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# New Approach for Assessing and Improvement of Environmental Management and Strategies in Agri-Business

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*Keywords :* *"environmental and natural resources; governance; strategies; institutions, market, private, public modes; agri-business".*

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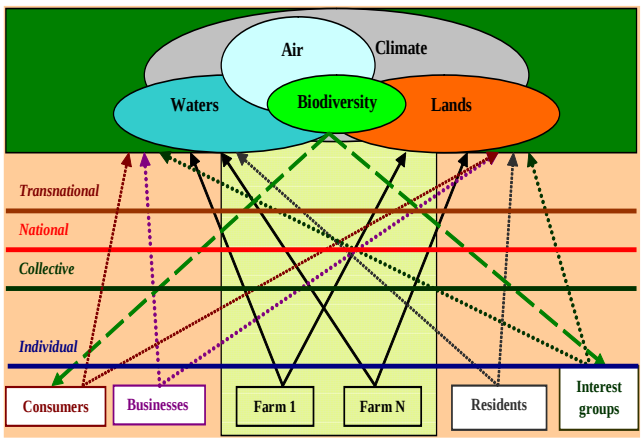
## I. Introduction

Modern agribusiness significantly affects the state and risks of natural environment being a major factor of environmental degradation and conservation. Most studies in the area focus on specific aspect of eco-management; form of governance, type of organization, management level, location; pure and formal forms. Uni-sectoral and uni-disciplinary analyses dominate; "normative" rather than a comparative institutional approach is employed; and significant transaction costs not taken into account. This paper suggests a holistic framework for assessing and improvement of environmental management and strategies in agri-business. First, it defines eco-management and specify managerial needs and forms of governance. Second, it identifies critical socio-economic, natural, technological, behavioral etc. factors of managerial choice. Third, it assesses comparative efficiency of alternative modes and strategies. Forth, it specifies stages for analysis and improvement of agro-eco-management identifying needs and forms for effective public intervention.

## II. Agro-Eco-Management Modes and Strategies

Agro-eco-management means management of environment preservation and improvement activities of individual agents associated with agri-food production. Conservation of natural environment and its individual components (air, waters, lands, biodiversity, climate, ecosystem services) requires an effective social order (governance). It (is to) is to induce appropriate behavior and coordinated actions at group, regional, national, and transnational levels of diverse (agrarian, non-agrarian) agents (Figure 1).

*Figure 1 :* Structures of environmental management in agri-business




Individual agrarian agents (owners or resources, entrepreneurs, labor) may have quite diverse strategies in terms of natural resources conservation. According to their ideologies and environmental ethics, awareness of eco-risks, managerial and technical ability, some individual agents may have direct natural resources conservation goals. Accordingly these green individuals will pursue natural resources conservation strategy in everyday life and activity. Besides, there have been developed a great number of farms and agri-business enterprises with a primary or a major mission environmental conservation and improvement.

Nevertheless, most agrarian structures in modern world have other goals pursuing other strategies – e.g. agri-firms are profit-oriented with a primary strategy to maximize profits for shareholders, cooperatives are member-oriented and carry strategy to increase benefits for members etc. However, there have been increasing consumer demands for environmental conservation, and for related organic eco- and specific products from. Consequently, many market oriented farms change their

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behavior in order to meet this growing market demand while keeping traditional (profit-making) strategy.

Finally, in modern societies there are a great number of formal and informal norms and restrictions related to exploitation of natural resources. For instance, in EU there is a huge body of environmental legislation and various environmental conservation programs. These institutional rules impose individual agents and farming structures mandatory norms and/or offer incentive to join voluntary schemes aiming at limiting eco-pressure, securing sustainable exploitation of natural resources etc. This new public order modifies individual strategies and behavior and eventually leads toward conservation of natural resources.

Thus achieving the effective natural resources conservation in agri-business will always be result of implementing of multiple voluntary or induced by market, community, public policies etc. individuals, farms, businesses, consumers, and public strategies.

In certain cases, agro-eco-management is entirely archived through individual actions of autonomous agents (within the "Sector Agriculture". For instance, a good care and sustainable use of privately owned agricultural lands and water sources are typical in a family farm since they are integral part of the strategy for sustainable development of that family enterprise. Similarly, many group farms have a primary goal for sustainable development or are set up as a green farms. Even when the individual strategies of farm's components (e.g. hired labor, family/group member) do not coincide with the overall farm strategy, the effective management (internal order) is able to achieve the goals for sustainable growth.

However, the effective eco-management often necessitates concerted (collective) actions and eco-strategies 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, effective provision of agro-ecosystem services etc. Furthermore, modern farming activity is often profit-oriented and frequently associated with significant positive and/or negative externalities. Implementation of individual strategies of different farmers not always leads to overall conservation of natural resources. That requires a "common" strategy and managing relations (cooperation, reconciling conflicts, recovery of costs) between different farms, and increasingly between farmers and non-farmers. 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 geo-graphical, sectoral, and temporal scales (Bachev, 2010).

What is more, modern environmental management is associated with growing needs for "additional" actions (monitoring, coordination, inve-stments 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. Thus effective conservation of natural resources will be achieved by coordinated collective actions and implementation of multisectoral and multilevel strategies of individual, family, partnership, private juridical, public juridical, state etc. agents with diverse immediate goals, positions, capability and interests.

Individuals behavior (actions, restriction of actions) are affected and governed by a number of distinct modes and mechanisms of management which include: 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). 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 state, community pressure, trust, reputation, private modes, and self-enforcement. 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.

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 circumstances of their life and relations associated with natural environment.

Second, market modes ("invisible hand of market") – various decentralized initiatives governed by free market price movements and market competition – (spotlight exchanges, classical contracts, production and trade of organic products and origins etc.). Individual agents use (adapt to) markets profiting from the specialization and mutually beneficial exchange (trade) while their voluntary decentralized actions govern



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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 (missing markets, monopoly and power relations, positive or negative externalities). Consequently, free market "fails" to manage effectively the entire eco-activity, exchanges, and investments of individuals.

Third, private modes ("private or collective order") – diverse private initiatives and special contractual and organizational arrangements (voluntary eco-actions, codes of eco-behavior, eco-contracts, eco-cooperatives etc.). Individual agents take advantage of economic, market, institutional etc. opportunities and deal with institutional and market deficiency by selecting/designing mutually beneficial private modes for governing their behavior, relations and exchanges. 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/or contracted rights. In modern society a great part of 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") – various forms of public (community, government, international) intervention in market and private sectors (guidance, regulation, taxation, assistance, funding, provision, property right modernization). Role of public (local, national, transnational) governance has been increasing along with intensification of activity and exchange, and growing interdependence of socio-economic and eco-activities. In many cases, effective management of individual behavior and/or organization of certain activity through market mechanism and/or private negotiation would take a long period of time, be very costly, could not reach a socially desirable scale, or be impossible. Thus a centralized public intervention could achieve 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.

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. "Governance matters" and depending on the (efficiency of) system of management "put in place" individual communities and societies achieve quite dissimilar results in eco-conservation and improvement. Consequently, the extend of conservation of natural resources in agri-business (type of exploitation of natural resources and impact on environment) would differ quite substantially in different stages of development and among diverse agrarian structures, eco-systems, regions, and countries.

## III. Needs and Factors of Eco-Management and Strategies in Agri-Business

According to (awareness, symmetry, strength, harmonization costs of) interests of agents associated with natural resources there are different needs for management of actions. For instance, a specific farm often is to be involved in several systems of governance in order to assure an effective supply of services from ecosystems of which it belongs or affects (Bachev, 2010).

Most environmental activity and exchange in agri-business could be managed through a great variety of alternative forms. For instance, supply of eco-preservation service could be governed as: voluntary activity of a farmer; though private contracts of the farmer with interested/affected agents; interlinked contract between the farmer and supplier/ 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. In the specific natural, socio-economic and institutional environment, the choice of management mode would depend on a number of key factors (Figure 2):

- personal characteristics of individual agents – preferences, believes, ideology, knowledge, capability, training, managerial experience, risk-aversion, bounded rationality, tendency for opportunism, reputation, trust, power etc.



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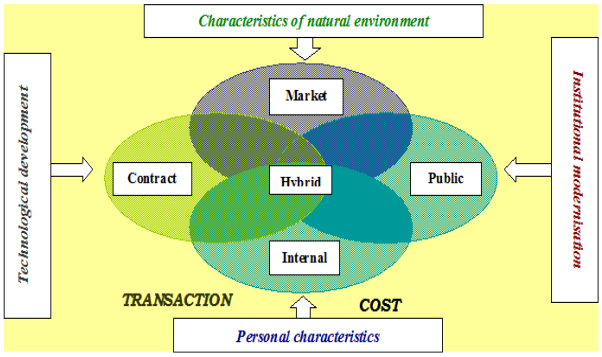
*Figure 2 :* Factors for managerial and strategy choices for agro-eco-management




Formal and informal institutions - often the choice of management mode is (pre)determined by institutional restrictions as some forms for carrying out agrarian, environmental etc. activities could be socially unacceptable or illegal. 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 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.

- natural and technological factors - eco-management strongly depends on the type of eco-challenge (spatial and temporal scale, risks) and natural recourses endowment as well as on development of farming, environmental, monitoring, information etc. technologies.

## IV. Efficiency of Agro-Eco-Management and Strategies

The problem of "social costs" does not exist in conditions of zero transaction costs and well defined private property rights (Coase). Then the stahe of maximum efficiency is always achieved independent of initial distribution of rights between individuals and mode of governance. All information for the effective potential of activity and exchange would be costlessly available to everybody. Individuals would costlessly coordinate activities; define, adapt and implement strategies, define new rights, and protect rights, and trade resources in mutual benefit with the same (equal) efficiency over 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 for sustainability and technological opportunities for economies of scale and scope (maximum environmental conservation/enhancement and productivity of resources, "internalization of externalities") and maximum welfare (consumption, conservation of natural resources) would be easily/-costlestly achieved.

However, when transaction costs are significant, then costless contracting, exchange and protection of individual right is impossible. Therefore, initial distribution of property rights between individuals and groups, and their good definition and enforcement are critical for overall efficiency and sustainability. For instance, if "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. What is more, in conditions of well-defined rights, eco-management is usually associated with significant transaction costs. For example, agents have costs for identification and protection of various rights (unwanted take overs from others); studying out and complying with diverse institutional restrictions (norms, standards, rules); collecting needed technological, environmental etc. Information; 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 production and exchange etc.

Therefore, 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 eventually (pre)determine the extent of degradation, conservation and improvement of natural resources (Bachev 2010). That is because different modes have unequal efficiency (benefits, costs) for governing the same eco-activity in the specific socio-economic and natural environment. Moreover, often high transaction costs deteriorate and even block organization of otherwise efficient (mutually-beneficial) for all participants eco-activity and exchange.

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 environmental requirement and/or exploration of pure technological economies of scale and scope of farm, environmental conservation etc. activities.

Usually, there are a number of alternative modes for governing of eco-conservation activity.



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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-behavior and activities, explore economies of scale and scope, save production and transaction costs. For instance, the 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 lack of (asymmetry) of information, low "appropriability" of some rights ("public good" character), price instability, a great possibility for facing an opportunistic behavior, "missing market" situation etc.

The special contract form ("private ordering") permits a better coordination and intensification of eco-activity, and safeguard of 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, 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 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 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"). What is more, evolution and maintenance of large collective organizations is usual associated with significant costs – for initiating, informing, "collective| decision-making and internal conflict resolution, controlling opportunism of (current and potential) members, modernization, restructuring, 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, reorganisation, and liquidation. What is more, unlike market and private modes, for public organisations there is no automatic mechanism (competition) for selection of ineffective forms. Here it is necessary public "decision making" which is associated with huge costs and time, and often affected by strong private interests (power of lobbying groups, politicians and their associates, bureaucrats, employees in the public forms) rather than efficiency.

Principally 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 – forms maximizing their overall (production, ecological, financial, transaction etc.) benefits and minimizing their overall (production, environmental, transaction etc.) costs. However, a result of such private strategies and optimization of management/activity is not always the most socially effective distribution of resources and the socially desirable (maximum possible) conservation of natural resources. It is well-known that agricultural activity is often associated with significant undesirable negative environmental effects – 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 public (state) involvement in agrarian and environmental management. Nevertheless, public intervention in (eco) management is not always more effective, since public failure is practically possible. Around the globe 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 market and private sector failures, or "correct| them with higher overall costs.

Thus the criterion for assessing the efficiency of agro-eco-management and strategies is to be whether socially desirable and practically possible environmental goals are realized with the minimum possible overall costs (direct, indirect, private, public, production, environmental, transaction etc.). Accordingly inefficiency is expressed either in failure to achieve feasible (technically, politically, economically) environmental goals (conservation of natural resources, overcoming certain eco-problems, diminishing existing eco-risks, decreesing eco-losses, recovery and improvement of natural environment etc.) or achieving of set up goals with more costs comparing to another feasible form of management.



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Modern socio-economic, institutional and (more often) natural environment in changing very fast and often unpredictably. Consequently, any strategy for effective management of natural resources conservation is to be adaptive strategy. Accordingly, dominating and other feasible (market, private, public, hybrid) forms are to be assessed in terms of their absolute and comparative (adaptation) potential 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.

## V. (The Most) Effective Forms for Agro-Eco-Management

Usually "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.

Transaction costs have behavioral origin: namely individual's bounded rationality and tendency for opportunism (Williamson). Agrarian agents do not possess full information about the system (eco-benefits and costs, effects on others, formal requirements, development trends etc.) since collection and processing of such information would be either very expensive or impossible (multiple spilovers effects and costs in large geographical and temporal scale, future events, partners intention for cheating etc.). In order to optimize the decision-making and activity the agents have to spent costs for "increasing their imperfect rationality" – for monitoring, data collection, analysis, forecasting, training, consulting etc.

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

Therefore, 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 partners credible commitments; ex post investments for over-coming (through monitoring, controlling, stimulating cooperation) of possible opportunism during contract execution stage; and permanent efforts/costs for protection from unwanted non-contractual exchange though safeguarding, diversification, cooperation, court suits etc.

Part of the transaction costs for ecomanagement could be determined relatively easily e.g. costs for licensing, certifications, tests, purchase of information, hiring consultants, payments for guards and lawyers, bribes etc.

However, assessment of another (significant) part of transaction costs in eco-activity is often impossible or very expensive (Bachev, 2011). That is why comparative structural analysis is to be employed (Williamson). This analysis would align 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.

Frequency, uncertainty, assets specificity, and appropriability are identified as critical dimensions of eco-activity and transaction - the factors responsible to the variation of transacting costs between alternative modes of management.

In the specific socio-economic and natural environment, depending to combination of critical factors of eco-activities/transactions, there will be different most-effective forms of management (Figure 3).



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*Figure 3 :* Principle modes for environmental management in agri-business

| Generic modes | *Critical dimensions of transactions* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Appropriability | | | | | | | | |
| | *High* | | | | | | | | *Low* |
| | Assets Specificity | | | | | | | | |
| | *Low* | | | | *High* | | | | |
| | Uncertainty | | | | | | | | |
| | *Low* | | *High* | | *Low* | | *High* | | |
| | Frequency | | | | | | | | |
| | *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

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-production or self-pick up of yields from customer, eco-education, eco-tourism, eco-restaurants etc.

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

Transactions and activity with high frequency, big uncertainty, and great assets specificity have to be managed within internal organization. For instance, a good portion of eco-investments are strongly specific to (certain land plots, eco-systems etc.) a farm 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 agro-eco-management to be executed by different type of farms – family, cooperative, agri-firms, public, hybrid. Despite that there are cases when farms and other agents are specialised in eco-management and are entirely engaged in (aimed at) "keeping natural resources in a good condition" or "recovery or amelioration of natural environment". Here agricultural activity either does not exist (e.g. prolonged follow up) or it is practiced as far as it is required by purely agronomic, ecological and other (e.g. educational, rehabilitation etc.) needs. According to the extent of appropriability of results and the universal character of investments, these farms could be market-oriented (selling eco-services to landlords or other buyers), community (funded by communities, interests groups) or public (e.g. for conservation of important eco-systems like national parks, natural phenomenon etc.).

Very often the effective scale of specific investment in agro-ecosystem services exceeds the borders of traditional agrarian organizations (family farm, small partnership). For instance, much of eco-investments, which are done in one farm (protection of waters and air, biodiversity etc.) benefit other farms or non-agrarian agents. Often, dependency of eco-investments of a farm is unilateral from the agent benefiting from the positive result. Besides, the positive impact of eco0investment often depends on the minimum scale of activity and frequently requires collective action (co0investment). Consequently, 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.

This if specific capital (knowledge, technology, equipment, funding) cannot be effectively organized within a single organization, then effective external



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form(s) is to be used – e.g. joint ownership, interlinks, cooperative, joint investment in labels and origins, lobbying for public intervention etc. For instance, environmental cooperatives are very successful in some European countries where there are strong incentives for cooperation due to the mutual-dependency of farms eco-activity, evolving "market" for eco0services, and widespread application of long-term public eco-contracts for eco-coalition. There is rapid development of diverse association of producers around specific capital invested in eco-products and services, trade-marks, advertisement, marketing channels etc.

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. That strongly necessitates a third-party involvement (non-governmental or state organization) to make such organization possible or more efficient.

The 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, funding) 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 certify-cation 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 behavior") 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, environ-mental standards are 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.

## VI. Public Modes and Strategies for Management of Natural Resources in Agriculture

In modern agri-business there are a great variety in forms and efficiency of public intervention in eco-management. 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 social eco-goals in comparison with another practically possible form of intervention. Discrete structural analysis is to be applied which would assist assessment of efficiency and design of forms and strategies of public intervention.

Interventions with a low uncertainty and assets specificity would normally require a smaller public organization - more regulatory modes, improvement of 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 labor contract for carrying out special public programs, leasing out public assets for private management etc. When transactions are characterized with high assets specificity, uncertainty and frequency, then internal mode and 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.

Initially, it is necessary to be specifies ways to correct existing/emerging eco-problems in market and private sector (difficulties, costs, risks, failures). The appropriate public involvement would be to create 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, State establishes and enforces quality, safety and eco-standards for inputs and produces, certifies producers and users of natural resources, transfers water management rights to farms associations, sets up minimum prices etc. All these facilitate and intensify private eco-initiatives and (market and private) eco-transactions and increase efficiency of economic organizations.

Next, practically possible modes for increasing appropriability of rights and results of activity and investment have to be considered. Low appropriability is often caused by unspecified or badly specified private rights (Bachev, 2004). In that case, most effective government intervention would be to introduce and enforce new private property rights – e.g. rights on



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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 introduction and enforcement of new rights is not associated with significant costs (uncertainty, recurrence, and level of specific investment are low).

Such public intervention effectively transfers organization of transactions into market and private management, liberalizes market competition and induces private incentives (and investments) in certain 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 progressive reduction is dictated through permits while trading allows compliance to be achieved at least costs (through private management). What is more, the tradable rights could be used a market for environmental quality to develop. The later let private agents to realize new eco-strategy purchasing permits from the market and taking them out of market turnover and utilization. In that way the environmental quality could be practically raised above the initially "planned" (by the Government) level, and would not have been achieved without additional private eco-initiatives.

In other instances, it would be more efficient to put in place regulations for trade and utilization of resources, products and services – e.g. 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; bans 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 farmers behavior, and directing toward new strategies restricting the negative impact on environment. It makes producers responsible for "environmental effects" (externalities) of their products or management of products uses (waste). This mode is effective when a general improvement of performance is desired but it is not possible to dictate what changes is appropriate for a wide range of operators and eco-conditions (high uncertainty and information asymmetry). When level of hazard is very high, outcome is certain and control is easy, and no flexibility exists (for timing or nature of socially required result), then bans or strict limits are the best solution. However, regulations impose uniform standards for all regardless of costs for compliance (adjustment) and give no incentives to over-perform beyond a certain (regulated) level.

In other instances, using incentives and restrictions of tax system would be most effective form for public intervention. Different sorts of tax preferences are widely used to create favorable conditions for certain (sub) sectors and regions, forms of agrarian organization, or specific types of activities. 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 society (big communities). Taxing is effective when there is close link between activity and environmental impact, and when there is no immediate need to control pollution or meet targets for reduction. However, "appropriate" level of charge is required to stimulate a desirable change in behavior. Furthermore, some emissions (nitrogen) vary according to 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. Public financial support for eco-actions is the most commonly used instrument for improving environment performance of farmers. It is easy to find economic justification for public payments as a compensation for provision of "environmental service" by farmers. However, share of farms participating in 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 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. 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 agri-environmental payments are efficient in maintaining the current level of environmental capital but less successful in enhancing 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 strategies). 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 total costs (such as transportation and environmental costs, "displacement effect" in other countries).



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Often providing public information, recommenddations, training and education to farmers, rural agents, and consumers are the most efficient form since they improve their capability and strategies. In some cases, a pure public organization (in-house production, public provision) will be the most effective one as of important agro-ecosystems and national parks; agrarian research, education and extension; agro-meteorological forecasts; border sanitary and veterinary control etc.

Usually, effective implementation of a long-term natural resources conservation strategy requites combined public intervention (governance mix). Necessity of multiple public intervention is caused by the fact that: different natural resources and diverse challenges associated with them need different instruments and form of public intervention; individual modes are effective if they are applied alone with other modes; frequently combined effect is higher that sum of individual effects; 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 ("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.

Besides, level of effective public intervention (management) depends on the scale of ecosystem and 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 strong necessity for trans-border actions (needs for cooperation in environment management, exploration of economies of scale/scale, prevention of ecosystem disturbances, governing of spill-overs) or consistent (national, local) government failures. Often effective governance of many challenges and risks of agro-ecosystems requite multilevel management with combined actions of different levels, and involving various agents, and different geographical and temporal scale.

Public (regulatory, inspecting, provision etc.) 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 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, 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. Here public "decision making" is required which is associated with high costs and time, and often influenced by strong private interests (power of lobbying groups, policy makers and their associates, employed bureaucrats) rather than 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 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, agrarian organizations and other beneficiaries increases efficiency, decreases asymmetry of information, restricts opportunisms, increases incentives for private costs-sharing, and reduces management costs. 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 farmers information superiority, strong interlinks of activity with traditional food production (economy of scope), high assets specificity to the farm (farmers competence, high cite-specificity of investments to the farm and land), and spatial interdependency (needs for cooperation of farmers at regional or wider scale), and not less important – farm's origin of negative externalities.

Furthermore, enforcement of most labor, animal welfare, biodiversity etc. standards is often very difficult or impossible. In all these cases, stimulating and supporting (assisting, training, funding) private voluntary actions are much more effective then mandatory public modes in terms of incentive, coordination, enforcement, and disputing costs.

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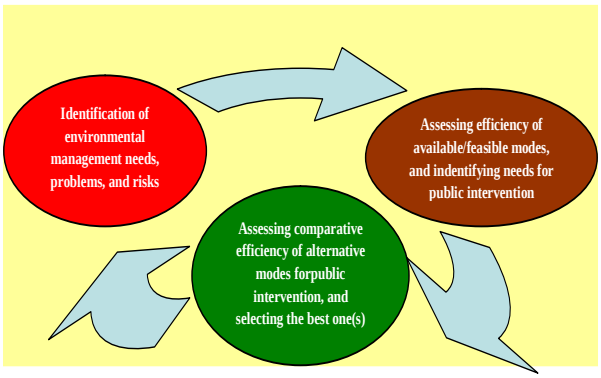
If there is a strong need for third-party public involvement but effective (government, local authority, international assistance) intervention is not introduced in a due time, then agrarian "development" is substantially deformed. Consequently, all class of socially needed eco-activities and investment are blocked, natural resources are degradated or pollutes in large scales, sustainability of farms structures in reduces etc.

## VII. Stages in Analysis of Environmental Management and Strategies in Agri-Business

Analysis and improvement of public agro-eco-management and strategies is to include following stages (Figure 4): First, assessment of specific management needs of conservation of natural resources utilized and/affected by agriculture. Later depends on particular characteristics of diverse natural resources and ecosystems they are part of, and the number, interests and strategies of related agents. For instance, persistence of serious eco-problems and risks is an indicator that effective system of eco-management is not put in place. Therefore, trends, factors, problems, and risks associated with natural environment and its individual elements are to be identified. Modern science offers quite precise methods to assess the state of environment, and detect existing, emerging and likely challenges - environmental changes, degradations, destructions and depletion of natural resources, eco-risks etc. (MEA).

*Figure 4 :* Stages in analysis and improvement of public agro-eco-management




What is more, science offers reliable instruments to estimate agricultural contribution to and impact on the state of environment and its different components, including 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 (FAÓ).

The lack of serious eco-problems, conflicts and risks is an indicator that there is effective system for eco-management, and therefore there is no need for changing public strategy for natural resources conservation. However, usually there are significant or growing eco-problems and risks associated with agriculture in developed and developing countries alike.

Second, assessment is to be made on efficiency and potential of available and other feasible modes and mechanisms of management for natural resources conservation, and for overcoming existing, emerging and likely eco-problems and risks associated with agriculture. Analysis is to embrace the system of agro-eco-management and its individual components – institutional environment and various (formal, informal, market, private, contract, internal, individual, collective, public, specialized, multifunctional, simple, complex) forms for governing eco-activities of agrarian agents. 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 strategies and (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 etc.) costs. Furthermore, efficiency of individual forms cannot be fully understood without analyzing complementarities and/or contradictions between different forms and strategies – e.g. high comple-mentarities between (some) private, market and public forms for eco-management; conflicts between "gray" and "light" sector of agriculture etc.

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, eco-management is usually associated with significant transaction (governance) costs.

Efficiency checks are to be performed periodically even when system of agro-eco-management "works well". That is because good conservation of natural resources 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 alternative more efficient organization of agro-eco-management - e.g. too expensive for taxpayer state eco-management (in terms of incentives, total costs, adaptation and investment potential) could be replaces



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with more effective private, market or hybrid mode (public-private partnership).

Usually assessments are limited to absolute efficiency of individual forms of eco-management (related costs, environmental effects) ignoring their comparative efficiencies. Analysis is to incorporate both absolute and comparative (in relation to other feasible modes) efficiency of diverse management modes.

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 needs for (new) public intervention in agrarian eco-management. They could be associated with; impossibility for achieving socially desirable and practically possible environmental goals, significant transaction difficulties (costs) of participating agents, inefficient utilization of public money and resources etc.

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 and complementarities 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.

Public modes not only support (market and private) transaction, but are also associated with significant (public and private) costs. Therefore, assessment is to comprise all costs 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, sectors, national, international) according to type of eco-challenge and scale of collective actions necessary to mitigate specific eco-problems and risks for each component of natural environment (soils waters, air, etc.) and integrally for natural environment as a whole. It is not 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 evolution of natural environment, individual and communities (social) awareness and preferences, and 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.

Comparative institutional analysis let define efficiency and potential of divers mechanisms and modes of management to deal with diverse problems and risks associated with natural environment. Moreover, it let improve 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.

## VIII. 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 agri-business, type of eco-challenges, formal and informal forms of agrarian organization and contractual arrangements, critical dimensions of activities and transactions etc.

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