

## MANAGEMENT OF AGRARIAN RISK

This paper incorporates the interdisciplinary New Institutional Economics<sup>1</sup> and presents a comprehensive framework for analyzing the risk management in the agri-food sector. First, it specifies the diverse (natural, technical, behavioral, economic, policy etc.) type of agrarian risks, and the (market, private, public, hybrid) modes of their management. Second, it defines the efficiency of risk management and identifies (personal, institutional, dimensional, technological, natural) factors of governance choice. Next, it presents stages in analysis of risk management and for the improvement of public intervention in risk governance. Finally, it identifies contemporary opportunities and challenges for risk management in agri-food chain.

JEL: L25; D81; Q12; O17

Around the globe the issues of management of diverse (natural, market, criminal, policy etc.) risks in agrarian sectors are among the most topical in academic, business and policies debates.<sup>2</sup> In the last decades, newly evolving uncertainty, risks and crisis associated with the progression of natural environment, products and technology safety, social demands, policies, economy, and globalization, all they have put additional challenges on existing system of risk management in agri-food sector.

Most risks management studies in agrarian sector predominately focus on technical methods and capability to perceive, prevent, mitigate, and recover from diverse threats and risks.<sup>3</sup> In majority of economic publications a Neoclassical approach is applied, the risk is studied as other commodity regulated by market

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<sup>1</sup> *Bachev, H.* Effectiveness of Farms and Agrarian Organizations. - *Economic Thought*, 2012, N 4, p 46-77 (in Bulgarian); *Coase, R.* The Problem of Social Costs. - *Journal of Law and Economics*. 1960, N 3, p. 1-44; *Furuboth, E. and R. Richter.* Institutions and Economic Theory: The Contribution of the New Institutional Economics. Ann Arbor. The University of Michigan Press, 1998; *Williamson, O.* The Mechanisms of Governance. New York: Oxford University Press, 1996.

<sup>2</sup> *Babcock, B.* Economics of Risk Management in Agriculture, Center for Agricultural and Rural Development. Iowa State University, 2004; Risk management in food supply chains, CIPS, 2012; *Deep, A. and S. Dani.* Managing Global Food Supply Chain Risks, POMS, 2009; From the farm to the fork, EU, 2011; OECD. Managing Risk in Agriculture Policy Assessment and Design, 2011; *Olsson, A. and C. Skjöldebrand.* Risk Management and Quality Assurance Through the Food Supply. - *The Open Food Science Journal*, 2008, N 2, p. 49-56; Disaster Risk Management in food and agriculture. RRDRM, 2012; *Shepherd, R, G. Barker, S. French, A. Hart, J. Maule, and A. Cassidy.* Managing Food Chain Risks: Integrating Technical and Stakeholder Perspectives on Uncertainty. - *Journal of Agricultural Economics*, 2006, 57 (2), p.313-327; *Trench P., C. Narrod, D.Roy, and M.Tiongco.* Responding to Health Risks along Value Chain, New Delhi: 2020 Conference Paper-5, 2011; *Weaver, R. and T. Kim.* Contracting to Manage Risk in Food Supply Chains. IAMA, 2000.

<sup>3</sup> *Barker, G.* Tools for assessing and managing food chain risks. RELU, 2005; *Hefnawy, M.* Advances in Food Protection Focus on Food Safety and Defense. Springer, 2011; *Jaffee, S., P. Siegel and C. Andrews.* Rapid Agricultural Supply Chain Risk Assessment. World Bank, 2008.

supply and demand, and farmers' "willingness to pay" for an insurance contract in relations to agents risk aversion, risk probability and magnitude of damages modeled.<sup>4</sup> Nevertheless, market and private failures are acknowledged, and the needs for public intervention in agrarian risk management are increasingly recognized. At the same time, most risk management analyses largely ignore a significant "human nature" (bounded rationality, opportunism) based risks, the critical factors for the managerial choice such as the institutional environment and the transaction costs, and the diversity of alternative market, private, collective, public, and hybrid (in addition to the risk insurance) modes of risk management.

Despite the significant advancement in the risk management technologies and the "menu" of risk reduction, mitigation and coping strategies, a great number of failures and challenges (production, supply chain, food and human safety, environmental etc.) continue to persist in agri-food sector. Consequently, a greater attention is directed to the *system of governance* which eventually determines the exploration of technological opportunities and the state of agrarian and food security.<sup>5</sup> In Bulgaria studies on risk management as a whole<sup>6</sup> and in agrarian sector in particularly<sup>7</sup> are at the beginning stage.

### Types of agrarian risk and modes of risk governance

*Risk* related to agri-food sector is *any current or future hazard (event) with a significant negative impact(s)*. It is either an *idiosyncratic*, accidental, low probability, unpredictable event/threat, or it is a *systematic* - a high probability, "predictable" event/threat. The risk and threat could be of a *natural* (adverse weather, insect attract, catastrophic event), *technological* ("pure" technical failure), or *human* (individual or collective actions/inactions, "human nature") origin or a combination of them.

*Individual* behavior and actions causing risks may range from: agent's *errors* and *ignorance* (lack of sufficient knowledge, information, and training); *risk-taking (retention) strategy* of individuals (accepting "higher than normal" risk); *mismanagement* (bad planning, prevention, recovery); deliberate *opportunistic behavior* (pre-contractual cheating and "adverse selection", post-contractual "moral hazard");

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<sup>4</sup> Gerasymenko, N. and O. Zhemoyda. New Challenges for Risk Management in Agri-food Industry, EAAE, 2009; Managing Risk in Agriculture Policy Assessment and Design...

<sup>5</sup> Bachev, H. Igri-Institutions Economy. - Agriculture Economics and Management, 2000, N 3, p. 16-21 (in Bulgarian).

<sup>6</sup> Georgiev, R. Systematic approach to risk from external financial disbalances in Bulgarian economy. - Economic Thought, N 5, 2009 (in Bulgarian); Daneva, I. Investment risk management in the private pension systems. - Economic Thought, N 2, 2009 (in Bulgarian); Markov, K. Defining internal rules for risk management in the public sector) (in Bulgarian) <http://ejournal.vfu.bg/bg/pdfs>; Nikolova, N. Opportunities for risk management in corporate investment projects) (in Bulgarian), [http://www.tu-sofia.bg/faculties/mf/adp/nntk\\_files/konf-11/Materials/NAPRAVLENIE-8/8-9-Neli-Nikolova.pdf](http://www.tu-sofia.bg/faculties/mf/adp/nntk_files/konf-11/Materials/NAPRAVLENIE-8/8-9-Neli-Nikolova.pdf)

<sup>7</sup> Bachev, H. Risk management in dairy livestock-breeding. - Economy and management of agriculture, 2008, N 2, p. 39-51 (in Bulgarian); Bachev, H. Management of farm contractual relations. - Economy and management of agriculture, 2009, N 2, p. 38-50 (in Bulgarian).

*criminal acts* (stealing or destroying property, invasion on individual safety); *terrorist attacks* (contamination of inputs and outputs aiming “mass terror”) etc.

*Collective actions* which are source of risks are commonly related to: *economic dynamics and uncertainty* (changing industry and consumer demands, market price volatility, international competition, market “failures” and imbalances such as “lack” of labor, credit, certain inputs); *collective order* (“free riding” in big organizations, codes of behaviors, industry standards, strikes and trade restrictions, community rules and restrictions); or *public order* (political instability and uncertainty, evolution in informal and formal social norms and standards, public “failures” such as bad, delayed, under/over intervention, law and contracts enforcements, mismanagement, “inefficiency by design”), etc.

The agri-food sector risk could be *faced* by an agri-food sector component (e.g. risk *on* a dairy-farm, *on* a food processor, *on* a trader) or it could be *caused* by the agri-food sector (risk *from* farming, *from* food processing, *from* food-distribution etc.). The risk could be *internal* for the agri-food chain such as hazards caused by one element to another, and staying in or mitigating *within* the sector. It could also be *external* associated with hazard coming from outside factors (such as natural environment, government policy, international trade), and/or affecting external components (consumers, residents, industries, nature). Finally, the risks could be *private*, when it is taken by individuals, collectives, economic entities (households, firms, cooperatives), industries; or often is *public* affecting large groups, communities, consumers, society, future generations.

The risk is big when there is *great likelihood* of a risky event to occur and that is combined with *substantial possible negative consequences*. The latter may take a great variety of forms – e.g. damaged human and livestock health and property, inferior yields and income, lost market positions, missed investment and business opportunities, transformation or liquidation of activity, food and environmental contamination etc. When risk is considerable it would likely be associated with *significant costs* which sometimes are hardly expressed in monetary terms - e.g. human health and life hazards, degraded soils, lost biodiversity and eco-system services etc. Thus the “rational” agents maximizing their own welfare will be interested to *invest in risk prevention and reduction* (safeguarding, assurance, minimizing, eliminating possibility and negative consequences).

In a *narrow* (“technical”) sense the *risk management* comprises the individual, collective and public *action(s)* for reducing or eliminating risk and its negative consequences. In a *broader* sense the *risk management* is the specific *system of social order (governance)* responsible for a *particular behavior(s) of agents* and determining the way(s) of assignment, protection, exchange, coordination, stimulation and disputing diverse risks, rights, resources, and activities.<sup>8</sup> In the particular socio-economic, technological and natural environment, *the specific system of risk*

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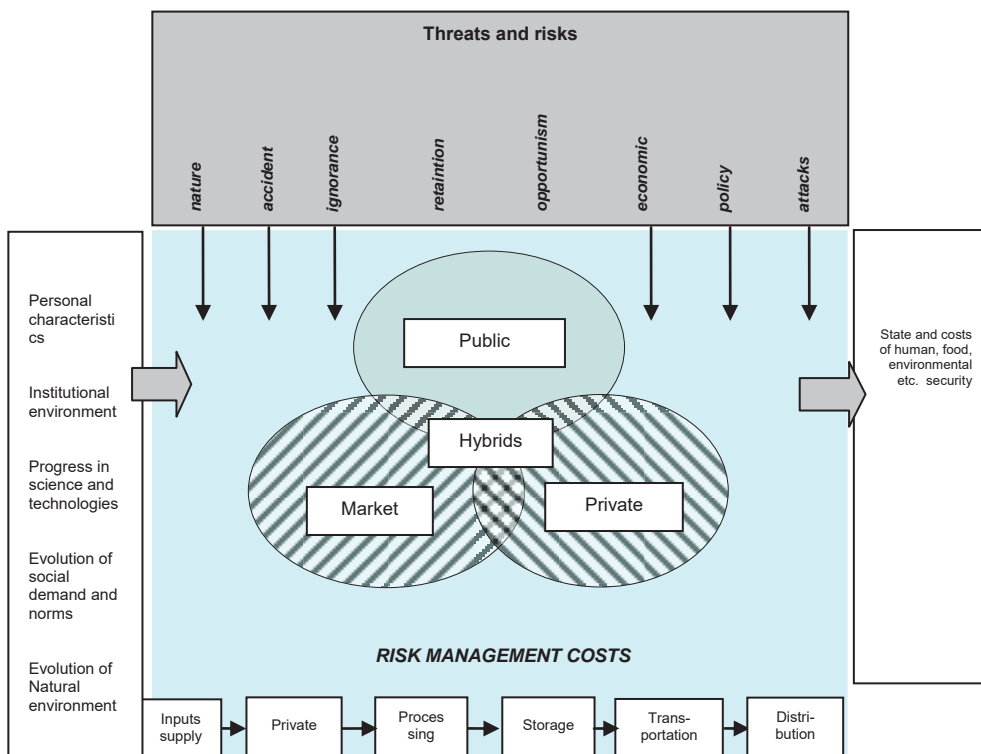
<sup>8</sup> *Bachev, H.* Modes, Challenges and Opportunities for Risk Management in Modern Agri-food Chains. - The IUP Journal of Supply Chain Management, 2012, N 9 (3), p. 24-51.

*governance* “put in place” is responsible for the efficiency of detection, prevention, mitigation, and reduction of diverse threats and risks and their negative consequences.

The generic *forms* and *mechanisms* of risk governance are (Scheme 1):

Scheme 1

Generic risks, factors, stages and modes of risk governance in agri-food sector



- *private modes* (“private and collective order”) - diverse private initiatives, and especially designed contractual and organizational arrangements tailored to particular features of risks and agents – e.g. private or collective codes of behavior, diverse (rational, security, future etc.) private contracts, cooperatives, associations, business ventures etc.;

- *market modes* (“the invisible hand of the market”) - various decentralized initiatives governed by the free market price movements and the market competition such as risk trading (selling and buying insurance), future contracts and options, production and trade of special (organic, fair-trade, origins) products etc.;

- *public modes* (“public order”) - various forms of a third-party public (Government, international) intervention in market and private sectors such as public information, public regulation, public ban, public assistance, public funding, public assurance, public taxation, public provision etc.

Sometimes, the risk management in the agri-food sector could be effectively done through “*self-management*” – e.g. production management, adaptation to industry and formal standards, “self-insurance” through keeping stocks, financial reserves etc. For instance, primitive forms of *on farm* risk management through improving *production management* are widespread such as control and security enhancement, application of appropriate (pest, disease, weather resist) varieties, technology and production structure, product diversification, dislocation etc. Similarly, *off-farm* enterprise (and income) diversification is a major strategy for risk management in most of the European farms.<sup>9</sup>

However, very often, the risk management requires an effective *governance of relations* with other agents – exchange and regulations of rights, alignment of conflicts, coalition of resources, collective or public actions at regional, national and transnational scales. Accordingly, a risk could be “managed” through a *market mode* (purchase of insurance, hedging with future price contingency contracts), a *private mode* (contractual or literal integration, cooperation), a *public form* (state regulation, guarantee, compensation), or a *hybrid* combination of other forms.

### **Evaluation of efficiency of risk management**

The individual modes of risk governance are with *unequal* efficiency since they have dissimilar *potential* to reduce the likelihood and the (negative) impact of risk, and command different *costs*.<sup>10</sup> Principally, the market or the collective governance has bigger advantages over the internal mode (“own protection”) since they allow the exploration of economies of scale and scope in risk prevention and bearing (sharing) negative consequences. However, the risk trading and/or sharing is often associated with significant *transaction costs* - for finding best partners, prices, formulating and disputing terms of exchange, coalition, safeguarding against new risk from opportunistic behavior of counterparts or partners etc. Consequently, *market and private sector “fail”* to govern effectively the existing and likely risks in agri-food sector, and there is a need for a “*state intervention*” in risk management - assisting farmers cooperation, public costs-sharing or provision, mandatory insurance regulation etc. Thus “*governance matters*” and applying a proper structure of risk management is an important part of the overall process of the optimization (effective allocation) of resources.

<sup>9</sup> *Bachev, H. and S.Tanic. Issues and challenges for farm and enterprise diversification and integration of small scale farmers into value chains in EECA. – In: Enabling Environment for producer-agribusiness linkages in EECA, FAO: Ankara, 2011.*

<sup>10</sup> *Bachev, H. Risk Management in Dairy Livestock-breeding..., p. 39-51 (in Bulgarian).*

Following Coase's logic<sup>11</sup> if *property rights* were *well-defined* and *transaction costs* were *zero* then all risks would be managed in the most efficient (socially optimal) way independent of the specific mode of governance.<sup>12</sup> Then individual agents would either sell out their risk to a specialized market agent, or safeguard against the risk through terms of a private contract, or join a risk-sharing organization of interested parties. The risk-taking would be distributed between (exchanged, shared by) agents according to their will while the total costs for risk prevention, assurance, reduction, and recovery minimized. The rational choice for an individual agent would be to get rid of a significant risk altogether – to sell the risk out to a specialized market agent (a risk-taker). Such totally decentralized (market) governance would optimize the risk-taking and minimize the “technological costs” for risk assurance and recovery exploring the entire potential for economies of size and scope at national and/or transnational scales.

However, when property rights are not well-defined or enforced and transaction costs are high then the *type of governance* is essential for the extent and costs of risk protection. For instance, an internal (ownership) mode is often preferred because of the comparative protective and costs advantages for “standard” natural or behavioral risk management over the outside (market or contract) modes. What is more, frequently the enormous transaction costs could even block the development of insurance market or the emergence of mutually beneficial (collective) risk-sharing organization. It is well known that despite the “common” interests and the huge potential for risk minimization the collective organization for risk-sharing are not or hardly developed by stallholders.

Furthermore, the formal and informal institutional restrictions could make some modes of risk governance impossible - e.g. risk assuring monopolies and/or cartel arrangements are illegal in many countries while most entrepreneurial risk-taking is endorsed (the “low risk - low profit” principle). Thus, not all modes of risk governance are constantly feasible in any socio-economic settings.

What is more, individual agents differ significantly in their capacity to recognize, take, pay for prevention, and manage a risk. For instance, a risk-taking farmer prefers risky but more productive forms - e.g. bank credit for a new profitable venture. Besides, the individual agents have quite different interests for an effective management of a particular risk(s) since they get unlike benefits and costs from the risk management.

Last but not least, there is no single *universal* form for the management of diverse types of risks and according to the *specific feature of each risk* (origin, probability, likely damages) there will be different most effective forms of governance. For instance, while a low probable “standard” (natural, criminal) risk could be effectively governed by a classical market contract (e.g. purchase of

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<sup>11</sup> Coase, R. Op. cit., p. 1-44.

<sup>12</sup> In such a situation some type of risks would not exist at all or would not be of importance – e.g. risks associated with unwanted human behavior.

insurance), most behavioral risks require a special private mode (branding, long-term or interlink contracts, vertical integration), a high damaging risk from a terrorist attack requires specialized public forms (intelligence, security enforcement) etc.

Hence, depending on the *kind and severity of risk*, and the *interests and personal characteristics of individuals*, and the *specific natural, economic and institutional environment*, there will be *different most efficient forms* of governing a particular kind of risk. Consequently, some *governance mix* will always exist to deal with diverse risks associated with the agri-food sector

In many cases, an *effective* risk management leads to a considerable reduction or removal of a particular type of risk. However, often complete risk elimination is either very costly (“unaffordable” to individuals, communities, and society) or practically impossible (when uncertainty associated with the future events is enormous, the transaction costs are very high etc.). For instance, certain natural risk will always exist despite the available system of risk management. Besides, it is practically impossible to write a “complete” contract (e.g. for insurance supply and trading risk) including all probable future contingencies, and the subsequent rights and obligations of each party. Consequently, some transacting risk will always remain.

Therefore, an effective risk management is usually connected with the needs for some *trade-off* between the benefits from reducing a particular risk (saved costs, minimized negative impacts) and the related *costs for risk governance*. Thus some “uncovered” risk would normally remain. Furthermore, an individual mode of governance could offer an effective protection from different (*multiple*) risks. Besides, an effective management of one type of risk might be associated with exposure to a new type of risk/costs – e.g. the vertical integration eliminates the “market risk” but creates a risk from opportunism of partners. Moreover, the level of the (overall) risk exposure is typically determined by the “critical” (most important) risk and the integral risk is rarely a sum of the individual risks.

Frequently, there are a number of possible (*alternative*) forms of governance of a particular type of risk – e.g. “risk to the environment” could be managed as voluntary actions of individual farmers, environmental cooperation, private contracts with interested parties, assisted by a third party organization, public eco-contact, public regulation, hybrid forms etc.<sup>13</sup> In certain cases, some forms of the risk management are practically impossible or socially unacceptable – e.g. insurance markets do not develop for many kinds of agro-food risks and the *private management* is the only option; the management of many environmental risks and challenges require *collective actions* at local, eco-system, regional or transnational levels etc. In modern societies many types of risks management are *publicly imposed* – e.g. food safety risk is under *public management* and harmonized in the EU, there are strict regulations on GM organisms, “precaution principle” is mandatory for the

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<sup>13</sup> *Bachev, H.* Eco-management in Bulgarian Agriculture - forms. - Economy and management of Agriculture. 2008, N 1, p. 33-43 (*in Bulgarian*).

environmentally related projects and carried out by the state authority, “safety nets” are organized as public projects etc.

Therefore, a *comparative analysis* is to be employed to select among (technically, economically, socially) *feasible alternatives* the most efficient one – which would reduce the overall risk to “*acceptable*” level, and which would require minimum *total* (risk assurance *and* risk governance) costs. The latter must include all current and future costs associated with the risk management – the *current* technological and management costs (for adaptation, compliance, information, certification), risk insurance premium, contracting and coalition costs as well as the (current and future) *long-term* costs for adaptation and recovering damages including associated *transaction costs* (disputes, expertise, low suits etc.) for claiming experienced losses<sup>14</sup>.

In any case an *individual, group, community, sector, chain, national and international* efficiency of the risk management have to be distinguished. It is often when elimination of a risk for one agent induce a (new) risk for another agent – e.g. the agri-food price fluctuation causes an income risk to the producers but benefits the speculators; the application of chemicals reduces risks for the farmers but produces significant negative effects (e.g. water, soil and air contamination) on the residents, consumers, affected industries etc.

Furthermore, the risk management is only a *part* of the overall governance of diverse (production, consumption, and transaction) activities of agents.<sup>15</sup> That is why the *total* efficiency (benefits, disadvantages, costs saving and risk minimization potential) of the various modes for the individual agents and the public at large are to be taken into account.<sup>16</sup>

According to the specific natural and socio-economic environment, the personal characteristics of individuals, and the social preferences, various *structure of risk governance* could evolve in different sub-sectors, industries, supply chains, and societies. In one extreme, the system of risk management would work well and only the “normal” (e.g. entrepreneurial) risk would be left “ungoverned”. In some cases, *market* (free-market prices, competition) would fail to provide adequate risk governance but a variety of effective *private modes* would emerge to fill the gap - special contractual and organizational arrangements, vertical integration, cooperation. Often, both market and private governance may fail, but an effective *public involvement* (regulation, assistance, support, partnerships) could cure the problem.

Nevertheless, there are situations when the specific institutional and risk management costs structure would lead to failures of market and private modes as

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<sup>14</sup> Most analyses of the agri-food risk management usually ignore the current and likely long-term *transaction costs* associated with the risk management.

<sup>15</sup> Most of agrarian innovations are driven by the transaction costs economizing reason (*Bachev, H. Effectiveness of farms and agricultural organizations...*, p. 46-77, *in Bulgarian*).

<sup>16</sup> Frequently minimization of the risk related costs is associated with an increase in production and/or transaction costs, and vice versa. Often the risk elimination costs of one agent brings about a higher security for another agent in agri-food chain etc.



well as of the needed public (Government, local authority etc.) intervention in risk governance.<sup>17</sup> Consequently, a whole range of risks would be left unmanaged which would have an adverse effect on the size and sustainability of agri-food enterprises, markets development, the evolution of production and consumption, the state of environment, and the social welfare.

Depending on the costs and the efficiency of the *specific* system of governance put in a particular (sub)sector, region, country, supply chain etc. there will be *unlike outcome* in terms of “*residual*” risks, and dissimilar *state and costs of human, food, environmental etc. security* in different regions and periods of time (Scheme 1). For instance, when there is inefficient public enforcement of food, labor, environmental etc. safety standards (lack of political willingness or administrative capability) then enormous “gray” agrarian and food sector develops with inferior, hazardous and counterfeit components.

### Factors of governance choice

The forms of management of agrarian risk depend on a number of factors (Scheme 1).

- *The risk features* like origin, probability of occurrence, likely damages, scale etc. are important factors for the governance choice. For instance, local technical or behavioral risk could be effectively managed though a private mode while most of market and environmental risks require collective actions at regional, national or transnational level. For a high probability and harmful risks the agents will prefer more secure (and more expensive) mode – e.g. security investment, purchase of insurance, keeping reserves, taking economic hostages, interlinked organization. Nevertheless due to the lack of economic means many small size farmers cannot afford related costs and practice no or primitive forms of risk management – cash and carry deals, product diversification etc. Here an intervention by a third party (Government, international assistance) is required though insurance, support, safety net etc. schemes to decrease farmers vulnerability.

- *The personal characteristics of agents* - interests, preferences, knowledge, capability, risk-aversion, reputation, trust, “contractual” power, opportunisms. For instance, some risks are not perceived (unknown) by private and public agents and therefore no risk management is put at all; in some cultures, the cooperative is the preferred mode of agrarian organization; experienced and trained farmer could design and manage a bigger organization (based on hired labor) and more outside (credit, insurance, inputs supply etc.) contracts adapted to his specific needs; a risk-taking entrepreneur prefers riskier but more productive (specialized, high margin) ventures etc.

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<sup>17</sup> Principally, when market and private modes fail there is a strong need for a public intervention in agriculture (Bachev, H. Effectiveness of farms and agricultural organizations..., p. 46-77, in *Bulgarian*).

The *behavioral* factors such as individuals' bounded rationality and opportunisms have been identified as responsible for the transaction costs, and thus for the choice of organizational mode.<sup>18</sup> They are widely studied in the insurance theory as a source for cheating by both sides of the contract.<sup>19</sup>

The agents do not possess full information about the economic system (risks, price ranges and dynamics, trade opportunities, policy development) since collection and processing of such information is very expensive or impossible (multiple markets, future events, partners intention for cheating). In order to optimize decision-making they have to spend on "increasing their imperfect rationality" (on data collection, analysis, forecasting, training, consultation) and selecting forms minimizing related risks/costs (internal organization, "selling out" risk etc.).

The agents are also given to opportunism and if there is an opportunity for some of the transacting partners to get without punishment extra benefit/rent from the exchange he will likely take an advantage of that<sup>20</sup> A *pre-contractual* opportunism ("adverse selection") occurs when some of the partners use the "information asymmetry" to negotiate better contract terms. A *post-contractual opportunism* ("moral hazard") occurs when some counterpart takes advantage of impossibility for full observation on his activities (by another partner, a third-party) or when he takes "legal advantages" of unpredicted changes in exchange conditions (costs, prices, formal regulations). *The third form* of opportunism ("free ride") occurs in development of large organizations where individual benefits are not-proportional to the individual efforts (costs) and everyone tends to expect others to invest in organizational development and benefit from the new organization in case of a success.<sup>21</sup>

It is often costly or impossible to distinguish the opportunistic from the non-opportunistic behavior because of the agents bounded rationality (e.g. a farmer finds out that purchased seeds are not of high quality only during the harvesting time). Therefore, agrarian agents have to protect their rights, investments, and transactions from the hazard (risk) of opportunism through: ex-ante efforts to find reliable counterpart and design efficient mode for partners credible commitments; and ex-post investments for overcoming (through monitoring, controlling, stimulating cooperation) of possible opportunism during the contract execution stage.<sup>22</sup>

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<sup>18</sup> *Williamson, O. Op. cit.*

<sup>19</sup> *Derrig, R. Insurance Fraud. - The Journal of Risk and Insurance, 2002, 69 (3), p. 271-287.*

<sup>20</sup> If there was no opportunism only risks related to the bounded rationality would remain (natural, technical) and consequences easily recovered with the cooperation and in a mutual benefit (risk sharing) of all parties.

<sup>21</sup> *Olson, M. The Logic of Collective Actions: Public Goods and the Theory of Groups. Harvard University Press, 1969.*

<sup>22</sup> *Williamson, O. Op. cit.*

In the agri-food sector the opportunism is widespread before signing an insurance contract (not disclosing the real information for possible risks) or during the contract execution period (not taking actions for reducing damages when a risky event occurs; consciously provoking damages in order to get insurance premium etc.).<sup>23</sup> That augments considerably the insurance prices and restricts the utilization of insurance contracts by farmers. On the other hand, farmers often “discover” the pre-contractual opportunism of the insurers only after the occurrence of a harmful event finding out that not all assurance terms (protected risks, extend of coverage of damages, ways of assessing damages, extra hidden costs) had been well explained and/or adapted to farmers needs in time of contract signing.

For many kinds of farm related risks the markets evolve very slowly and/or the insurance services are practically inaccessible by the majority of small operators. What is more, for many important risks an insurance is not available “for purchase at all” – e.g. the risk of lack of market demand for farm products, the fluctuation of prices, possible opportunism of the counterparts etc. That is why farmers have to develop other (private, collective) modes to safeguard their investments and rights or lobby for a public intervention in the assurance supply.

• *The institutional environment* (“rules of the game”) is an important factor for the management choice. For instance, in many countries some forms of risk governance are fundamental rights (on food, labor, environmental security and safety) and guaranteed by the state; a public income support to farmers is “institutionalized”; environment and food safety standards could differ even between different regions in the same state etc. Furthermore, the (external) institutional environment considerably affects the level of transaction costs – e.g. in recent years tens of thousands of European farms and processors have been closed due to the impossibility to adapt to (invest for) newly introduced EU standards for quality, safety, environmental preservation, animal welfare, certification etc.

Principally, in the conditions of stable and well-working public regulation (regulations, quality standards, price guarantees, quotas) and the effective mechanisms for laws and contract enforcement, a preference is given to the standard (spotlight and classical) market contracts. However, when rights and rules are not well defined or changing, and the absolute/contracted right effectively enforced, that lead to the domination of primitive forms of risk management (subsistence farming, personalized and over-integrated forms) and the high vulnerability to diverse (natural, private, market, contractual, policy) risks. The latter was the case during the post communist transition in Bulgaria characterized by the fundamental restructuring, the “rules change” and ineffective public enforcement, a high exposure to “new” (natural, market, entrepreneurial, private, contractual, institutional, international) risks by the newly evolving private

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<sup>23</sup> *Bachev, H. Management of farm contractual relations...*, p. 38-50 (in Bulgarian).

structures, unsustainable organizations, large gray economies, undeveloped or missing (agrarian credit, insurance, extension supply) markets, individual (e.g. thefts) and organized (e.g. providers of “security services”) risk introduction devastating the private businesses and the household welfare.

• *The dimensional characteristics of the activity and transactions* - the combination of uncertainty, frequency, assets specificity, and appropriability).<sup>24</sup>

When *recurrence* of the transactions between the same partners is high, then both sides are interested in sustaining and minimizing costs of their relations (avoiding opportunism, sharing risk, building reputation, setting up incentive, adjustment, and conflict resolution mechanisms). Here continuation of the relations with a particular partner/s and designing a special mode for transacting has a high economic value and the costs for its development could be effectively recovered by frequent exchange. When a transaction is *occasional* (incidental) then the possibility for opportunism is great since the cheating side cannot be easily punished by turning to a competitor (losing future business).

When *uncertainty* surrounding transactions increases, then costs for carrying out and securing transactions go up (for overcoming information deficiency, safeguarding against risk). Since bounded rationality is crucial and opportunism can emerge the agents will use such forms, which diminish transaction uncertainty – e.g. trade with origins; providing guarantee; using share-rent or output-based compensation; an obligatory collateral for providing a credit; participating in inputs-supply or marketing cooperative; complete integration.

The transaction costs become very high when *specific assets* for the relations with a particular partner are to be deployed. Here a costless alternative use of the specific assets is not possible (loss of value) if the transactions fail to occur, are prematurely terminated, or less favorable terms are renegotiated (in contract renewal time before the end of the life-span of the specific capital). Therefore, the dependant investment/assets have to be safeguarded by a special form such as a long-term or tied-up contract, interlinks, pledge taking, joint investment, quasi or complete integration.

If a high *symmetrical* (risk, capacity, product, timing, location) dependency of the assets of the counterparts exists (a regime of “bilateral trade”) there are strong incentives by both parties to elaborate a special private mode of governance (e.g. interlinking the credit, inputs and insurance supply against the marketing of output). A special *relational contract* is applied when detailed terms of transacting are not known at outset (a high uncertainty), and a framework (the mutual expectations) rather than the specification of the obligations of counterparts is practiced. Here partners’ (self)restrict from opportunism and are

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<sup>24</sup> First three factors are identified by *Williamson, O.* Op. cit., and the forth added by *Bachev, H.* Organization of agrarian innovations – Economy and management of agriculture, 1998, N 5, p. 18-32 (*in Bulgarian*).

motivated to settle emerging difficulties and continue relations (a situation of frequent reciprocal trade).

When a strong *unilateral* dependency exists (risk of unwanted “exchange”, quasi or full monopoly), then the dependent side has to protect the investments against possible opportunism (behavioral uncertainty/certainty) through integrating transactions (unified organization, joint ownership, cooperative); or safeguarding them with an interlinked contract, exchange of economic pledge, development of collective organization to withstand asymmetrical dependency (association for price negotiation, lobbying for Government regulations, etc.).

The activity and transacting are particularly difficult when *appropriability of rights* on behavior, products, services or resources is low. Because of the limited rationality, the costs for the protection, detection, verification, and a third-party (court) punishment of unwanted exchange are extremely high. The agents would either over-produce (e.g. negative externalities) or under-organize such an activity (positive externalities) unless they are governed by an efficient private or hybrid mode - cooperation, strategic alliances, a long-term contract, trade secrets, or a public support.

• *The progress in science and technologies* significantly improves the risk management and facilitates the diversification of its form. For instance, the introduction of new (resistant) plant and livestock varieties; the automation and standardization of operations and products; the application of information, forecasting, monitoring, storage, and transportation technologies, all they improve significantly the risk management in the agri-food chain.<sup>25</sup> The modern application of science and technologies is also associated with the production and/exposure to the new type of risks – e.g. green-house gas emissions, genetic contamination, natural resource depletion, technical over-dependency etc.

Finally, evolution of natural environment – global warming, extreme weather, plant and animal diseases, drought, flooding and other natural disasters, are posing series of new challenges for the risk management in the agrarian and food sector.<sup>26</sup>

Identification of the “critical factors” of the risk management choice, the range of practically possible forms, and their efficiency (costs and benefits) for individual agents, stages, subsectors, countries, food chains and public at large, is to be a subject for a special *micro-economic study*.

The *comparative analysis* is to be employed to select among the feasible forms the most efficient one – the one reducing the overall risk to an “*acceptable*” level and minimizing the *total* (risk assurance and governance) *costs*.

Most of the elements of the efficiency of risk governance are hardly to quantify – e.g. the individuals’ personal characteristics, the amount of risk, the

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<sup>25</sup> COST Foresight 2030. Benefiting from the Digital Revolution, Gent: COST, 2009.

<sup>26</sup> *Нелнавы, М.* Op. cit.

level of benefits and costs<sup>27</sup> associated with each mode etc. That is why a *qualitative (Discrete structural) analysis*<sup>28</sup> could be used. The latter matches the *features of a risk* to be managed (the probability, significance, acceptance level, needs for collective actions) with the *comparative advantages* (the effective potential) of the *alternative modes* to overcome, reduce, control, share, dispute, and minimize the overall costs of that risk.

In a *specific* market, institutional, technological and natural environment the effective risk governance choice will depend on the combination of the risk features (probability of occurrence, likely magnitude of damages) and the critical dimensions of the activity/transactions (appropriability, assets specificity and frequency).

Scheme 2

Principal modes of risk governance in the agri-food sector

Critical dimensions of activity  Risk features				Appropriability				PO
				High			Low	
				Assets Specificity				
				Low		High		
				Frequency				
		Low	High	Low	High			
Severity of damages	High	Probability /uncertainty	Low	M/CC	M/CC	SC	VI	PO
			High	M/CC	SC	CO	CO	
	Low		Low	na	na	SC	VI	Na
			High	M/CC	M/CC	TPI	VI	CO & TPI

Legend: M – free market; CC – classical (standard) contract); SC – special contract; VI – vertical (internal) integration; CO – collective organization, TPI – needs for a third-party involvement; PO – needs for a public organization; n.a. – not applied

Scheme 2 presents a matrix with the principal forms for the effective risk governance in the agri-food sector. For instance, highly probable and low

<sup>27</sup> The “measurement problems” associated with the transaction benefits and costs are well specified (Bachev. H. Effectiveness of agrarian organizations with accounting transaction costs. - Economy and management of agriculture, 2008, N 2, p. 13-20, in Bulgarian). They also prevent the utilization of the traditional (Neoclassical) models simply by adding a new “transacting”, risk management etc. activity (Furuboth and Richter. Op cit.).

<sup>28</sup> Operationalisation of the Discrete Structural Analysis of the economic organization is done by Williamson (Op. cit.).

damaging risks combined with a small assets specificity and appropriability usually do not necessitate (motivate, economically justify) *any risk management*. A high “standard” risk could be effectively managed through a *free market* mode such as a standard (*classical*) insurance, inputs supply, marketing etc. *contracts*. Highly probable and damaging risks with a good appropriability and frequency of transactions between the same partners require a *special* (e.g. relational) *contract*. The latter form is also appropriate for risks associated with low uncertainty, high assets specificity and appropriability, and occasional character of the relations between counterparts.

In general, risks combined with high specificity, appropriability and frequency could be effectively managed through a *vertical integration* (internal risk management, contract forward or backward integration for risk sharing or mitigation). Most probable and menacing risks combined with high assets specificity and good appropriability call for a *collective organization* (cooperation, collective action). Moreover, such risk/costs sharing organization could be easily initiated and maintained since the condition of a high risk and assets dependency is in place.

A serious transacting risk exists when the situation of assets specificity is combined with a high uncertainty, low frequency, and good appropriability. Elaboration of a special governing structure for private transacting is not justified, the specific (risk reducing) investments not made, and the activity/restriction of activity fails to occur at an effective scale (“market and contract failure”). Here, a *third-party* (private, public, NGO) *involvement* in the transactions is necessary (assistance, arbitration, regulation) in order to make them more efficient or possible at all. The unprecedented development of special origins, organic farming, systems of “fair-trade” are good examples in this respect. There is an increasing consumer’s demand (a price premium) for the organic, original, and fair-trade products associated with some forms of risk management - natural, poverty, labor and product quality, etc. Nevertheless the supply of the latter products could not be met unless effective trilateral governance including an independent certification and control is put in place.

Similarly, for risks with a low appropriability a third party (*public*) intervention is necessary to secure the effective risk management. Moreover, while a high probable low danger risks need a *collective organization assisted by a third-party* (a “quasi” public organization for risk sharing and mitigation), the high damaging risks necessitate a *public organization*.

### **Stages in the analysis and improvement of risk management**

The *analysis* and the *improvement* of risk governance in the agrarian sector is to include following *steps*:

*First*, identification of *existing* and *emerging* threats and risks in agri-food chain. The persistence of certain risks is a good indicator for ineffective manage-

ment. The modern science offers quite reliable and sophisticated methods for assessing various risks *to or caused by* the agrarian sector.<sup>29</sup>

*Second*, specifying *existing* and *other feasible modes* of risks governance, and assessing their efficiency, sustainability and prospects of development. The *efficiency* of individual modes shows the capability for risks detection, prevention, mitigation and recovery at lowest costs while the *sustainability* reveals the "internal" potential to adapt to socio-economic, technological and environmental changes and associated threats and risks. A holistic framework for assessing the efficiency and the evolution of governing modes is suggested in the literature.<sup>30</sup>

That stage is to identify the *deficiencies* of dominating (market, private, and public) modes to solve the existing and emerging risks, and to determine the *needs for a (new) public intervention*. For instance, when appropriability associated with the transaction/activity is low, there is no pure market or private mode to protect from associated risks. Emerging of special large-members organizations for dealing with low appropriability to cover the entire "social" demand/risk would be very slow and expensive, and they are unlikely to be sustainable in a long run ("free riding" problem). There is a strong need for a *third-party public intervention* in order to make protection of such a risk possible or more effective – either pure public organization (e.g. public assurance for high damage natural or economic disasters) or "quasi public" mode (collective organization assisted/ordered by a third party) for high probable lower damaging risks (Scheme 2).

*Third*, identification of the *alternative* modes for public intervention to correct (market, private, public) failures, assessing their *comparative efficiency*, and *selection* the best one(s). Comparative assessment is to be made on (technically, economically, politically) *feasible* forms as mode(s) minimizing the *total* risk management (implementing *and* transaction) costs selected. The analysis is to take into account the overall *private* and *social* costs – *direct* and *indirect* (individual, third-party, tax payer, assistance agency etc.) expenses, *and* the *private* and *public transacting costs*. The latter often comprise a significant portion of the overall risk management costs and are usually ignored by analysts – e.g. the costs for coordination, stimulation, mismanagement of the bureaucracy; for the individuals' participation and usage of public modes (expenses for information, paper work, payments of fees, bribes); the costs for community control over and for the reorganization of bureaucracy (modernization and liquidation of public modes), and the (opportunity) costs of public inaction, etc.

Initially, the existing and emerging problems (difficulties, costs, risks, failures) in the organization of market and private governance have to be specified. The appropriate public involvement would be to *create institutional environment* for: making private investments less dependent, decreasing uncertainty surrounding market and private transactions, increasing intensity of exchange, protecting

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<sup>29</sup> Trench P., C.Narrod, D.Roy, and M.Tiongco. Op. cit.; Hefnawy, M. Op. cit.

<sup>30</sup> Bachev, H. Governance of Agrarian Sustainability. New York: Nova Science, 2010; OECD. Managing Risk in Agriculture Policy Assessment and Design...



private rights and investments. For instance, the State establishes and enforces quality, safety and eco-standards, certifies producers, regulates employment relations, transfers management rights on natural resources etc., and all that increases the efficiency of market and private risk management.

Next, practically possible modes for increasing appropriability have to be considered. The low appropriability is often caused by unspecified or badly specified private rights and obligations. In some cases, the most effective government intervention would be to *introduce and enforce new private and group (property) rights* – on a diverse type of risk and its trading; on natural and biological resources; on food safety and clean environment; tradable quotas for products, inputs, emissions; private rights on intellectual agrarian property, origins etc. The intervention transfers the organization of transactions into market and private governance, liberalizes market competition and induces private incentives (and investments) in a part of agrarian risk management.

In other cases, it is more efficient to put in place *public regulations* for risk minimization: for utilization of resources, products and services (standards for labor, product, and environmental safety); introduction of foreign species and GM crops, and for water, soil, air contamination, comfort disturbance; ban on utilization of certain inputs, products or technologies; trade regimes; mandatory risk and eco-training and licensing of farmers.

Sometime, using the incentives and restrictions of the *tax system* is the most effective form for intervention. Different sorts of tax preferences are widely used to create favorable conditions for the development of certain (sub)sectors and regions, forms of organization, segment of population, or types of activities. For instance, environmental taxation on emissions or products (inputs, outputs of production) is applied to reduce use or emissions of harmful substances; tax exemption or reduction are used to assist overcoming the negative consequences of natural disasters etc.

In some cases, *public support* to private organizations is the best mode for intervention. Large programs for modernization, enterprise adaptation, income support, environmental conservation, public risk-sharing etc. are common in all developed countries. For instance, in the USA farm crop insurance has emerged as the most important farm program while insurance payments to farmers as the largest source of farm assistance.<sup>31</sup>

Often providing *public information, recommendations, and training* to farmers, entrepreneurs, and consumers in risk management is the most efficient form. In some cases, a *pure public organization* (in-house production, public provision) is the most effective one as in the case of critical infrastructure and activity (e.g. food safety inspections, hail prevention); research, education and extension; agro-meteorological forecasts; sanitary and veterinary control; recovery from the natural disasters and catastrophes etc.

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<sup>31</sup> Zulauf, C. and D. Orden. US Farm Policy and Risk Assistance. Issue Paper N 44, Genève: ICTSD, 2012.

Usually, individual forms are effective if they are applied along with other modes of public intervention. Necessity of *combined intervention* (governance mix) is caused by: complementary individual forms (joint effect); restricted potential of some less expensive forms to achieve a certain (but not the entire) level of socially preferred risk prevention and mitigation; possibility to get extra benefits (e.g. “cross-compliance” requirement for participation in public programs); specific critical dimensions of governed activity, risk; uncertainty (little knowledge, experience) associated with likely impact of new forms; administrative and financial capability of the State to fund, control, and implement different modes; and dominating policy doctrine.

The level of effective public intervention (governance) also depends on the kind of risk and the scale of intervention. There are public involvements which are to be executed at *local* (ecosystem, community, regional) level, while others require *nationwide* governance. And there are risk management activities, which are to be initiated and coordinated at *international* (regional, European, worldwide) level due to the strong necessity for trans-border actions or the consistent (national, local) government failures. Very frequently the effective governance of many problems and risks requires *multilevel* governance with a system of combined actions at various levels involving diverse range of actors and geographical scales.

The public (regulatory, provision, inspecting) modes should have mechanisms for increasing the competency (decreasing the bounded rationality, powerlessness) of bureaucrats, beneficiaries, interest groups and the public at large as well as for restricting the possible opportunism (cheating, interlinking, abuse of power) of the public officers and stakeholders. That could be made by training, introducing new assessment and communication technologies, increasing transparency, and involving experts, beneficiaries, and interest groups in the management of public modes at all levels. Application of “market like” mechanisms (competition, public auction) in the design, selection and implementation of public projects also increases incentives and decreases overall costs.

In general, *hybrid modes* (public-private partnership) are much more efficient than *pure* public forms due to coordination, incentives, control and cost-sharing advantages. Involvement of farmers, beneficiaries and interest groups increases efficiency, decreases asymmetry of information, restricts opportunisms, increases incentives for private co-investment, and reduces management costs.

If there is a strong need for a third-party public involvement but the effective (state, local authority, international assistance) intervention in the risk management is not introduced in a due time, then significant risks to individuals and public at large will persist while agrarian “development” is substantially deformed.

Dealing with many problems and risks in the agri-food sector/chain would require *multiform*, *hybrid*, *multilevel*, and *transnational* intervention. Therefore the appropriate *governance mix* is to be specified as a result of the comparative analysis. The latter let improve the design of the (new) public intervention according to the specific conditions of food-chain components in a particular country or region in terms of increasing security and decreasing costs. The suggested new approach also lets

predict likely cases of the (new) public failures due to impossibility to mobilize a political support and resources or ineffective implementation of otherwise “good” policies in the particular conditions. Since *public failure* is feasible, its timely detection permits foreseeing the persistence/ rising of certain risks, and informing the local and international community about likely consequences.

The risk management analysis is to be made at *different levels* – individual component (inputs supply, farm, processing, transportation, distribution, region, sub-sector, food-chain, national, international) according to the *type of risks* and the *scales of collective actions* necessary to mitigate the risks. It is not a single exercise ending in the last stage with a perfect system of risk-management. It is rather a *permanent process* which is to improve the risk-management along with the evolution of socio-economic and natural environment, the individual and communities’ awareness, and the modernization of technologies. Besides, the public (local, national, international) failure often prevails which brings us into the next cycle in the improvement of risk-management in agrarian sector.

For the application of suggested new approach, besides traditional statistical, industry etc. data, a *new type of data* are necessary for diverse type of risks and the forms of governance, their critical factors for each agent, the level of related benefits and costs etc. Such data are to be collected through interviews with the agri-food chain managers and entrepreneurs, stakeholders, and experts in the area.

### **Contemporary opportunities and challenges for agri-food risk management**

The modern agri-food chains involve millions actors with different interests, multiple stages, and diverse risks requiring a complex, multilateral and multilevel governance at a large scale. For instance, there are several millions of farmers, hundreds of thousands processing industries and traders, and 500 millions of end users in the EU. These figures become much bigger if we take into account the total number of global agents involved in the EU agri-food chains – farmers, processors, importers etc. from all over the world.

Various existing and emerging (natural, technological, health, behavioral) *threats and risks* along with the modern agri-food chains are well-identified.<sup>32</sup>

Diverse *market* and *private* modes have emerged to deal with the specific risks driven by ethics, competition, consumer demand, business initiatives, and trade opportunities – e.g. direct marketing, voluntary codes (professional and corporate social, labor, environmental etc. responsibility), industry standards, insurance schemes, guarantees, fair-trade, trade with brands, origins, organic and quality products etc.<sup>33</sup>

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<sup>32</sup> Humphrey, J. and O. Memedovic. Global Value Chains in Agri-food Sector, Vienna: UNIDO, 2006; OECD. Managing Risk in Agriculture Policy Assessment and Design...

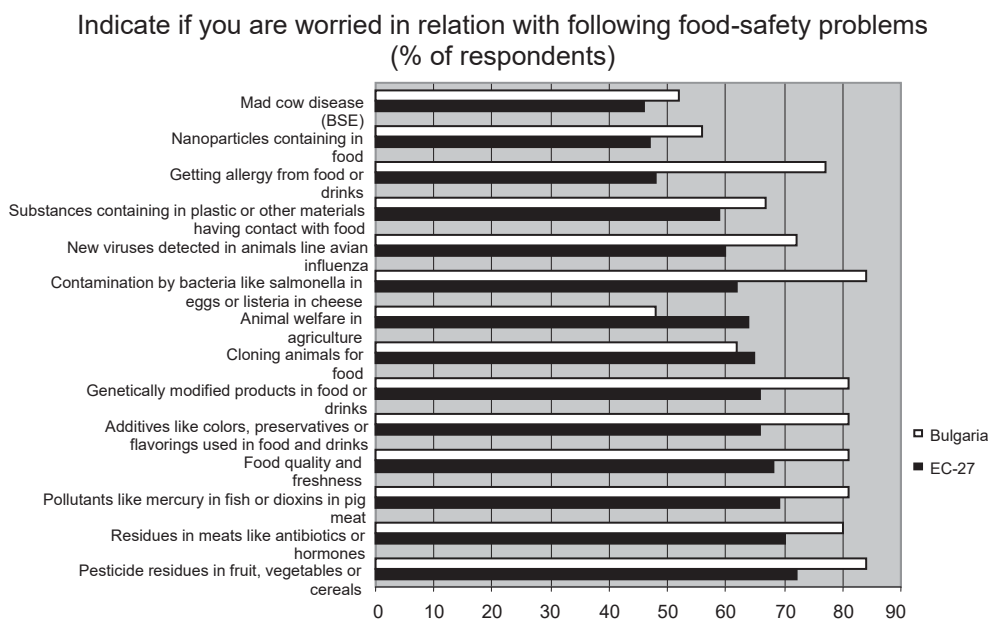
<sup>33</sup> Review of specific forms of agrarian risk management is done by *Bachev, H. Modes, Challenges and Opportunities for Risk Management in Modern Agri-food Chains...*, p. 24-51.

Furthermore, different *bilateral and multilateral private* forms are widely used to safeguard against the risks, explore the benefits, and facilitate the exchange – e.g. clientalisation, contractual arrangements, cooperation, complete backward or forward integration etc. Special *trilateral forms* have evolved to enhance security and partners and consumers confidence including an independent (a third-party) certification and inspection. Trade internationalization is increasingly associated with the *collective private* actions (standards, control mechanisms etc.) at a transnational and global scale (e.g. GLOBALGAP).

Property (security and safety) rights modernization, and market and private “failures” have brought about needs and modes for *public intervention* (assistance, regulations, provision) in agrarian sector. Moreover, the scope and stringency of publicly-imposed rules expands, constantly embracing new products, methods, dimensions (human, animal, plant, eco-health), hazards (GMC, nanotechnology, terrorism), and information requirements.

Furthermore, globalization of exchange, and threats and risks increasingly require setting up a *transnational public order* (ISO, WHO, FAO, WTO etc.). For instance, there are common (traceability, precaution, communication) principles, (food, veterinary, phytosanitary, feed, environmental etc.) legislation, and implementing and enforcing agencies (EFSA, ECDC, ECHA) for the agri-food chains in the EU (including for imported products).

Figure



Source: Eurobarometer 73.5, 2010.

Consumers' concerns about food-safety risks significantly have increased after the major food-safety "events"/crisis in recent years (e.g. Avian flu; Mad-cow and Foot-and-mouth diseases; poultry salmonella; contaminations of dairy, berries, olive-oil; natural and industrial disasters impacts). For instance, since 2005 there has been an augmentation of the respondents "worrying about food-safety problems" in the EU and it comprise a significant share now (see the Figure); as much as 48% of the European consumers (in Bulgaria 75%) indicate that the consumed food "very or fairly likely" can damage their health etc.<sup>34</sup>

There are a number of (*new*) *opportunities* for the risk governance in the agri-food chain:

*First*, advances and dissemination of the *technical* food-chain, training and risk-management *methods* (such as microbiological, genetic, electrical, laser, robotic, immunological, chemical and biosensors, nanotechnology, ICT etc.), the integral and food-chain *approaches*, and the research, monitoring, testing, decision, and forecasting *capability* for the risk-detection, assessment, prevention, and mitigation.<sup>35</sup> For instance, the advancements in detection, assessment and mitigation methods and technologies associated with the biological and chemical risks have been presented at a recent international conference.<sup>36</sup>

*Second*, modernization and *international* harmonization of the *institutional environment* (private, corporate, collective, NGOs, public food-safety and related standards, rules, enforcements etc.). For instance, EU membership improves considerably the "rules of the game" in the new member states like Bulgaria; market access rules, and/or "corporate responsibilities" induce agri-food sector transformation of exporting countries in Africa, Latin America and Asia.

*Third*, considerable development of the *specialization* of activities (including risk-taking, monitoring, management) and the *concentration of (integral) management* in the food-production, processing, servicing, and distribution - centralized innovation and enforcement; time, scale, and scope economies; easy third-party control etc. For instance, the market share of the three largest food-retailers comprise between 27-91% in the EU states;<sup>37</sup> the food-safety training, certification, inspection, and information are big international business.<sup>38</sup>

*Forth*, quasi or complete *integration* of the food-chain's consecutive or dependent stages creating mutual interests, and the effective and long-term means for risk-perception, communication, and management. For example, in Bulgaria the (raw) milk supply is closely integrated by the (dairy) processors

<sup>34</sup> Eurostat. Consumers survey, 2010.

<sup>35</sup> COST Foresight 2030, Benefiting from the Digital Revolution...; *Trench et al.* Op. cit.

<sup>36</sup> Exploring Multidisciplinary Approaches to Chemical and Biological Defense, Proceedings, DTRA & IIBR Workshop, June 19-23, 2011, Eilat.

<sup>37</sup> Eurostat. Consumers survey, 2010.

<sup>38</sup> *Humphrey, J. and O.Memedovic.* Op. cit.

through on-farm (milk collecting and quality control) investments and interlink (inputs, credit, and service supply against milk-delivery) contracts with stallholders, while dairy products marketing is managed by branding and long-term contracts – standards and bio-labels.<sup>39</sup>

Fifth, increasing consumers' "willingness to pay" for the food-safety attributes such as chemical and hormone bans, safety and inspection labels, original and special products etc.<sup>40</sup> The latter justify and make economically possible the paying-back of the costs for special governance.

Six, growing *consumers'* and *media* involvement, and the *national* and *transnational* (information, technical, managerial, training, certification) *cooperation* of partners and stakeholders improving agents choice, inducing public and private actions, enhancing risk-management communication, efficiency, and speed.

Modern development is also associated with a number of (*new*) *challenges* for the risk governance in the agri-food chain:

- emergence of new threats, risks and uncertainty associated with the evolution of *natural environment* (e.g. climate change, water stress, "new" plant, animal and human hazards etc.) as well as the new human induced *economic, financial, food, food safety, water, environmental etc. crises* at large (*transnational, global*) scales;

- increasing new threats, risks and uncertainty connected with the *inputs, technologies, and products* differentiation and innovation – e.g. Fukushima nuclear accident severely affected the agri-food sector;<sup>41</sup> there are uncertainties and safety concerns associated with the growing application of nanotechnologies and GMCs etc.;

- increasing specialization and concentration of activity and organizations which *separate* the "*risk-creation*" (incident, ignorance, opportunistic behavior) and the *risk-taking* (unilateral-dependencies, quasi-monopolies, spill-overs, externalities). That makes the risk-assessment, pricing, communication, disputing, and liability through (pure) market and private modes very difficult and costly. For instance, cheating, misleading, and pirating are common in the food-chain relations – high information asymmetry, and detection, disputing, and punishment costs. It is indicative that for the risk information consumers in the EU trust more to "health professionals", "family and friends", "consumers associations", "scientists" rather than "food producers" and "supermarkets and shops",<sup>42</sup>

- widespread mass production, distribution, and consumption increases *vulnerability* of the agri-food chain expanding the scope and the severity of

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<sup>39</sup> *Bachev.H.* Management of risk in dairy livestockbreeding..., p. 39-51 (*in Bulgarian*).

<sup>40</sup> *Trench P., C.Narro, D.Roy, and M.Tiongco.* Op. cit.

<sup>41</sup> *Behdani, B.* Japanese Catastrophe and the Dark Side of Global supply Chains [http://www.nextgenerationinfrastructures.eu/images/Japanese%20Catastrophe%20and%20the%20Dark%20Side%20of%20Global%20supply%20Chains%20\(1\).pdf](http://www.nextgenerationinfrastructures.eu/images/Japanese%20Catastrophe%20and%20the%20Dark%20Side%20of%20Global%20supply%20Chains%20(1).pdf)

<sup>42</sup> Eurobarometer 73.5, 2010.

natural, incidental, opportunistic, criminal or terrorist risks. For instance, in Europe there has been a progressive number of the official notifications based on the market and non-member countries controls, food-poisoning, consumer complaints, company own-checks, border screening and rejections;<sup>43</sup>

- increasing *adaptation* and *compliance costs* (capital, training, certification, documentation etc.) for rapidly evolving market and institutional environment which delay or prevent the reformation of smaller farms and food-chain enterprises.<sup>44</sup> For instance, in Bulgaria the dairy and meat processors adaptation to the EU standards have continued 10 years while two-thirds of them ceased to exist before the country accession to the EU;<sup>45</sup>

- public and private food quality and safety standards and the efficiency of their enforcement differ considerably among the industries, countries, and regions.<sup>46</sup> That is a result of *unequal norms* (e.g. GAPs, formal and informal rules) and *implementing* and *enforcing capability*, and/or deliberate *policies* or private *strategies* (e.g. multinationals sell the “same” products with unlike quality in different countries). The “double/multiple standards” are responsible for the inequality of exchange, and the dissimilar threats and risks exposure of individual agri-food systems;

- *wide spread “public failures”* in the food-chain (risk) management – bad, inefficient, delayed, under or over interventions; gaps, overlaps, infighting and contradictions of different agencies and rules; high bureaucratic costs; unsustainable and underfunding etc. For instance, the Bulgarian Food Agency was established with a 5 years delay; the EU Acquis Communautaire has not been completely implemented in the country (capability deficiency, mismanagement, corruption); trust to the European than the national institutions prevails etc. There are also numerous instances of the *international assistance* or *governance failures* when institutions are “imported” rather than adapted or designed for the specific local conditions;

- production, marketing, and consumption traditions, the high food or governance costs, the will and capacity deficiency, all they are responsible for the persistence of a large risky *informal/gray* agri-food sector around the globe without any effective control, and substandard, fake, and illegitimate products and activities. For instance, merely one-third of the Bulgarian dairy farms comply with the EU raw milk standards, only 0.1% possess safe manure-pile sites, a half of produced milk is home-consumed, exchanged or directly sold;<sup>47</sup>

- multiplying new treats and risks associated with the *adversary* (e.g. by a competitor) and the *terrorist* attacks, and the emerging *governing* and *exchange forms* (e.g. street-sells; internet, phone and mail-orders; shopping-trips). All they

<sup>43</sup> Eurostat. Consumers survey, 2010.

<sup>44</sup> Trench P., C.Narro, D.Roy, and M.Tiongco. Op. cit.

<sup>45</sup> Bachev.H. Management of risk in dairy livestockbreeding) p. 39-51 (in Bulgarian).

<sup>46</sup> Humphrey, J. and O. Memedovic. Op. cit., 2006.

<sup>47</sup> Bachev H. Management of Farm Contracts and Competitiveness. VDM Verlag, 2010.

require specific non-traditional risk-management methods and modes such as guards; policing; intelligence; multi-organizational and transnational cooperation etc.

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The analysis of the modes, efficiency and challenges of the risk management in agri-food chain let us make a number of academic, business and policies recommendations:

*First*, the *governance* (along with the technical, information etc.) issues are to take a central part in the risk management analysis and design. The type of threats and risks, and the specific (natural, technological, behavioral, dimensional, institutional etc.) factors, and comparative benefits and costs (including third-party, transaction, time) are to be taken into account in assessing the efficiencies, complementarities and the prospects of alternative (market, private, public and hybrid) modes. The system of risk management is to adapt/improve, taking advantage of the number of new opportunities and overcoming/defending against the evolving new challenges summarized in this paper.

*Second*, more hybrid (public-private, public-collective) modes should be employed given the coordination, incentives, control, and costs advantages. The (pure) public management of most agri-food-chain risks is difficult or impossible (agents opportunism, informal sector, externalities). Often introduction and enforcement of new rights (on food security, risk-management responsibility etc.), and supporting the private and collective initiatives (informing, training, assisting, funding) is much more efficient.

*Third*, a greater (public) support must be given to multidisciplinary and interdisciplinary research on (factors, modes, impacts of) the risk governance in agri-food chain in order to assist effectively national and international policies, the design of modes for public interventions, and the individual, collective and business actions for risk management.

2.XI.2012