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# Assessing environmental management in agriculture

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## Abstract

This paper incorporates interdisciplinary New Institutional Economics and suggests a holistic framework for assessing the forms and efficiency of environmental management in agriculture. First, it defines environmental management as a specific system of social order regulating behaviour and relations of various agents related to natural environment, and environmental management in agriculture as eco-management associated with agricultural production. Second, it specifies spectrum of modes and mechanisms of eco-management comprising: institutional environment, market, private, collective, public and hybrid. Third, it suggests stages in analysis and improvement of environmental management in agriculture including: identification of problems, and risks associated with natural environment; assessment of efficiency of available and feasible modes, and specifying cases of market, private, and public failures; assessment of comparative efficiency of alternative modes for new public intervention and selection of the most efficient one(s). Forth, it classifies personal, institutional, technological, natural, and transaction costs factors of management choice. Finally, it builds a principle governance matrix with the most effective market, private, and public modes taking into account the critical dimensions of eco-activity and transactions (appropriability, assets specificity, uncertainty and frequency), and their potential to coordinate and stimulate eco-activities, meet preferences and reconcile conflicts of individuals, protect eco-rights and investments, overcome uncertainty and risk, assure socially desirable level of environmental protection, and minimize overall (implementing, third-party and transacting) costs.

**Keywords:** *eco-governance; institutions, market, private, public and hybrid modes; agriculture*

## 1. Introduction

The question of assessment of environmental management in agriculture is among the most topical for farmers, residents of rural areas, interests groups, politicians, academicians, and public at large. Often it is restricted to evaluation of pure ecological aspects of different farming practices, technologies or systems. In recent years, increasing attention is put on institutional and governance aspects of the problem.

Nevertheless, most studies are restricted to a certain form (formal, contract, cooperative, an industry initiative, a public program), or a management level (farm, eco-system, sector, public), or a particular location (eco-system, region). Moreover, “normative” (to some “ideal” or “model in foreign country”) rather than comparative institutional approaches between feasible alternatives are employed. Likewise, the significant social costs associated with the management, known as transaction costs, are not (or only partially) taken into consideration. Furthermore, uni-disciplinary approaches dominate, and efforts of researchers in economics, organization, law, sociology, ecology, technology, and behavioural and political sciences are rarely united. Lastly, there are few studies on specific institutional,

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economic, cultural, natural, etc. factors responsible for the big variation among countries, regions, sub-sectors, and organizations.

Consequently, institutional, behavioural, economic, ecological, international etc. factors of environmental sustainability are not properly understood, spectrum of feasible management modes properly identified, and efficiency, complementarities, and prospects of development correctly assessed. All these restrict our capability to assist improvement of public policies and modes of intervention, and to support individual, business and collective actions for sustainable development.

This paper incorporates interdisciplinary New Institutional Economics and suggests a holistic framework for assessing the forms and efficiency of environmental management in agriculture. First, it defines environmental management as a specific system of social order regulating behaviour and relations of various agents related to natural environment. Second, it specifies spectrum of modes and mechanisms of eco-management comprising: institutional environment, market, private, collective, public and hybrid. Third, it suggests stages in analysis and improvement of environmental management in agriculture. Forth, it classifies personal, institutional, technological, natural, and transaction costs factors of management choice. Finally, it builds a principle governance matrix with the most effective market, private, and public modes taking into account the critical dimensions of eco-activity and transactions, and their potential to coordinate and stimulate eco-activities, meet preferences and reconcile conflicts of individuals, protect eco-rights and investments, overcome uncertainty and risk, assure socially desirable level of environmental protection, and minimize overall social costs.

## 2. Definition and modes of eco-management in agriculture

*Environmental management* means management of environment preservation and improvement activities of individual agents. Maintaining and amelioration of the state of natural environment (air, waters, lands, biodiversity, climate) requires an effective *social order* (governance) regulating behaviour and relations of various agents related to environment - a system of motivation and coordination of (eco-)actions which is to induce *appropriate behaviour*<sup>2</sup> of individuals and *coordinated actions* at group, regional, national, and transnational levels (Bachev, 2010a).

*Environmental management in agriculture* comprises the environmental management associated with agricultural (food, fiber, fuel, raw material etc.) production. It (is to) involves management of activities, relations, and impacts of diverse agrarian (farm managers, resource owners, agricultural labour) and non-agrarian (upstream and down-stream businesses, consumers, residents, interest groups) agents (Figure 1).

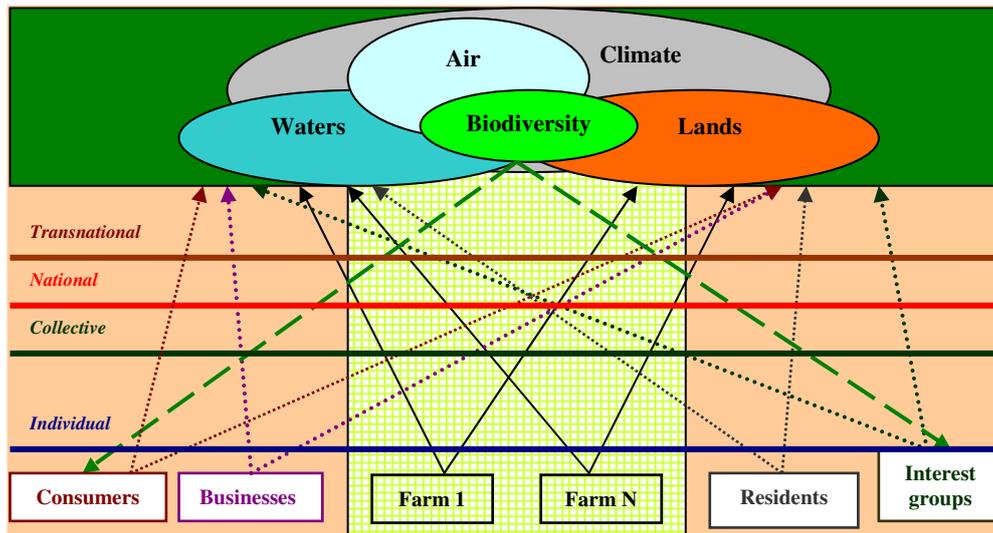
In certain cases, eco-management in agriculture is entirely archived through *individual actions* of autonomous agents (farms) within the "Sector Agriculture" (yellow pattern area of Figure 1) – e.g. a good care for privately owned agricultural land is typical in a family farm.

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. Furthermore, modern farming activity is frequently associated with significant (positive and/or negative) externalities which require *managing relations* (cooperation, reconciling conflicts, recovery of costs)

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<sup>2</sup> "pro-environmental" actions, "anti-environmental" inactions.

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 residents and businesses in neighbourhood or more remote regions. Similarly, agricultural contribution to ecosystem services benefits a large number of residents, visitors, consumers, businesses, and interest groups requiring certain collective actions for sustainable supply. In all these instances, environmental management goes beyond simple (technical, agronomic, ecological) “relations with nature” and embraces the *governance of relations* and *collective actions* of agents with diverse interests, power positions, awareness, capabilities etc. in large *geographical, sectoral, and temporal* scales.



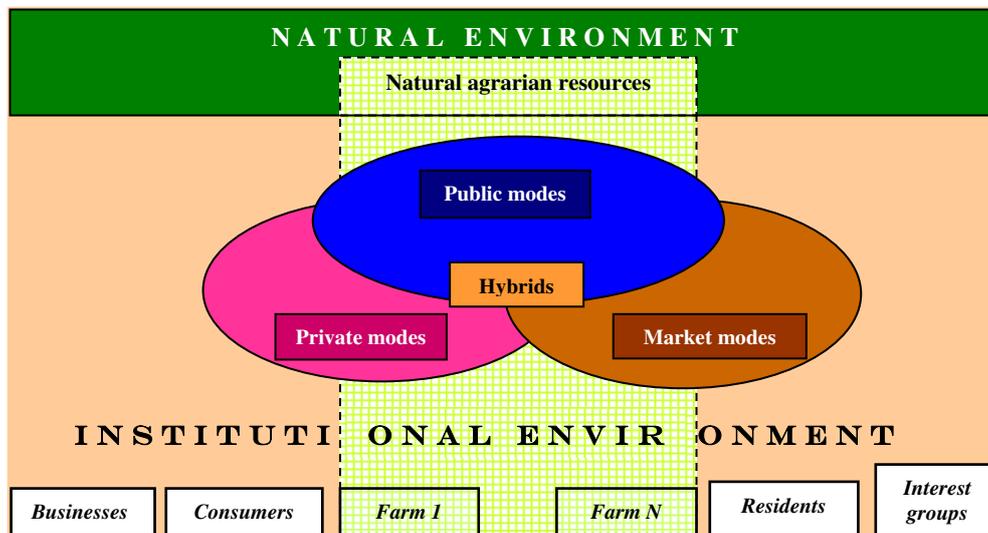
**Figure 1.** Structure of environmental management in agriculture

What is more, modern environmental management is associated with growing needs for “additional” actions (monitoring, coordination, investments etc.) and integral management of natural resources and eco-risks at *national* and progressively at *transnational* scale. The later include water and garbage management, biodiversity conservation, climate change etc. issues demanding effective regional, nationwide, international, and global governance. For instance, the effective management of biodiversity “component” of environment includes multilevel (individual, sectoral, national, EU, worldwide) and multilateral initiatives of numerous farmers, businesses, consumers, residents, interests groups etc. (area under green downward arrows, Figure 1). The same is true for waters, lands, air etc. management.

Individuals behaviour (actions, restriction of actions) are affected and governed by a number of distinct *modes and mechanisms of management* which include (Figure 2):

First, *institutional environment* (“rules of the game”) - that is the distribution of rights between individuals, groups, and generations, and the system(s) of enforcement of these rights and rules (Furuboth and Richter; North). The spectrum of rights could embrace material assets, natural resources, intangibles, certain activities, clean environment, food security, intra- and inter-generational justice etc. A part of the rights and rules are constituted by formal laws, regulations, standards, court decisions etc. In addition, there are important informal

rules and rights determined by tradition, culture, religion, ideology, ethical and moral norms. Enforcement of rights and rules is done by the state, community pressure, trust, reputation, private modes, and self-enforcement.



**Figure 2.** Modes of environmental management in agriculture

Institutions and institutional modernization create dissimilar incentives, restrictions and costs for maintaining and improving environment, intensifying eco-exchange and cooperation, increasing eco-productivity, inducing private and collective eco-initiatives, developing new eco- and related rights, decreasing eco-divergence between social groups and regions, responding to ecological and other challenges etc.<sup>3</sup>

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. In modern society a great deal of individuals’ activities and relations are regulated and sanctioned by some (general, specific) 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 of their life and relations associated with the natural environment.

Second, *market modes* (“invisible hand of market”) – those are various decentralized initiatives governed by free market price movements and market competition – e.g. spotlight exchanges, classical contracts, production and trade of organic products and origins etc.

The importance of free market for the coordination (direction, correction) and stimulation of economic activities, exchanges and allocation of resources is among

<sup>3</sup> Socially and legally acceptable norms for use of labour, plant, livestock, and environmental resources; employment of certain forms of contracts or organizations; trade with natural resources and products etc., all they could differ even between various regions of the same country.

fundamentals of the Economic theory. Individual agents use (adapt to) markets profiting from the specialization and mutually beneficial exchange (trade) while their voluntary decentralized actions govern the overall distribution of efforts and resources between activities, sectors, regions, eco-systems, 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-behaviour, eco-contracts, eco-cooperatives etc.

Individual agents take advantage of economic, market, institutional etc. opportunities and deal with institutional and market deficiency by selecting or designing mutually beneficial private modes (rules) for governing their behaviour, 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<sup>4</sup> and/or contracted rights. In modern society a great part of the agrarian activity is managed by voluntary initiatives, private negotiations, “visible hand of the manager”, or collective decision-making. Nevertheless, there are many examples of private sector deficiency in governing of socially desirable activity such as environmental preservation, eco-system services etc.

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, taxation, assistance, funding, provision, property right modernization etc.

The role of public (local, national, and transnational) governance has been increasing along with the intensification of activity and exchange, and growing interdependence of socio-economic and environmental activities. In many cases, effective management of individual behaviour and/or organization of certain activity through a market mechanism 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. Nonetheless, there are a great number of bad public involvements (inaction, wrong intervention, over-regulation) leading to significant problems of sustainable development around the globe (Bachev, 2010b).

Fifth, *hybrid forms* – some combination of the above three modes.

The efficiency of individual management modes is quite different since they have unlike potential to: induce eco-friendly behaviour, 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. For instance, appropriate information would be enough to induce voluntary actions by a “green” farmer, while most commercial enterprises would need outside incentives (price premium, 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, etc.

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<sup>4</sup> assigned by the dominating institutions.

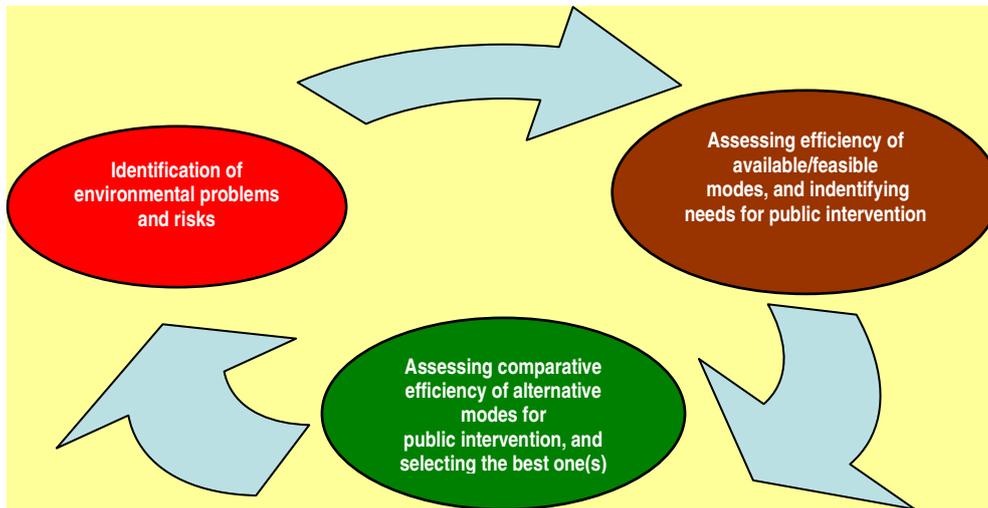
“Governance matters” and depending on the (efficiency of) system of management “put in place” the individual communities and societies achieve quite dissimilar results in eco-conservation. Consequently, the type of exploitation of natural resources by agriculture and the agricultural impact on environment would differ quite substantially in different stages of development and among diverse farming structures, eco-systems, regions, and countries.

### 3. Stages of analysis and improvement of eco-management

Analysis and improvement of environmental management involves following *stages*:

*First*, trends, factors, problems, and risks associated with natural environment and its individual elements (land, water, air, biodiversity, eco-systems, climate etc.) are to be identified (Figure 3). The modern science offers quite precise methods to assess the state of environment, and detect existing, emerging and likely challenges - environmental changes, degradations, destructions, and risks (MEA). What is more, it offers reliable instruments to estimate agricultural contribution to and impact on the state (“health”) of environment and its different components, including in different spatial and temporal scales.

In any case, persistence of serious eco-problems and risks is an indicator that an effective system of eco-management is not put in place (Bachev and Nanseki).



**Figure 3.** Stages in analysis and improvement of eco-management in agriculture

*Second*, assessment is to be made on efficiency and potential of available and other feasible modes and mechanisms of management (institutions, market, private, public, hybrid) to deal with existing, emerging and likely eco-problems and risks associated with agriculture.

Analysis is to embrace *all forms* of management related to eco-management - formal, informal, market, contract, internal, individual, collective, public, specialized, multifunctional, simple, complex, etc. In fact most analyses are restricted to a certain form (formal, farm, cooperative, public program) ignoring other important, dependent, or complementary modes.

Efficiency of individual modes are to be evaluated in terms of their *potential* to induce eco-friendly behaviour and cooperation, detect eco-problems and risks, reconcile eco-

conflicts, stimulate eco-activity and protect eco-investment, save overall environmental (conservation, recovery, enhancement, transaction etc.) costs, and contribute to sustainable exploitation of environmental resources. Furthermore, efficiency of individual forms can not be fully understood without analyzing the *complementarities* between different forms – e.g. a high complementarities between family farms and farm cooperatives for certain activities.

Most assessments include only direct, production (eco-recovery, eco-maintenance, eco-enhancement), or program (international assistance, taxpayer) costs. Analysis is to include *all (social) costs* associated with different forms of eco-management – private, third-party, public, current, long-term, production, transaction etc. In addition to proper individual and third-party *production* (technological, agronomic, ecological etc.) costs, the eco-management is usually associated with significant *transaction* (governance) costs. The later could be defined as costs for protection, contracting and exchange of individual rights or costs for governing relations with other agents - individuals, private entities, public authorities (Bachev, 2010b).

Usually assessments are limited to absolute efficiency of individual forms of eco-management (related costs, environmental effects) ignoring their comparative efficiencies. The analysis is to incorporate both *absolute* and *comparative* (in relation to other feasible modes) efficiency of diverse management modes. For instance, often dominating public organisations “work well” but they are less efficient (in terms of incentives, overall costs, adaptation and investment potential) in comparison to private, market or hybrid (public-private partnership) structures.

Comprehensive analysis let determine *deficiencies* (“failures”) in dominating market, private, and public modes to manage effectively existing, emerging and likely eco-problems and risks, and specify the *needs for (new) public intervention* in agrarian eco-management.

*Third*, alternative and practically possible modes for new public intervention able to correct market, private and public failures are to be identified, their comparative efficiency assessed, and the most efficient one(s) selected. Only technically, economically, and politically *feasible* modes of new public intervention in environmental management are to be specified. 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.

Suggested analysis is to be made at *different levels* (farm, eco-system, regional, sectors, national, international) according to the type of eco-challenges and scales of collective actions necessary to mitigate specific eco-problems and risks. It is not a one time exercise completing in the last stage with a perfect system of eco-management. It is rather a permanent *process* which is to improve eco-management along with the evolution of natural environment, individual and communities’ awareness, and modernisation of technologies and institutional environment. Besides, *public* (local, national, international) *failure* is also possible which brings us into the next cycle in improvement of eco-management in agriculture.

#### **4. Factors of eco-management choice in agriculture**

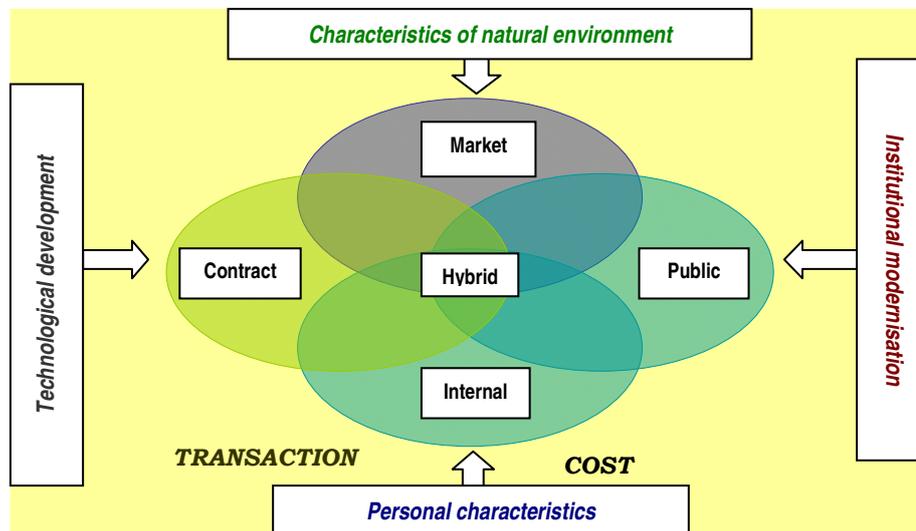
Most environmental activity and exchange in agriculture could be managed through a great variety of *alterative* forms. For instance, a supply of environmental preservation service could be governed as: voluntary activity of a farmer; though private contracts of the farmer

with interested or affected agents; though interlinked contract between the farmer and a supplier or processor; though cooperation (collective action) with other farmers and stakeholders; though (free) market or assisted by a third-party (certifying and controlling agent) trade with special (eco, protected origins, fair-trade) products; though a public contract specifying farmer's obligations and compensation; though a public order (regulation, taxation, quota for use of resources/emissions); within a hierarchical public agency or by a hybrid form.

Commonly natural and institutional environment evolve very slowly over a long-term periods. Therefore, in the specific natural, socio-economic and institutional environment, the choice of management mode would depend on a number of *key factors* including (Figure 4):

- *personal characteristics of individual agents* – preferences, beliefs, ideology, knowledge, capability, training, managerial experience, risk-aversion, bounded rationality, tendency for opportunism, reputation, trust, power etc. For instance, benefits for farmers from eco-management could range from monetary or non-monetary income; profit; indirect revenue; to pleasure of involvement in environment and biodiversity preservation activity.

- *formal and informal institutions* - 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<sup>5</sup>. For instance, market trade of farmland, natural resources, and (some) eco-system services are not allowed.



**Figure 4.** Factors for eco-management choice in agriculture

Furthermore, institutional environment considerably affects the level of management costs and thus the choice of one or another form of organization. For instance, in conditions of well-working public system of regulations (quality standards, guarantees) and laws and contract enforcement, a preference is given to spotlight and classical (standard) contracts. On the other hand, when rights on major agrarian and natural resources are not defined or not

<sup>5</sup> When costs of illegitimate forms is not high (possibility for disclosure low, enforcement and punishment insignificant) while benefits considerable, then more effective *gray* or *black* modes prevail.

well defined, and absolute and contracted right effectively enforced, then high transaction costs could create difficulties (block) effective eco-management - costly unsolvable disputes between polluting and affected agents, disregards of interests of certain groups or generations etc. Consequently, the institutional structures for carrying out agrarian and environmental activities become an important factor, which eventually determines the outcome of the system (efficiency) and the type of development (sustainability).

- *natural and technological factors* - eco-management strongly depends on the type of environmental challenge (spatial and temporal scale, risks etc.) and natural resources endowment as well as on the development of farming, environmental, monitoring, information etc. technologies. For instance, management of water resources depends on the advancement of water conservation, use, recycling and monitoring technologies etc.

## 5. Principle modes for effective eco-management

Different management modes are alternative but *not equally efficient* modes for the organization of eco-activities. Each form has distinct *advantages* and *disadvantages* to protect eco-rights and investment, coordinate and stimulate socially desirable eco-behaviour and activities, explore economies of scale and scope, save production and transaction costs. Therefore, available forms are to be assessed in terms of the absolute and the comparative potential (limits) of protect eco-rights and investments of agents, assure socially desirable level of environmental conservation (enhancement), minimize overall costs, coordinate and stimulate eco-activities, reconcile conflicts, and recover long-term costs for organizational development in the specific economic, institutional and natural environment.

*Free market* has a big coordination and incentive advantages (“invisible hand”, “power of competition”), and provides “unlimited” opportunities to benefit from specialization and exchange. However, market management could be associated with a high uncertainty, risk, and costs due to low appropriability of some rights (“public good” character), price instability, a great possibility for facing an opportunistic behaviour, “missing market” situation etc.

*Special contract form* (“private ordering”) permits a better coordination and intensification of activity, and safeguard of agent’s rights and 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.

*Internal organization* allows a greater flexibility and control on activity (direct coordination, adaptation, enforcement, and dispute resolution by a fiat). However, extension of internal mode beyond family and 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 labour).

*Separation of the ownership from the management* (cooperative, corporation, public farm/firm) gives enormous opportunities for growth in productivity and management efficiency – internal division and specialization of labour; achieving ecosystem’s requirements; exploration of economies of scale and scope; introduction of innovation; diversification; risk 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 management and 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 non-for-profit goals and non-tradable character of shares (so called “horizon problem”).

If transaction costs were *zero*, then the mode of management would have no economic importance (Coase; Williamson). Individuals would manage their relationships with the same (equal) efficiency though: free market (adapting to price movements), and private modes of different types (contracts, firms), and collective decision making (cooperative, association), and in a nationwide hierarchy (a single private or state company). Then ecological requirements and technological opportunities for economies of scale and scope (the maximum environmental enhancement and productivity of resources, “internalization of externalities”) would be easily achieved (Coase). 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, and individuals would costlessly define new rights, and protect their (absolute and contracted) rights, and trade owned resources (and products) in mutual benefit until exhausting the possibilities for increasing productivity and environmental conservation (improvement).

However, environmental management is usually associated with considerable transaction costs<sup>6</sup>. For example, agents have costs for identification and protection of various rights; complying with diverse institutional restrictions (norms, standards, rules); finding 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 evolving conditions of exchange etc.

Assessment of the precise levels of transaction costs in eco-activity is often impossible or very expensive (Bachev, 2009). That is why the analysis is to focus on the combination of *critical dimensions* of eco-activity and transaction<sup>7</sup> - the factors responsible to the variation of transacting costs between alternative modes of management (Figure 5).

Eco-activity and transactions with good appropriability of rights, high certainty, and universal character of investments could be effectively managed by free market through *spotlight* or *classical contracts*. For instance, there are widespread market modes for selling diverse ecosystem services and eco-products - eco-visits, organic, fair-trade, origins, self-pick, eco-education, eco-tourism, eco-restaurants etc.

Transactions with low specificity and high appropriability could be effectively managed through a *special contract*. For example, 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 etc.) protecting water from pollution, mitigating floods and wild fires etc.

Transactions and activity with high frequency, big uncertainty, great assets specificity, and high appropriability, have to be managed within *internal organization*. Very often the effective scale of specific investment in eco-management (minimum required for eco-impact,

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<sup>6</sup> Transaction costs have two *behaviour* origin – agents *bounded rationality* and *tendency for opportunism* (Williamson).

<sup>7</sup> *Frequency, uncertainty*, and *asset specificity* are identified as critical factors of transaction costs by Williamson (Williamson) while *appropriability* added by Bachev and Labonne (Bachev and Labonne).

exploring economies of scale and scope) exceeds borders of traditional agrarian organizations (family farm, small partnership). If specific capital (knowledge, technology, equipment, funding) cannot be effectively organized within a single organization<sup>8</sup>, then effective *external form(s)* is to be used – e.g. joint ownership, interlinks, cooperative, lobbying for public intervention. For instance, environmental cooperatives are very successful in some European countries. Nevertheless, costs for initiation and maintaining collective organization for overcoming unilateral dependency are usually great (big number of coalition, different interests of members, opportunism of “free-riding” type) and it is unsustainable or does not evolve at all.

Generic modes	<b>Critical dimensions of transactions</b>							
	<b>Appropriability</b>							
	High							Low
	<b>Assets Specificity</b>							
	Low				High			
	<b>Uncertainty</b>							
	Low		High		Low		High	
	<b>Frequency</b>							
	High	Low	High	Low	High	Low	High	Low
Free market	Y	Y						
Special contract form			Y			Y		
Internal organization					Y		Y	
Third-party involvement				⚠				⚠
Public intervention								⚠

Y - the most effective mode; ⚠ - necessity for a third party involvement

**Figure 5.** Principle modes for environmental management in agriculture

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

Respecting others rights or granting out additional rights could be managed by “*good will*” or *charity actions*. For instance, a great number of *voluntary* environmental initiatives (“codes of behaviour”) have emerged driven by farmers’ preferences for eco-production, competition in industries, and responds to public pressure for a sound environmental management. However, voluntary and charity initiatives could hardly satisfy the entire social demand especially if they require considerable costs. Besides, environmental standards are

<sup>8</sup> coalition made, minimum scale of operations reached, economy of scale and scope explored.

usually “process-based”, and “environmental audit” is not conducted by independent party, which does not guarantee a “performance outcome”.

Most environmental management requires large organizations with diversified interests of agents (providers, consumers, destructors, interest groups etc.). Emergence of special large-members organizations for dealing with low appropriability is slow and expensive, and they are not sustainable in long run (“free riding” problem). Therefore, there is a strong need for a *third-party public* (Government, local authority, international assistance) intervention to make such eco-activity possible or more effective (Bachev 2009).

## 6. Public modes of eco-management in agriculture

The overall (public and private) implementation *and* transaction costs of public modes of eco-management are to be taken into account. The later would depend on uncertainty, frequency, and necessity for specific investment of public involvement (Figure 6).

Interventions with a low uncertainty and assets specificity would normally require a *smaller public organization* - more regulatory modes, improvement of the general laws and contract enforcement etc. When uncertainty and assets specificity of transactions increases a *special contract mode* would be necessary – e.g. employment of public contracts for provision of private services, public funding (subsidies) of private activities, temporary labour contract for carrying out special public programs, leasing out public assets for private management etc. And when transactions are characterized with high assets specificity, uncertainty and frequency, then an *internal mode* and a *bigger public organization* would be necessary – e.g. permanent public employment contracts, in-house integration of crucial assets in a specialized state agency or public company etc.

<i>Level of Uncertainty, Frequency, and Assets specificity</i>					
<i>Low</i>		←-----→		<i>High</i>	
New property rights and enforcements	Public regulations	Public taxation	Public assistance	Public funding	Public provision

**Figure 6.** Principle modes for public intervention in environmental management

Initially, existing and emerging problems (difficulties, costs, risks, failures) in the organization of market and private transactions are specified (Figure 5). The appropriate public involvement would be to create an environment for: decreasing uncertainty surrounding market and private transactions, increasing intensity of exchange, protecting private rights and investments, and making private investments less dependent. For instance, 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 (market and private) transactions and increase efficiency of economic organizations.

Next, practically possible modes for increasing appropriability of activity (transactions) have to be considered. The low appropriability is often caused by unspecified or badly specified private rights (Bachev, 2004). In some cases, the most effective government intervention would be to introduce and enforce *new private property rights* – e.g. 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 would be efficient when privatization of resources or the introduction and enforcement of new rights is not associated with significant costs (uncertainty, recurrence, and level of specific investment are low).

That public intervention effectively transfers the organization of transactions into the market and private management, liberalizes market competition and induces private incentives (and investments) in certain 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 and specific conditions of production. That form is efficient when a particular target must be met, and the progressive reduction is dictated through permits while trading allows the compliance to be achieved at least costs (through a private management). The later let also a market for environmental quality to develop<sup>9</sup>.

In other instances, it would be efficient to put in place *regulations* for trade and utilization of resources and products – e.g. standards for labour 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 environmental regulations in developed countries aim changing the farmers behaviour 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 not possible to dictate what changes (in activities, technologies) is appropriate for a wide range of operators and environmental conditions (high uncertainty and information asymmetry). When the level of hazard is 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 level.

In other instances, using the incentives and restrictions of *tax system* would be the most effective form for public intervention. Different sorts of tax preferences (exception, breaks, credits) are widely used to create favourable 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. The later impose the same conditions for all farmers using a particular input and give signals to take into account the “environmental costs” inflicted on the rest of society. Taxing 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. However, an appropriate level of the charge is required to stimulate a desirable change in farmers’ behaviour. Furthermore, some emissions vary

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<sup>9</sup> Permits can be taken out of market in order to raise the environmental quality above the “planned” (by the Government) level.

according to the conditions of application 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 for intervention. The public *financial* support for environmental actions is the most commonly used instrument for improving environment performance of farmers. It is easy to find a justification for the public payments as a compensation for the provision of an “environmental service” by farmers. However, the share of farms covered by various agri-environmental support schemes has not been significant. That is a result of 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 cases, the low-rate of farmers’ compliance with the environmental contracts is a serious problem. The later cannot be solved by augmented administrative control (enormous enforcement costs) or introducing bigger penalty (politically and juridical intolerable measure). Principally, 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 “payment system” is that once introduced it is practically difficult (“politically unacceptable”) to be stopped when goals are achieved or there are funding difficulties. Moreover, withdraw of subsidies may lead to further environmental harm since it would induce the adverse actions (intensification, return to conventional farming). Other critics of subsidies are associated with their “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) will be 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.

Usually, specific public modes are effective if they are applied alone with other modes of public intervention. The necessity of *combined intervention* (a governance mix) is caused by: 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 an 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 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 (Bachev, 2010b).

Besides, the level of an effective public intervention (management) depends on the kind of problem and the scale of intervention. There are public involvements which are to be executed at local (farm, ecosystem, community, regional) level, while others require nationwide management. And finally, there are 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 (national, local) government failures.

The public (regulatory, inspecting, provision etc.) modes must have built special mechanisms for increasing the competency (decrease bounded rationality and powerlessness) of bureaucrats, beneficiaries, interests groups and public at large as well as restricting the possible opportunism (opportunity for cheating, interlinking, abuse of power, corruption) of public officers and other stakeholders. That could be 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.

Principally, a pure public organization should be used as a *last resort* when all other modes do not work effectively (Williamson). “In-house” public organization has higher (direct and indirect) costs for setting up, running, controlling, reorganization, and liquidation. What is more, unlike market and private forms there is not automatic mechanism (competition) for sorting out the less effective modes<sup>10</sup>. 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” of public modes is practiced to secure (rent-taking) positions of certain interest groups, stakeholders, bureaucrats etc. Along with development of general institutional environment (“The Rule of Law”, transparency) and monitoring, measurement, communication etc. technologies, the efficiency of pro-market modes (regulation, information, recommendation) and contract forms would get bigger advantages over the internal less flexible public arrangements.

Usually *hybrid modes* (public-private partnership) are much more efficient than pure public forms given coordination, incentives, and control advantages. In majority of cases, 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 (Bachev, 2004). For instance, a hybrid mode would be appropriate for carrying out the supply of preservation of environment, biodiversity, landscape, historical and cultural heritages etc. That is determined by the farmers information superiority, strong interlinks of activity with traditional food production (economy of scope), high assets specificity to the farm (farmers competence, high site-specificity of investments to the farm and land), and spatial interdependency (needs for cooperation of farmers at a regional or wider scale), and not less important – farm’s origin of negative externalities. Furthermore, enforcement of most labour, animal welfare, biodiversity etc. standards is often very difficult or impossible at all. In all these cases, stimulating and supporting (assisting, training, funding) private voluntary actions are much more effective than 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 (government, local authority, international assistance) intervention is not introduced in a due time, then the agrarian “development” is substantially deformed. Thus public (Government) failure is also possible and often prevails. In Bulgaria, there have been a great number of bad examples for public under- and over-interventions in agrarian sector during post-communist transition now (Bachev, 2010b). Consequently, a primitive and uncompetitive small-scale

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<sup>10</sup> It is not rare to see highly inefficient but still “sustainable” public organizations around the world.

farming; predominance of over-integrated and personalized exchanges; ineffective and corrupted agrarian bureaucracy; blocking out all class of agrarian transactions (innovation and extension supply, long-term credit supply, supply of infrastructure and environmental goods); and development of a large informal (gray) sector, all they have come out as a result.

The Institutional analysis let define the efficiency and the potential of divers mechanisms and modes of management to deal with diverse problems and risks associated with the natural environment. Moreover, it let improve the *design* of the new forms of public intervention according to the specific market, institutional and natural environment of a particular farms, eco-system, region, sub-sector, country, and in terms of perfection of coordination, adaptation, information, stimulation, restriction of opportunism, controlling (in short – minimizing transaction costs) of participating actors (decision-makers, implementers, beneficiaries, other stakeholders). What is more, that analysis unable us to predict likely cases of *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 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.

## 7. Conclusion

Suggested framework let better understand, assess and improve eco-management in the specific market, institutional and natural environment of individual farms, ecosystems, regions, sub-sectors and countries. However, its application requires new type of data for the formal and informal rights distribution, system and efficiency of enforcements, personal characteristics (preferences, interests, capability etc.) of agents related to eco-management in agriculture, type of eco-challenges, formal and informal forms of farming organisation and contractual arrangements, critical dimensions of activities and transactions etc.

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