

ENVIRONMENTAL MANAGEMENT IN AGRICULTURE

This paper incorporates the interdisciplinary New Institutional Economics and suggests a holistic framework for analyzing, assessing and improving the system of environmental management in agriculture. First, the importance of issue is presented and a short review on the state of economic studies in the area is made. The needs and mechanisms of agro-eco-management are clarified. Institutional, behavioral, technological, natural etc. factors of agro-eco-management efficiency are identified. The Discrete Structural Analysis is used and the principal market, private, and public modes for effective agro-eco-management are determined. Finally, stages for analyzing and improvement of eco-management in agriculture are presented.

JEL: JEL: O13; O17; Q12; Q18; Q24; Q28

The issue of “environmental management” in agriculture is among the most topical for scientific community, farmers, agri-business, residents of rural areas, interest groups, agrarian administration, politicians, international organizations etc.¹ Its significance is determined by the fact that agricultural activity is simultaneously a major factor for degradation and pollution of natural environment and an important contributor for conservation and improvement of nature. The interest in assessment of various forms of eco-management is particularly enhanced as a result of enormous public interest in growing eco-problems, risks and conflicts (such as degradation and pollution of soils, waters, air, biodiversity; decreasing eco-system services; extreme climate and frequent natural disasters; cultivation of genetically-modified crops; augmentation of garbage; depletion of natural resources; competition of agrarian resources with other industries and activities), ‘greening’ public policy (in particular the Common Agricultural and other policies of the European Union) and increasing amount of private and public costs for restoration and conservation of natural environment; and the necessity to design effective forms for eco-cooperation and public involvement in eco-management of local, national, and transnational importance.

Numerous studies on environmentally sustainable (traditional, conservation, ecological, organic, biological, alternative, biodynamic, regenerative etc.) agriculture predominantly focus on pure agronomic, technological and ecological aspects of eco-management. However, despite the existing “good agronomical and technological models” there is a great diversity in efficiency of eco-activity of different type of farms, sub-sectors of production, regions of an individual country, and in different countries. Consequently, in recent years attention increasingly is directed toward studying the system of management (*governance*), which eventually (pre)determines the eco-behavior of diverse agrarian agents, stimulates implementation of the good agro-ecological practices, eco-innovations and eco-investment, coordinates eco-activity on

¹ EC. Agri-environment Measures..., 2005; Barbu, 2012; Carruthers, G., 2005; Frouws and Tatenhove, 2008, p. 220–239; UNEP. Governance and Agriculture..., 2008; Millennium Ecosystem Assessment..., 2005; Scozzari, and Mansouri, 2011.

eco-system and/or regional level, reconciles evolving eco-conflicts, and determines (positive and negative) impacts of agriculture on natural environment.

In the economic theory the eco-management is studied in relation with the problems of “market failure”, commonly associated with: the problems associated with the utilization of “common natural resources” („tragedy of commons”), the production of “positive and negative externalities”, the impossibility for adequate “economic evaluation” of natural resources, and the multi-functionality of certain production producing “private and public goods”. In order to eliminate such failures “state intervention” in certain sectors, markets and activities is suggested – eco-regulations, eco-taxations, eco-subsidies, eco-contracts, eco-assessments, modernization of eco-rights.

Socio-economic aspects of agro-eco-management are widely studied in the literature.² Nevertheless, the research on eco-management in agriculture is at the initial stage due to: the relative “newness” of the problem, and the emerging “new challenges” (inter-sectors competition for natural resources, global climate change, depletion of non-renewable environmental resources), the fundamental development of economic theory in the last years, and the “lack” of long-term experiences and relevant data for the process and the efficiency.

Most studies focus on the specific aspect of natural resource management (management of soils, waters, biodiversity, agro-ecosystems services) without studying their relations. What is more, they are typically restricted to a certain form of governance (eco-product, eco-contract, eco-cooperative, industry eco-initiative, public eco-program), or a particular type of agricultural farm (family, agri-firm, cooperative), or management level (farm, ecosystem, national), or individual sub-sector of agriculture, or a specific location (region, ecosystem). Usually they study the pure and formal modes while various (and often more efficient) informal and complex forms (integral, interlinked) are ignored.

Besides, (uni)sectoral approach is broadly used, separating the farm governance from the overall management of the households and rural activity. The “legislative” (in comparison with some “ideal model’ or the “model in other countries”) rather than a comparative institutional analysis between feasible alternatives in the specific socio-economic and natural environment of a certain farm, region, sector, or country is employed. The significant transaction costs are not or only partially taken into consideration. (Uni)disciplinary approach dominates and efforts of researchers in economics, organization, sociology, law, ecology, technology, behavioral and political sciences are rarely integrated in studying that complex matter. There are few studies on specific institutional, economic, ideological, cultural, natural, etc. factors responsible for the big variation among countries, regions, industries, and organizations of agricultural activity.

² Baba, Tayfur, Gunduz, Howard, Friedel, and Chambel, 2011; Defrancesco, Gatto, Runge, Trestini, 2008, p. 114 -131; Dobbs and Pretty, 2008, p. 765–775; Ducos and Dupraz, 2006; Hagedorn, 2002; Hart and Latacz-Lohmann, 2004, p. 75-91; McCanna, Colbyb, Easterc, Kasterined, Kuperane, 2005, p. 527–542; Peerlingsa and Polman, 2009, p. 593-612.

In Bulgaria the problem of eco-management in general and in agriculture in particular is relatively new for the socio-economic scientists.³ Studies are predominately limited to individual private issues (biological agriculture, management of waters and agro-ecosystem services) or public measures and programs (agro-ecological measures of NPARD), restricted approaches are applied, and they cover short periods of time and participants in eco-management.

Defining agro-eco-management

Unlike the literal meaning of that word the “environmental management” means management of human activity for environment preservation and improvement. Eco-management in agriculture (or agro-eco-management) comprises the environmental management associated with the agricultural production – the management of eco-activities in the process of production of foods for people and animals, raw materials for industries, bio-energy, diverse agro and related services etc. In modern stage the agricultural production is carried out by different type of farms – individual, family, cooperative, corporative, public etc. Therefore, agro-eco-management is an integral part of the system of farm management and the system of eco-management in society. Regardless of the specific form it will always include the farmer as a major component, and will aim at improving his environmental preservation activity and behavior.

Maintaining and amelioration of the state of natural environment and its individual components (soils, waters, air, biodiversity, climate) requires an effective *social order* (governance) which is to regulate the behavior and the relations of various agents related to natural environment - a system of motivation and coordination of (eco)actions which is to induce *appropriate behavior*⁴ of individuals and *coordinated actions* at group, regional, national, and transnational levels⁵. It should involve management of activities, relations, and impacts of diverse agrarian (farm managers, resource owners, agricultural labor) and non-agrarian agents (upstream and down-stream businesses, consumers, rural residents, interest groups, agrarian administration) (see the Figure).

In certain cases, eco-management in agriculture is entirely archived through *individual actions* of autonomous agents (farms) within the “Sector Agriculture” - patterned area of the Figure. For instance, a good care for the privately owned agricultural land is typical in a family farm. However, the effective environmental management often necessitates *concerted (collective) actions* of a number of farms as it is in the case of sustainable use of a common pasture and limited water supply, protection of local biodiversity etc. Modern farming activity is frequently associated with significant (positive and/or negative) externalities which requires

³ Bachev, 2006, p. 27-37; 2008, p. 33-43; 2009, p. 3-20; Yovchevska, 2012, p. 25-34; Marinova, 2011, p. 69-76; Mitova, 2005, p. 40-45; Mochurova, 2008, p. 112-147; Stankov, Stankova and Kostov, 2005, p. 65-85..

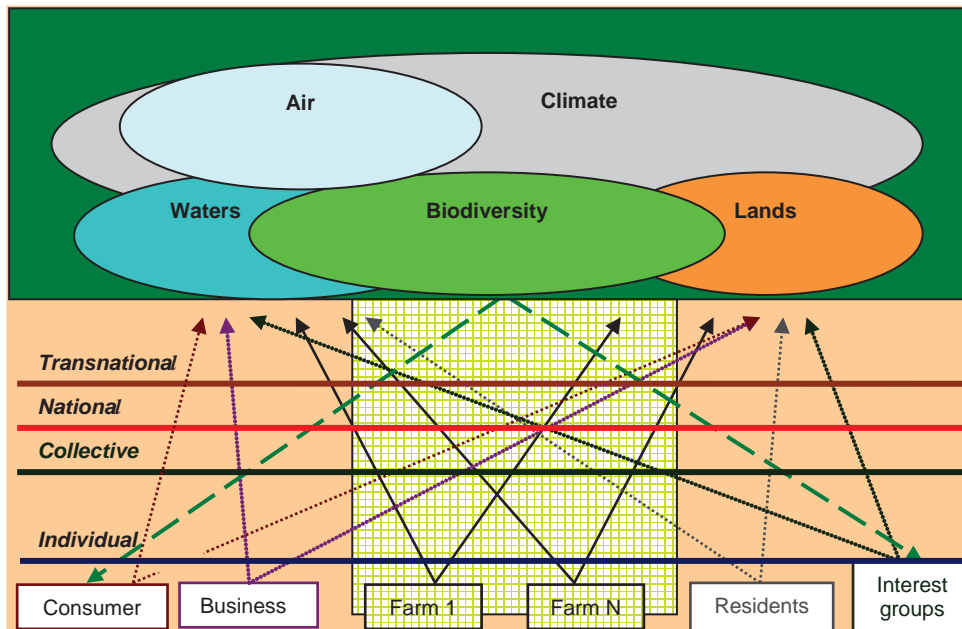
⁴ “Pro-environmental” actions, “anti-environmental” inactions.

⁵ Bachev, 2008, 2009.

managing relations (cooperation, reconciling conflicts, recovery of costs) between different farms, and increasingly between farmers and non-farmers. For example, adverse effects of agricultural activities on water and air quality are often felt by the residents and businesses in neighborhood or more remote regions. Minimization of the later is achieved through effective public intervention (regulation, control, sanctions). Similarly, agricultural contribution to the ecosystem services usually benefits a large number of residents, visitors of the region, businesses, and interest groups, which requires certain collective actions for sustainable supply.

Figure

Structure of environmental management in agriculture



In all these instances, environmental management goes beyond the simple (technical, agronomic, ecological) “relations with the nature” and embraces the governance of relations and collective actions of agents with diverse interests, power positions, awareness, information, capabilities in large geographical, sectoral, and temporal scales. Modern environmental management is also associated with growing needs for “additional actions” (monitoring, coordination, investments) and integral management of natural resources and eco-risks at national and progressively at transnational scale. The latter include water and garbage management, biodiversity conservation, climate change etc. issues, which demand effective regional, nationwide, international, and global governance. For instance, the effective management of the biodiversity “component” of the environment

includes multilevel (individual, sectoral, national, European, worldwide) and multilateral initiatives of numerous farmers - on the Figure the portion under biodiversity restricted with dotted arrows. The same is often true for waters, lands, air etc. management.

Evolution of the system of agro-eco-management in the society depends on multiple factors – *existing natural resources, processes of “natural” and “man-made” evolution of environment, the progress of science and technologies, social preferences and demand*. For example, the progress of science and technologies is associated with new challenges for the system of eco-management and gives new possibilities to overcome the existing eco-problems and risks. The management of water resources for instance, strongly depends on the advancement of water conservation, use, recycling and monitoring technologies. Likewise, development of social eco-preferences and demands provide new opportunities and restrictions for agricultural producers. At the same time, the acceleration of the process of global warming and extreme climate put up serious requirements for the modernization of eco-management in agriculture in many places around the globe.

The system of eco-management also depends on institutionally determined *eco-rights, norms and obligations* as well as on the practically possible market, private and public forms of management. For instance, often the choice of management mode is (pre)determined by the institutional restrictions as some forms for carrying out farming, environmental etc. activities could be socially unacceptable or illegal. For example, market trade of farmland, natural resources, and (some) eco-system services are not allowed in many countries.

Last, but not least, the choice of the form of agro-eco-management depends on the personal characteristics of agrarian and related agents – individual preferences, beliefs, ideology, knowledge, training, risk-aversion, tendency for opportunism, professional and financial capability, reputation, trust, power position etc. For instance, “sustainability movement” initially developed as voluntary initiatives of individual farmers applying eco-sustainable production. Similarly, specific benefits for individual farmers from the eco-management could take various forms - monetary or non-monetary income; profit; indirect economic benefits, pleasure of involvement in environment preservation activity, desire for preservation of nature for future generations etc.

Depending on the (efficiency of) specific system of management “put in place” the individual communities and countries achieve dissimilar results in environmental conservation and improvement as different state of natural resources, and levels of eco-risks and eco-costs can be observed.

Needs and mechanisms of agro-eco-management

According to (awareness, symmetry, strength, harmonization costs of) interests of agents associated with natural environment there are different needs for management of eco-actions in agriculture. For example, a farm has to manage its efforts and relations with another farm if both receive services from the same ecosystem, and affect (positively or negatively) service supply of that ecosystem.

Besides, both farms are to manage their relations with consumers of services from the ecosystem to meet total demand, mitigate likely conflicts, and compensate the costs for maintaining the ecosystem. Therefore, a particular farm is to be involved in *multiple* systems of governance in order to assure an effective supply of the services from ecosystems of which it belongs or affects. Unlike management of “pure” agricultural activity (where “simple” private and market mechanisms work well), the effective governance of agro-eco-activity often requires *complex (and multilateral) forms*. For instance, farm’s inclusion in the chain of “organic products” will coordinate well the relationships between producers and final consumers. However, the positive eco-effect could be insignificant, if simultaneously there isn’t any established mode for coordinating relations (co-activities) with other farms in the region or ecosystem.

Eco-behavior and eco-activity of agrarian agents are (could be) governed by a number of distinct mechanisms and mode. First, *institutional environment* (“rules of the game”) - that is the distribution of rights and obligations between individuals, groups, and generations, and the system of enforcement of these rights and rules.⁶ The spectrum of rights could embrace material and intangible assets, natural resources, certain activities, clean environment, food and environmental security, intra- and inter-generational justice etc.

A part of the rights and rules are constituted by the formal laws, regulations, standards, court decisions etc. In addition, there are important informal rules and rights determined by the tradition, culture, religion, ideology, ethical and moral norms etc. Enforcement of the rights and rules is done by the state, community pressure, trust, reputation, private modes, and self-enforcement. Institutions and institutional modernization create dissimilar incentives, restrictions and costs for maintaining and improving the natural environment, for intensifying eco-exchange and cooperation, for increasing eco-productivity, for inducing private and collective eco-initiatives and investment, for developing new eco- and related rights, for decreasing eco-divergence between social groups and regions, for responding to ecological and other challenges etc.

The institutional “development” is initiated by the public (state, community) authority, international actions (agreements, assistance, pressure), and the private and collective actions of individuals. It is associated with the modernization and/or redistribution of the existing rights; and the evolution of new rights and the emergence of novel (private, public, hybrid) institutions for their enforcement. For instance, Bulgaria’s membership to EU is associated with the introduction of the modern European eco-legislation as well as better enforcement of eco-norms (superior outside monitoring and sanctions for incompliance by the EU). At the present stage of the development many of the institutional eco-innovations are consequences of the pressure or initiatives of particular interests groups – eco-associations, consumer organizations etc. In modern society a great deal of the individuals’ activities and

⁶ North, 1990.

relations are regulated and sanctioned by some formal and informal institutions. However, there is no perfect system of preset outside rules that can manage effectively the entire eco-activity of individuals in all possible (and quite specific) circumstances and relations associated with the natural environment.

Second, market modes (the “invisible hand of market”) – those are various decentralized initiatives governed by the free market price movements and the market competition – spotlight exchange of eco-products and services, classical contract, production and trade of organic products and origins etc. The individual agents use (adapt to) markets profiting from the specialization and mutually beneficial exchange (trade) while their voluntary decentralized actions direct and correct the overall distribution of resources between different activities, sectors, regions, ecosystems, countries etc. Nevertheless, there are many instances of lack of individual incentives, choices and/or unwanted exchanges related to conservation of natural environment - e.g. missing markets, monopoly and power relations, positive or negative externalities etc. Consequently, free market “fails” to manage effectively the entire eco-activity, exchanges, and investments of individuals.

Third, private modes (“private or collective order”) – those are diverse private initiatives and special contractual and organizational arrangements – e.g. voluntary eco-actions, codes of eco-behavior, eco-contracts, eco-cooperatives and associations etc. The individual agents take advantage of economic, market, institutional etc. opportunities and deal with institutional and market deficiency by selecting or designing of new (mutually) beneficial private modes (rules) for governing their behavior, relations and exchanges. The private mode negotiates own rules or accepts (imposes) existing private or collective order, transfers existing rights or gives new rights to counterpart(s), and safeguards absolute and contracted rights. In the present stage a great part of the agrarian activity is managed by the voluntary initiatives, private negotiations, the “visible hand of the manager”, or collective decision-making. Nevertheless, there are many examples of private sector deficiency in governing of socially desirable environmental conservation.

Forth, *public modes* (“public order”) – these are various forms of public (community, government, international) intervention in market and private sectors - e.g. public guidance, regulation, assistance, taxation, funding, provision, property right modernization etc. The role of public (local, national, and transnational) governance increases along with the intensification of activity and exchange, and the growing interdependence of socio-economic and environmental activities. In many cases, the effective management of individual activity and/or the organization of certain activities through market mechanisms and/or a private negotiation would take a long period of time, be very costly, could not reach a socially desirable scale, or be impossible at all. Thus a centralized public intervention could achieve the willing state faster, cheaper or more efficiently. The public is “involved” is agro-eco-management through provision of eco-information and eco-education of private agents, through stimulation and (co)financing of their voluntary actions, through imposing a mandatory eco-order and sanctions in case of non compliance, through direct organization of eco- and

related activities (state eco-firm, scientific research, monitoring). Nonetheless, there are a great number of bad public involvements (inaction, wrong intervention, over-regulation, corruption) leading to significant problems of sustainable development around the globe.

The Table summarizes the evolution of forms of eco-management in the Bulgarian agriculture after 1989.⁷

Table

Evolution of agro-eco-management system in Bulgarian

Institutions	Private modes	Market modes	Public modes
Post-communist transition (1989-2000)			
Not well defined eco- and resource rights, bad enforcement; Sustainability concept absent	Provisional lease in contracts on natural resources; Unregistered farms; Firms; Cooperatives	Trade with informal brands, origins, and ecosystem services; Free (monopoly) agricultural water pricing	State and cooperative farms; Organization under privatization, liquidation and reorganization; Outdated system of eco-regulations, monitoring and information
Pre-accession to European Union (2001-2006)			
Better defined and badly enforced rights on agrarian and eco-resources, and contracts	Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes	Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing	Special Accession Program for Agrarian and Rural Development; Cross-compliance; Environmental regulations, standards, and agencies; Regulations for organic farming; Agricultural Advisory Service
EU membership (since January 1, 2007)			
Well-defined rights, and better enforcement; EU Community Acquis; Collective institutions	Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes; NGOs; Codes of behavior; Eco-labels	Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing; Insurance against natural disasters	EU eco-regulations and standards; EU Operational Programs; National programs for eco-management; National Plan for Agrarian and Rural Development; Direct payments; Advisory Service; Eco-monitoring and assessment; Protected zones (NATURA); Compensations for natural disasters; Mandatory eco-training; Garbage taxation; State companies for Natural Parks; Support to trans-border initiatives

The efficiency of individual management modes is quite different since they have unlike potential to: provide adequate eco-information, induce eco-friendly behavior, reconcile eco-conflicts and coordinate eco-actions of different parties, impact environmental sustainability and mitigate eco-risks, and minimize the overall environment management (conservation, third-party, transaction) costs, for agents with different preferences and capability, and in the specific (socio-economic, natural) conditions of each eco-system, community, industry, region, and country.

⁷ Detailed analysis is made by Bachev, 2008, 2009.

For instance, appropriate eco-information would be enough to induce voluntary actions by a “green” farmer, while most commercial enterprises would need outside incentives (price premium, cash compensation, punishment); market prices would usually coordinate well relations between water suppliers and users, while regulation of relations of water polluters and users would require a special private or public order; independent actions of farms would improve the state of local eco-systems, while dealing with most of (regional, national, global) eco-challenges requires collective actions in large geographical and temporal scales, etc.

Efficiency of agro-eco management

The problem of “social costs” does not exist in the conditions of zero transaction costs and well defined private property rights.⁸ Then the state of maximum efficiency is always achieved independent of initial distribution of rights among individuals and the mode of governance. All information for the effective potential of activity and exchange (optimization of resources, meeting various demands, respecting assigned and transferred rights) would be costlessly available to everybody. Individuals would costlessly coordinate their activities, and define and protect possessed rights, and trade resources in mutual benefit with the same efficiency over free market (adapting to price movements), and private modes of different types (contracts, firms), and collective decision making (cooperative, association), or in a nationwide hierarchy (a single private or state company). Then also optimal ecological requirements for sustainability, and the technological opportunities for economies (the maximum environmental conservation/enhancement and productivity of resources, “internalization of externalities”), and the maximum welfare (consumption, conservation of nature) would be easily/costlessly achieved.⁹

When transaction costs are significant, then costless contracting, exchange and protection of individual rights is impossible. The initial distribution of property rights between the individuals and groups, and their good definition and enforcement, are critical for the overall efficiency and sustainability. For instance, if the “right for clean and conserved natural environment” is not well-defined, that creates big difficulties for efficient eco-management – costly disputes between polluting and affected agents; not respecting interests of certain groups or generations etc. In conditions of well-defined rights, the eco-management is usually associated with significant transaction costs. They are for the identification of various rights and their effective protection (unwanted take over from others); studying out and complying with diverse institutional restrictions (norms, standards, rules); collecting needed technological, environmental etc. information; finding out

⁸ Coase, 1960, p. 1-44.

⁹ There is a *principle agreement* (“social contract”) for global sustainable development. Nevertheless, depending on specific social preferences the “social consensus” is not always a maximum preservation of nature. Often social priority is given to the economic growth at the “price” of certain degradation of natural resources - „over” pollution and emissions, unsustainable exploitation, complete exhaustion.

the best partners and prices; negotiating conditions of exchange; contract writing and registration; enforcing negotiated terms through monitoring, controlling, measuring and safeguarding; disputing through a court system or another way; adjusting or termination along with the evolving conditions of production and exchange etc.

In the real world with not completely defined and/or enforced rights, and positive transaction costs, the mode of agro-eco-governance is crucial and (pre)determine the extent of degradation, conservation and improvement of nature. That is because the different modes have *unequal efficiency* (benefits, costs) for governing the same eco-activities in the specific socio-economic and natural environment. Frequently the high transaction costs deteriorate and even block the organization of otherwise efficient (mutually-beneficial) for all participants' eco-activities and exchange.

A distinction should be made between the transaction costs and the proper conservation/"production" (agronomic, opportunity etc.) environmental costs. The later are a significant economic cost, which is to be recovered like other technological costs from the beneficiaries of the conserved nature. Sometimes that is the farmer, who invests in order to maintain the productivity of natural resources (soil fertility, water purity), and recover these costs similarly to the other investments thought flow of future benefits (productivity, profitability, market positions). Often these are other agents, who pay for used eco-services directly (buying eco-products and services) or indirectly (through collective organizations, taxes and fees).

The effective modes for agro-eco-management optimize the *total* (transaction *and* conservation costs) for agrarian activity – minimizing transaction costs and allowing (otherwise mutual beneficial) eco-exchange to be carried out in a socially desirable scale, and allowing achievement of minimum/optimum ecological requirement and/or exploration of pure technological economies of scale and scope of farm, environmental conservation etc. activity.

Usually there are a number of alternative modes for governing of eco-conservation activity. For instance, the supply of "environmental preservation service" could be governed as: a voluntary activity of a farmer; through private contracts of the farmer with interested or affected agents; through an interlinked contract between the farmer and a supplier or a processor; through a cooperation (collective action) with other farmers and stakeholders; through a (free) market or assisted by a third-party (certifying agent) trade with special (eco, protected origins, fair-trade) products; through a public contract specifying farmer's obligations and compensation of costs; through a public order (regulation, quota for use of resources/emissions, taxation); within a hierarchical public agency (company) or by a hybrid form.

The different management modes are alternative but not equally efficient modes for the organization of eco-activity. Each form has distinct *advantages* and *disadvantages* to protect eco-rights and investment, coordinate and stimulate

socially desirable eco-behavior, explore economies of scale and scope, save production and transaction costs. The *free market* has big coordination and incentive advantages (“invisible hand”, “power of competition”), and provides “unlimited” opportunities to benefit from the specialization and exchange. However, the market management could be associated with a high uncertainty, risk, and costs due to the lack of (asymmetry) of information, low “appropriability” of some rights (“public good” character), price instability, a great possibility for facing an opportunistic behavior, situation of “missing” or “undeveloped” markets.

The *special contract form* (“private ordering”) permits a better coordination and intensification of eco-activity, and safeguards agent’s eco-rights and eco-investments. However, it may require large costs for specification (and writing) contract provisions, adjustments with constant changes in conditions, enforcement and disputing of negotiated terms etc.

The *internal organization* allows a greater flexibility and control on activity (direct coordination, adaptation, enforcement, and dispute resolution by a fiat). However, the extension of the internal mode beyond the family and the small-partnership boundaries (allowing achievement of minimum technological or ecological requirements; exploration of technological economies of scale and scope) may command significant costs for development (initiation, design, formal registration, restructuring), and for current management (collective decision making, control on coalition members opportunism, supervision and motivation of hired labor). The separation of the ownership from the management (cooperative, corporation, public farm/firm) gives enormous opportunities for growth in productivity, environmental and management efficiency – internal division and specialization of labor; achieving ecosystem’s requirements; exploration of the economies of scale and scope; introduction of innovation; diversification; risk taking and sharing; investing in product promotion, brand names, relations with customers, counterparts and authorities. However, it could be connected with huge transaction costs for decreasing information asymmetry between the management and the shareholders, decision-making, controlling opportunism, adaptation etc. The cooperative and non-for profit form also suffers from a low capability for internal long-term investment due to the non-for-profit goals and non-tradable character of shares - so called “horizon problem”. The evolution and the maintenance of large collective organizations is often associated with significant costs – for initiating, informing, “collective” decision-making and internal conflict resolution, controlling the opportunism of the (current and potential) members, modernization, restructuring, and liquidation.

Finally, the *pubic forms* also command high internal (internal administration and coordination) and outside (for other private and public agents) costs – for establishment, functioning, coordination, controlling, mismanagement, misuse by private and other agents, reorganization, and liquidation. Unlike the market and the private modes, for the public organizations there is no automatic mechanism (the competition) for selection of the ineffective forms. Here it is necessary public “decision making” which is associated with huge costs and time, and often affected by strong

private interests (lobbying groups, politicians and their associates, bureaucrats, employees) rather than the efficiency.

The „rational” agents tend to use and/or design such modes for governing their diverse activity and relations which are the most efficient in the specific institutional, economic and natural environment – the forms maximizing their overall (production, ecological, financial, transaction etc.) benefits and minimizing their overall (production, environmental, transaction etc.) costs. The result of such private optimization of management and activity is not always the most socially efficient distribution of resources and the socially desirable (the maximum possible) activity for conservation of nature. It is well-known that agricultural activity is often associated with significant undesirable negative environmental effects such as soils degradation, waters pollution, biodiversity termination, air pollution, considerable green-house gases emissions etc.

Therefore, the system of agro-eco-management is to be improved, and that frequently necessitates a public (state) involvement in the agrarian and the environmental management. Nevertheless, the public intervention in (eco)management is not always more effective, since a public failure is practically possible. There are many examples for inappropriate, over, under, delay, or too expensive public intervention at all levels. Often the public intervention either does not correct the market and the private sector failures, or “corrects” them with higher overall costs. The *criterion* for assessing the efficiency of agro-eco-management is to determine *whether the socially desirable and the practically possible environmental goals are realized with the least possible overall costs* (direct, indirect, private, public, production, environmental, transaction etc.). Accordingly the inefficiency is expressed either in the failure to achieve the (technically, politically, economically) feasible environmental goals (overcoming certain eco-problems, diminishing existing eco-risks, decreasing eco-losses, recovery and improvement of the natural environment etc.) or in the achievement of the set up goals with more costs comparing to another feasible form of management.

(The most) effective forms for agro-eco-management

Usually the “evolution” of natural and institutional environment is quite slow and in long periods of time. Therefore, to a great extent the efficiency of the system of agro-eco-management will depend on the level of transaction costs. They have *behavioral origin - individual's bounded rationality and tendency for opportunism*.¹⁰ The individual agents do not possess full information about the system (the eco-benefits and costs, the effects on others, the formal requirements, the possibilities for trade and cooperation, the trends) since the collection and the processing of such information is either very expensive or impossible (multiple spillovers effects and costs in large geographical and temporal scale, future events, partners intention for cheating). In order to optimize the decision-making and the activity, the

¹⁰ Williamson, 1996.

agents spend costs for “increasing their imperfect rationality” – for monitoring, data collection, analysis, forecasting, training, consulting.

Besides, the economic agents are given to (pre-contractual, post-contractual, and non-contractual) opportunism. Accordingly, if there is opportunity for some of the sides to get non-punishably an extra benefit/rent from voluntary or unwanted exchange, it will likely take advantage of that. Usually it is very costly or impossible to distinguish the opportunistic from the non-opportunistic behavior (the bounded rationality). In the real life there is also widespread the non-contractual opportunism¹¹, namely the unwanted “exchange” or stealing of rights from a private and/or public agent without any contracting process (because of the lack or asymmetry of information, the capability for detection and protection, the weak negotiating positions).

Therefore, the individual agents have to protect their rights, investments and transactions from the hazard of opportunism through: *ex ante efforts* to find a reliable counterpart and to design efficient mode for partner’s credible commitment; *ex post investments* for overcoming (through monitoring, controlling, stimulating cooperation) of possible opportunism during contract execution stage; and *permanent efforts/costs* for protection from unwanted non-contractual exchange through safeguarding, diversification, cooperation, court suits etc. The *eco-opportunism* is also widespread in agriculture – e.g. the farmer knows or eventually recognizes that his activity is harmful for the nature, but in order to save the additional costs continues to execute the risky operations when the negative effects are for the other agents (owners of natural resources, other farms, non-agrarian agents, the society as a whole); the farmer sells conventional products as “organic” and profits a price premium from the unaware buyers; or he joins the public agro-eco-programs to get subsidies, but does not comply with the contracted eco-obligations.

Part of the transaction costs for the eco-management are determined relatively easily - e.g. costs for licensing, certifications, tests, purchase of information, hiring consultants, payments for guards and lawyers, bribes etc. However, the assessment of another (significant) part of the transaction costs in eco-activity is impossible or very expensive. That is why the *Comparative Structural Analysis* is to be employed, which aligns the eco-activities/transactions (which differ in their attributes) with the governance structures (which differ in their costs and competence) in discriminating (mainly transaction cost economizing) way.¹² The frequency, uncertainty, assets specificity, and appropriability are identified as the critical dimensions of the eco-activity and transaction - the factors responsible for the variation of transacting costs between the alternative modes of management.

In the specific socio-economic and natural environment, depending to the *combination* of the critical factors of the eco-activities and the eco-transactions, there will be different the most-effective forms of the management. Eco-activity and transactions with good appropriability of rights, high certainty, and universal character

¹¹ Most analyses ignore the widely distributed *non-contractual* opportunism.

¹² Presented in details in Bachev, 2012, p. 46-77.

of investments could be effectively managed by the free market through *spotlight* or *classical contracts*. There are many examples for market modes for selling diverse ecosystem services and eco-products - eco-visits, organic, fair-trade, origins, self-production or self-pick up of yields from customer, eco-education, eco-tourism, eco-restaurants.

Frequent transactions with high appropriability could be effectively managed through a *special contract*. For instance, eco-contracts and cooperative agreements between farmers and interested businesses or communities are widely used including a payment for ecosystem services, and leading to production methods (enhanced pasture management, reduced use of agrochemicals, wetland preservation) protecting water from pollution, mitigating floods and wild fires etc.

When uncertainty is high and assets dependency (specificity) is symmetrical the *relational contract* could be used. Since detailed terms of transacting and results are not known at outset (high uncertainty), a framework (mutual expectations) rather than a specification of obligations of partners is practiced (opportunisms is (self)restricted due to the symmetrical dependency of investments of partners). A special contract form is also efficient for rare transactions with a low uncertainty, high specificity and appropriability. Here the dependent investment could be successfully safeguarded through the contract provisions since it is easy to define and enforce the relevant obligations of partners in all possible contingencies (no uncertainty exist).

Transactions and activities with high frequency, big uncertainty, and great assets specificity have to be managed within *internal organization*. A good portion of the eco-investments are strongly specific to a farm (certain land plots, ecosystems) and can be effectively implemented and "paid-back" within the borders of the particular farm. The high interdependency (specificity) of eco-investments with other farm's assets and activity is the reason a great part of the agro-eco-management to be executed by the different type of farms (family, cooperative, agri-firms, public, hybrid). There are also cases when farms and other agents are tightly *specialized* in eco-management and are entirely engaged in (aimed at) "keeping natural environment in a good condition" or "recovery or amelioration of nature". Here the agricultural activity either does not exist (e.g. prolonged follow up) or it is practiced as far as it is required by the purely agronomic, ecological and other (e.g. educational, rehabilitation etc.) needs. According to the extent of appropriability of results and the universal character of the investments, these farms could be market-oriented (selling eco-services to landlords or other buyers), community (funded by the communities, interests groups)¹³ or public (for conservation of important eco-systems like national parks, natural phenomenon etc.).

Very often the effective scale of the specific investment in the agro-ecosystem services exceeds the borders of traditional agrarian organizations (family farm,

¹³ In response to the unprecedented decrease in number of farms in Japan a "third sector" has developed as in many places community farms are established aiming at conservation of natural environment rather than farming production.

small partnership). For instance, much of the eco-investments, which are done in one farm (protection of waters and air, biodiversity) benefit other farms or non-agrarian agents. Often, dependency of the eco-investments of a farm is unilateral from the agent benefiting from the positive result. Besides, the positive impact of the eco-investment frequently depends on the minimum scale of activity and requires collective action (co-investment). Consequently, the eco-activity/ assets of many farms happen to be in a high *mutual-dependency* with the eco-activity/assets of other farms and other non-agrarian agents in a *large spacial* and often *temporal scale*.¹⁴ If the specific capital (knowledge, technology, equipment, funding) cannot be effectively organized within a single organization¹⁵, then effective *external form(s)* is to be used – joint ownership, interlinks, cooperative, joint investment in labels and origins, lobbying for public intervention. For instance, the environmental cooperatives are very successful in some European countries where there are strong incentives for cooperation (mutual-dependency of the farms eco-activity, evolving “market” for eco-services, widespread application of long-term public eco-contracts for eco-coalition). There is also a rapid development of diverse association of producers around specific capital invested in eco-products and services, trademarks, advertisement, marketing channels etc. Nevertheless, the costs for initiation and maintaining collective organization for overcoming the unilateral dependency are usually great (big number of the coalition, different interests of the members, opportunism of “free-riding” type) and it is unsustainable or does not evolve at all. That strongly necessitates a *third-party involvement* (non-governmental or state organization) to make such organization possible or more efficient.

The transaction costs analysis lets us identify situations of *market and private sector failures*. For instance, serious problems usually arise when the condition of assets specificity is combined with a high uncertainty and a low frequency, and when the appropriability is low. In all these cases, a third part (private agent, NGO, public authority) involvement in transactions is necessary (through assistance, arbitration, regulation, funding) in order to make them more efficient or possible at all. The emergence and the unprecedented development of the special origins, the organic farming and the system of fair-trade, are good examples in that respect. There is increasing consumer’s demand (price premium) for organic, original, and “fairly-traded” products in the developed countries. Nevertheless, their supply could not be met unless an effective trilateral management including independent certification and control is put in place.

The respecting others rights or granting out “additional” rights to others could be managed by “*good will*” or *charity actions*. A great number of *voluntary* environmental initiatives (“codes of eco-behavior”) have emerged driven by the

¹⁴ For a positive long-term effect on certain natural resources/ecosystems collective actions of farmers in the region is required – public eco-contracts are for minimum 5 year period, eco-measures require minimum 50% participation of farms in the region etc.

¹⁵ Coalition made, minimum scale of operations reached, the economy of scale and scope explored etc.

farmers' preferences for eco-production, the competition in industries, and in responds to the public pressure for a sound environmental management. However, the voluntary and charity initiatives could hardly satisfy the entire social demand especially if they require considerable costs. Besides, the environmental standards are usually "process-based", and the "environmental audit" is not conducted by an independent party, which does not guarantee a "performance outcome"

Environmental management requires large organizations with diversified interests of agents (providers, consumers, destructors, interest groups etc.). The emergence of special large-member organizations for dealing with the low appropriability is slow and expensive, and they are not sustainable in the long run ("free riding" problem). There is a strong need for a *third-party public* (state, local authority, international assistance) *intervention* to make such eco-activity possible or more effective. For example, the supply of "environmental goods" by individual farmers could hardly be governed through private contracts with the individual consumers (the low appropriability, high uncertainty, and rare character of transactions). At the same time, the supply of service is very costly and is not carried out on a voluntary basis. The financial compensation of the farmers by the willing consumers through a pure market mode (eco-fee, eco-premium to price) is ineffective due to the high information asymmetry, and the massive costs for enforcement, disputing and excluding of the "dishonest" users. A third-party mode with a direct public involvement makes these transactions effective: on behalf of the consumers the State agency negotiates with the individual farmers a public contract for "environment conservation service", coordinates the activities of various agents, provides public payments for compensation of farmers, and controls the implementation of negotiated terms

(Effective) forms of public agro-eco-management

In modern agriculture there are a *great variety* in forms and efficiency of public intervention on agro-eco-management.¹⁶ In assessment of public modes for agro-eco-management it has to be taken into account the *overall* (public and private) costs for implementation and transaction for achievement of the social eco-goals *in comparison with another practically possible form of intervention*. The Discrete Structural Analysis could assist the assessment of efficiency and the design of the forms of public intervention.

Interventions with a low uncertainty and assets specificity require a *smaller public organization* - more regulatory modes, improvement of the laws, contract and standards enforcement etc. When uncertainty and assets specificity of the transactions increases, a *special contract mode* is necessary – employment of public contracts for provision of private services, public funding and subsidising of private activities, temporary labor contract for carrying out special public programs, leasing out public assets for private management etc. When transactions are characterized with high

¹⁶ Review of applied modes of agro-eco-management is done by Bachev, 2006.

assets specificity, uncertainty and frequency, then an *internal mode* and a bigger public organization are necessary – permanent public employment contracts, in-house integration of crucial assets in a specialized state agency or public company etc.

Initially, it is necessary to specify the ways to correct existing and emerging eco-problems in market and private sector (difficulties, costs, risks, failures). The appropriate public involvement is to create an environment for: decreasing uncertainty surrounding market and private transactions, increasing intensity of exchange and cooperation, protecting private rights and investments, and making private investments less dependent. For instance, the State establishes and enforces quality, safety and eco-standards for farm inputs and produces, certifies producers and users of natural resources, transfers water management rights to farms associations, sets up minimum farm-gate prices etc. All these facilitate and intensify private eco-initiatives and (market and private) eco-transactions and increase the efficiency of economic organizations.

Next, practically possible modes for increasing the appropriability of rights and results of activity and investment have to be considered. The low appropriability is often caused by unspecified or badly specified private rights. In that case, the most effective government intervention is to introduce and enforce *new private property rights* – rights on natural, biological, and environmental resources; rights on issuing and trading eco-bonds and shares; tradable quotas for polluting; private rights on intellectual agrarian property and origins etc. That is efficient when the privatization of resources or the introduction and enforcement of the new rights is not associated with significant costs (uncertainty, recurrence, and level of specific investment are low). Such intervention effectively transfers the organization of transactions into the market and private management, liberalizes market competition and induces private incentives (and investments) in eco-activities. For instance, tradable permits (quotas) are used to control the overall use of certain resources or level of a particular type of pollution. They give flexibility allowing farmers to trade permits and meet their own requirements according to their adjustment costs, specific conditions of production etc. That form is efficient when a particular target must be met, and the progressive reduction is dictated through permits. At the same time the trading allows the compliance to be achieved at least costs and in interests of participants (through a private management). What is more, the tradable rights could be used a *market for environmental quality* to develop. The private agents could purchase permits from the market and take them out of the market turnover and utilization. In that way the environmental quality could be practically raised above the initially “planned” level (and would not have been achieved without these additional private eco-initiatives).

In other instances, it is more efficient to put in place *regulation* for trade and utilization of resources, products and services – standards for labor safety, product quality, environmental performance, animal welfare; norms for using natural resources, introduction of foreign species and GM crops, and (water, soil, air, comfort) contamination; a ban on application of certain chemicals or technologies;

regulations for trading ecosystem service protection; foreign trade regimes; mandatory eco-training and licensing of farm operators etc.

The large body of the environmental regulations in the European Union aim at changing farmers behavior and restricting the negative impact on environment. It makes producers responsible for the “environmental effects” (externalities) of their products or the management of products uses (e.g. waste). This mode is effective when a general improvement of the performance is desired but it is impossible to dictate what changes (in activities, technologies) are appropriate for a wide range of operators and environmental conditions (high uncertainty and information asymmetry). When the level of hazard is very high, the outcome is certain and the control is easy, and no flexibility exists (for timing or the nature of socially required result), then the *bans* or strict limits are the best solution. However, the regulations impose uniform standards for all regardless of the costs for compliance (adjustment) and give no incentives to over-perform beyond a certain (regulated) level.

In other instances, using the incentives and restrictions of the *tax system* is the most effective form for intervention. Different sorts of tax preferences (exception, breaks, credits) are widely used to create favorable conditions for certain (sub)sectors and regions, forms of agrarian organization, or specific types of activities. *The environmental taxation* on emissions or products (inputs or outputs of production) is also applied to reduce the use of harmful substances. Eco-taxes impose the same conditions for all farmers using a particular input and give signals to take into account the “environmental costs” inflicted on the society as a whole (or big communities of affected individuals). Taxation is effective when there is a close link between the activity and the environmental impact, and when there is no immediate need to control the pollution or to meet the targets for reduction. An “appropriate” level of the charge is required to stimulate a desirable change in farmers’ behavior. Some emissions (e.g. nitrogen) vary according to the conditions of application (fertilization with N) and attempting to reflect this in tax system often result in complexity and high administrating costs.

In some cases, a *public assistance and support* to private organizations is the best mode. The public *financial support* for environmental actions is the most commonly used instrument for improving environment performance of farmers. It is easy to find an economic justification for the public payments as a compensation for the provision of an “environmental service” by farmers. However, the share of farms participating in various agro-environmental support schemes has not been significant. That is a result of a voluntary (self-selection) character of this mode which does not attract farmers with the highest environment enhancement costs (most intensive and damaging environment producers). In some countries the low-rate of farmers’ compliance with the environmental contracts is a serious problem.¹⁷ The latter cannot be solved by augmented administrative control (enormous enforcement costs)

¹⁷ For instance, 40% of French farmers experience problems implementing public eco-contracts (Dupraz, Latouch, and Bonnieux, 2004).

or introducing bigger penalty (politically and juridical intolerable measure). Actually, it is estimated that the agri-environmental payments are efficient in maintaining the current level of environmental capital but less successful in enhancing the environmental quality. Another disadvantage of the “payment system” is that once introduced it is practically difficult (“politically unacceptable”) to be stopped when goals are achieved or there are funding difficulties. Withdraw of the subsidies may lead to further environmental harm since it would induce the adverse actions (intensification, return to conventional farming strategies). The subsidies also have “distortion effect”- negative impact on “entry-exit decisions” from polluting industry, unfair advantages to certain sectors in the country or industries in other countries, not considering the total costs (such as transportation and environmental costs, “displacement effect” in other countries).

Often *providing public information, recommendations, training and education* to farmers, rural agents, and consumers are the most efficient form. In some cases, a *pure public organization* (in-house production, public provision) is the most effective one as it is in the case of important agro-ecosystems and national parks; agrarian research, education and extension; agro-meteorological forecasts; border sanitary and veterinary control etc.

Combined intervention is often necessary because of: the complementarities (joint effect) of individual forms; restricted potential of some less expensive forms to achieve a certain (but not the entire) level of socially preferred outcome; possibility to get extra benefits (e.g. “cross-compliance” requirement for participation in public programs); particularity of problems to be tackled; specific critical dimensions of managed activity; uncertainty (little knowledge, experience) associated with likely impact of new forms; needs for “precaution”; practical capability of the State to organize (administrative potential to control, implement) and fund (direct budget resources and/or international assistance) different modes; and dominating (right, left) policy doctrine.

The level of an effective public intervention (management) also depends on the *scale of ecosystem* and the *type of problem*. There are public involvements which are to be executed at *local* (farm, agro-ecosystem, community, regional) level, while others require *nationwide* management. There are also activities, which are to be initiated and coordinated at *international* (regional, European, worldwide) level due to the strong necessity for trans-border actions (needs for a cooperation in natural resources and environment management, for exploration of economies of scale/scale, for prevention of ecosystem disturbances, for governing of spill-overs) or consistent *state failures*. Often the effective governance of many challenges and risks of agro-ecosystems require *multilevel* management with combined actions on different levels, and involving various agents, and different geographical and temporal scale.

The public (regulatory, inspecting, provision) modes must have built special mechanisms for *increasing competency* (decrease bounded rationality and powerlessness) of bureaucrats, beneficiaries, interests groups and public at large as well as restricting possible opportunism (opportunity for cheating, interlinking, abuse

of power, corruption) of public officers and other stakeholders. That is made by training, introducing new monitoring, assessment and communication technologies, increasing transparency (e.g. independent assessment and audit), and involving experts, beneficiaries, and interests groups in management of public modes at all levels. Furthermore, applying “market like” mechanisms (competition, auctions) in public projects design, selection and implementation would significantly increase the incentives and decrease the overall costs.

In general, a *pure* public organization should be used as a last resort when all other modes do not work effectively. The “in-house” public organization has higher (direct and indirect) costs for setting up, running, controlling, reorganization, and liquidation. Unlike market and private forms there is no automatic mechanism (competition) for sorting out the less effective modes. Here a *public “decision making”* is required which is associated with high costs and time, and it is often influenced by strong private interests (power of lobbying groups, policy makers and their associates, employed bureaucrats) rather than the efficiency. What is more, widespread “inefficiency by design” is practiced to secure (rent-taking) positions of certain interest groups, stakeholders, bureaucrats etc. Along with the development of general institutional environment (“The Rule of Law”, transparency) and the monitoring, measurement, communication etc. technologies, the efficiency of pro-market modes (regulation, information, recommendation) and the contract forms get bigger advantages over the internal less flexible public arrangements.

Usually the *hybrid modes* (public-private partnership) are much more efficient than the pure public forms. The involvement of farmers, farmers organizations and other beneficiaries increases efficiency - decreases asymmetry of information, restricts opportunisms, increases incentives for private costs-sharing, and reduces management costs. Hybrid mode is appropriate for carrying out of the many of activities for environmental preservation due to the farmers information superiority, the strong interlinks of such activity with the traditional food production (economy of scope), the high assets specificity to the farm (farmers competence, high site-specificity of investments to the farm and land), and the spatial interdependency (the needs for cooperation of farmers at a regional or wider scale), and the farm’s origin of negative externalities. The enforcement of most labor, animal welfare, biodiversity etc. standards is often very difficult or impossible at all. Stimulating and supporting (assisting, training, funding) private voluntary actions are much more effective than the mandatory public modes in terms of incentive, coordination, enforcement, and disputing costs.

If there is a strong need for a third-party public involvement but an effective (state, local authority, international assistance) intervention is not introduced in time, then the agrarian “development” is substantially deformed - all class of socially needed (eco)activities and investment are blocked, natural resources are degraded or polluted in large scales, sustainability of farms structures in reduced etc.

Stages in analysis of agro-eco-management

The *analysis* and the *improvement* of public agro-eco-management is to include following stages: *First*, trends, factors, problems, and risks associated with the natural

environment and its individual elements (land, water, air, biodiversity, eco-systems, climate etc.) are to be identified. The modern science offers quite precise methods to assess the state of environment, and to detect existing, emerging and likely challenges - climate changes, degradations, destructions and depletion of natural resources, eco-risks etc.¹⁸ It also offers reliable instruments to estimate the (positive and negative) agricultural contribution to and the impact on the state of environment and its different components, including on different spatial and temporal scales. For instance, there are widespread applications of numerous eco-indicators for pressure, state, respond, and impact as well as for integral assessment of agrarian environmental sustainability. The *lack of serious eco-problems, conflicts and risks* is an indicator that *there is an effective system for eco-management*. However, usually there are significant or growing environmental problems and risks associated with agriculture, which is the case of Bulgaria as well.

Second, assessment is to be made on the efficiency of *available* and other *feasible modes* and mechanisms of management for eco-conservation, and for overcoming of the existing, emerging and likely eco-problems and risks associated with agriculture. The analysis is to embrace the system of agro-eco-management and its individual components – the *institutional environment* and the *various* (formal, informal, market, private, contract, internal, individual, collective, public, specialized, multifunctional, simple, complex, etc.) *forms* for governing eco-activities of agrarian agents (the farms of different type).

The efficiency of individual modes are to be evaluated in terms of their (comparative) potential to safeguard and develop agents eco-rights and investments, stimulate socially desirable level of environment protection behavior and activity, rapid detection of eco-problems and risks, cooperation and reconciliation of eco-conflicts, and to save and recover total environmental (conservation, recovery, enhancement, transaction, direct, indirect, private, public) costs. Also the assessment is to be made on *complementarities* and/or contradictions between different forms – e.g. the high complementarities between (some) private, market and public forms for eco-management; the conflicts between the “gray” and “light” sector etc.

The *efficiency checks* are to be performed periodically even when the system of agro-eco-management “works well”. The good conservation of nature could be done at *excessive social costs* or *further improvement* of environment may be done at *the same social costs*. In both cases there is an alternative *more efficient* organization of agro-eco-management - e.g. too expensive for the taxpayer state eco-management (in terms of incentives, total costs, adaptation and investment potential) could be replaced with more effective private, market or hybrid modes.

Third, *deficiencies* (“failures”) in dominating market, private, and public modes are to be determined, and *the needs for (new) public intervention* in agro-eco-management to be specified. They could be associated with; impossibility for achieving socially desirable and practically possible environmental goals,

¹⁸ Millennium Ecosystem Assessment ..., 2005.

significant transaction difficulties (costs) of participating agents, inefficient utilization of public money and resources etc. *Finally*, the *alternative* modes for *new public intervention* able to correct (market, private and public) failures are to be identified, their *comparative efficiency* and *complementarities* assessed, and *the most efficient one(s)* selected. It is important to compare only (technically, economically, and politically) *feasible* modes of the new public intervention in eco-management. Their comparative (goal achieving, coordinating, stimulating, costs-minimizing) efficiency to and complementarities with other practically possible modes of public involvement (assistance, public-private partnership, property rights modernization etc.) is to be assessed, and the best one(s) introduced.

The assessments are to comprise *all* costs associated with the public forms - for implementation *and* transaction: direct (tax payer, assistance agency) expenses, *and* transacting costs of bureaucracy (for coordination, stimulation, control of opportunisms and mismanagement), *and* costs for individuals' participation and usage of public modes (adaptation, information, paper works, payments of fees, bribes), *and* costs for community control over and for reorganization of bureaucracy (modernization, liquidation), and (opportunity) costs of public inaction.

Suggested analysis is to be made at *different levels* (farm, eco-system, regional, sector, national, international) according to the *type of eco-challenge* and the scale of *collective actions necessary* to mitigate the specific eco-problems and risks for *each component* of the natural environment (soils waters, air, etc.) and *integrally* for the nature as a whole. It is not one time exercise completing at the last stage with a perfect system of agro-eco-management. It is rather a permanent *process* which is to improve eco-management along with the evolution of natural environment, the individual and communities (social) awareness and preferences, and the modernization of technologies and institutional environment. Besides, *public* (local, national, international) *failure* is also possible (and often prevail) which brings us into the next cycle in improvement of eco-management in agriculture.

The Comparative Institutional Analysis also enables us to *predict* likely cases of the *new public* (local, national, international) *failures* due to impossibility to mobilize sufficient political support and necessary resources and/or ineffective implementation of otherwise "good" policies in the specific socio-economic environment of a particular country, region, sub-sector etc. Since the public failure is a *feasible option* its timely detection permits foreseeing the persistence or rising of certain environmental problems, and informing (local, international) community about associated risks.

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The socio-economic study of eco-management in Bulgarian agriculture is far behind the other countries as well as from the practical evolution and demands. Adaptation of the modern achievements of the theory of management and economics in that important area will let: develop and apply a holistic interdisciplinary approach for analysis, assessment and improvement of the system of eco-management in our agriculture; identify diverse (private, market, collective, public, hybrid) modes for

eco-management during the European integration, and (social, economic, institutional, behavioral, technological, natural, international etc.) factors of their development, and evaluate their efficiency, complementarities, and prospects of development in the conditions of reforming EU CAP and evolving socio-economic and natural environment; suggest realistic directions for improvement of individual and collective eco-strategies and actions, as well as public policies, forms of public intervention, and eco-programs in agriculture.

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