we have in the case of CAM actions. Our presumption was that in case of high level of trust companies use CAM actions on a strategic way. In an economic situation where trust between the agents is higher, companies take part in collective marketing actions often, according to their own strategy. They use the CAM support consciously to reach the companies' aims.

**Figure 3: Relationship between trust and taking part in CAM actions (%)**

Looking at Figure 3, results are almost the same as in Figure 2, but the lack of strategic thinking can be observed much more stressfully. The companies use CAM actions only occasionally, independently from trust. Both Figure show, that there is no direct relationship between trust and collective actions or CAM actions in the Hungarian food industry. Companies take part in collective actions and CAM actions only occasionally not as part of their own strategy. Maybe in the companies' decision-making process other factors (time, money, human factors) play more dominant role than trust. Independently from trust companies operate only in their own interests. Collective thinking is not typical of them. It won't be a problem when they can solve economic difficulties independently. But in many cases in the agriculture and food industry the base solving the problems is collective actions. Building trust in the consumer after BSE disease, bird flue, different food contamination needs cooperation between all of the represents of the food-chain.

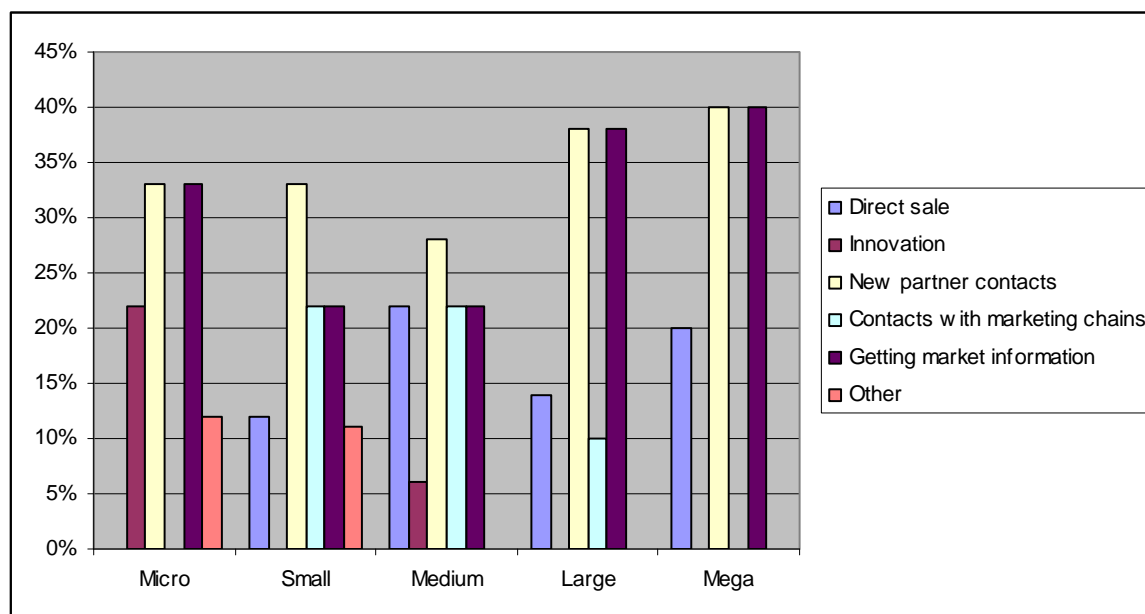
### 3.2 Satisfaction with CAM actions

In the survey several questions focused on measuring the satisfaction of agents with CAM programs. Among them one was dealt with financial contentment and, one focused on professional supports. We also asked companies about their total contentment as well. It has to be underlined that the answers to the questions are quite different. About half of the companies was ambivalent (partly satisfied and partly not), 21% were mostly satisfied and 27% mostly dissatisfied with CAM services. Thus one can say 70% of the responses were contented in some extent. Thanks to CAM programs 10 per cent of the participants acquired a direct marketing possibility, so they succeeded in establishing new business contacts, which brought them an increasing marketing outcome. 12 per cent of the companies which came into contact with a market chain got new opportunities of sales and, 34 per cent of them established contacts with new partners.



As Figure 4 shows companies with higher turnover use CAM actions collecting market information and establishing new contacts and, it is the same in case of micro companies.

**Figure 4: Usefulness of CAM actions for food industrial companies**



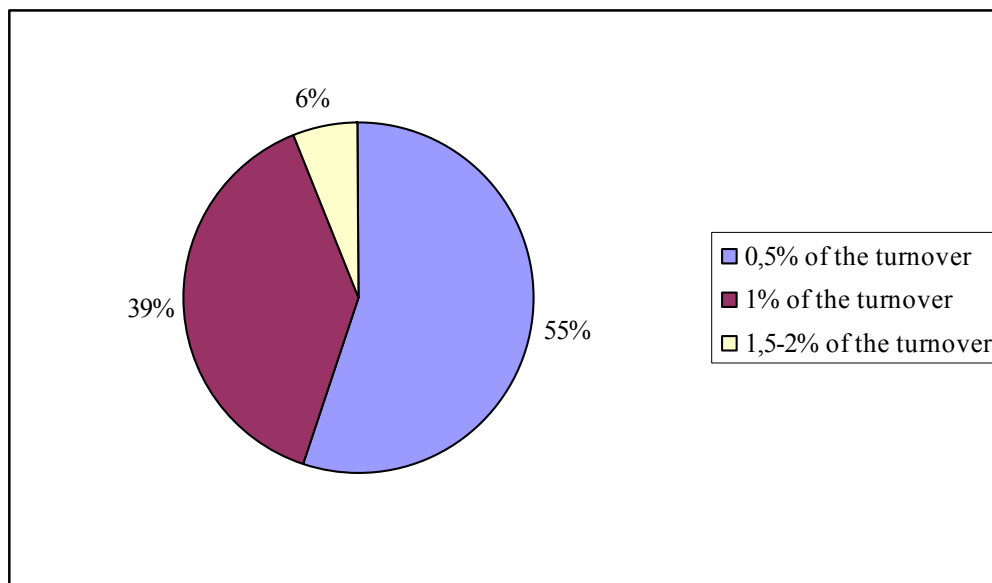
Companies not being satisfied with the CAM programs mostly complained about the lack of its professional usefulness. E.g. they couldn't find trading partners what they needed, or couldn't access to relevant market information. Independently from the size of the turnover, companies have problems with professional usefulness of CAM programs.

However, it is important to point out and to make it clear to the participants attending the programs itself doesn't bring a direct, immediate measurable positive effect. So the aim of the participation in an exhibition is introducing the company and the product to the costumers, or establishing business contacts in sales promotion actions. Improving the competitiveness of the company and developing product image need long-term efforts. Almost 40 per cent of dissatisfied participants indicated imperfections in organization field and in implementation. That means tasks for the CAM coordinator organization choosing an animator for a program or refining the requirements for them. At that point the professional organizations can give remarkable assistance; with their widespread experience they can organize the CAM actions according to the needs of the participants. That is why the agents of the food industries are interested in taking part of organising CAM actions and in co-financing these collective actions. As they get more freedom in decision making and organising CAM actions, with their own contribution, they will be interested taking part in effective actions directly.

### 3.3 Willingness of co-financing and arranging CAM actions

It has also been tested whether the companies would be in favour for having a mixed CAM funding (state + food industrial companies' contribution). 74% of the respondents supported the idea to have a mixed fund, 25% didn't answer the question (probably they would keep the present state-financed budget going on) and only 1% voted to establishing a fund with companies' contribution only. 55% of the companies are in favour of the mixed fund and would be willing to pay 0,5% while, 39% pay 1% and about 6% would pay even 1,5-2% of their yearly turnover to the mixed CAM fund.

**Figure 5: Contribution to CAM**



Many companies are content to take part in financing a collective agricultural marketing fund. For estimating the amount of contribution let's see an example. According to the Federation of Hungarian Food Industries (FHFI), the food, liquid and tobacco industry in Hungary had an annual average total turnover of HUF 1837 Billion between 2000-2005". Counting the 0,5% contribution from this amount of money to the fund we get HUF 9,185 billion. Adding this amount to the yearly average CAM budget it would amount to HUF 11-12 Billion. This is multiple to the available average CAM budget financed by the state in last years. With budget expansion it is possible to get the opportunity to work out and realize long-term, strategic, coherent CAM actions besides to routine short-term practices. The clearly defined coherent actions give the companies the opportunity of planning and by this way helping them developing their strategic thinking. Taking part in the decision-making process and realizing the CAM actions could ensure carrying the industries' viewpoints through while state contribution can help to achieve agricultural policy's goals.

The food industrial companies in return of their financial contribution expect to get a more active representation in the decision-making process. Remarkable part

of them would accept the participation of associations representing agents' interests in the decision-making. In the process they would like to take part in their own sector's CAM decisions, including the short-term, a year long and the long-term programs. In almost every European country, the basis of the collective agricultural marketing is the common (business and state) finance and decision making system. Food producers or food processing companies pay for the CAM activity on legal base. The way of operating this system could be different, common feature is the collective interest, collective responsibility and collective outcome. As the CAM actions are partly financed by the attended participants, they become interested in the collective decision-making and in better quality of decisions. The collective financing enables more effective CAM actions. The contributors not only expect professional CAM services for their payment but they do everything from their own side to reach the expected efficiency.

In the field of rural development improving collective thinking and taking part in collective actions involvement can be proved by the Leader program. The organization of regional areas is very weak, taking part in collective actions is contingent (ESZTER HAMZA, KRISZTINA MISKÓ, 2005.) The developing intentions are separated from other areas, this way the exploit of inside resources is low. Leader has the aim of incentive to develop the cooperation of people, the collective working and common developing. It has important community building power. As the people and the companies feel the positive effect of their collective actions, the cooperation will be more and more effective.

The collective contribution to CAM actions can be entered by a collective agricultural marketing law. As collective agricultural marketing law comes into force and collective thinking among food industrial companies exists, this would be the first step toward elaborating long-term, strategic collective agricultural marketing programs. On this base a new program protocol can be elaborated, achieving yearly CAM programs (for products) be organised along the middle-term CAM strategy. The collective agricultural product marketing (CAPM) programs can build up the yearly complex CAM program. All related sectors have to be interested in collective program-elaborating with the participation of the representation of interests' organisations, product councils etc. By this way long term CAM programs can be organised with the aims of the participants with transparent responsibilities and conditions.

The elaborated CAM strategy has to be suited to the New Hungary Rural Development Strategic Plan (NHRDSP) and Programme, and CAM actions have to be connected to other rural development and tourist programs. E.g. there couldn't be separate CAM program for fruits, wine and spirit without tourism. CAM has to support the regional development and regional marketing programs. Every county or region with a special feature connected to food or agriculture has to be involved in the collective agricultural marketing programs. NHRDSP, CAM and tourism can strengthen their sustainable exist with keeping their traditional

features. Now the "Traditions, Flavours and Regions" program is in operation. This collection means not only cultural value. These products have to be offered to those foreign and Hungarian travellers who are interested in Hungary's regions and famous attractions. It has to be achieved that these special foods of Hungary keeping their cultural and traditional value become elemental part of the regional development and, CAM helps to know them. In the case of other food or agricultural products, which have no specific features but the quality is really excellent, CAM must help the activity of the manufacturers and distributors and increase their competitiveness and enhance their exportability.

#### 4 CONCLUSIONS

Based on our research it can be stated agents in the Hungarian food industry are ready to take part in co-financing the CAM activities. Based on their own practise and satisfaction, they are really interested in co-financing and co-decision making, as well as playing an active role in organising CAM. First, they claim for representing their interest, second they would handle the CAM actions differently. They can regard the actions as their "own" ones and would use the collective marketing services consciously. Financing and the arranging tasks can not be separated. No one exists without the other one. The contributors become directly interested in collective actions and their outcome. By the contribution constraint taking part in collective actions can be stimulated. The institutions of interests' representatives have to be involved in decision-making and arranging CAM actions. As they get responsibilities arranging the CAM actions they will be forced to collective thinking and cooperation with the companies they represent.

Taking into consideration, that food industrial companies – independently from the size of their turnover – mostly complained about the professional usefulness of CAM actions, further research is needed to find out what "professional usefulness" means for companies. The expectations could be really different according to the size of the company.

Finally it can be stated that food industrial companies are really interested in co-financing CAM actions and in collective thinking. The common goals, common interests and collective "ready-to-change" way of thinking can develop collective agricultural marketing and this way the competitiveness of the Hungarian food industries.

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## **FARMERS' REASONS FOR ENGAGING IN BIOENERGY UTILISATION AND THEIR INSTITUTIONAL CONTEXT: A CASE STUDY FROM GERMANY**

*MELF-HINRICH EHLERS<sup>1</sup>*

### **ABSTRACT**

In Germany utilisation of biogas from agricultural resources has increased significantly in recent years. Farm waste and purposely grown biomass are used. Despite the introduction of formal incentives, reasons of farmers for their individual activities relating to biogas remain unclear. This research integrates a qualitative case study with institutional economic approaches to investigate farmers' reasons for action. A preliminary reading of interviews with farmers suggests a variety of reasons that changed over time from first biogas plants in 1980 until 2007. Particular patterns seem to evolve.

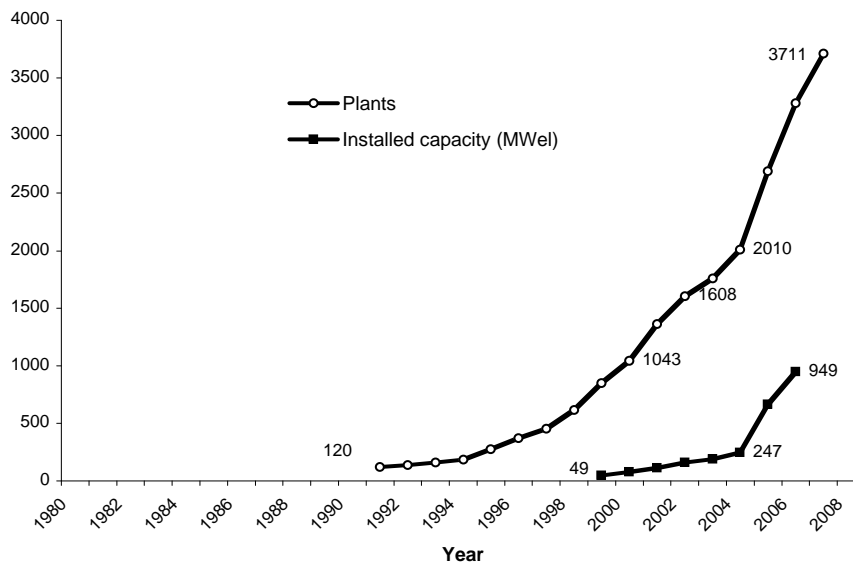
**Keywords:** Farmers, bioenergy, biogas, institutions, action, diffusion.

### **1 INTRODUCTION**

This paper tries to address the question why some German farmers engaged in projects aiming at the utilisation of bioenergy deriving from farmland crops and farm waste. It focuses on biogas utilisation for electricity and heat from the early 1980s to mid-2007. During that phase, though especially in recent years, uptake of agricultural biogas utilisation increased for Germany as whole (Figure 1). In 2007 renewable sources made up 14.2 per cent of gross electricity consumption and 6.6 per cent of total final heat consumption in Germany (BMU, 2008). The share of biogas from sources other than landfills and sewage in renewable electricity rose from 5.9 percent in 2006 (BMU, 2007) to 8.5 percent in 2007 (BMU, 2008). Biogas is mainly generated from farmyard manure and slurry, but increasingly also from purposely grown biomass. In 2007 about 400,000 hectares of 16.8 million hectares agricultural land in Germany were cropped for biogas (FNR, 2007) and 60 per cent of the biogas plants received a premium under the electricity feed-in law for using purposely grown biomass (FNR, 2007).

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**Figure 1: Biogas plants in Germany**

Source: FNR 2005, FNR 2007.

This study specifically asks how changing institutions relate to reasons farmers ascribe to their activities in the field of biogas utilisation. The preliminary reading of qualitative material from a regional case study in Germany offers first insights into drivers and barriers to the diffusion of agricultural biogas utilisation.

## 2 MATERIALS AND METHODS

To date there has been little research on the diffusion of agricultural bioenergy utilisation. This holds also for biogas utilisation in Germany, where the major focus is on trying to determine the possible scale of biogas or bioenergy use at different spatial levels and regions in Germany (e.g. FRITSCH, DEHOUST, 2004; HOLM-MÜLLER, BREUER, 2006). Moreover, the broader literature on the adoption of technology or farming practices suggests that there can be a diversity of drivers and barriers (e.g. LYNNE et al., 1988; BEEDELL, REHMAN, 2000). These tend to be strongly context dependent (e.g. SKERRATT, DENT, 1996; SHUCKSMITH, HERRMANN, 2002). The context dependency of diffusion processes of renewable energies such as wind or biomass is emphasised in the functional models of e.g. JACOBSSON and JOHNSON (2000) and NEGRO et al. (2007), which take both exogenous and endogenous factors including feedbacks into account. TOKE (2002) and RAVEN and GREGERSEN (2007) draw specific attention to the Danish incentive structures to invest in wind or biogas. They conclude that specific local conditions are particularly important to investment decision of farmers. Such local context dependency of planning biogas projects in Sweden is also emphasised by KHAN (2005).

Germany's 2004 feed-in law determines prices for renewable electricity, which utility companies have to pay at a fixed rate for 20 years. Basic rates decrease with increasing plant size (Table 1) and every year by 1.5 per cent. Additional premiums are paid since 2004. The premium for purposely grown biomass is six cent per kWh

up to plant sizes of 500kW and four cent per kWh until 5000kW. Further two cent per kWh are paid for combined heat and power. Finally, two cent per kWh are paid, if a novel technology is used.

**Table 1: Payment rates under the German electricity feed-in law**

Year	Payment rates in ct/kWh					
	Basic payment					
	Feed-in law from 1990		Feed-in law from 2000	Feed-in law from 2004		
	1991 <sup>#</sup>	1995 <sup>#</sup>	2000 <sup>#</sup>	2000*	2004	2004
Up to 150 kW	7.08	7.84	7.32	10.23	9.90	11.50
150 to 500 kW	7.08	7.84	7.32	10.23	9.90	9.90
500 to 5 MW	–	–	–	9.21	8.90	8.90
5 MW to 20 MW	–	–	–	8.70	8.40	8.40

Notes: <sup>#</sup> 80 per cent of average electricity prices for consumers.

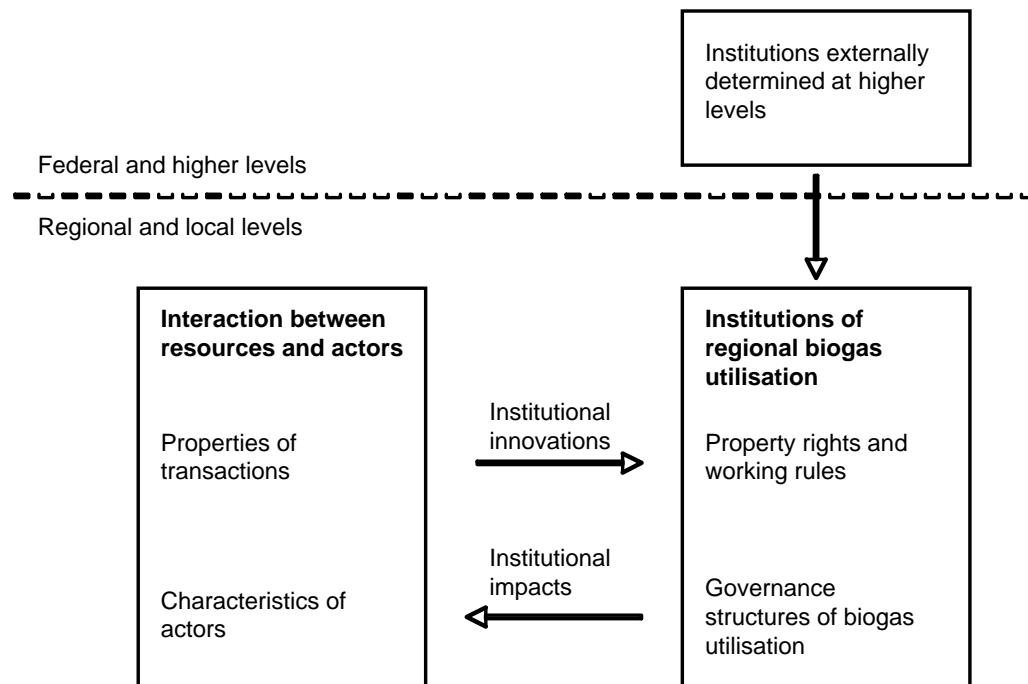
\* Starting April 2000 and decreasing by 1 per cent from 2002 onwards.

(Exchange rate of 1.95583 DM/EURO used throughout).

There are further incentives from the national level. As part of a so-called "market incentive programme" soft loans are provided specifically to investors of biogas plants. A premium is paid (initially 45 euro per hectare) for energy cropping on non set-aside land. Set-aside land, in turn, can be used for growing energy crops. Some biogas projects in the past were also designed to be able to receive rural development funds. Especially before 2004 there were further soft loans and grants available mainly from federal states.

A "biomass order" determining to which feedstock and technologies the feed-in law is applicable was introduced in 2001. Concerning planning regulations, plants larger than one MW are only granted planning permission in accordance with federal emission law, whereas plants not greater than 0.5 MW receive privileged planning when located close to farms. Relevant legislation changed from the late 1970s to today. It seems therefore difficult to determine when, under which conditions, which combinations of incentives and disincentives came into effect in terms of uptake of biogas production. Indeed, there may be various reasons for farmers to engage in activities supporting, shaping or constraining the diffusion of biogas utilisation.



**Figure 2: Institutions of agricultural biogas utilisation**

Source: HAGEDORN et al. (2002), own adaptations.

The underlying research uses as a conceptual framework based on the "Institutions of Sustainability" (HAGEDORN et al., 2002), which explicitly includes actors – in the case of the paper farmers are at the core – and three further sets of institutional context variables (Figure 2). Institutions can be defined as sets of conventions, norms and formally sanctioned rules that coordinate human interactions (VATN, 2005: 60). The basic unit of analysis is the transaction of energy from agricultural land and waste resources to the electricity grid. The transaction integrates all actors and biophysical flows from land use to outputs of utilisable energy. It involves sub-transactions like biomass and farm waste provision, energy conversion or environmental impacts. Properties of these transactions such as measurability, frequency, scale and value vary. Most of these transactions come into effect as part of actions of actors at local and supra-local or regional level, like farm holdings, local banks, developers of biogas plants or planning authorities. Farming operations are suggested to be a bottleneck for biogas utilisation and its wider impacts. In this research actions of actors other than farmers are taken as given when investigating farmers' reasons for action. Reasons for action can depend on the characteristics of actual and potential transactions, while institutions determining property rights of actors and certain modes of action shape both actions of individual farmers and characteristics of transactions. Property rights are defined as rights and privileges to benefit streams (BROMLEY, 2006: 54-66). In addition there are rights and privileges as well a duties and no right to choose modes of action, which are determined by formally sanctioned working rules (BROMLEY, 2006: 51-54; VATN, 2005: 60).

These are taken as explicit context variables of reasons for action, while existing norms and conventions may also provide reasons for action (BROMLEY, 2006: 51). All formal institutions, determined at political levels from federal state level upwards are taken as given, though they change over time and their execution at regional and local levels may be imperfect, as they are influenced by lower level institutions and relating actions (YOUNG, 2002: 23-26). Whether and how these institutions are coming into effect also depends on the governance structures.

The unit of analysis determines the boundaries for the empirical case study. First, the biophysical context is spatially defined from an input and impact perspective. Regional land and regional supply of farm wastes are included, but inflows of feedstuff into the region etc. that lead to farm wastes are not. In turn, only those biophysical impacts of the utilisation of biogas that occur in the region itself are taken explicitly into account. Yet, from a social perspective such biophysical boundaries of a case study may be inappropriate (YIN, 1994: 42-44), as for example regional actors may base their actions on economic, social or environmental impacts outside the regions like it may be the case with climate change. Therefore the case boundaries are drawn in terms of whether actors have a direct influence on regional biogas transactions. Actors with such direct influence may, however, be based on a supra-county level and may include environmental administration handling planning applications or technology providers and engineers.

A case study approach has been chosen due to data availability and the research questions. Particularly current financial conditions and the size of investments are seen to make investors into biogas utilisation reluctant to supply reliable business data. Predominantly qualitative empirical approaches have the advantage that they help to elucidate "why questions" such as reasons for action (YIN, 1994: 5; MAXWELL, 1996: 20) and at the same time provide indications of factors such as the evaluation of costs which are at present inaccessible to quantitative means. With a qualitative case study approach it is not aimed at statistically representative samples. Rather it is aimed to identify purposeful samples that are typical or extreme (MAXWELL, 1996: 71-72).

Based on administrative counties, a purposeful sample of farmers was chosen for qualitative face-to-face interviews in a northwest region in Germany, called Nordfriesland. In the region first modern biogas plants were erected in the early 1980s and then from the late 1990s onwards increasingly until today. Current plant numbers are greater than 40 and installed capacities are comparatively high. The interviews were carried out on the basis of an interview guide with themes listed in the left hand column of Table 2 that were addressed by open questions (see HELFFERICH, 2004). Table 3 provides an overview of the selected interviewees. As part of the case study strategy written documents were taken into consideration to contextualise the analysis of the interviews and the cases as a whole (MAXWELL, 1996: 75-76; YIN, 1994: 81).

**Table 2: Interview themes and reading categories**

Interview theme	Reading categories
a) Reasons for activities relating to biogas utilisation from an individual perspective	<ol style="list-style-type: none"> <li>1. General reasons for action</li> <li>2. Decision processes</li> <li>3. Timing of decisions and actions</li> <li>4. Resources needed for action</li> </ol>
b) The meaning of other persons for individual activities	<ol style="list-style-type: none"> <li>1. Interaction with others</li> </ol>
c) Rules that influence individual activities	<ol style="list-style-type: none"> <li>1. Formal institutions</li> <li>2. Enforcement of rules</li> <li>3. Informal institutions</li> </ol>
d) Change in courses of action and procedures over time	<ol style="list-style-type: none"> <li>1. Changes of rules, norms and conventions</li> <li>2. Perceived possibilities to change rules</li> <li>3. Individual rule changing activities</li> </ol>
e) The role of input and output characteristics and the environment for biogas utilisation	<ol style="list-style-type: none"> <li>1. Characteristics of soil and inputs</li> <li>2. Impacts of activities on the environment</li> </ol>

The preliminary reading of the interviews follows a two-step approach of first categorising material according to topical issues and then coding its content according to explanatory factors. To date the material of the interviews has been categorised in close relation to the above-mentioned interview themes (MAXWELL, 1996: 78-79). Table 2 relates the categories to interview themes. The material has then been exposed to a preliminary coding (MAXWELL, 1996: 79) of reasons for action based on plural rationalities that are more or less bounded (VATN, 2005a). The first coding targets well-informed individualistic cost-benefit calculations. A second coding takes up the notion of costly information and rule enforcement, as it is emphasised in new institutional economics (e.g. NORTH, 1990; WILLIAMSON, 1985). The third coding relates action to beliefs or concepts and typifications of natural and social phenomena that form a basis for action as enabling institutions (e.g. VATN, 2005a) or volitional pragmatism (BROMLEY, 2006) that determine future expectations. A fourth coding is the relating concept of the logic of appropriateness (MARCH, OLSON, 1989: 22) where action is based on what is considered as socially appropriate. Finally it is coded for expressive rationality, which emphasises action to articulate meaning (HARGREAVES HEAP et al., 1992: 21-23). The latter three coding concepts put strong emphasis on the role of preference formation for behavioural intentions (BOWLES, 2006: 100-01, 200).

**Table 3: Overview of interviewed farmers**

<b>Farmer</b>	<b>Farming since (year)</b>	<b>Farm enterprises</b>	<b>Farm size (ha)</b>	<b>Plant size (kW<sub>el</sub>)</b>	<b>Operating since (year)</b>	<b>Investment in other renewable energies (type, first year)</b>
A1	1969	wheat, barley, oil seed rape (OSR), pigs	125	15	1980	Wind 1990
B1	1993	wheat, rye, OSR, maize, pigs	236	only biomass supply		Wind 1998, photovoltaics 2004
A2	2000	wheat, OSR, maize, pigs	200	330	2006	Wind 1995, photovoltaics 2003
A3	1978	grass, maize, wheat (whole crop silage), pigs	130	250	2006	Wind 2005 (small share)
A4	1997	maize, potatoes, sugar beet, pigs, sows	155	500	2006	Wind 2007
A5	1978	grass, maize, (limited area of wheat, OSR) dairy cows, sows, pigs	160	75 (upgraded to 175), (2nd: 360)	1997 (upgraded 2004), (2nd 2007)	Wind 1990, photovoltaics 2007
A6	1978	clover, grass, maize, oats, barley, peas, seed grass, potatoes, rye, spelt, OSR, dairy cows	450	145 (upgraded 530)	2001 (upgraded 2006)	none
A7	1984	maize, grass, wheat, sows, dairy cows	200	(-) (upgraded to 300), 600	(1997), (upgraded 2001), 2005	Wind 2000
A8	1988	grass, rye, wheat, maize, dairy cows, cattle	120	300 (upgraded to 360)	2005	Wind 1997

### 3 RESULTS

The results consist of a preliminary reading of the qualitative interviews with farmers. The reading of the material from the early 1980s suggests that experiences with the oil crises in the 1970s brought alternative energies on the agenda. "Energy autarky" of farm holdings emerged as an aim where energy had to come from resources available directly on the farm. This led to a search for technological options to convert farm resources into energy. Biogas was seen as advantageous as it makes use of farm waste. The energy, especially in terms of heat could be

used directly on the farm for pig houses and living space. To achieve energy autarky, reliable technology had to be found, for which one had to persistently search and to communicate the intention to set up a biogas plant. After an intensive search one could perceive a certain technology as trustworthy, but then the question arises how to finance that technology. Farmer A1 would not have invested into biogas, if he had not discovered federal grants. The farmer set up a biogas plant, despite agricultural extension services warned him of potential financial losses. It was easy to receive planning permission, as the biogas plant was on a farm and the technology rather unknown. However, when the plant was established more and more rules were introduced. The farmer, a university and some extension workers did not succeed to make the plant profitable. Even the novelty of a contract to sell electricity was insufficient. While farmer A1 initially was keen to share his experiences, he was later increasingly frustrated when losses piled up. Finally he decommissioned the plant.

Energy autarky seems less a reason for the second generation of farmers investing into biogas (A5-7). A major driver was to make use of farm waste (mainly slurry) and to sell electricity, whilst using the heat on the holding and neighbouring buildings. The early feed-in law provided some incentives in addition to soft loans. Generally the farmers emphasised to be keen on doing "new things" and to manoeuvre in legally ill-defined areas. Producing renewable energy was seen to contribute to wider society. However, achieving planning and operating consent was considered increasingly difficult, particularly when importing organic waste to increase productivity. Several construction regulations were held inappropriate. Extension services were rather seen as discouraging. Farmers of this group, except A6, are based in villages and proactively informed their neighbours, who were generally interested in biogas. All farmers disliked public administration and regulation, but emphasised the importance of keeping good relations with public servants. Purposely grown biomass was only used later when farmers increased plant sizes. Though all made use of it, the EU energy crop premium was considered not worthwhile its paperwork and monitoring.

Farmers who invested into biogas after the introduction of the 2004 feed-in law (A2-4, A8) emphasised commercial interest in biogas due to low cereal prices and the incentives offered by a well-established feed-in law. All had additional reasons for their action including demand for heat on the holding, better usage of farm waste, choice between investment opportunities, cereal cropping problems, benefiting from renewable energy after having missed out opportunities in wind energy, etc. Most saw biogas as a valuable contributor to climate change mitigation as well as to meet increasing energy demands. However, all worried about increased cereal prices and difficulties to secure biomass. An exception is farmer A3 who uses his entire land to grow biomass. Measures are undertaken to mitigate impacts on neighbours and landowners through spatial allocation of maize plots, timing of harvest, routing of transport, etc. Yet, obtaining planning consent was generally

not seen difficult, partly due to good collaboration with technology providers and engineers. Still, some suggest lower trust in technology providers as a consequence of a rapidly developing market for biogas technology. All found the EU energy crop premium not worth the efforts. Good relations to local banks ensured that soft loans were integrated into the financial planning from the start.

The farmer (B1) does not run a biogas plant. He responded to enquiries of a biogas cooperation to supply biomass and first started to grow maize on set aside land of low productivity. Low cereal prices, opportunities to spread his pig slurry on maize plots and the ease of growing maize encouraged him to expand the maize area including better soils. He is continuing to grow maize, despite increased cereal prices, because several biogas plants in the area are now competing with prices for biomass.

## **4 DISCUSSION**

Thus far the diffusion pattern of biogas plants in Germany seems to resemble the stylised S-shaped diffusion curve (see Figure 1) (ROGERS, 2003: 273), though adoption rates changed when the rules of the national electricity feed-in tariff scheme changed. This relation is supported by this case study. The preliminary reading of the interviews, however, seems also to be in line with KHAN (2005) and RAVEN and GREGERSEN (2007) in terms of local context dependency. Persistent proactivity of farmers in relation to neighbours and other actors may have prevented certain property right conflicts, especially in recent years. In turn, conflicts with planning authorities, waste regulators and technology providers were in parts gradually mitigated by new institutions in the 1990s, despite emergence of new conflict laden rules relating to input use and outputs, including emissions. These redefine property rights and impact on transaction costs. However, farmers find themselves in a diversity of settings. Hence, there can be various reasons for their actions. Prominent examples relate to the suitability of a biogas plant to the portfolio of a farm, while in case of cropping decisions or heat usage preferences of local communities matter and for initial interests social discourse on energy use might be important.

A further analysis of the interviews should be able to draw clearer connections to the logic of appropriateness (MARCH, OLSON, 1989: 22) and the role of social beliefs (BROMLEY, 2006) in these matters. Social beliefs seem important for shared expectations on profitability and wider impacts of biogas use. Recently these were partly consolidated. Hence, economic calculus may have gained importance, whereas in the early years expressive action (HARGREAVES HEAP et al., 1992: 21-23) of a more entrepreneurial nature (EBNER, 2006) may have had prevailed. The preliminary reading suggests that social learning and formalisation of information are a prerequisite of more calculated reasoning. Such reduction of uncertainty implies an agreed interpretation of information, which is established to some extent by trial and error of first movers and perceptions of other actors. Still, it has to be

adjusted to changing circumstances, which may trigger surprises to settled beliefs of involved actors (BROMLEY, 2006). A logic of appropriateness would in this sense apply to the rules underlying the financial and environmental evaluation of biogas projects and energy cropping. These rules cannot be expected as entirely stable, as for example regional accumulation of biogas utilisation leads to changing economic and environmental circumstances. Overall, a more thorough analysis would have to include the perspectives of other actors (HAGEDORN et al., 2002). Only then the co-evolution of reasons for action and institutions, which constitute the emerging biogas sector, can be thoroughly explored.

## 5 CONCLUSION

This preliminary reading of qualitative material from a German setting suggests that a diversity of factors may drive the diffusion of agricultural biogas. First, this could be due to an institutional context associated with limited degrees of formalisation, especially in early years. Second, farmers were embedded in a diversity of settings and found a diversity of reasons for actions relating to biogas utilisation. Especially in early years successful plant development seemed to be due to proactive measures to receive funding. Only later information and rules gained some clarity and relating expectations were increasingly shared. However, despite today's commercialisation, the financial sustainability of projects seems to strongly depend on contract arrangements to secure biomass, on payments under the feed-in law and on possibilities to utilise heat and other outputs.

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## DEGREE AND PATTERN OF AGRO-FOOD TRADE INTEGRATION OF SOUTH-EASTERN EUROPEAN COUNTRIES WITH THE EUROPEAN UNION

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### ABSTRACT

Agro-food trade of the South-Eastern European (SEE) countries with the European Union is of the inter-industry type. The intra-industry trade (IIT) tends to increase. Most of IIT is based on vertically differentiated products. The importance of the high and low quality vertical IIT vary between the SEE. This is consistent with different price-quality range patterns in the SEE agro-food IIT as an outcome of trade liberalisations, economic growth, and resource reallocations and restructuring in the agro-food sectors with associated adjustment costs during the pre-accession period.

**Keywords:** European integration, trade types, South-Eastern Europe.

### 1 INTRODUCTION

The integration of the South-Eastern European (SEE) countries into the European Union (EU) is still the challenging issue for the enlarged EU-27.<sup>1</sup> We aim to identify different integration paths of these countries with the EU-15 that are pertained to different trade regimes during the pre-enlargement period 1995-2003. The main research question focuses on the impact of different integration paths on the degree and patterns of agro-food trade integration. They depend on whether trade is of an inter-industry trade with a reallocation of resources between industries or intra-industry trade (IIT) with a reallocation within industries.

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<sup>1</sup> The SEE-7 countries geographically cover former Yugoslav republics (Bosnia and Herzegovina, Croatia, FYR of Macedonia, and Serbia and Montenegro), except of Slovenia, and three other Balkan countries (Albania, Bulgaria, and Romania). During the analyzed period (1995-2003), Serbia and Montenegro were within the same country, whereas Kosovo declared independence in 2008.

Since the end of 1990s, the literature has supported the view that IIT has an increasing role in agro-food trade especially between developed countries, which increasingly trade processed agro-food products (e.g. HENDERSON et al., 1998). A high level of IIT suggests an advanced degree of economic integration and tends to be positively correlated with participation in a preferential trading area. This has been confirmed for agro-food trade by QASMI and FAUSTI (2001) within North American Free Trade Agreement and VAN BERKUM (1999) within the Association Agreements for ten Central and Eastern European Countries with the EU-15. In addition, recent trade studies provide further evidence of the importance of IIT in agro-food sectors (LUKA, LEVKOVYCH, 2004; FERTÖ, 2005; BOJNEC et al., 2005; SARKER, SURRY, 2006). So far there is no any such a study for the SEE countries involved focusing on IIT in agro-food products.

In addition to the SEE-7 countries and a specific geographical regional coverage, the paper contributions are twofold. First, it provides comparative evidence on development of IIT types and price-quality ranges for the SEE-7 countries in agro-food trade with the EU-15. Second, it derives implications for agro-food integration of the SEE countries into the EU with a scope for possible efficiency and international competitiveness improvements.

The rest of the paper is organised as follows. Section 2 outlines the employed methodology on measuring IIT, vertical and horizontal IIT, and explains data used. Section 3 presents empirical results on developments of types of IIT. Section 4 provides evidence on quality specialisation. The last section 5 summarises with policy implications.

## **2 MEASURING VERTICAL AND HORIZONTAL INTRA-INDUSTRY TRADE**

The export-to-import unit values have been used for assessing product quality in trade data and in the separation of horizontal and vertical IIT (ABD-EL-RAHMAN, 1991; GREENAWAY et al., 1994; 1995). The export-to-import unit values as relative prices are assumed to reflect relative qualities (STIGLITZ, 1987). Trade flows are defined as horizontally differentiated where the spread in the export-to-import unit values is not more than 15% at the five-digit Standard Industrial Trade Classification (SITC) level, and vertically differentiated otherwise. The presumption is that transport and other freight costs do not cause a difference in export and import unit values by more than  $\pm 15$  per cent. ABD-EL-RAHMAN (1991) and GREENAWAY et al. (1994; 1995) demonstrate that increasing the range from 15 to 25 per cent does not substantially alter the division of trade into horizontally and vertically differentiated products.

Formally, bilateral trade of a horizontally differentiated product,  $j$ , occurs when the unit value of exports ( $UV_j^x$ ) and the unit value of imports ( $UV_j^m$ ), for a particular dispersion factor,  $\alpha$  (e.g. 0.15), satisfies the following condition:

$$1 - \alpha \leq \frac{UV_j^x}{UV_j^m} \leq 1 + \alpha \quad (1)$$

Similarly, bilateral trade of a vertically differentiated product is defined as being when:

$$\frac{UV_j^x}{UV_j^m} < 1 - \alpha \text{ or } \frac{UV_j^x}{UV_j^m} > 1 + \alpha \quad (2)$$

Adopting this approach of a  $\pm 15$  per cent unit price threshold as a means of separating horizontally and vertically differentiated products, we compute measures of IIT types using the methodological approach, which is based on GREENAWAY et al. (1994; 1995), who calculated overall IIT using an unadjusted GRUBEL-LLOYD (GL) index and then divide it into horizontal and vertical components on the basis of the export and import unit values, as indicated in equations (1) and (2). The GREENAWAY, HINE AND MILNER (GHM) measure expresses horizontal (vertical) matched trade as a share of gross bilateral trade:

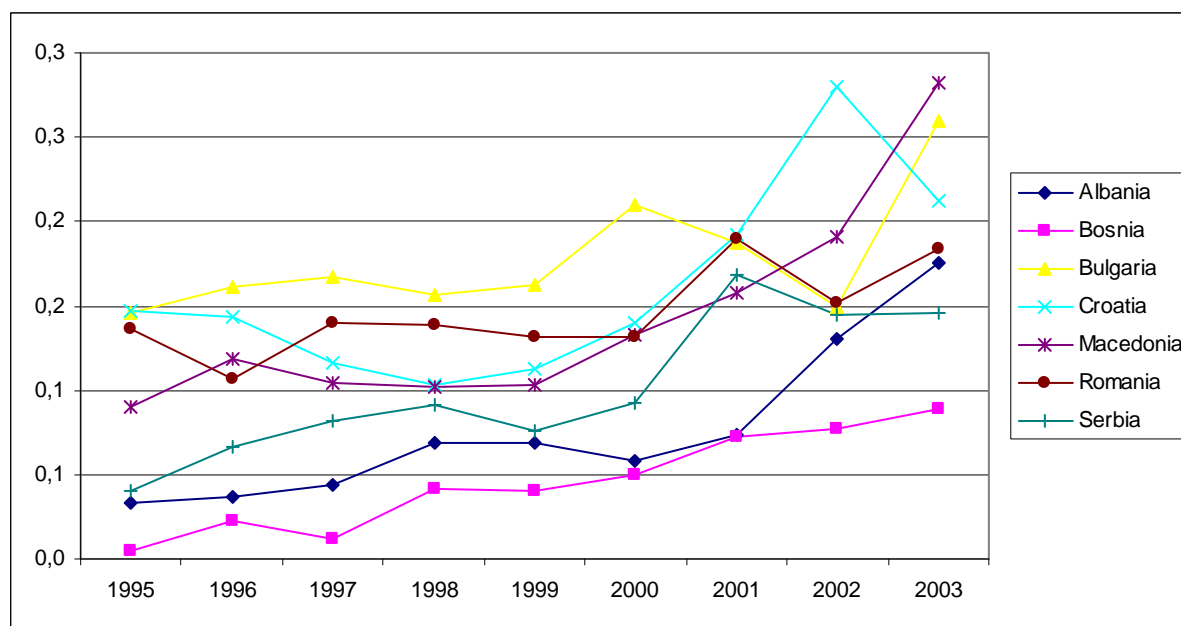
$$GHM_k^p = \frac{\sum_j \left[ \left( X_{j,k}^p + M_{j,k}^p \right) - \left| X_{j,k}^p - M_{j,k}^p \right| \right]}{\sum_j \left( X_{j,k} + M_{j,k} \right)} \quad (3)$$

where  $X$  and  $M$  are values of exports and imports, respectively,  $p$  is either horizontal or vertical trade,  $j$  is the product category ( $j=1, \dots, n$ ) and  $k$  is a trading partner.

### 3 DEVELOPMENT OF VERTICAL AND HORIZONTAL INTRA-INDUSTRY TRADE

The agro-food trade types are analyzed using detailed trade data from OECD for the years 1995-2003. The agro-food trade is defined by EU-COMMISSION (1999). This trade data sample consists of 255 items at four-digit level in the SITC system. We employ GRUBEL-LLOYD IIT index to measure degree and patterns in agro-food trade integration. We focus on the analysis of trade types, horizontal vs. vertical IIT using 15 per cent threshold in the SEE-7 agro-food trade with the EU-15. The potential implications of such results are for the welfare analysis of economic integration (BLANES, MARTIN, 2000). The IIT based on horizontally differentiated products is associated with "smooth adjustment" at lower costs (BRÜLHART, 1999). These adjustment costs can be significantly higher for trade with vertically differentiated products.

**Figure 1: Development of intra-industry trade**  
(share of IIT in agro-food trade, 0.0-1.0)



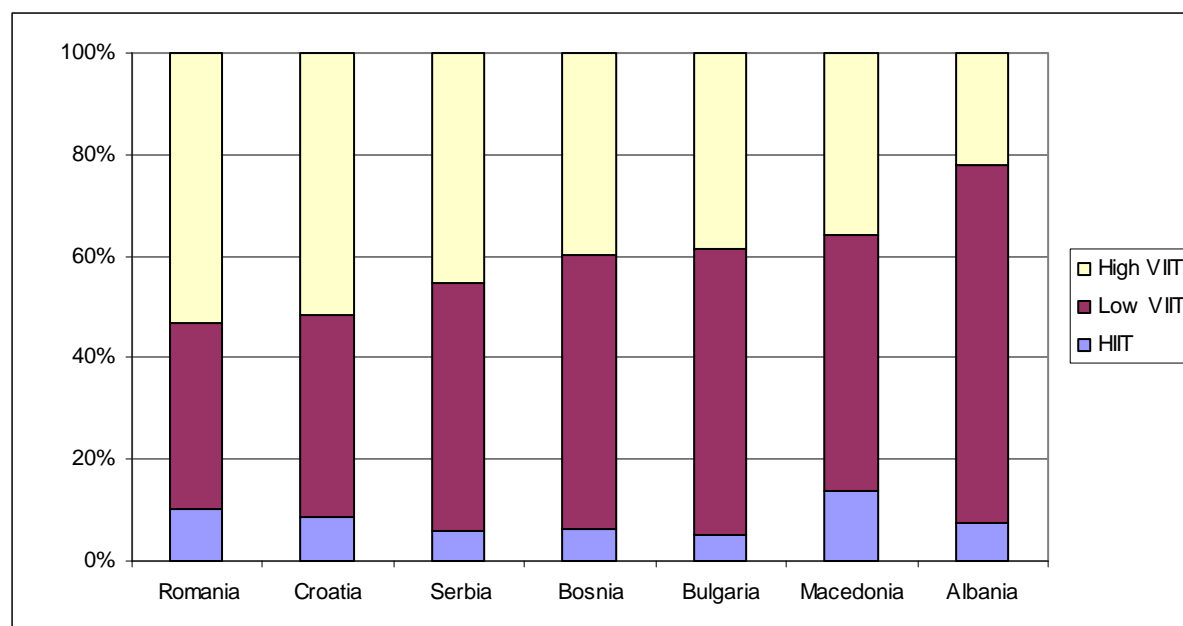
Source: Own calculations based on the OECD data.

Note: Bosnia refers to Bosnia and Herzegovina and Serbia to Serbia and Montenegro.

Inter-industry trade is predominant in agro-food trade of the SEE-7 countries with the EU-15 (Figure 1) suggesting considerable adjustment in resource reallocation. The degree of IIT and thus the degree of SEE-7 agro-food trade integration with the EU-15 tended to increase. The rising IIT structures imply reallocations within agro-food sectors.

The share of horizontal IIT in total IIT is below 15 per cent (Figure 2). The variations in vertical IIT are seen by SEE-7 countries. The high quality vertical IIT in total vertical IIT exceeds the 50 per cent for Romania and Croatia. The low quality vertical IIT is more important for the remaining SEE-5 countries. These results clearly indicate different quality types and patterns in agro-food IIT of the analyzed SEE-7 countries with the EU-15, which have been an outcome of trade liberalisations, economic growth and agro-food sector restructurings.

**Figure 2: Share of horizontal and vertical IIT in total IIT, average 1995-2003**

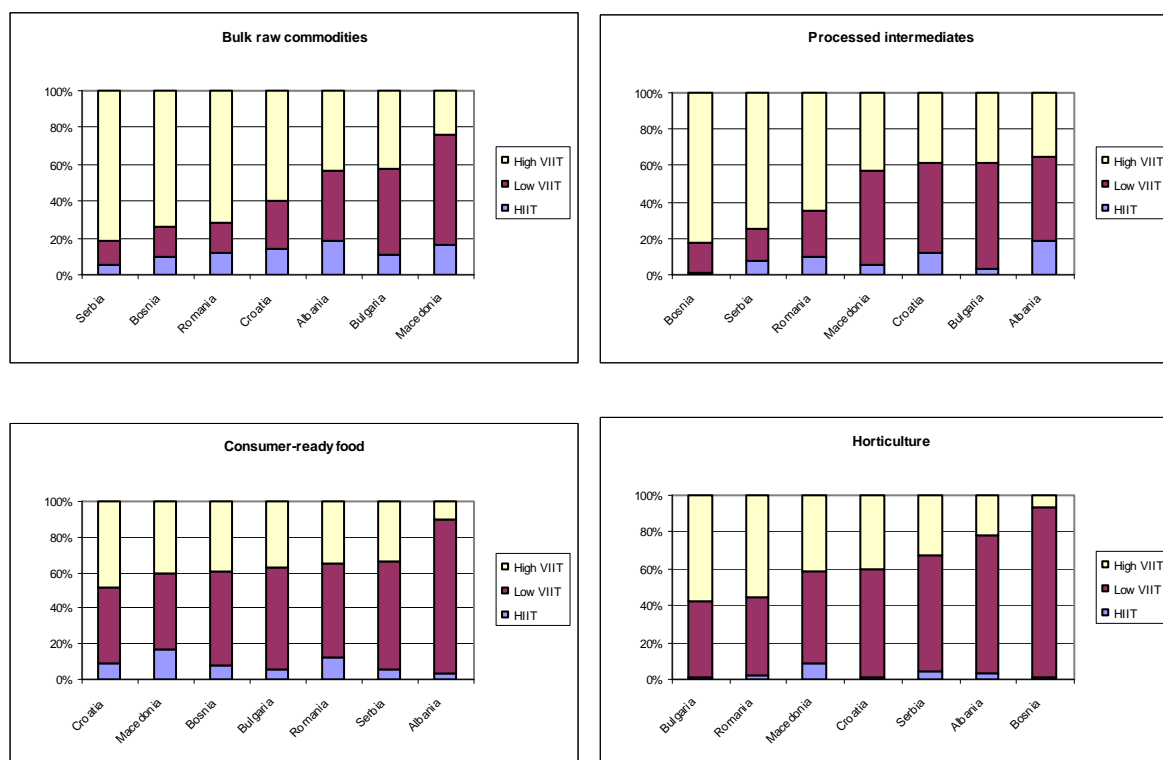


Source: Own calculations based on the OECD data.

Note: See Note to Figure 1. IIT – Intra-industry trade, HIIT – Horizontal IIT and VIIT – Vertical IIT.

To get more insights into the nature of IIT, we follow CHEN et al. (2000) to classify agro-food trade into four commodity groups: bulk raw commodities, processed intermediates, consumer-ready food, and horticulture. Figure 3 shows that there are significant differences across product groups and SEE-7 countries in IIT types. The share of horizontal IIT is low; it is negligible for horticultural products. The high quality vertical IIT plays important role for bulk raw commodities and for processed intermediates, especially for Serbia and Montenegro, Bosnia and Herzegovina, and Romania. The fraction of the high quality vertical IIT for consumer-ready food is somewhat lower, but it is still important (above 40 per cent) in the case of Croatia and FYR of Macedonia. Similar fractions of the high vertical IIT can be observed for Bulgaria, Romania and FYR of Macedonia for horticultural products.

**Figure 3: Share of horizontal and vertical IIT in total IIT by main agro-food product groups in trade of the SEE countries with the EU-15, average 1995-2003**



Source: Own calculations based on the OECD data.

Note: See Note to Figures 1 and 2.

#### 4 WHY DOES PRODUCT QUALITY IN TRADE FLOW MATTERS?

The price-quality differentiation and market segmentation have consequences for adjustments costs, income distributions, and successful catching up. In addition, trade specialisation in high quality produce allows the extraction of rents that are pertained to the demand for high quality goods, which are characterised by higher income elasticity and lower price elasticity.

In order to characterise the corresponding agro-food specialisation of SEE-7 countries, we assume that the differential in the export-to-import unit values reflect quality differences. We analyse the export and import flows separately for the same product with a given trade partner to investigate possible differentiations in price-quality ranges. Applying FONTAGNE et al. (1998) approach we define the following market segments: up-market produce (with the SEE export-to-import unit values exceeding the EU-15 average by at least 15 per cent), down-market produce (the SEE more than 15 per cent below the EU-15 average), and medium-market produce (the remainder). Additionally, we use the LAFAY (1992) index as a measure of trade specialisation by comparing product groups' trade balance to the overall agro-food trade balance. We apply the LAFAY (*LFI*) index in the following way:

$$LFI_j^i = \left( \frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^N x_j^i - m_j^i}{\sum_{j=1}^N x_j^i + m_j^i} \right) \frac{x_j^i + m_j^i}{\sum_{j=1}^N x_j^i + m_j^i},$$

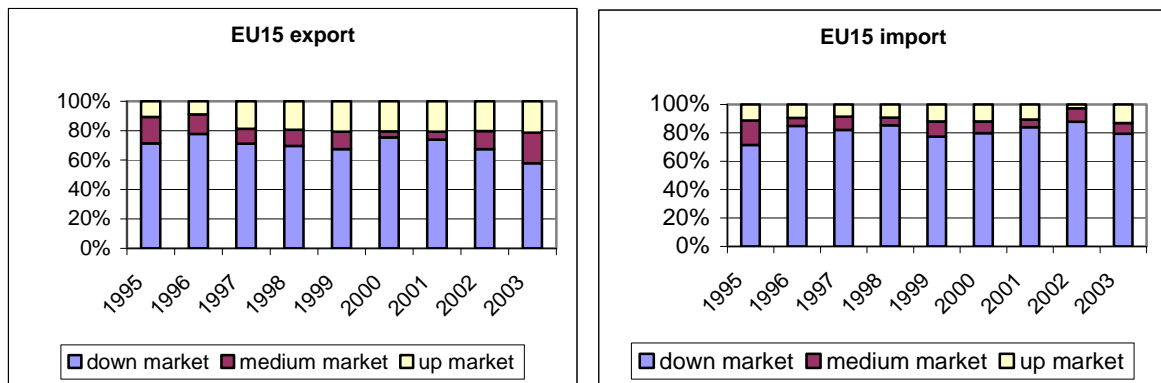
where  $x_j^i$  and  $m_j^i$  are exports and imports to and from the EU-15, respectively, of product  $j$  of country  $i$ , and  $N$  is the total number of agro-food products. The  $LFI$  index measures the trade specialisation of country  $i$  in the production of item  $j$  as the deviation of product  $j$  normalised trade balance from the overall normalised agro-food trade balance. The normalisation of each sector is obtained by weighting each product's contribution regarding to the respective importance in agro-food trade. Because the  $LFI$  index measures each product's contribution to the overall normalised agro-food trade balance, the following relation holds:

$$\sum_{j=1}^N LFI_j^i = 0.$$

If  $LFI > 0$ , then a trade specialisation is revealed. The larger positive  $LFI$  value indicates the higher degree of export specialisation. Similarly, negative  $LFI$  values imply trade de-specialisation.

The 15% threshold for the differential in the SEE-7 export-to-import unit values vis-à-vis the EU-15-average is applied to define three price-quality market segments. Figure 4 shows that the down-market produce are the most important market segment for the EU-15 agro-food export and import sides. The relatively small share of agro-food trade is in the medium-market produce segment in imports. The proportion of the up-market produce segment is increasing in exports, whilst it fluctuates without clear trend on import's side.

**Figure 4: The evolution of the EU-15 agro-food trade price-quality range**



Source: Own calculations based on the OECD data.

The SEE-7 agro-food import structures from the EU-15 by the price-quality range shows a large variation across countries (Table 1). The FYR of Macedonia and Serbia and Montenegro imported mainly top high quality agro-food produce, whilst Albania, Bosnia and Herzegovina, and Romania concentrated on imports



of low quality agro-food produce in 1995. The share of high quality agro-food produce in imports has fallen in the SEE-7 countries at the expense of low quality agro-food produce (Croatia and Serbia and Montenegro) and of medium quality agro-food produce (Albania, Bulgaria, FYR of Macedonia, and Romania).

The SEE-7 agro-food export structures to the EU-15 show that some SEE countries specialised in top high quality agro-food produce (FYR of Macedonia and Serbia and Montenegro), whilst some others (Albania and Romania) specialised on low quality agro-food market segments in 1995. However, the position of SEE-7 countries in up-market agro-food segments has changed substantially by 2003. The former Yugoslav countries lost their share in high quality agro-food market segments, whereas Albania improves significantly its performance. In general, the SEE-7 export price-quality range structures have changed considerable during the analysed period.

These results suggest the relatively low agro-food trade specialization in up-market segment (less than 20 per cent) for the SEE-7 countries. In addition, the value of the *LFI* index has decreased over time, except for Bosnia and Herzegovina. Bulgaria and FYR of Macedonia have experienced the highest value of the *LFI* index, indicating trade specialisation in agro-food products with the EU-15.

**Table 1: Price-quality ranges for the SEE-7 agro-food trade with the EU-15**

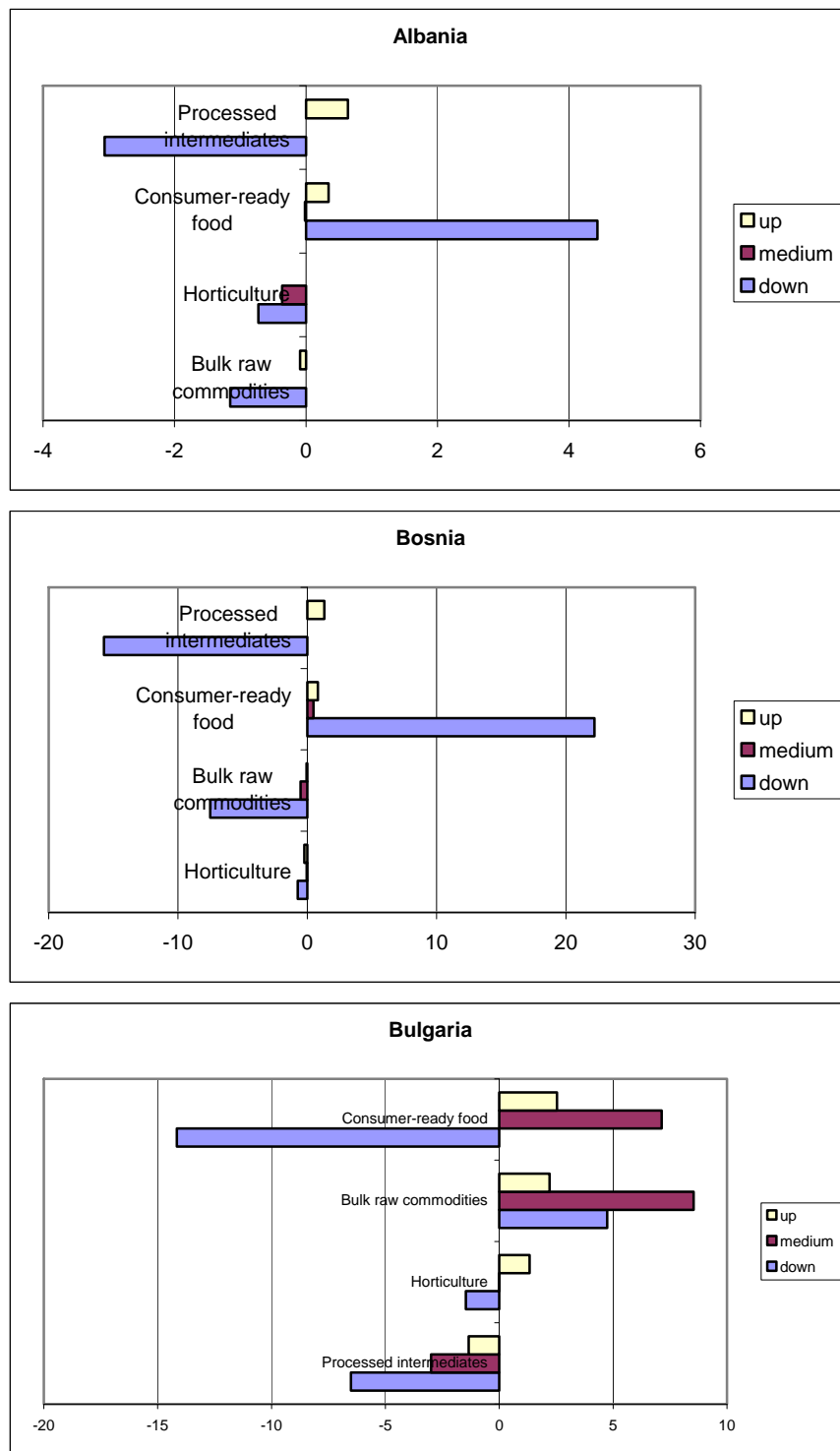
	1995								
	Export (% of total)			Import (% of total)			<i>LFI</i>		
	down	medium	up	down	medium	up	down	medium	up
<b>FYR of Macedonia</b>	22.4	5.7	71.9	33.2	19.5	47.3	-16.8	-1	17.8
<b>Bulgaria</b>	28.5	45.9	25.6	35.8	34.8	29.4	-21.5	14.9	6.7
<b>Serbia and Montenegro</b>	28.4	5.0	66.6	12.6	40.7	46.7	-5.1	-0.3	5.3
<b>Albania</b>	61.2	17.4	21.4	75.2	15.6	9.2	-1.7	0.5	1.3
<b>Romania</b>	50.9	37.4	11.7	44.7	20.3	35.0	-13.7	13.2	0.4
<b>Bosnia and Herzegovina</b>	52.0	0.6	47.3	41.6	34.5	23.8	0.1	0.0	-0.1
<b>Croatia</b>	65.8	12.4	21.8	31.9	43.0	25.1	4.6	0.5	-5.2
	2003								
	Export (% of total)			Import (% of total)			<i>LFI</i>		
	down	medium	up	down	medium	up	down	medium	up
<b>Bulgaria</b>	30.8	43.1	26.1	36.4	52.0	11.6	-17.4	12.7	4.7
<b>FYR of Macedonia</b>	36.0	44.5	19.5	37.7	45.8	16.5	-17.2	14.3	2.9
<b>Bosnia and Herzegovina</b>	56.9	27	16.1	47.6	28.3	24.1	-1.8	-0.1	1.8
<b>Albania</b>	35.9	2.7	61.4	74.2	21.5	4.3	-0.5	-0.4	0.9
<b>Serbia and Montenegro</b>	18.2	70.1	11.7	36.2	51.2	12.7	-26.7	26.8	-0.2
<b>Croatia</b>	37.1	52.2	10.7	58.8	23.6	17.6	-2.9	12.3	-9.4
<b>Romania</b>	22.9	59.7	17.4	39.4	40.3	20.3	-10.2	23	-12.8

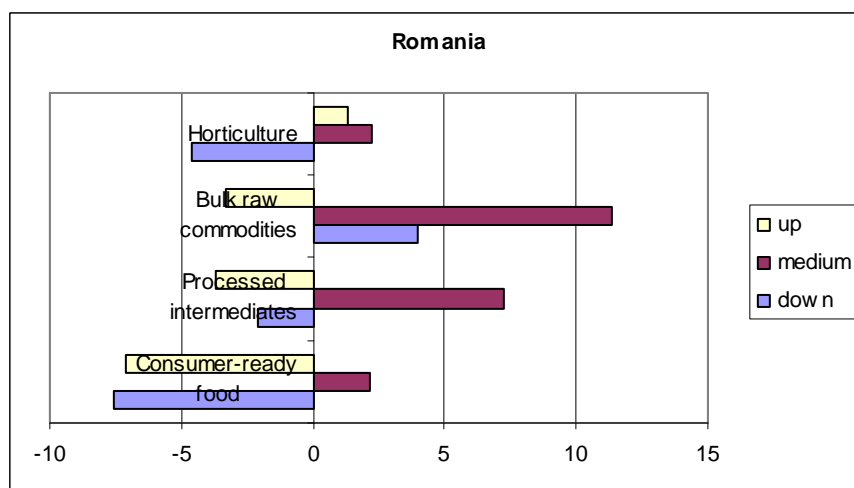
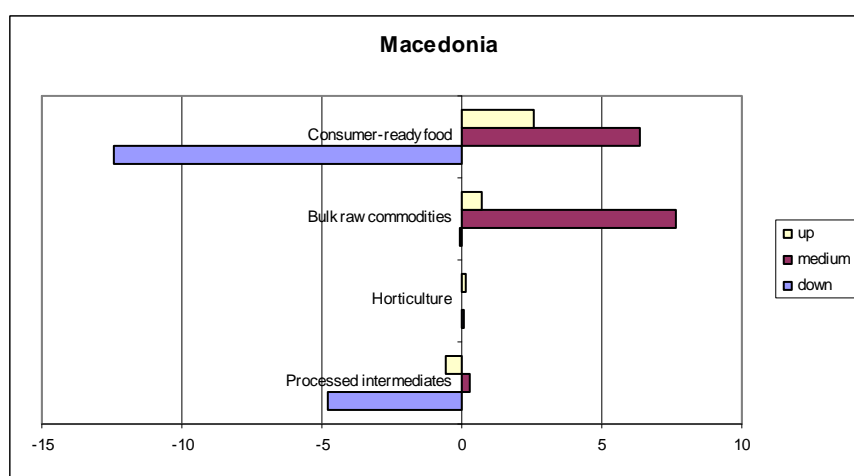
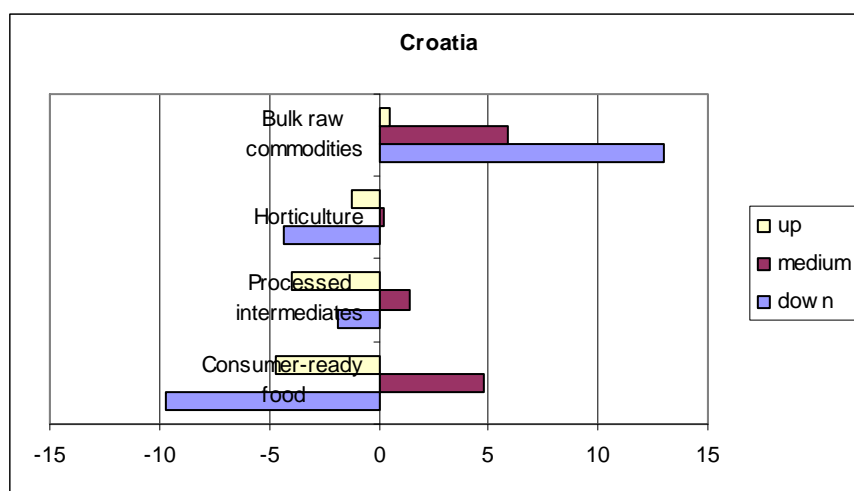
Source: Own calculations based on the OECD data.

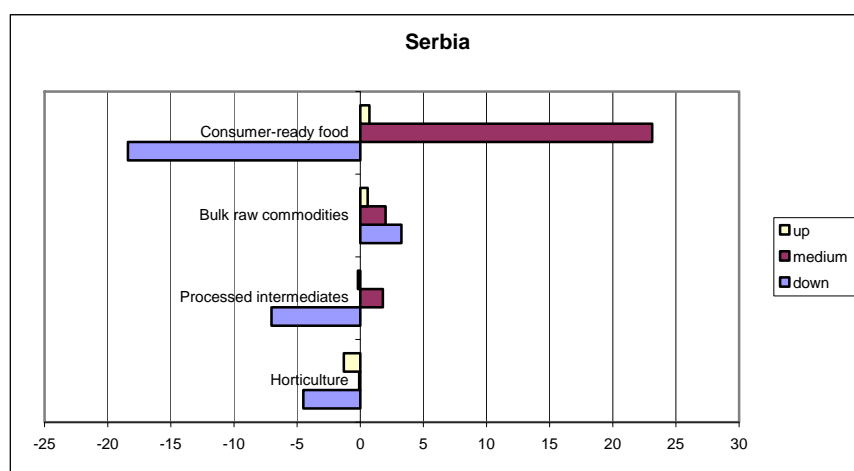
Note: SEE-7 countries are ranked by decreasing value of Lafay (*LFI*) index for up-market produce.

Figure 5 shows the *LIF* index by product groups by degree of processing and price-quality ranges for the SEE-7 countries in 2003. Some SEE countries are specialised in certain product groups (bulk raw commodities) over the whole price-quality spectrum: Bulgaria, Croatia, and Serbia and Montenegro. The value of the *LFI* index is the highest for processed intermediates for Albania and Bosnia and Herzegovina, and in consumer-ready foods for Bulgaria, FYR of Macedonia and Serbia and Montenegro.

**Figure 5: LAFAY (*LFI*) indices by the SEE-7, product groups and price-quality ranges in 2003**







Source: Own calculations based on the OECD data.

Note: See also Note to Figure 1. Product groups are ranked by decreasing value of the LAFAY (*LFI*) index for up-market goods.

**Table 2: Trade specialisation in market segments for top five product groups in 2003**

Product groups	LAFAY index	Market segment
<b>Albania</b>		
0013: Swine, live	7.92	Down
0597: Confidential trade of division 05	3.24	Down
0999: Intrastat: estimation of missing declarations of division 09	3.06	Down
0344: Fish fillets, frozen	2.04	Down
0242: Processed cheese, not grated or powdered	1.48	Down
<b>Bulgaria</b>		
2224: Sunflower seeds	4.34	Medium
1121: Wine of fresh grapes; grape must in fermentation	3.59	Down
0121: Meat of sheep or goats, fresh, chilled or frozen	3.52	Medium
0449: Other maize, unmilled	2.23	Up
1211: Tobacco, not stemmed/stripped	2.17	Medium
<b>Bosnia and Herzegovina</b>		
0597: Confidential trade of division 05	21	Down
0342: Fish, frozen (excluding fillets and minced fish)	5	Down
0577: Edible nuts (no oil nuts), fresh or dried	4	Down
0344: Fish fillets, frozen	3	Down
4213: Groundnut (peanut) oil and its fractions	2	Down
<b>Croatia</b>		
0612: Other beet or cane sugar and pure sucrose, in solid	12.43	Medium
2484: Non-coniferous wood, sawn lengthwise, thickness>6mm	12.05	Down
2475: Wood, non-coniferous, in the rough, not treated	3.10	Medium
2485: Non-coniferous wood, continuous. shaped, edges, faces	1.88	Up
0449: Other maize, unmilled	1.86	Medium
<b>FYR of Macedonia</b>		
1121: Wine of fresh grapes; grape must in fermentation	8.93	Down
1211: Tobacco, not stemmed/stripped	7.79	Medium
0121: Meat of sheep or goats, fresh, chilled or frozen	6.88	Medium
0129: Meat and edible meat offal, n.e.s.	3.29	Up
2924: Plants & parts of plants for perf., pharm., insecti.	1.42	Down

Product groups	LAFAY index	Market segment
		<b>Romania</b>
2484: Non-coniferous wood, sawn lengthwise, thickness>6mm	6.25	Medium
0012: Sheep and goats, live	5.72	Medium
2224: Sunflower seeds	5.19	Down
2482: Wood of coniferous species, sawn, sliced, thick> 6mm	4.88	Medium
2485: Non-coniferous wood, continuous. shaped, edges, faces	2.12	Medium
		<b>Serbia and Montenegro</b>
0583: Fruits and nuts, frozen, whether or not sweetened	17.86	Medium
0612: Other beet or cane sugar and pure sucrose, in solid	8.28	Medium
2484: Non-coniferous wood, sawn lengthwise, thickness>6mm	3.91	Down
0449: Other maize, unmilled	2.64	Medium
0579: Fruit, fresh or dried, n.e.s.	1.85	Down

Source: Own calculations based on the OECD data.

The SEE-7 specialise in different top five agro-food products to the EU-15 (Table 2). In addition, these specialisations differ by the degree of export specialisation and market type of market segments. A greater focus in the SEE-7 should be given towards the up-market segment products, which except for some primary raw bulk commodities are identified as a rare in the SEE specialisation to the EU-15 markets.

## 5 CONCLUSIONS

We find that inter-industry trade prevails in the SEE-7 agro-food trade with the EU-15 markets. The share of IIT is relatively low, indicating relatively low degree of integration of the SEE-7 agro-food trade with the EU-15, but the degree of IIT for the SEE-7 agro-food trade with the EU-15 tended to increase over time. These rising IIT structures imply an increase in the degree of the SEE-7 agro-food trade integration and reallocations of resources within the agro-food sectors. Vertical IIT represents the main component of IIT, but mixed results by the SEE-7 are found for the significance of high and low vertical IIT. Horizontal IIT is less significant. These results on vertical and horizontal IIT imply the presence of larger variations in the SEE-7 agro-food export-to-import unit values with the EU-15 markets. The predominantly inter-industry trade and vertical IIT in agro-food trade between SEE-7 and EU-15 incur adjustment costs in the SEE-7 agro-food sectors that are believed to be higher than in the case with prevailing horizontal IIT. The dominance of vertical IIT suggest that agro-food industries of SEE-7 and the EU-15 are developing in a complementary manner, which is lowering adjustment costs.

Variations in degrees and patterns of IIT by the SEE-7 countries are related to different paths of trade liberalization and adjustments to the EU-15. IIT trade types are also caused by impacts of the agro-food sector restructurings, comparative (dis)advantages, and economic growth. The SEE high vertical IIT is pertained to bulk raw commodities and to a lesser extent to processed intermediates. The SEE low vertical IIT is pertained to consumer-ready food and to a lesser extent to horticultural produce. The results imply a lack of the SEE quality competition in

consumer-ready food, which requires more advanced food processing and marketing. The SEE-7 specialises on the EU-15 markets toward few primary bulk raw commodities, but de-specialises in consumer-ready food.

The down-market produce segment pertains to the export-to-import unit values more than 15 per cent below the EU-15 average is the most significant segment in the EU-15 agro-food exports and imports. Within this group of produce we find mixed specialization patterns for the SEE-7 countries agro-food trade with the EU-15 markets. In the medium-market produce segment is identified a slight improvement in some SEE-7 countries agro-food exports to the EU-15 markets, but less in the up-market produce segment. The de-specialization patterns in the high quality agro-food produce segment confirm agro-food supply side problems in most of the SEE-7 countries to compete in exports on the EU-15 markets. The best performing the SEE-7 countries by agro-food specialization patterns with the EU-15 markets are found Bulgaria and the FYR of Macedonia. The variations in the results by the SEE-7 countries over time imply that the price-quality ranges are still rather unstable, with still less clear the SEE-7 agro-food trade specialization patterns on the EU-15 markets.

The harmonization and reduction of trade barriers to be consistent with principles of the World Trade Organisation (e.g. CHUANMIN, GUOJIANG, 2007), improvements in veterinary, fitosanitary and quality standards, and adjustments of agro-food policies in the SEE-7 countries towards the EU, including a greater inflow of foreign direct investments, are factors that are expected to reduce the SEE-7 agro-food trade costs. In addition, the speed up in the growth of IIT is also seen in the growth of relatively low incomes per capita in the SEE-7 countries as an important factor of consumer demand for high quality agro-food produce. The competitive pressures and market selection processes are expected to cause restructuring and adjustments of the SEE-7 agro-food sectors and agro-food marketing towards more efficient and competitive EU-15 markets as well as towards other markets in new EU member states from the Central and Eastern European region.

## ACKNOWLEDGEMENTS

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## COMPETITIVENESS OF COTTON AND WHEAT PRODUCTION AND PROCESSING IN CENTRAL ASIA

INNA LEVKOVYCH\*

### ABSTRACT

The purpose of this paper is to assess the progress of the transition process in the cotton and wheat sectors of Central Asian countries. The development of foreign trade may serve as an indicator of success of market reforms. Thus, we analyse the changes in the trade structure of agri-food sector and compute indicators for inter- (RTA Index) and intra-industrial trade (Grubel-Lloyd Index) for the period 1996-2005. We also discuss which policy measures are necessary for further economic integration of Central Asian countries into world markets.

**Keywords:** Agri-food sector, intra-industry trade, marginal intra-industry trade, Central Asia.

### 1 INTRODUCTION

Since the beginning of the 90s the countries from Central Asia are in transition process, characterised by reforms in the spheres of administration, policy and economy. The transition process concerns also the integration of these economies into international markets by adjustment of the trade regimes, i.e. trade liberalisation. On the one hand, with liberalization of foreign exchange relations enterprises and branches could take advantage of the positive effects of market co-ordination. On the other hand, the new conditions come together with enhanced competition on the factor and product markets. Enterprises and branches are going to be successful only when they put themselves in front of the challenges of a complex environment, define their competence and develop sustainably. This includes a certain specialization in spheres where comparative advantages exist. Following this deliberations, it could be concluded that the transition process is expected to be successful particularly in businesses and branches, in which they have succeeded to integrate themselves in the input markets as well as in the product markets. This means integration not only into the national, but also into the international market and ability of domestic producers to reach, keep and even to enhance positions on the

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international market under new circumstances. This can be used as an indicator of the successes of transition.

The aim of this study is to show the progress of the transition process in Central Asia measured by various trade indicators, like: RCA, Grubel-Lloyd index. We concentrate on the analysis of cotton and cereals trade as the pivotal products of this region. The analysis covers the years 1996-2005. In the discussion of the results, the political regulations which are responsible for the present situation as well as for the opportunities for further international integration are addressed.

This paper is structured as follows. The second chapter presents the methodological framework for analysis of trade flows. In Chapter 3, the current situation and structure of agro-food trade in Central Asia countries are described. The main results of the empirical estimations are discussed in Chapter 4. The conclusions of this study and policy recommendations are presented in Chapter 5.

## 2 METHODOLOGICAL FRAMEWORK

Several indicators for measuring inter- and intra-industry trade relations have been developed. In this paper we calculate revealed trade advantage Index (RTA) to measure the competitiveness of agri-food products and Grubel-Lloyd Index to measure the level of intra-industry trade. These indicators are complementary to each other insofar as they measure different aspects of trade relations.

**Inter-industry trade.** VOLLRATH (1991) and SCOTT and VOLLRATH (1992) build on the work of BALASSA (1963), developed an indicator of inter-industry trade, the relative trade advantage (RTA). This index considers exports as well as imports, and thus shows the net trade advantages. The RTA is defined as the difference between Relative Export Advantage (RXA) and the Relative Import Penetration Index (RMP):

$$(1) \quad RTA_{ij} = RXA_{ij} - RMP_{ij}, \text{ where}$$

$$(2) \quad RXA_{ij} = \frac{\left[ x_{ij} / \sum_{l, l \neq j} x_{ij} \right]}{\left[ \sum_{k, k \neq i} x_{kj} / \sum_{k, k \neq i} \sum_{l, l \neq j} x_{kl} \right]} \quad \text{and} \quad RMP_{ij} = \frac{\left[ m_{ij} / \sum_{l, l \neq j} m_{ij} \right]}{\left[ \sum_{k, k \neq i} m_{kj} / \sum_{k, k \neq i} \sum_{l, l \neq j} m_{kl} \right]} .$$

An RTA larger than 0 denotes competitive advantages, while values less than 0 indicate disadvantages.

PITTS and LAGNEVIK (1998) argue that because the results of the calculations depend on the size of country  $i$ , the Balassa Index is primarily suitable for comparing the competitiveness of different domestic sectors, but not of the same sector, among different countries. Thus, the RTA is mainly suitable for comparing competitiveness among sectors in one country and can be regarded as an indicator

of international competitiveness in the interpretation of VANEK (1968) and LEAMER et al. (1981). A further problem results from the fact that the Balassa Index is affected by trade and other policy measures and thus provides a biased view of international competitiveness. The RTA is not only more comprehensive than the original Balassa Index, it also has higher consistency with trade theories (FROHBURG and HARTMANN, 1997). The RTA is superior to the Balassa Index because it considers transit trade appropriately. In addition, the adjustments made in the summation account for the scale effect, thus reducing the bias induced by country size.

**Intra-industry trade:** The most popular indicator of intra-industry trade is the Grubel-Lloyd Index (GL) (GRUBEL and LLOYD, 1975) defined as:

$$(3) \quad GL_i(n) = \frac{(x_i + m_i) - |x_i - m_i|}{(x_i + m_i)} \text{ or } GL_i(n) = 1 - \frac{|x_i - m_i|}{(x_i + m_i)} .$$

The GL relates the difference between total trade ( $x$  and  $m$ ) and net trade to total trade for sectors differentiated at the  $n$  digit level. Thus, the GL measures the overall importance of intra-industry trade in total trade. The values of the GL are between zero and one, where  $GL = 0$  indicates that there is no intra-industry trade. The GL index is static in the sense that only one year is considered in its construction.

### 3 ROLE OF AGRICULTURE IN THE NATIONAL ECONOMY AND AGRI-FOOD TRADE

#### 3.1 Economic and institutional development – The macro level

The collapse of the Soviet Union led to political and economic transition processes in Central Asia. The objectives include the separation from Moscow and the implementation of an economic reform that foster the restructuring towards a market based economy. However, various indicators show that the progress was rather limited. Basically, the institutional environment in market economies should (1) allow people to act according to individual plans (economic freedom) and (2) to afford people to appropriate the rents resulting from their economic activities (appropriability). There are no indicators, which could measure the successes in this respect directly; however, various other indicators can be used to assess the success of the transition processes.

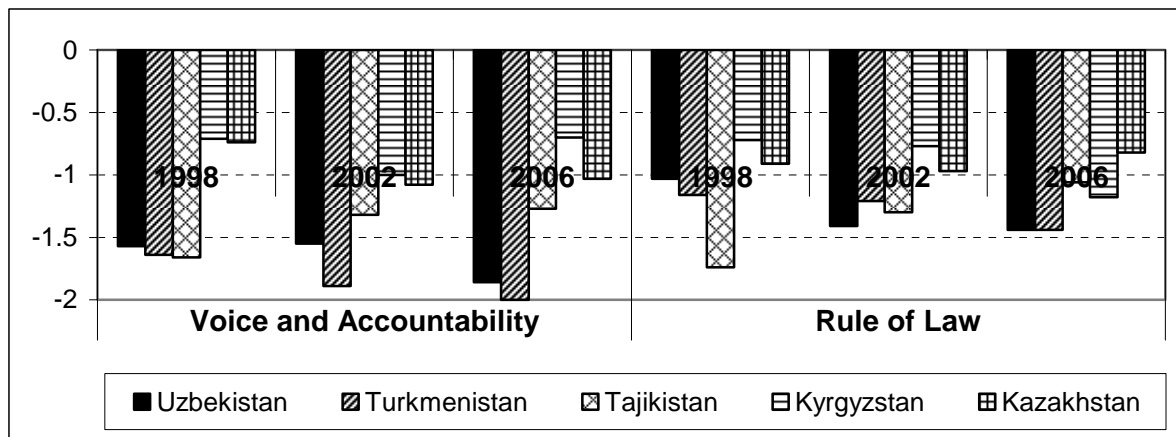
Widespread are the governance indicators provided by the World Bank (KAUFMANN et al., 2007)<sup>1</sup>. We selected the "voice and accountability" and two

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<sup>1</sup> The various indicators are calculated from a bundle of individual valuations using suitable econometric techniques. Additionally, the techniques normalize the scope of the indicators to range from 3 (very good) to -3(very poor), The indicators are Voice and Accountability,

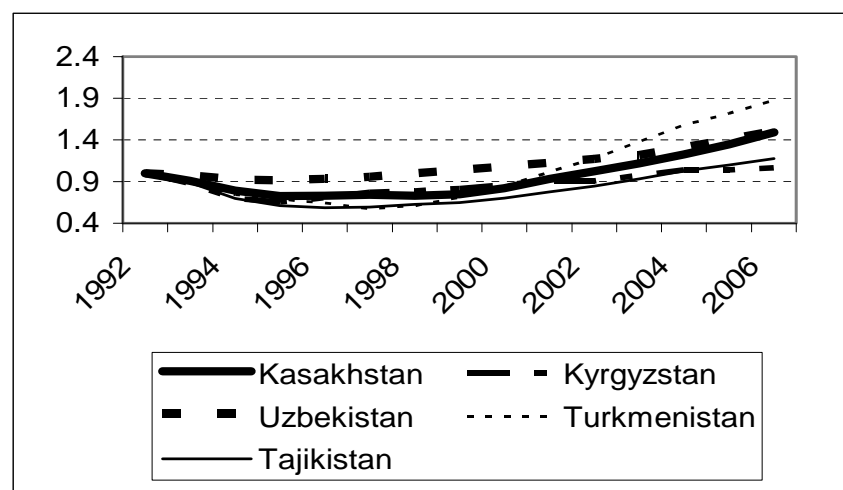
indicators which are most closely related to economic freedom and appropriability. Voice and accountability measure political freedom, which as such is closely related to economic freedom (Figure 1). The indicator "Rule of law" measures how easy it is to enforce individual rights, and is thus closely related to appropriability. Figure 1 provides that in all countries the indicators are negative and rather close to the lower bound than to the average. Moreover, there is only little indication that the situation has improved during the last decade. Thus, it can be concluded that only a small step regarding a successful transition has been made; decision and coordination mechanisms resemble those of prevalent under central planning.

**Figure 1: Selected key transition indicators, Central Asia, 1998-2006**



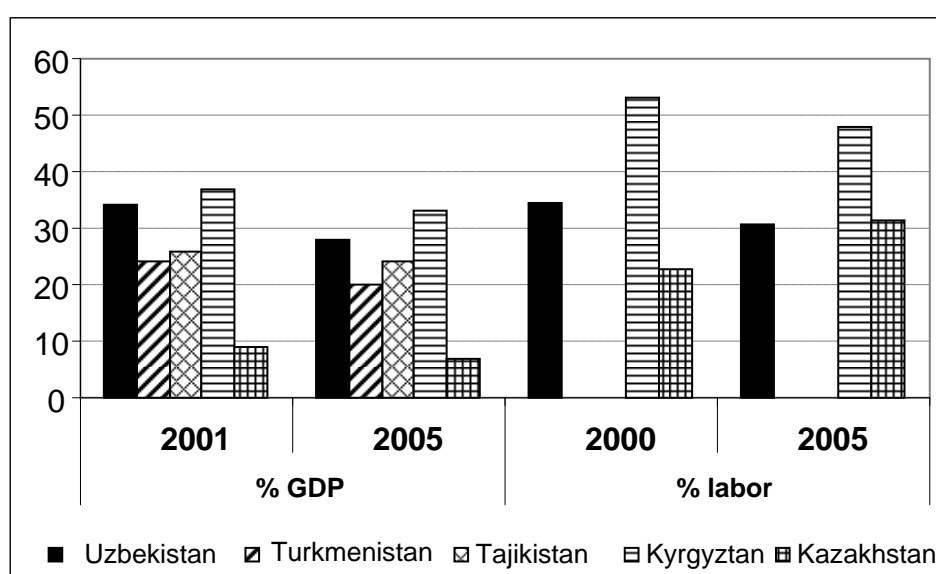
Source: KAUFMANN et al., 2007.

Despite the low transition processes GDP in 2007, it is considerably higher in all Central Asian countries compared to 1992 (Figure 2). All transition countries from Central Asia experienced a drastic decline of GDP until 1998. This depression was differently pronounced in the individual countries. While Tajikistan and Turkmenistan lost 40 % of their GDP, Uzbekistan managed to keep its economic performance almost at the pre-transition level. However, after 1998 considerable improvements could be observed. The highest growth occurred in oil-exporting countries, indicating that the developments are much more due to favourable prices on the world raw material markets instead of due to a beginning basic restructuring of the economy.

**Figure 2: GDP development in Central Asia, 1992-2006 (1992=1)**

Source: FAOSTAT, own calculations.

Figure 3 provides information about the significance of agriculture in Central Asian economies. The declining of the share of agriculture in GDP suggests that agricultural output followed another pattern than total output. A similar development can be observed for the share of agriculture in employment. However, except Kazakhstan, agriculture is still one of the most important employers in Central Asia, accounting for about 20-30 % of GDP and up to 50% of the labour force. Astonishingly, despite substantial economic growth agricultural labour' share in Kazakhstan is increasing. Shares of about 7% of GDP but 30% of employment suggest that the agricultural sector is characterized by strong hidden unemployment. Moreover, the increasing in agricultural labour share suggests that the sector has become more important as a basin of released labour from other sectors in recent years.

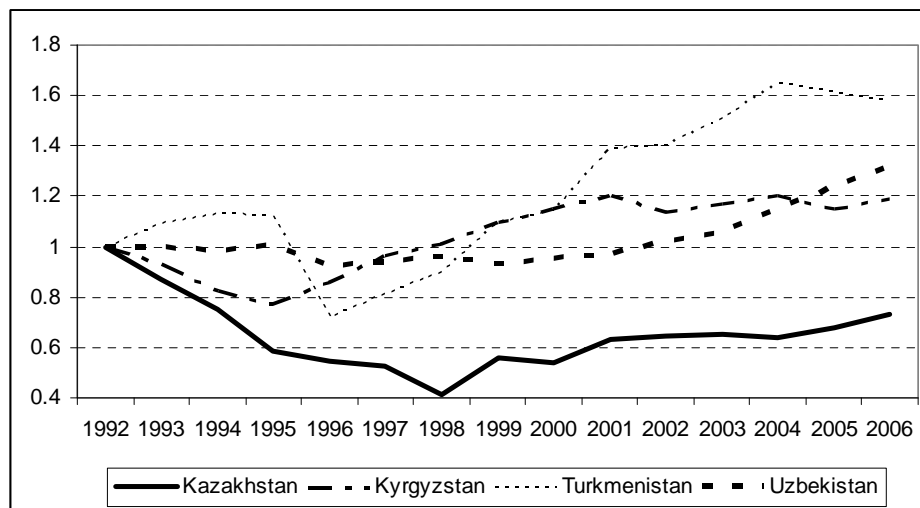
**Figure 3: Significance of agriculture in Central Asian economies**

Source: FAOSTAT, own calculations.

### 3.2 Agricultural development during transition

Basically, agricultural production followed a similar pattern like the overall GDP, although the developments are less pronounced (Figure 4). The drop of agricultural production of lower than the decline of total GDP, in addition the increase after 1998 is also smaller. An exception is Kazakhstan, where agricultural production has still not reached its pre-transition level.

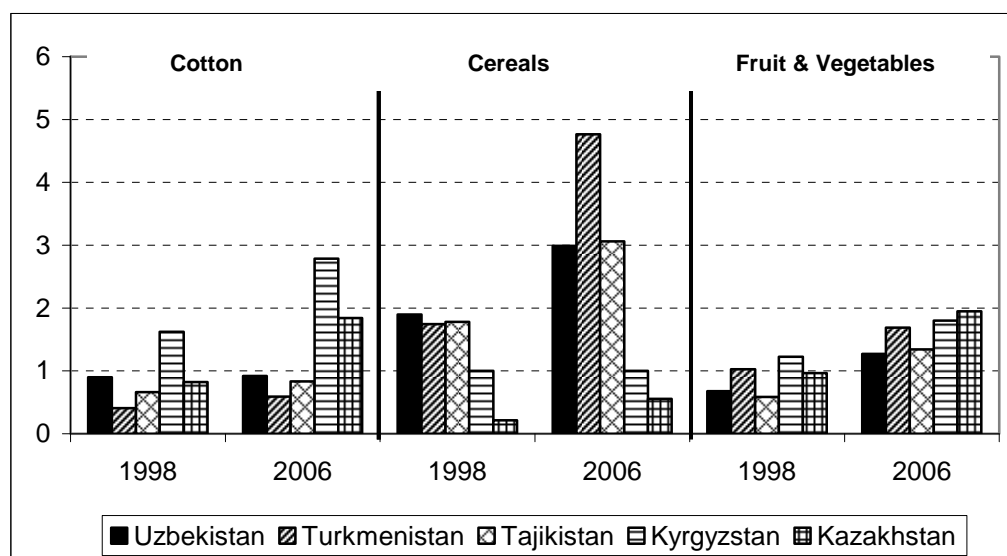
**Figure 4: Agricultural GDP, Central Asia, 1992-2006 (1992=1)**



Source: FAOSTAT, own calculations.

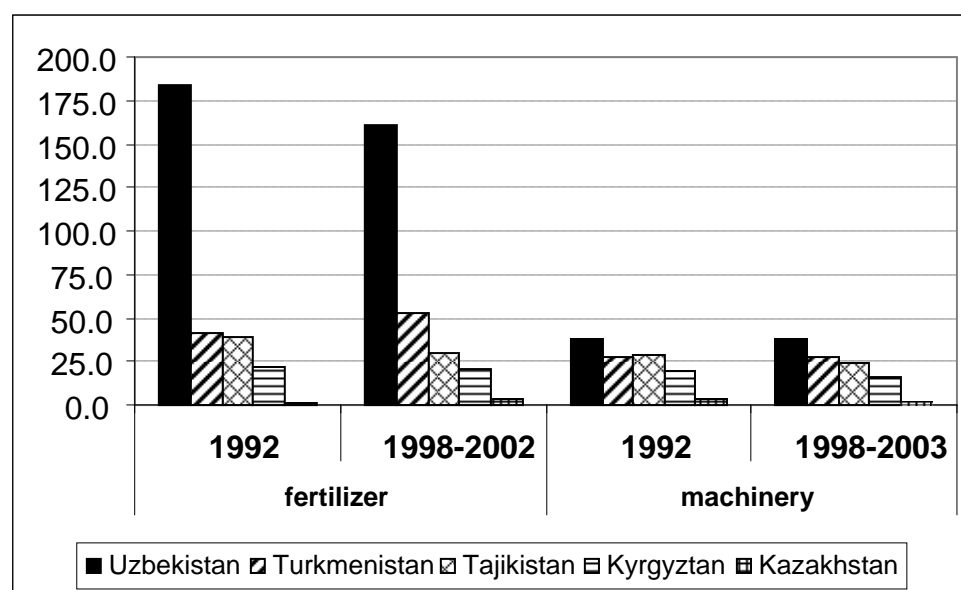
Crop production accounted for about 80% of total agricultural output. Only in Kazakhstan animal production with a share of about 40% of total output had a higher significance. Moreover, there is a strong specialisation on crop production. The three main crops are cotton, cereals (wheat), and fruit and vegetables. They accounted between 80 % (Kazakhstan) and 98% of total crop production.

Production developments for these products are shown in Figure 5. In most countries cotton production is still under its pre-transition level. Exceptions are Kyrgyzstan and Kazakhstan. Interestingly, cereals showed almost the opposite pattern. In Uzbekistan, Tajikistan and Turkmenistan cereal production experienced a steady growth, while in the other two countries it was decreasing. Remarkable is that cereal production in Kazakhstan is at about half as large as in 1992. Fruit and vegetable production was significantly larger in 2006 than in 1992 in all countries. The data suggest furthermore, the specialisation processes occurred mainly in the early years of transition, but that after 1998 the countries experienced a similar development. In addition, the data in Figure 5 provide information about structural change in production. In Turkmenistan, Uzbekistan and Tajikistan cereal production has gained; the same holds for fruit and vegetables, while cotton production was reduced. Contrary, in Kazakhstan and Kyrgyzstan, cotton production was intensified mainly on the cost of cereal production.

**Figure 5: Production indices for selected agricultural commodities, 1992 = 1**

Source: FAOSTAT, own calculations.

The use of purchased inputs in agriculture was in 2000 at about the same level as in the pre-transition period (Figure 6). This deviates from the development of former members of the Soviet Union, where input use in agriculture dropped significantly in the 1990s and has still not reached its pre-transition level. Because of lack of data, the development of factor input in Central Asia cannot be documented; however, one can assume similar developments of production and inputs. Moreover, considering that in 2000 agricultural production was as high as it was prior to transition, the data on factor use indicate that technological change had only minor influences on agricultural production but that output growth resulted mainly from the intensification of production.

**Figure 6: Factor use in Central Asian agriculture\***

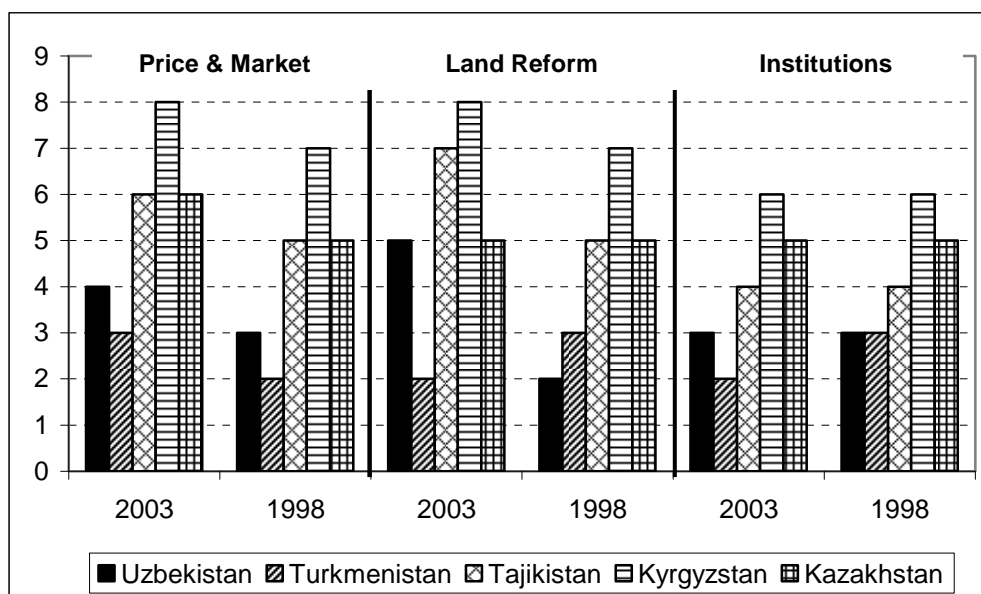
Source: FAOSTAT, own calculations.

Notes: \* Fertilizer in metric tones/1000 hectare, machinery in number/1000 hectares.

The transition period brought significant changes in agricultural land. By 2004, Turkmenistan had much more agricultural land than in pre-transition time due to extensive irrigation projects. Uzbekistan and especially Kyrgyzstan and Kazakhstan had gone through a period of serious land abandonment. In comparison to 1980 these countries used only 76%, 45% and 40% of agricultural land, respectively, in 2004. These changes can be attributed to purely technical reasons, but also to substantive changes in producer behaviour during the transition from plan to market.

Indicators of the progress regarding institutional reforms in the agricultural sectors are presented in Figure 7. The information was taken from CSABA and ZUSCHLAG (2004) who collected information about the liberalisation of agricultural markets (Price and Markets), farm restructuring and land privatisation (Land Reform), and the emergence of institutions supporting agricultural production (Institutions). Their indicators represent expert assessments ranging from 10 (finished) to 0 (yet not started). Although the values presented in Figure 7 are quite high, the Central Asian countries are lacking behind other transition countries, where the reforms and restructuring processes are almost completed. However, the best performance is observed for Kyrgyzstan. This observation is consistent with the information provided in Figure 1, the overall governance indicators. This pattern is also consistent with the fact that Kyrgyzstan is the only country in the region which is member of the WTO. The lowest progress is revealed for Uzbekistan and Turkmenistan. Moreover, between 1998 and 2003 there was not necessarily an improvement of the situation, in the contrary, stagnation regarding the development of the institutional environment and land reform could be observed in all countries.

**Figure 7: Indicators of the transition in the agricultural sector**



Source: CSABA and ZUSCHLAG, 2004.



Land reform and farm restructuring are not well advanced. Although land is privatized in most of the countries, due to institutional restriction, a land market does not exist. Moreover, although farm restructuring has started, the new agricultural enterprises resemble the former sovkhozes and kolhozes. This concerns not only farm size and specialisation of production but also the decision-making processes. Beyond, all countries were not successful in implementing supporting institutions. Agricultural extension services, research and development as well as a market information system do not exist or are only poorly developed. Beyond, public and private price controls and other market interventions have increased in all countries between 1999 and 2003. Moreover, imports and exports are often highly regulated. Various forms of interference exist ranging from the awarding of licences, price control, state control of exports as well as the erection of high technical barriers to trade. Only Kyrgyzstan, because restricted by its WTO membership, pursues a relative liberal trade policy.

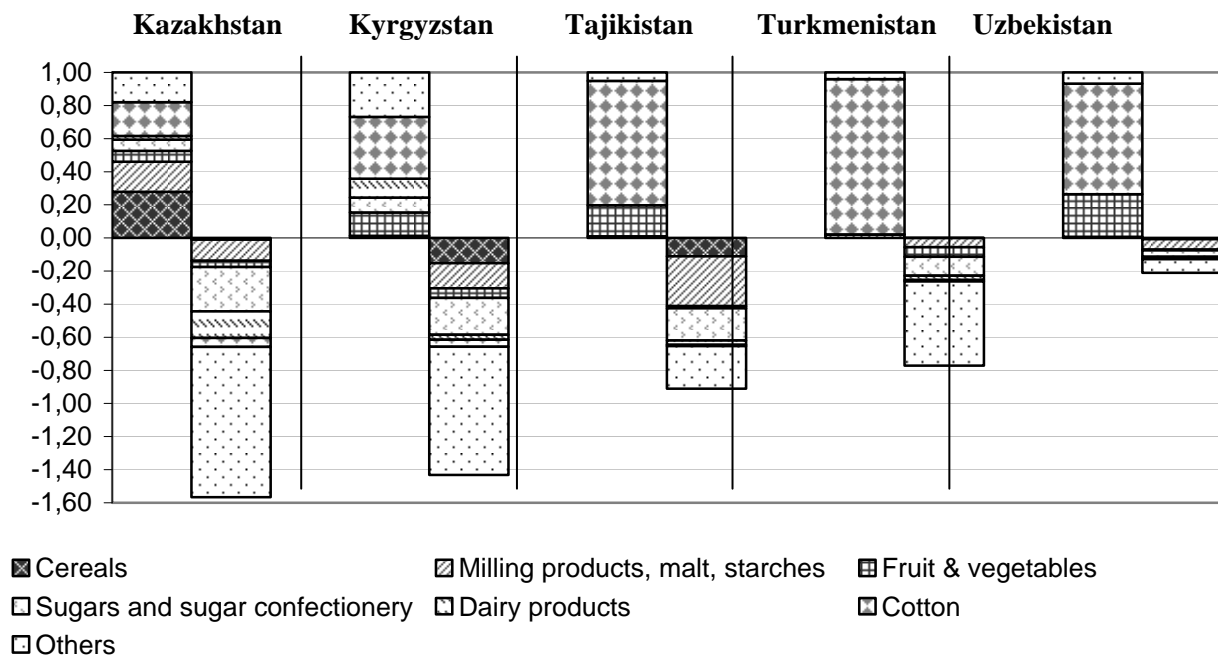
### **3.3 Agri-food trade**

Agricultural export of Central Asian countries is concentrated on a few product groups (Figure 8). Cotton and fruit & vegetables accounted in 2005 about 93-96% of agricultural export of Tajikistan, Turkmenistan and Uzbekistan. Moreover, the share of cotton in Turkmenistan's export was 94%. Kazakhstan and Kyrgyzstan have some differentiated export structure. The main export products of Kazakhstan are cereals, milling and cereals products and cotton. They accounted in 2005 about 66% of total agricultural export. Kyrgyzstan exports first of all cotton, fruit & vegetables, dairy products, tobacco and sugar. The trade specialisation is consistent with production specialisation. Agricultural import of Central Asian countries is more fragmented than the export. The share of individual products in import structure does not exceed 20%. Exception is Tajikistan. The import of milling and cereal products makes up about 30% of the total agricultural import. Sugar and sugar confectionery are important import goods for all Central Asian countries.

Looking at only agri-food trade, Uzbekistan is a net exporter of agri-food products, while other CA countries are net importers. Moreover, agri-food trade balance has worsened for these countries during the last five years. An important feature of agricultural export is that countries export more primary agricultural products and import processing products. The share of processing products in imports is 53% on average, while in exports it is only 20%.

Since Central Asia is not densely populated, it is astonishing that the countries did not manage to become net exporters of food products. This failure is mainly due to the extreme specialisation of the agricultural production introduced in the Soviet era. The information indicates, moreover, that the countries were not yet able to introduce production systems that allow a diversified agriculture appropriate to the natural conditions.

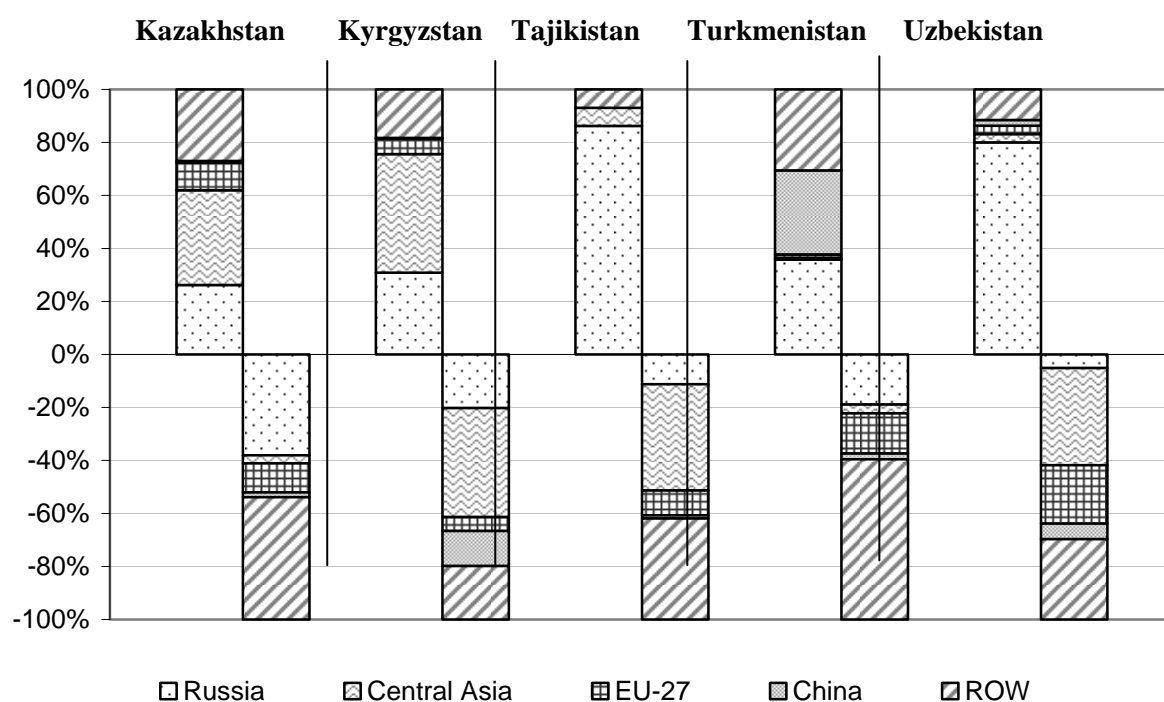
**Figure 8: Trade structure in Central Asia countries in cotton and agri-food products, 2005**



Source: Own presentation based on COMTRADE.

As far as the geographical structure of Central Asian countries' agricultural foreign trade is concerned, their largest economic partner is Russia (Figure 9). More than 80% of agri-food of Tajikistan and Uzbekistan goes to Russia. Other three Central Asian countries – Kazakhstan, Kyrgyzstan and Turkmenistan, have a bipolar geographical structure of export. Russia remains an important export market for central Asian countries, which also plays an important role for agricultural export. They accounted in 2005 for 40% of agri-food export of Kazakhstan and Kyrgyzstan. Russia and China are the main export markets of agri-food products for Turkmenistan. They absorbed in 2005 about 35% and 30% of its agri-food export.

On the one hand, this trade pattern is a typical picture as it would be expected when analysing trade with gravity models. However, on the other hand, the low regional diversification of exports shows that trade patterns implemented during the central planning period remains basically intact. To a large extent, this can be regarded as a consequence of the failures in implementing market oriented reforms in Central Asia.

**Figure 9: Structure of trade flows of Central Asian countries, 2005**

Source: Own presentation based on COMTRADE

## 4 ANALYSIS OF TRADE INDICATORS

Export and import statistics from the COMTRADE databank were used in the trade analysis with agricultural commodities and foodstuffs. In this study, we focus on trade from 1996-2005. The data includes 24 agri-food product groups for each Central Asian country. Agricultural commodities are included in section 01-15, and foodstuffs are under section 16-24 of HS 1996 Trade Classification. Cotton is added to these groups in order to get a more complete coverage of agricultural products.

### 4.1 Inter-industry trade

The relative trade advantage of agricultural commodities and foodstuffs, and cotton at world levels were evaluated. RTAs were calculated in a world context, as a measure of global competitiveness of central Asia's agri-food and cotton sectors. We calculated RTA indices at a two-digit level, according to HS 1996. Also, we calculated RTA for cotton at a four-digit level for identification of competitiveness of the good by different processing levels.

The main feature is that all Central Asian countries have a comparative advantage for primary agricultural products. For example, in Kyrgyzstan only 2 from 8 and in Uzbekistan 2 from 6 products with positive RTA-Indexes belong to processing agri-food goods. The positive level of RTA varies by country and by products significantly. For some products, RTA-Indices are close to zero, but for others is

the RTA-Index more than 100. Moreover, the development of RTA-indices over time shows that competitiveness of agri-food production has declined. An exception is Uzbekistan, where the RTA for most agri-food products in 2005 in comparison to 1996 has grown. Uzbekistan's products of animal origin, fruit and vegetables became more competitive on the world market (see Appendix).

#### *4.1.1 Cereals*

RTA Indices for cereals and products of the first and second processing stage are presented in Table 1. Except Kazakhstan, the RTAs are negative for all stages of production. Moreover, although the annual indices are fluctuating considerably, there is a tendency towards an increase of competitiveness in countries with negative RTA. However, in Kazakhstan RTA is decreasing suggesting a loss of competitiveness. These results are consistent with the developments of production presented in Figure 5, where it was shown that all countries except Kazakhstan experienced a substantial growth in cereal production.

Given the low level of economic development, it could be assumed that the competitiveness indicator is decreasing with a higher degree of processing. Due to processing activities, value is added insofar as relatively homogeneous products become vertically and horizontally differentiated. Moreover, these activities require facilities which possess appropriate technical characteristics in order to meet the various needs of the consumers. While competitiveness of agricultural raw products is to a large extent determined by natural conditions, a competitive advantage for processed products basically depends on the quality of the processing facilities, which in turn results in investment activities and thus, can be regarded as endogenous in the context of economic development. Because of the higher value added, firms (or countries) are more interested in being competitive with processed products. Implementing the corresponding technologies requires significant investment which can often be conducted in economically advanced countries only or in less developed countries by foreign investors. However, conducting significant investment requires a stable and reliable institutional environment allowing the investor to appropriate the benefits of his activities. Given the poor development of the governance indicators (Figure 1) and the low level of development, it follows that that one could expect a decrease in competitiveness with an increasing level of processing.

The data in Table 1 do not provide an unambiguous picture. While for the first processing stage (milling products), the expectation is usually confirmed, however, the trade indicator shows higher competitiveness regarding the second stage compared to raw materials and milling products. An exception is Kazakhstan. In this country and there is a decline of competitiveness with an increasing level of processing. The available data do not allow to provide a definite answer regarding the structure of competitiveness indicators, since economic consideration discussed may be biased by various other factors. In this context, the influence of interest

groups and/or individuals has to be mentioned. Often special branches are monopolized and trade restrictions regarding import are erected in order to have a full control of the domestic market. Because of the higher value added of highly processed products, it can be assumed that this effect will be more present at more advanced stages of the value chain.

**Table 1: RTA Index for cereals and cereal products, Central Asia, selected years**

		1996	1998	2000	2002	2004	2005
Kazakhstan	Cereals	22.7	6.9	11.1	6.5	5.0	2.3
	Milling products	12.6	4.8	3.7	1.4	4.7	6.7
	Cereal, flour preparations	-6.5	-2.3	-2.1	-1.4	-1.6	-1.8
Kyrgyzstan	Cereals	-7.5	-2.3	-12.8	-3.4	-1.5	-2.6
	Milling products	-30.9	-4.0	5.9	-6.5	-3.0	-7.3
	Cereal, flour preparations	-1.5	-4.3	-2.1	-1.3	-1.4	-0.7
Tajikistan	Cereals	-25.9	-13.5	-23.8	-6.7	-2.1	-5.5
	Milling products	-205.0	-47.7	-42.4	-60.7	-62.4	-74.6
	Cereal, flour preparations	-6.1	-10.7	-0.4	-6.2	-3.8	-4.8
Turkmenistan	Cereals	-2.5	-1.0	-0.8	-0.7	0.0	0.0
	Milling products	-0.9	-5.2	-3.5	-3.7	-1.2	-2.3
	Cereal, flour preparations	-1.7	-12.2	-4.0	-1.3	-1.0	-1.5
Uzbekistan	Cereals	-7.9	-5.9	-6.0	-3.5	3.0	-0.6
	Milling products	-5.3	-6.4	-10.4	-6.3	-19.5	-46.4
	Cereal, flour preparations	-7.3	-1.1	-0.5	-0.5	-0.7	-1.6

Source: Own calculations from COMTRADE.

#### 4.1.2 Cotton

The Central Asian countries have strong comparative advantage in cotton production (Table 2). However, competitiveness of cotton in the world market has decreased during the period under investigation. Only Kyrgyzstan shows a relative stable level of RTA for cotton in this time period. These developments also correspond to the production development mentioned in Figure 5. In addition, compared to cereals the level of the RTAs is considerably higher. This documents again the extreme specialisation in production and trade already mentioned in the context of Figure 8.

For processed cotton, we found the expected pattern of competitiveness indicators (see discussion in the previous section). All countries concentrate on raw cotton production without making significant efforts to appropriate the additional benefits resulting from the higher degrees of processing. In fact, most of the countries loose

their competitive advantage, in some years it turned even into competitive disadvantage.

With regard to the RTAs of processed cotton, high fluctuations of the indicator can be observed. This indicates that the countries rather pursue a sustainable long-term development strategy regarding cotton processing, but are reacting mainly towards short terms incentives on the world market. This problem will be picked up in the next section.

**Table 2: RTA Indices for cotton and cotton products, Central Asia, selected years**

		1996	1998	2000	2002	2004	2005
Kazakhstan	Raw Cotton	35.5	11.6	12.5	15.2	9.8	7.3
	Cotton yarn	0.3	-0.1	-0.2	-0.2	0.0	-0.1
	Woven cotton	0.0	-0.2	-0.2	-0.2	-0.1	-0.1
Kyrgyzstan	Raw Cotton	124.6	49.6	210.6	485.5	173.1	215.7
	Cotton yarn	0.5	0.1	0.5	0.3	0.7	5.1
	Woven cotton	2.2	0.8	0.5	0.8	0.0	0.0
Tajikistan	Raw Cotton	547.8	368.3	451.8	260.7	302.7	220.3
	Cotton yarn	6.0	1.4	-9.1	7.3	3.7	1.8
	Woven cotton	-5.5	10.6	8.6	5.1	4.2	2.9
Turkmenistan	Raw Cotton	694.2	246.2	597.0	28.5	29.0	18.6
	Cotton yarn	4.2	13.2	53.0	1.8	4.0	4.2
	Woven cotton	0.8	6.4	11.9	1.4	2.3	1.4
Uzbekistan	Raw Cotton	759.2	655.9	571.3	533.6	382.5	263.4
	Cotton yarn	0.7	15.7	13.0	21.2	14.2	12.5
	Woven cotton	-1.4	2.0	3.2	4.6	3.5	1.8

Source: Own calculations from COMTRADE.

## 4.2 Intra-industry trade

The analysis of Central Asia's intra-industry trade is based on unadjusted Grubel-Lloyd (GL) index. We concentrated on cotton and calculated GL-Index for all central Asian countries, because these products are most important in the trade structure. In order to diminish the heterogeneity problem, the GL index was calculated at the 4-digit levels of HS-1992 classification.

IIT in all Central Asian countries for all cotton products is at a rather low level. Only Kazakhstan achieved a noteworthy level. However, intra-industry trade of cotton follows a typical pattern insofar as it increases with the degree of processing. For instance, on average it accounted for 32%, 14% and 8% of the trade of woven cotton in Kazakhstan, Kyrgyzstan and Uzbekistan, respectively.

This corresponds to developments in world agricultural trade and supports the theoretical statement that IIT is more representative of the sectors with higher product differentiation. A positive tendency in the development of cotton's intra-industry trade is observed in Kazakhstan. The level of IIT has increased during the last 5 years and amounted to 13.7% in 2005. For other countries the level of IIT with total cotton, an average during 1996-2005, amounted about 1%.

**Table 3: IIT indices for total cotton trade and woven cotton, Central Asia, selected years**

		1996	1998	2000	2002	2004	2005
Kazakhstan	Total (Raw, Yarn and woven)	0.0	3.4	1.7	1.2	1.5	13.7
	Woven cotton	0.1	32.7	44.1	35	43.4	15.8
Kyrgyzstan	Total (Raw, Yarn and woven)	0.6	2.5	0.2	0.1	0.1	0.0
	Woven cotton	7.7	42.7	3.4	9.6	5.1	5.5
Tajikistan	Total (Raw, Yarn and woven)	0.0	0.1	0.0	0.3	0.3	1.0
	Woven cotton	1.3	0.2	1.7	2.6	0.4	0.3
Turkmenistan	Total (Raw, Yarn and woven)	1.6	2.3	0.2	0.2	0.5	0.4
	Woven cotton	1.3	1.2	1.7	6.7	3.6	6.8
Uzbekistan	Total (Raw, Yarn and woven)	0.2	0.2	0.3	0.3	0.2	0.1
	Woven cotton	19.8	8.8	8.8	3.2	2.9	6.8

Source: Own calculations from COMTRADE.

Looking at intra-industry trade by trading partners, the highest level of IIT is observed for Russia, Turkey and EU-countries (Germany, Italy). But these IIT flows are very instable. In the trade relation between Kazakhstan and Russia with woven cotton, the level of IIT accounted in 2000 for 43%, in 2003 – 8% and in 2005 IIT increased again to 17%. The same fluctuations are observed in the IIT with Germany from 69% in 2003 to 8% in 2004. These instabilities support the conclusion made in the last section, i.e. that the developments are due to short-term reaction to market changes and less the result of a pronounced and well defined development strategy.

With low level of intra-industry trade countries don't receive additional gains from trade resulting from the exploitation of economies of scale. This is also an indirect indicator of low technology transfer and innovation in the processing industry. The Central Asian countries, with the exception of Kyrgyzstan, are not members of the WTO. With trade liberalisation on global but also on regional level, cotton

industry (like industry with low level of IIT) will undergo significant structural transitions and therefore might face high adjustment costs.

## 5 CONCLUSIONS

In recent years, a substantial recovery of the Central Asian economies occurred. Interestingly, this development was not accompanied by significant reforms changing the supporting institutional environment towards more market oriented decentralized coordination mechanisms. This provides indication that economic growth is mainly due to favourable world market process for raw materials than due to a significant restructuring of the economy. The fact that the highest growth rates could be observed in Kazakhstan and Turkmenistan supports this interpretation.

The recovery of agricultural sector is lacking behind overall economic development. Similar to the economy market, oriented reforms for the sector are not pronounced. Beyond, agricultural production is highly concentrated on three kinds of production (cotton, cereals, fruit and vegetables). To some extent this concentration is caused by the natural conditions. However, a significant part of the extreme specialisation results from central planning and the fixation of specialisation. Especially with regard to cotton production, the countries might have not been able to adjust production to a level consistent with the natural conditions. Furthermore, there is only limited indication for the introduction of a coherent and consistent rural development concept.

The specialisation in production finds its expression in the agricultural trade flows. Exports are dominated by cotton, which accounts for up to 90% of the revenues. Only in Kazakhstan cereal export is significant. This trade patterns find their expression in the indicators applied to assess competitiveness. Basically, the results provide a competitive advantage for raw materials and disadvantages for processed products. This pattern is consistent with the expectations resulting from theoretical consideration regarding the specialisation of trade and economic development. However, there is some indication that the competitive indicators for highly processed food may be positively biased due to the implementation of trade restrictions which found their expression in the management and distribution of export and import licences as well as other technical barriers to trade.

The low levels of IIT indicate that most trade flows are the result of the specialisation of agricultural production, which in turn is due to natural conditions and former political decisions. In accordance with the theory, a significant part of IIT is rooted in factors specific to individual countries, such as: geographical closeness, shared border, same level of development, similar preferences, language, culture, institutional conditions and construction of transportation routes. This is particularly applicable in the case of trade with Russia.



In order to increase the competitiveness of the agri-food sector and integration into the world economy, it is important to increase quality, stability and efficiency of agricultural production. In this context political stability and consistent agricultural and trade policy are very important. Modernisation of the processing industry, improvement of the investment climate, governmental programs to support innovative projects allow strengthening of comparative advantages of Central Asian countries and the development of information networks and access to market information. Beyond, political stability and the implementation of market oriented reform together with the enforcement of the new rules appear to be indispensable for further sustainable development and successful integration into the world economy.

From this point of view, the conclusion derived from trade indicators those with stem from the discussion of the indicators of institutional development. However, since trade data are usually much easy and more comprehensive available than detailed information about institutional development, the analysis of trade flows may provide important insights regarding the failures or successes of the transition processes.

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