Governing of Agro-Ecosystem Services

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Abstract

In this paper we incorporate interdisciplinary New Institutional and Transaction Costs Economics (combining Economics, Organization, Law, Sociology, Behavioral and Political Sciences), and suggest a framework for analysis of mechanisms of governance of agro-ecosystem services. Firstly, we present a new approach for analysis and improvement of governance of agro-ecosystem services. It takes into account the role of specific institutional environment (formal and informal rules, distribution of rights, systems of enforcement); and behavioral characteristics of individual agents (preferences, bounded rationality, opportunism, risk aversion, trust); and transactions costs associated with ecosystem services and their critical factors (uncertainty, frequency, asset specificity, appropriability); and comparative efficiency of market, private, public and hybrid modes of governance. Secondly, we identify spectrum of market and private forms of governance of agro-ecosystem services (voluntary initiatives; market trade with eco-products and services; special contractual arrangements; collective actions; vertical integration), and evaluate their efficiency and potential. Next, we identify needs for public involvement in the governance of agro-ecosystem services, and assess comparative efficiency of alternative modes of public interventions (assistance, regulations, funding, taxing, provision, partnership, property right modernization).

Finally, we analyze structure and efficiency of governance of agro-ecosystems services in Zapadna Stara Planina – a mountainous region in North-West Bulgaria. Post-communist transition and EU integration has brought about significant changes in the state and governance of agro-ecosystems services. Newly evolved market, private and public governance has led to significant improvement of part of agro-ecosystems services introducing modern eco-standards and public support, enhancing environmental stewardship, desintensifying production, recovering landscape and traditional productions, diversifying quality, products, and services. At the same time, novel governance is associated with some new challenges such as unsustainable exploitation, lost biodiversity, land degradation, water and air contamination. What is more, implementation of EU common policies would have no desired impact on agro-ecosystem services unless special measures are taken to improve management of public programs, and extend public support to dominating small-scale and subsistence farms.

Key words: *agro-ecosystem services; market, private, public and hybrid governance; Bulgaria*

Introduction

The issues of assessment and management of ecosystem services have been taking increasing attention in recent years (Berge and Stenseth; Boyd and Banzhaf; Daily, 1997, 2000; Duraiappah; Farber *et al.*; MEA). A number of studies on specific challenges, institutions, and policies for agro-ecosystem services have also appeared (Antle; Gatzweiler *et al.*; OECD; VanLoon *et al.*; WISP). It is recognized that maintaining and improving ecosystem services requires an effective social order (governance) and coordinated actions at various levels (individual, organizational, community, regional, national, transnational). It is also known that effective forms of governance are rarely universal and there is a big variation among different ecosystems, regions, countries. Efficiency of environmental management depends on specific governing structures which affect in dissimilar ways individuals behavior, give unlike benefits, command different costs, and lead to diverse performances (Bachev, 2007).

Research on mechanisms of governance of agro-ecosystem services is at beginning stage due to "newness" of problem, little awareness, emerging novel challenges, "lack" of

long-term experiences, and fundamental modernization during last two decades. Most studies focus on certain hotspots or type ecosystem (e.g. pastoral) and individual modes (formal, contract, business, public). What is more, "normative" (to some ideal or external) rather than comparative institutional approach between feasible alternatives is employed. Likewise, significant social costs associated with the governance (known as transaction costs) are not taken into consideration. Furthermore, uni-disciplinary approach dominates, and efforts of economists, lawyers, ecologists, behavioral and political scientists are rarely united. Besides, there are little studies on specific natural, economic, institutional, international etc. factors responsible for variation among ecosystems, regions, countries. Consequently, understanding on factors of governance of ecosystem services is impeded, spectrum of feasible (informal, market, private, public, integral, multilateral, transnational) modes cannot be identified, and their efficiency, complementarities, and prospects of development assessed. All these restrict our capability to assist public policies, and individual, business and collective actions for effective supply of ecosystem services.

In this paper we incorporate interdisciplinary New Institutional and Transaction Costs Economics (combining Economics, Organization, Law, Sociology, Behavioral and Political Sciences), and suggest framework for analysis of mechanisms of governance of agro-ecosystem services. Firstly, we present a new approach for analysis and improvement of governance of agro-ecosystem services. It takes into account specific institutional environment; behavioral characteristics of individual agents; transactions costs associated with ecosystem services and their critical factors; comparative efficiency of market, private, public and hybrid modes of governance. *Secondly,* we analyze structure and efficiency of governance of agro-ecosystems services in Zapadna Stara Planina giving insights on state and challenges of agro-ecosystem services in Bulgaria.

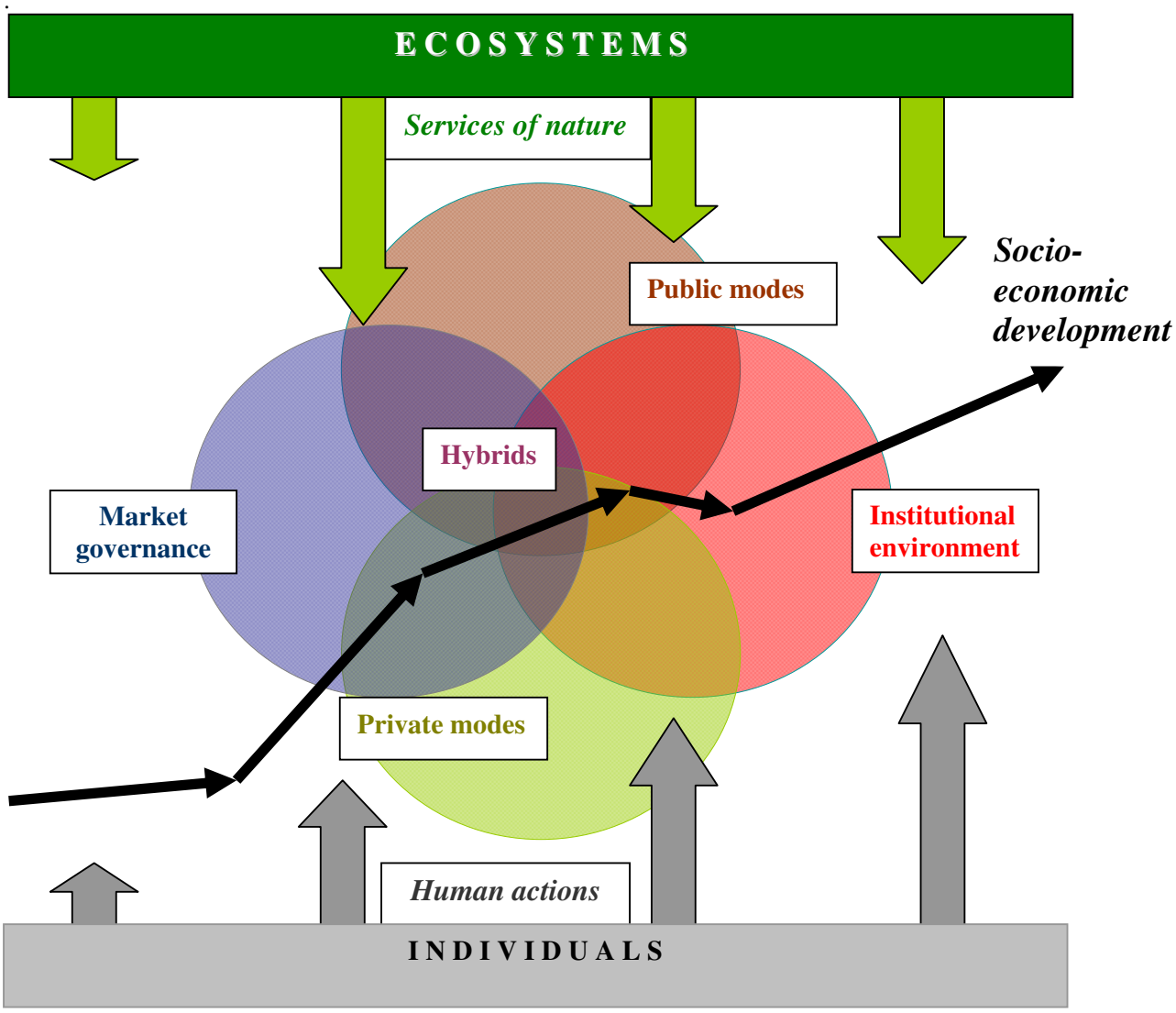
Economics of agro-ecosystem services

Governance matters

Humans benefit from multiple resources, products and processes supplied by natural ecosystems known as *ecosystem services*[1]. The amount of these services depends on natural evolution of ecosystems and development of human society (Figure 1). Unprecedented progress in science and technologies has augmented enormously human capability to benefit from diverse services of nature. At the same time, growing demand for natural resources and increased pressure on environment have been associated with immense degradation of ecosystems (overuse, pollution, destruction, reengineering) and reduction of related services (MEA). That leads to increased individuals and public concerns about the state of environment and enhanced actions for environmental conservation. What is more, traditional goals of socio-economic development have been expended incorporating environmental sustainability as an essential part (Raman; UN).

[1] They include: *provisioning services* (food; water; pharmaceuticals, biochemicals, and industrial products; energy; genetic resources), *regulating services* (carbon sequestration and climate regulation; waste decomposition and detoxification; purification of water and air; crop pollination; pest and disease control; mitigation of floods and droughts), *supporting services* (soil formation; nutrient dispersal and cycling; seed dispersal; primary production), *generation and maintenance of biodiversity,* and *cultural services* (cultural, intellectual and spiritual inspiration, recreational experiences, scientific discovery) (Daily, 1997; MEA).

Figure 1: Governing mechanisms for ecosystem services

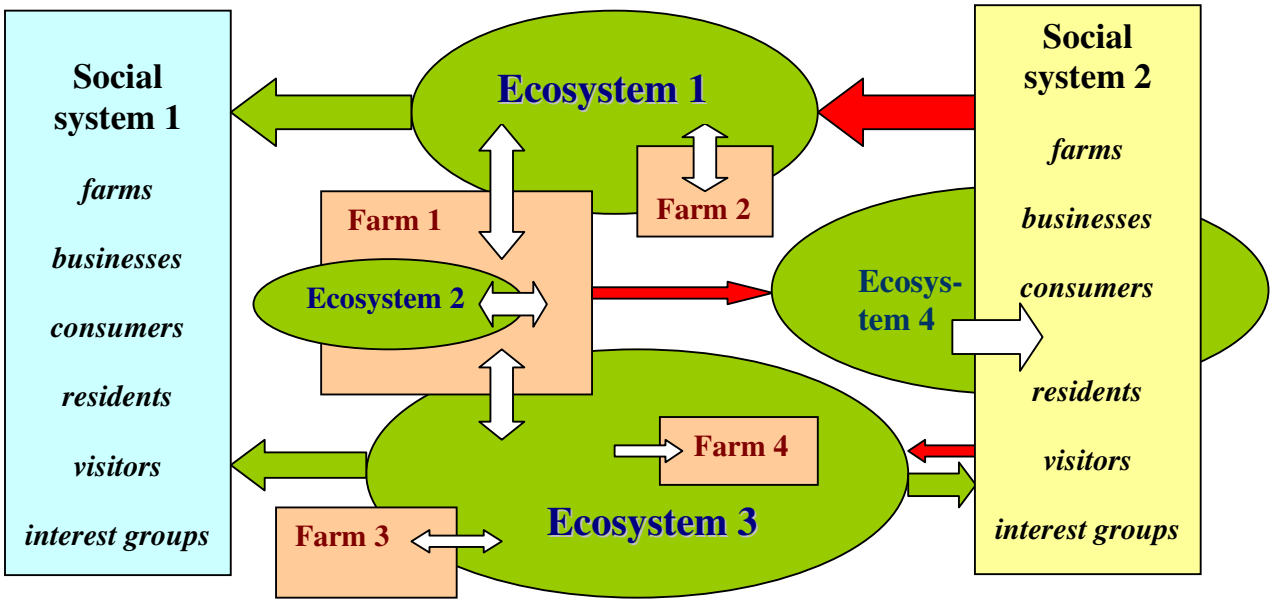


Achieving sustainable development and assuring effective supply of ecosystem services require *appropriate behavior* of individuals[2] and *coordinated actions* at local, regional, national, transnational and global levels (Bachev, 2009). According to (awareness, symmetry, strength, harmonization costs of) *interests* of agents associated with ecosystem services (consumers, contributors, transmitters, interest groups) there are *different needs* for governing of actions. Various governance needs for effective supply of agro-ecosystem services are presented in Figure 2. Farms 1 has to govern its *efforts* and *relations* with Farm 2 since both receive services from Ecosystem 1 and affect (positively or negatively) service supply of that ecosystem. Besides, both farms are to govern their relations with consumers of services from Ecosystem 1 (agents in Social system 1) to meet *total demand* and *compensate costs* for maintaining ecosystem services to that direction. In addition, Farms 1 and 2 have to coordinate efforts with agents in Social system 1 to *mitigate conflicts* with agents in Social

[2] "pro-environmental" actions, "anti-environmental" inactions.

system 2 (affecting negatively services of Ecosystem 1). Furthermore, Farm 1 is to govern its relations with Farm 3 for effective service supply from Ecosystem 3, and manage its interaction with Ecosystem 2. Moreover, Farms 1 and 3 have to govern their relations with Farms 4 and agents from Social system 1 (consumers of services of Ecosystem 3) and Social system 2 (consumers and destructors of Ecosystem 3 services). Finally, Farm 1 affecting adversely Ecosystem 4 services is to govern relations with agents in Social system 2 (consumers of Ecosystem 4 services) to reconcile conflicts and secure effective flow of ecosystem services. Therefore, Farm 1 is to be involved in seven different systems of governance in order to assure effective supply of services from ecosystems of which it belongs or affects. Similarly, for effective governance of Ecosystem 1 services there are necessary five governing modes – for coordination of actions of Farms 1 and 2; agents in Social system 1; Farms 1 and 2 with Social system 1; agents in Social system 2; Farms 1 and 2 and Social system 1 with Social system 2.

Figure 2: Governance needs for effective supply of agro-ecosystem services



Individuals can govern their relations by *free market* (adapting to market prices movements), *contracting* (negotiating a "private order"), *coalition* (collective decision-making, cooperation), within *internal organization* ("hand of manager"), by *public mode* or *hybrid* organization. "Rational" agents tend to select or design the most effective form for governing of their relations maximizing benefits and minimizing costs of transactions (Williamson). In some cases, choice of governance is imposed by dominating *institutional environment*[3]. For instance, market and private mode could be illegitimate for certain natural resources (e.g. managing national parks and reserves). Mode of governance also depends on *personal characteristics* of agents – individuals preferences, ideology, ethical and religious

[3] Institutions (*"rules of the game")* determine individuals' rights and obligations, and way(s) they are enforced (North). They are constituted by *formal* laws, regulations, international agreements as well as tradition, culture, religion, ideology, ethical and moral norms (*informal rules)*. *Enforcement* of rights is done by state, community or international pressure, trust, reputation, private modes, self-enforcement.

believes, bounded rationality[4], training, managerial skills, risk aversion, trust, tendency for opportunism.[5] For example, there are increasing number of *voluntary* and *cooperative* initiatives of producers and consumers ("codes of eco-behavior", "sustainability movements", "green alliances") being an important part of eco-governance.

Problem of effective management of environmental resources is important part of economic theory. Most often it is discussed in relation to (in)efficiency of using common natural resources ("tragedy of commons") (Hardin), and "negative externalities" of some activities (Pigou). When common ownership and "open access" to natural resources exists, there is tendency for inefficient use ("overuse") of resources. For example, there are certain natural limits for "sustainable" exploitation of a meadow for livestock farming and long-term efficiency (output) would decrease if number of grazing animals increase beyond these norms of effective reproduction. In one-person farm or private ownership, there will be no conflict between efficiency and sustainability (maximization of output over time). However, in situation of multiple users and open access, there are strong individual interests for overusing common resources since private costs are not proportionate to private benefits.[6] Consequently, constant overuse (non-sustainability) and low long-term efficiency come out as result of this form of organization of natural resources. Nonetheless, "tragedy of commons" could be avoided by alternative mode of governance. For instance, introduction of public regulation on exploitation of natural resources, such as distribution (enforcement) of quotas for farmers would keep sustainability. In other instances, privatization of natural resources would be effective solution since it would create strong private incentives (mechanisms) for preservation of resources[7].

Typical case for "market failure" in effective allocation and sustainable use of natural resource is caused by negative (positive) externalities of certain activities. Free-market prices do not always reflect impact on third party's welfare, and cannot govern effectively resource allocation (uses). For instance, price of livestock products does not comprise costs of pollution of underground water by farm activity. Since private agents (farmers, consumers) do not pay full price and costs associated with their activity, they are not interested in most effective (sustainable) use of natural resources. Maximization of social output (welfare) is not achieved, and inefficient allocation and overuse of resources, and unsustainable development come as a result. Hence farmers will over-produce "public bads" (noise, air, water pollution) and under-produce "public goods" (rural amenities, ecological and cultural services; biodiversity). Therefore, public intervention for elimination of differences between "social" and "private" prices ("internalization of externalities") through taxes, norms etc. is suggested.

Coase proved that problem of "social costs" does not exist in world of zero transaction costs[8] and well-defined private rights (Coase). Situation of maximum efficiency is always achieved independent of initial allocation of rights. If for instance, farmer has "right to

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[4] Agents do not possess full information about system (price ranges, trade opportunities, adverse effects of their activities on others, trends in development) since collection and processing such information is very expensive or impossible (future events, partners intention for cheating, time and space discrepancy between actions and adverse impacts).

[5] Individuals are given to opportunism and if there is opportunity to get non-punishably extra rent from exchange (performing unwanted exchange) they will likely "steal" others rights (Williamson).

[6] Individuals get full output from increasing number of animals while bear small portion of overall decrease in total yield as result of over-exploitation.

[7] Private agent (owner) will contract and control effective and sustainable use of limited natural resources.

[8] Transaction costs are costs for governing *relations* between individuals – "costs associated with protection and exchange of individuals' rights" (Furuboth and Richter). They have two *behavioral* origins – individuals bounded rationality and tendency of opportunism (Williamson).

pollute", affected agents would pay him appropriate "bribe"[9] to stop polluting activity. If farmer does not possess "right to pollute", then he would compensate other agents to let him certain pollution. In either case, welfare of all agents is maximized and maximum efficiency ("Pareto optimum") reached without any need for public intervention. In situation of minor transaction costs the mode of governance would not be of economic importance (Williamson). Individuals could coordinate and stimulate environmental conservation and consumption activity with equal efficiency though free market, or through private organizations of different types, or in a single nationwide hierarchy. All information for effective exploitation of natural and technological opportunities and satisfying various demands would be costlessly available. Individuals would easily coordinate activity and exchange rights in mutual benefit until exhausting possibilities for maximizing welfare (productivity, consumption, supply of ecosystem services[10]).

When transaction costs are significant then costless negotiation, exchange and protection of individuals rights is not possible. Therefore, *initial allocation of property rights* between individuals (groups) and their *good assignment* and *enforcement* are *critical* for overall *efficiency* and *sustainability.* For instance, if "rights on sustainable environment" are not well-defined that creates big difficulties in effective ecosystem service supply – costly disputes between polluting and affected agents; disregards of interests of certain groups or generations etc.

In *specific* natural, economic and institutional environment individuals develop and use diverse *effective* (market, private, hybrid) modes to govern their relations (Figure 1). However, individual modes have *unequal efficiency for supplying ecosystem services* since they posses unlike potential to decrease bounded rationality, induce individual and collective efforts, safeguard investment, protect and dispute rights, facilitate exchange, coordinate actions, save transacting costs, adapt to changing natural and institutional environment (Bachev, 2007). Often, imperfect institutional environment and high costs of market and private governance block otherwise effective for all sides (socially desirable) eco-activity. There is a need for third-party *public intervention* (assistance, regulation, arbitration) in individuals transactions to make them more efficient or possible. Nonetheless, public involvement is not always effective (delayed, under-, over-intervention) and as result agrarian "development" is substantially deformed. When market *and* private sector "fail", *and* effective public intervention is not put in place, environment conservation and improvement activities would not be carried at (socially) effective scale, and supply of ecosystem services diminished bellow practically possible level. In Bulgaria for instance, there has been numerous "government failures" during post-communist transition now. Consequently, ineffective farming organization with significant environmental problems sustain in agriculture[11].

[9] equal to lost income or welfare.

[10] There is principle *agreement ("social contract") for global sustainable development*. Specific individuals and public demand *(value)* of ecosystem services depend on state of economic development, endowments with natural resources, awareness of environmental challenges, dominating institutions in different communities, regions and countries.

[11] Ineffective farming structures, degradation of farmland, pollution of surface and ground waters, loss of biodiversity, significant greenhouse gas emissions, are typical (Bachev, 2008).

Choice of governing mode

In rare cases there is *only one* practically possible form for governance of ecosystem service activity[12]. Generally there is great variety of *alterative* modes for governing of environmental activity. For instance, supply of environmental conservation service could be governed as: voluntary activity of farmer; though private contracts of farmer with interested (affected) agents; though interlinked contract between farmer and supplier (processor); though cooperation (collective action) with other farmers and stakeholders; though (free)market or assisted by third-party (certifying, controlling agent) trade with special (eco, protected origin, fair-trade) products; though public contract specifying farmer's obligations and compensation; though public order (regulation, taxation, quota); within hierarchical public agency or hybrid form.

Individual governing forms have distinct *advantages* and *disadvantages* to protect rights, and coordinate and stimulate socially desirable activities. *Free market* has big coordination and incentive features ("invisible hand of market"[13], "power of competition"), and provides "unlimited" opportunities to benefit from specialization and exchange. However, market governance could be associated with high uncertainty, risk, and costs due to lack of information, price instability, great possibility for facing opportunism, "missing market" situation. *Special contract form* permits better coordination, intensification, and safeguard transactions. However, it may require large costs for specifying provisions, adjustments with changes in conditions, enforcement and disputing of negotiated terms. *Internal (ownership) organization* allows greater flexibility and control on transactions (direct coordination, adaptation, enforcement, dispute resolution by *fiat*). However, extension of internal mode beyond family and small-partnership boundaries[14] may command significant costs for making coalition (finding partners, design, registration, restructuring), and current management (coordination, decision-making, control of coalition members opportunism). *Separation of ownership from management* (cooperative, corporation) gives enormous opportunities for growth in productivity and transacting efficiency – internal division and specialization of labor; exploration of economies of scale/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. *Cooperative* and *non-for profit form* also suffers from low capability for internal long-term investment due to non-for profit goals and non-tradable character of shares ("horizon problem").

Efficiency of governance also depends on *"critical dimensions"* of transactions – factors responsible for *variation* of transaction costs[15]. When *recurrence* of transactions *between same partners* is high, then both (all) sides are interested in sustaining and minimizing costs of relations (avoiding opportunism, building reputation, setting up adjustment mechanisms). Besides, costs for developing special private mode for facilitating bilateral (multilateral) exchange could be effectively recovered by frequent transactions. When (environmental, behavioral, institutional) *uncertainty* surrounding transactions

[12] In Japanese dispersed paddy agriculture water supply could not have been conducted by individual farmers (interdependency, nonseparability of water use) and since earliest period water use organization developed as public projects (Mori).

[13] Some ecosystem services are directly priced on market or included in related resource (product) prices – soil quality, access to clean water, land location (beauty), special origin (quality) of products.

[14] allowing resource concentration for effective operations (exploration economies of scale/scope).

[15] "Frequency", "uncertainty", and "asset specificity" were identified by Williamson while "appropriability" added by Bachev and Labonne.

increases then costs for securing transactions are high – for overcoming information deficiency, safeguarding against risk etc. While certain risks could be diminished by particular market mode (purchase of insurance) governance of most transacting risk[16] requires special private (collective) form - contract, cooperation, integration.

Transaction costs get very high when *specific assets for relations with a particular partner* are to be deployed. Relation specific investments are "locked" in transactions with particular buyer (seller), and cannot be recovered through "faceless" market trade or redeployment to another uses. Therefore, *dependant* investment have to be safeguarded by special form such as long-term contract, interlinks, hostage taking, joint investment, ownership integration. Nevertheless, when *symmetrical* (capacity, site, origin, branding, time of delivery) *inter-dependency* of *investments* or *welfare* of agents exist, then costs of governance are not significant (mutual interests for cooperation).

Transacting is particularly difficult when *appropriability* of rights (on products, services, resources) is low. In this case, possibility for unwanted (market, private) exchange is great, and costs for protection (safeguard, detection of cheating, disputing) of private rights extremely high. Agents would either over-produce (negative externalities) or under-organize such activity (positive externalities) unless they are governed by efficient private or hybrid mode (cooperation, strategic alliances, long-term contract, trade secrets, public order).

Thus, we have to put individual transaction(s) in *center of analysis,* and assess *comparative efficiency* of practically possible forms for governance of that transaction(s)[17]. *Discrete structural analysis* is suggested which "align transactions (differing in attributes) with governance structures (differing in costs and competence) in discriminating (transaction cost economizing) way" (Williamson). According to *combination* of specific characteristics of each transaction, there will be *different* most *effective form* for governing of ecosystem service activity (Figure 3). Transactions with good appropriability, high certainty, and universal character of investments could be effectively carried *across free market* through *spotlight* or *classical contracts*[18]. There are widespread market modes for selling *pure* "ecosystem services" (eco-visits, hunting, fishing, harvesting wild plants, animals) or "ecosystem services" *interlinked* with other products and services (organic, fair-trade, special origins, on-farm sale, self-pick, education, eco-tourism, horse-riding, eco-restaurants).

Recurrent transactions with low specificity, high uncertainty and appropriability, could be effectively governed through *special contract*. *Relational* contract is applied when detailed terms of transacting are not known at outset (high uncertainty), and framework (mutual expectations) rather than specification of obligations is practiced[19]. Special contract forms is also efficient for rare transactions with low uncertainty, high specificity and appropriability. Here dependent investment could be successfully safeguarded through contract provisions since it is easy to define and enforce relevant obligations of partners in all possible contingencies (no uncertainty). For example, eco-contracts and cooperative agreements between farmers and interested businesses[20] or communities are widely used including payment for ecosystem services, and lead to production methods (enhanced pasture management, reduce use of agrochemicals, wetland preservation) protecting water from pollution, mitigating floods and wild fires.

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[16] risk of market, behavioral or institutional uncertainty.

[17] There are effective modes for *integral* organization of different type transactions but there is *no universal* form for effective organization of all transactions.

[18] Partner can be changed anytime without significant additional costs (no dependency). Private governance would only bring costs without producing any benefits.

[19] No big risk is involved since investments could be easily/costlessly redeployed to another use(users).

[20] e.g. drinking water companies in Germany (Hagedorn), and mineral water company Vittel in France (Hanson *et al.*). We discovered such agreements between farmers and Sony, Kumamoto region, Japan.

Figure 3: Principle modes for governing of ecosystem service transactions

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	♈	♈							
Special contract form			♈			♈			
Internal organization					♈		♈		
Third-party involvement				🚑				🚑	
Public intervention									🚑

♈ - *the most effective mode*; 🚑 - a *necessity for a third party involvement*

Transactions with high frequency, big uncertainty, great assets specificity, and high appropriability, have to be governed *within* internal organization. Very often effective scale of specific investment in agro-ecosystem services exceeds borders of traditional agrarian organizations. If specific capital (knowledge, technology, equipment, funding) cannot be effectively organized within singe organization[21], then effective external form(s) is to be used – joint ownership, interlinks, cooperative, lobbying for public intervention. For instance, environmental cooperatives are very successful in some EU countries (Hagedorn). 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[22].

Serious problems also arise when condition of assets specificity is combined with high uncertainty, low frequency, and good appropriability of transactions. Here governance of transacting risk would require special private forms – direct marketing, distribution channels, providing guarantees, investing in labels, share-rent (output-based) compensation, employing economic hostages, participating in risk-pooling cooperative, complete integration. However, elaboration of special governance for private (occasional) transacting is not always justified, specific investments not made and activity fails to occur at effective scale. In these cases, *a third part* (private, public) *involvement* in transactions is necessary (assistance, arbitration, regulation) to make them more efficient or possible. Unprecedented development of special origins[23], organic farming and system of fair-trade are good examples in that respect. There is increasing consumer's demand (price premium) for organic, original, and fair-trade products in developed countries. Nevertheless, their supply could not be met unless effective *trilateral governance* (including independent certification and control) is put in place.

[21] coalition made, minimum scale of operations reached, economy of scale/scope explored.

[22] Individual benefits are not proportional to individual efforts, and everybody tends to expect others to invest costs for organizational development and later on benefit ("free riding") from new organization (Olson).

[23] EU "Protected Designation of Origin", "Protected Geographical Indication", "Traditional Specialty Guaranteed".

Governing transactions is extremely difficult when *appropriability* is low. Respecting others rights or granting out additional rights could be governed by *"good will"* or *charity actions*. Many voluntary initiatives have emerged driven by preferences for eco-production, competition in industries, responds to public pressure for sound environmental management. However, environmental standards are usually "process-based", and "environmental audit" is not conducted by independent party, which does not guarantee performance outcome[24]. Besides, voluntary (charity) initiatives could hardly satisfy entire social demand especially when require considerable costs. Some *private modes* could be employed if high frequency (investment pay-back possible) and mutual dependency (incentive to cooperate) exists. In these instances, unwritten accords, interlinking, bilateral (collective) agreements, close-membership cooperatives, codes of professional behavior, alliances, internal integration are used.

Governance of most ecosystem services requires large organizations with diversified interests of agents (providers, consumers, destructors, interest groups). 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"). 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. For example, supply of "environmental goods" by farmers could hardly be governed through private contracts with individual consumers because of low appropriability, high uncertainty, and rare character of transacting[25]. At the same time, supply of environmental service is very costly and unlikely be carried on voluntary basis. Besides, financial compensation of farmers by willing consumers through pure market mode (fee, price premium) is also ineffective due to high information asymmetry, massive enforcement costs. Third-party mode with direct public involvement would make that transaction effective: on behalf of consumers State agency negotiates with farmers contract for "environment conservation and improvement service", coordinates activities of various agents, provides public payments for farmers compensation, controls implementation of negotiated terms[26].

Effective modes for public intervention

Analysis and i*mprovement* of public governance of agro-ecosystems services have to include following steps (Figure 4):

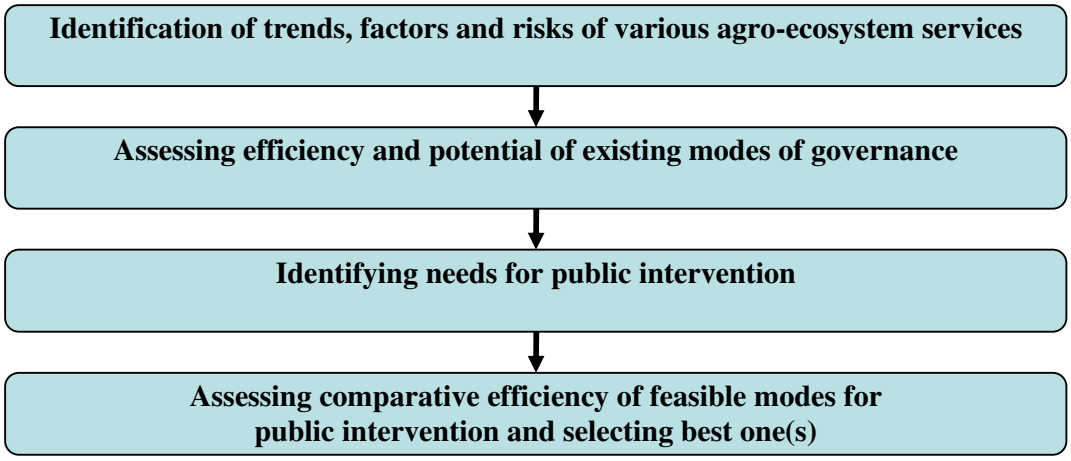
Firstly, we have to identify trends, factors and risks associated services of various agro-ecosystems. Modern science offers precise methods to classify diverse agro-ecosystem services (their spatial and temporal scales), evaluate trends and risks in their evolution, and identify driving ecological and social factors for their progression (MEA). What is more, it suggests effective methods to improve farming, business and consumption practices in order to mitigate environmental and social hazards on ecosystem services.

[24] Huge food safety, animal safety, and eco-scandals demonstrates that private schemes could often fail (high information asymmetry, possibility for opportunism).

[25] high costs for negotiating, contracting, charging all potential consumers, disputing.

[26] *Public environmental contracts* with farmers are broadly used in EU as effective form for governing supply of environmental preservation and improvement services (EC).

Figure 4: Steps in improvement of public governance of agro-ecosystem services



Secondly, we have to access efficiency and potential of *existing* mechanisms of governance (institutions, market, private, public) to deal with *problems* and *risks* for sustainable flow of agro-ecosystem services. It will be based on analysis of *structure* and *dynamics of* (individuals, groups, public) *interests* in each agro-ecosystem and *transaction costs* for their communication, protection and reconciliation.

Third, we have to identify *deficiencies* (failures) in dominating *market, private*, and *public*[27] modes to govern effectively behavior of agents associated with agro-ecosystem services (consumers, contributors, transmitters, interest groups, authorities). Existing and emerging *transacting difficulties* are to be specified - undefined or badly defined and enforced private rights, bounded rationality and opportunisms of agents; low appropriability and frequency, and high dependency and uncertainty of transactions. That help define *needs* and *types* for new public interventions in agro-ecosystem services.

Finally, we have to identify *alternative* modes for *new* public intervention able to *correct* market, private and public failures; assess their *comparative efficiency,* and select *most efficient* one(s). It is essential to compare *practically* (technically, socially) *possible* forms of governance which correspond to *social preferences* for *benefits*[28]*, instruments*, and *costs.* Comparative efficiency is to be evaluated in terms of *coordination, incentive, conflict resolution and (transaction) costs minimization potential*. Public modes not only facilitate (market, private) transactions but also command significant (public *and* private) costs. That is why assessment is to comprise *all* implementation *and* transaction *costs* – direct (tax payer, assistance agency) expenses, *and* transacting costs (for coordination, stimulation, information, control of opportunism, mismanagement) of bureaucracy, *and* costs for individuals' participation in public modes (adaptation, information, paper works, fees, bribes), *and* costs for community control over and reorganization (modernization, liquidation) of public forms, *and* (opportunity) "costs" of public inaction [29].

[27] Major reason for reforming EU CAP was "undesired" effects as over-intensification, environmental degradation, market distortions.

[28] Behavior to be changed; conflict to be mitigated; risks to be overcome; extend of restoration, preservation, augmentation of agro-ecosystem services.

[29] Value of some *lost* agro-ecosystem services could be expressed in economic terms – income decline in related industries, substitution or recovery costs, adverse impacts on human welfare. However,

Depending on *uncertainty, frequency*, and necessity for *specific investment* of public involvement, there will be different most effective forms (Figure 5). Interventions with low uncertainty and assets specificity would require *smaller* public organization (more regulatory modes; improvement of laws, contract enforcement). When uncertainty and assets specificity of transactions increases a *special contract mode* would be necessary – public contracts for provision of private services, public funding (subsidies) of private activities, temporary labor contract for carrying public programs, leasing out public assets for private management. When transactions are with high assets specificity, uncertainty and frequency then *internal mode* and *bigger public organization* would be needed – permanent public employment contracts, in-house integration of crucial assets in specialized public agency (company).

Figure 5: Effective modes for public intervention in agro-ecosystem services supply

Level of Uncertainty, Frequency, and Assets specificity				
Low	←----------		----------→	*High*
New property rights	**Regulations**	**Taxes**	**Assistance and support**	**Public provision**
Rights for clean, beautiful environment, biodiversity; Private rights on natural, biological, and environmental resources; Private rights for (non) profit management of natural resources; Tradable quotas (permits) for polluting; Private rights on intellectual property, origins, (protecting) ecosystem services; Rights to issue eco-bonds, shares; Private liability for polluting	Regulations for organic farming; Regulations for trading of protection of ecosystem services; Quotas for emissions and use of products, resources; Regulations for introduction of foreign species, GM crops; Bans for certain activity, use of inputs, technologies; Norms for nutrition and pest management; Regulations for water protection against nitrates pollution; Regulations for biodiversity, landscape management; Licensing for water or agro-system use; Quality, food safely standards; Standards for good farming practices; Mandatory eco-training; Certifications, licensing; Compulsory eco-labeling; Designating environmental vulnerable, reserve zones; Set-aside measures; Inspections, fines, ceasing activities	Tax rebates, exception, breaks; Eco-taxation on emissions, products; Levies on manure surplus; Levies on farming or export for innovation funding; Waste tax	Recommendation, information, demonstration; Direct payments, grants for eco-actions of farms, businesses, communities; Preferential credit; Public eco-contracts; Government purchases (water, other limited resources); Price, farm support for organic production, special origins; Funding eco-training; Assistance in farm, eco-associations; Collecting fees for paying ecosystem service contributors	Research, extension; Market information; Agro-meteorological forecasts; Sanitary and veterinary control, vaccination, prevention measures; Public agency (company) for important ecosystems; Pertaining "precaution principle"; Eco-monitoring; Eco-foresight; Risk assessment

Initially, it is to be considered ways to fix market and private failure by creating environment for decreasing uncertainty surrounding (market, private) transactions, increasing intensity of private exchange, protecting private rights (investments), making private investments less dependent (Figure 3). For instance, State establishes (enforces) quality, safety and environmental standards, certifies producers and users of natural resources, regulates exploitation of eco-resources, transfers water management rights to farms associations, and that facilitates (market and private) transactions of agro-ecosystem services.

Likewise, low appropriability is often caused by unspecified or badly specified private rights. In this cases, most effective government intervention would be to introduce and

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significant social value can hardly be expressed in monetary terms – adverse impact on biodiversity, other ecosystems, human health, future generations.

enforce *new private property rights* – rights on natural, biological, and environmental resources; on issuing environmental bonds and shares; marketing and stock trading of ecosystem services protection; tradable quotas for polluting; private rights on intellectual agrarian property, origins. That would be appropriate when privatization of resources or introduction (enforcement) of new rights is not associated with significant costs (low uncertainty, recurrence, and specificity of investment). That public intervention effectively transfers transactions into market and private governance, liberalizes market competition and induces private incentives (investments) in eco-activities. For instance, tradable permits (quotas) are used to control overall use of resources or level of particular pollution[30]. They give flexibility allowing farmers to trade permits and meet own requirements according to their adjustment costs and specific conditions. That form is efficient when particular target must be met, and progressive reduction is dictated through permits while trading allows compliance to be achieved at least costs (private governance). The later let also *market for environmental quality* to develop[31].

In other instances, it would be efficient to put in place *regulations* for trade and utilization of resources, products and services – standards for product quality, eco-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 and technologies; regulations for trading ecosystem service protection[32]; foreign trade regimes; mandatory eco-training and licensing of farm operators. Large body of environmental regulations in developed countries aim changing farmers behavior and restricting negative externalities[33]. It makes producers responsible for environmental effects of their activity or management of products uses (e.g.waste). This mode is effective when general improvement of performance is desired but it is not possible to dictate what changes (in activities, technologies) is appropriate for wide range of operators and eco-conditions (high uncertainty, information asymmetry). When level of hazard is 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 best solution. However, regulations impose uniform standards for all regardless of compliance (adjustment) costs and give no incentives to over-perform beyond certain level.

Sometimes, using incentives and restrictions of *tax system* would be effective form for intervention. Different tax preferences (exception, breaks, credits) are widely used to create favorable conditions for development of certain sub-sectors, regions, activities, forms of organizations, segment of population. Environmental taxation on emissions or products (inputs, outputs) is also applied to reduce use or leakage of harmful substances[34]. Eco-taxes impose same conditions for all farmers using particular input and give *signals* to take into

[30] E.g. manure production quotas (Holland), water abstraction licenses and water rights trading (UK, Australia), nutrition trading schemes (some US river catchments).

[31] Permits can be taken out of market to raise environmental quality above publicly "planned" level.

[32] One can acquire credits for sponsoring protection of carbon sequestration sources or restoration of ecosystem service providers. Banks for handling such credits are established and conservation companies even gone public on stock exchanges (Daily *et al.*).

[33] In EU there are bans for spraying pesticides by airplane, burning after harvest, overhead irrigation of grassland; detailed regulations for nutrition and pest management, water protection against pollution by nitrates, biodiversity and landscape management; licensing for water use. Each country develops "good farming practices" system setting specific codes for sustainable farming.

[34] Taxes on manufacturing or trade of pesticides and fertilizer are used (Scandinavian countries, Austria) to decrease their application and environmental impact. Dutch levies on manure surplus (based on levies for nitrogen and phosphorus surpluses) create incentives to minimize leakages and not substitute taxable for non-taxable inputs.

account *"environmental costs"* inflicted on rest of society. 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. Tax revenue is also perceived to be important to maintain budget (activities) of special environmental programs. However, appropriate level of charge is required to stimulate desirable change in farmers behavior[35]. Furthermore, nitrogen emission can vary according to conditions when nitrates are applied and attempting to reflect this in tax may result in complexity and high (administrative and private) costs[36].

In some cases, *public assistance and support* to private organizations is best mode. Large agrarian (rural) development, environment conservation, and trans-border cooperation programs are widely used in industrialized countries. Public *financial* support for eco-actions is most commonly used instrument for improving environment performance of farmers. It is easy to justify public payments as compensation for provision of "environmental service". All studies shows that value placed upon landscape exceed greatly costs of running schemes. However, share of farms and land covered by various agri-environmental support measures is not significant[37]. That is a result of voluntary (self-selection) character of this mode not attracting farmers with highest environment enhancement costs (intensive, damaging environment producers). In other cases, low-rate of farmers' compliance with eco-contracts is serious problem[38]. Later cannot be solved by augmented administrative control (enormous enforcement costs) or introducing bigger penalty (politically, juridical intolerable). 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 adverse actions (intensification, return to conventional farming)**.** Main critics of subsidies are associated with their "distortion effect", negative impact on "entry-exit decisions" from polluting industry, unfair advantages to certain sectors in country or industries in other countries. It is estimated that agri-environmental payments are efficient in maintaining current level of environmental capital but less successful in enhancing environmental quality (EC).

Often providing *public information, recommendations, training and education* to farmers, rural population, and consumers are most efficient form. In some cases, *pure public organization* (in-house production, public provision) will be effective as in case of important agro-ecosystems[39] and national parks; agrarian research, education and extension; agro-meteorological forecasts; sanitary and veterinary control.

Usually, individual modes are effective if they are applied *alone with other modes* of public intervention. Necessity of *combined* intervention (*governance mix)* is caused by: complementarities (joint effect) of different forms; restricted potential of some less expensive forms to achieve certain (but not entire) level of socially preferred outcome; possibility to get extra benefits (e.g."cross-compliance" requirement for receiving public support); particularity of problems to be tackled; specific critical dimensions of governed activity; uncertainty (little knowledge, experience) associated with likely impact of new forms; Government

[35] In Scandinavia introduction of such tax brought reduced pesticide use while doubling tax rate in California had no discernable effect on sales (ECOTEC).

[36] Dutch annual tax revenue was 7,3 millions Euro against administration costs 24,2 millions and compliance expenses 220-580 per farms (ECOTEC).

[37] It is 25% of Utilized Agricultural Area (UAA) in old EU members (EC).

[38] In France 40% of farmers face some difficulties to enforce contracts in their parts of eco-impact (Dupraz *et al.*).

[39] In Japan special ("third sector") public organizations at local level take care of farmland in unpopulated regions.

(administrative, financial) capability to fund, control, and implement different modes; dominating policy doctrine (Bachev, 2007).

Besides, *level* of effective public intervention (governance) depends on the scale of ecosystem and kind of the problem. There are public involvements which are to be executed at *local* (agro-ecosystem, community) level, while others require *regional* and *nationwide* governance. There are also activities, which are to be coordinated at *international* (regional, European, worldwide) level due to strong necessity for *trans-border actions* (needs for cooperation in natural resources management, prevention of ecosystem disturbances, exploration of economies of scale/scale, governing spill-overs)[40] or consistent (national, local) *government failures*. Frequently effective management of many agro-ecosystem problems (risks) requires *multilevel* governance with combined actions at various levels involving diverse range of actors and geographical scales.

Public (regulatory, provision, inspecting) modes must have built *special mechanisms* for increasing *competency* (decrease bounded rationality, powerlessness) of bureaucrats, beneficiaries, interests groups and public at large as well as restricting possible *opportunism* (cheating, interlinking, abuse of power, corruption) of public officers and other stakeholders. That could be made by training, introducing new communication technologies, increasing transparency (independent assessment, 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 incentives and decrease overall costs.

Principally, *pure* public organization should be used as *last resort* when all other modes do not work effectively (Williamson). "In-house" public organization has higher (direct, indirect) costs for setting up, running, controlling, reorganization, liquidation. What is more, unlike market and private forms there is *not automatic mechanism* (competition) for sorting out less effective modes[41]. 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 associates, employed bureaucrats) rather than efficiency. Along with development of general *institutional environment* ("The Rule of Law") and measurement, communication etc. *technologies,* efficiency of pro-market modes (regulation, information, recommendation) and contract forms would get bigger advantages over internal less flexible public arrangements (Bachev, 2007).

Usually *hybrid modes* (public-private partnership) are much more efficient than pure public forms given coordination, incentives, and control advantages. Involvement of farmers, beneficiaries and interest groups increase efficiency - decrease asymmetry of information, restrict opportunisms, increase incentives for private costs-sharing, reduce management costs. For instance, hybrid mode would be appropriate for carrying out supply of environment, biodiversity, landscape, and heritage preservation service by farmers. That is determined by farmers information superiority, interlinks of activity with farming production (economy of scope), high assets specificity to farm (farmers competence, investment's cite-specificity to farm, land, ecosystem), spatial interdependency (need for farmers cooperation at ecosystem or wider scale), and origin of negative externalities. Furthermore, enforcement of most environmental, 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, disputing costs (Bachev, 2004).

[40] e.g. in 2009 Bulgarian authority started fox vaccination as part of EU fox protection initiative.
[41] It is not rare to see highly inefficient but "sustainable" public organizations around globe.

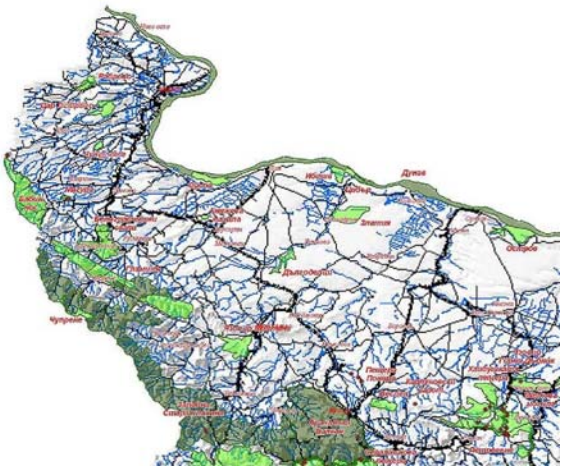
Comparative analysis let us *improve design* of new forms of public intervention according to *specific* (natural, market, institutional) *conditions* of particular agro-ecosystem[42] and participating *actors* (decision-makers, implementers, beneficiaries, and interest groups). What is more, we could *predict* likely cases of *new* public (local, national, international) *failures* due to impossibility to mobilize political support and necessary resources or ineffective implementation of otherwise "good" policies. Since public failure is feasible option its timely *detection* permits foreseeing persistence (rising) of certain environmental problems and conflicts, and *informing* (local, international) community about associated risks.

Bulgarian experiences in Agro-ecosystem service governance

Post-communist transformation in Bulgaria has been associated with significant challenges for agro-ecosystems such as degradation and contamination of farmland, pollution of surface and ground waters, loss of biodiversity, significant greenhouse gas emissions etc. (Bachev, 2008). Badly defined and enforced environmental rights; prolonged process of privatization; domination of farming structures with no incentives for long-term investment; high uncertainty and asset specificity combined with low frequency and appropriability of eco-transactions; ineffective forms of public intervention - all they are responsible for poor environmental management. EU integration and implementation of common (agricultural, environmental, regional) policies gives new opportunities to improve eco-management and services of agro-ecosystems in the country.

We will analyze structure, efficiency and prospects of governance of agro-ecosystem services in Zapadna Stara Planina (ZSP) – a mountainous region in North-West Bulgaria (Map 1). Specific agro-ecosystems services and their governance are significantly affected by recent development.

Map 1: Zapadna Stara Planina ecosystem in Bulgaria



Map 2: Natura 2000 Habitat directive sites (light green) and Bird directive sites (dark green)

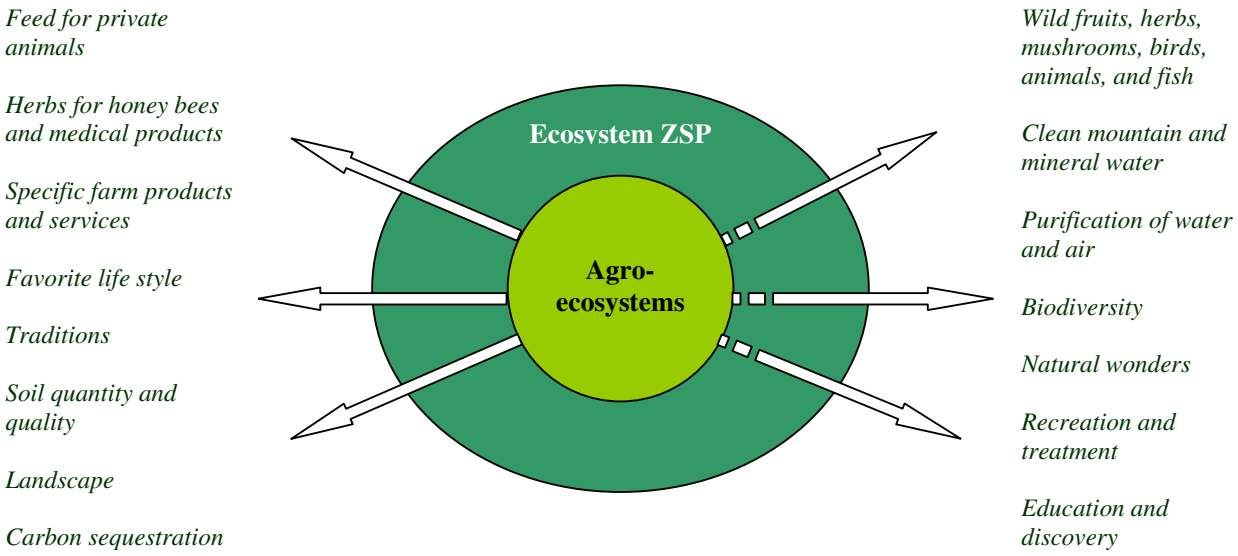
Agro-ecosystems in ZSP are part of unique ecosystem of ZSP[43] and provide a wide range of *specific* services (Figure 6). Great number of agents *from* and *outside* region

[42] Institutions can rarely be "imported" but must be designed for specific conditions of different ecosystems, communities, regions, countries.

[43] ZSP region covers area of 4043 km^2 (2099 km^2 in Bulgaria and 1944 km^2 in Serbia) out of which 60% is forests and rest is farmland (Grigorova and Kazakova).

benefit from and *affect* services of these ago-ecosystems – owners[44], farmers, residents, businesses, visitors, consumers, scientists and interest groups.

Figure 6: Services of Agro-ecosystems in Zapadna Stara Planina



Approximately 70% of farmland in ZSP comprises meadows and pastures (MAF). They provide abandon feed for farm and household animals, and create good conditions for development of grazing livestock (sheep, goats, cattle, buffalos, horses) and domestic animals (poultry, rabbits, pigs). In addition, there are plenty of wild flowers and herbs which favor bees keeping and herbal honey production as well as collection of natural medical plants. Furthermore, a wide range of farm products are produced in this environment used for provisioning of local population and marketing. Some of local farm-based produces are well-known for their quality, unique taste and original character (strawberry, raspberry, blackberry, berry jams, herb honey, sheep yogurt and cheese, lamb meat, wool, fur, prune, plum brandy) and marketed at regional, national and international markets. Simultaneously, they favor development of related productions and services being important income source for local populations – (jam, dairy, brandy, leather) processing, dying wool, weaving and crafts making, on-farm and direct marketing, agro-tourism.

What is more, for many local and not-permanent residents interactions with agro-ecosystems are favorite mode of recreation (part-time or hobby farming, short or longer term visits) or life style (weekend/summer houses). Moreover, local traditions and ethnic culture of Torlaks and Karakachans are closely related to agro-ecosystems and farming system – specific agricultural and related products (e.g. Chiprovtsi hand-made carpets), crop verities and animal breeds, production methods and technologies, festivals, cuisine, crafts. Besides, unique shape and quality of landscape is a critical feature of agro-ecosystems dominating by natural or semi-natural high mountain pastures, riparian meadows, stony and rocky terrains. All these attract many visitors from the region, country and abroad.

Next, agro-ecosystems contribute significantly for maintaining (improving) soil quality - vegetation cover reducing soil loss and degradation and promoting water infiltration.

[44] 50% of pollution in ZSP own agricultural lands (Grigorova and Kazakova).

Furthermore, carbon sequestration is important service of grasslands, berry bushes, orchards and vineyards storing considerable amount of CO_2 stock.

Agro-ecosystems also provide *combined* services with larger ecosystem of ZSP. Great variety of wild fruits, herbs, chestnuts, mushrooms, birds, animals and fish are available and picked up or hunted by local population and visitors. What is more, some of them are commercially gathered for processing and sells bringing additional incomes for around 20% of population (Grigorova and Kazakova).

Ecosystem ZSP is a source of clean mountain and mineral water used by farmers (for animals, irrigation), residents (for drinking, household needs), businesses (for inputs, bottling) and health centers (for balneotherapy) in the region and neighboring areas. Besides, it purifies water and air and regulate climate making region one of favorite destination for tourism, recreation and treatment[45]. Moreover, some of country's most popular natural wonders like Rocks of Belogradchik[46], Iskar Gorge, and number of picks, waterfalls and caves are located in ZSP enhancing cultural services of ecosystem.

Furthermore, territory of ZSP is with high ornithological and botanical importance designated as Pan-European network NATURA 2000 site (Map 2). Maintaining this rich biodiversity is a great service of ecosystem ZSP. For instance, in its flora there are more than 2000 species of higher plants (among which 12 Bulgarian and 79 Balkan endemics[47]) while its fauna comprise more than 180 bird species, more than 50 species of mammals, 26 species of amphibians and reptiles, and many butterfly species of conservation importance (Grigorova and Kazakova). All these increase educational and scientific services of this unique ecosystem as well.

Various market, private and public modes are used for governing of agro-ecosystem services in ZSP (Figure 7).

Figure 7: Modes of governance of agro-ecosystem services in Zapadna Stara Planina

Market	Private	Public
Informal branding *Organic (berry) farming* *Organic apiaries* *Organic livestock* *Organic wild fruits and herbs gathering* *Specific origins (lamb, cheese, berries, carpets, crafts)* *Organic processing (berries, milk, herbs)* *Eco-labeling* *On farm and direct marketing* *Clientatlisation (cheese, meat, berries)* *Agro and eco-tourism*	*Voluntary initiatives* *Long-term supply contracts (milk, berries)* *Vertical integration of farming into processing, and services (shops, hotels, restaurants)* *Interlink organization (dairy)* *Diversification of production and services* *Cooperatives* *NGO's* *Organic alliances*	*Environmental regulations* *Eco-information, monitoring, assessment* *Promotion or joining eco-initiatives (festivals, networks, ads)* *Designated zones of eco-importance (natural parks, NATURA)* *Area-based direct payments* *Leasing out public land for private management* *Cross-compliance requirement* *Agro-ecological payments (voluntary contracts)* *Support to traditional and original productions* *Support to farms and processing modernization* *Support for semi-market farms* *Support to young farmers* *Support for adaptation of quality, safety, eco etc. standards* *Support to collective actions (producers groups, cooperation)* *Support for diversification of activity (eco-tourism, heritage)* *(Mandatory) environmental training* *Program for development of agriculture in North-West Bulgaria* *Fox vaccination* *Recultivation of degradated farmlands* *Garbage taxation* *State company for Vratza Natural Park* *Support to trans-border initiatives*

[45] Well-known mountainous resorts Berkovitza, Varshetz, Izketz are located in ZSP.
[46] It is nominated to be one of New 7 Natural Wonders of the World.
[47] Besides, hill "Vrashka Chuka" is worlds only place of *Eranthis bulgaricus*.

Post-communist reforms transferred entire agrarian activity from large public farms into market and private governance (Bachev, 2006). Private management and market adjustments have been associated with domination of small-scale and subsistence holdings (Table 1), sharp decline in crop and livestock (but goat) productions[48] and general desintensification of activity[49]. Private ownership introduced better incentives for environmental stewardship while small operational size led to overcoming certain problems of large public enterprises from the past[50] and revived some traditional (more sustainable) technologies, varieties and products. By-product from this market and private "governance" has been overall improvement of agro-ecosystems services in ZSP. Farm and related productions have got "organic" character obtaining good reputation for products with high quality and safety. Region has become attractive destination for many local and foreign tourists willing to experience genuine nature, and traditional cuisine and lifestyle.

Table 1: Major characteristics of farms in Zapadna Stara Planina*

Indicator	Value	Indicator	Value
Number of farms	12151	Share of farms with cattle (%)	17,2
Average UAA (ha)	*0,997*	*Average cattle per farm*	*2,9*
Share of arable land (%)	33,6	Share of farms with sheep (%)	51,1
Share of cereals (%)	18,4	*Average sheep per farm*	*5,5*
Share of horticulture (%)	4,3	Share of farms with goats (%)	62,7
Share of grassland (%)	58,7	*Average goats per farm*	*2,6*
Share of permanent crops (%)	4,9	Share of farms with pigs (%)	47,2
Share of farms with bees (%)	6,3	*Average pigs per farm*	*1,5*
Average bees colonies per farm	*7,1*	Share of farms with poultry (%)	69,0
		Average poultry per farm	*14,2*

** Berkovitsa, Varshets, Georgi Damyanovo, Chiprovtsi, Belogradchik, Chuprene, Godech, Svoge municipalities*
Source: MAF

Market-driven organic production has emerged in recent years but it is restricted to few farms, processors and traders. Currently organic mode covers 3% of UAA, several hundreds livestock and hives, insignificant gathering area for wild fruits and herbs (MAF). Country biggest producers of organic raspberries and bee honey are located in ZSP. Organic form has been introduced by business entrepreneurs who managed to organize and fund this new venture arranging independent certification[51] and marketing highly specific output. However, internal market for organic and eco-products is still undeveloped because of higher prices and limited consumer confidence in authenticity[52].

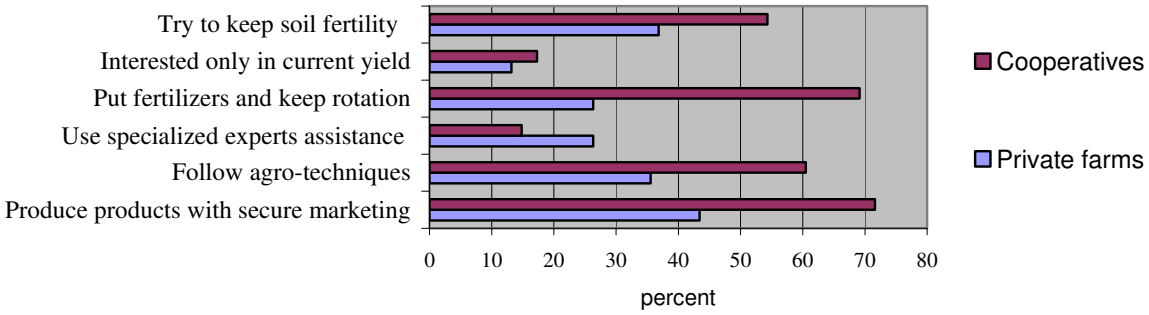
Number of effective private modes have also evolved and govern relations between farmers, processors, food stores, and consumers. High specificity and capacity dependency are widely safeguarded by cooperation (services, processing), long-term contracts (marketing of milk and organic berries), interlinked organization (milk marketing against free provision of cooling vanes and credit), and compete integration (diversification of farming into processing, agro-tourism). Often non-agrarian agent (processor, food store, restaurant chain,

[48] Number of cattle, pigs, sheep and poultry dropped by 61%, 77%, 81% and 53% accordingly while potatoes, wheat, vegetables and Alfalfa hay productions shrunk by 33%, 50%, and 75% (NSI).
[49] Now per ha application of fertilizers and pesticides represents 22% and 31% of 1989 levels (MAF).
[50] lost natural landscape and biodiversity, nitrate and pesticide contamination, huge manure concentration, uncontrolled erosion, significant green gas emissions.
[51] Most certification is done by foreign bodies since no local institutions existed until recently.
[52] Fake labeling is reported daily by Organization for Consumer Protection.

exporter) driven by market or institutional demand initiates, funds, and integrates eco-farming. That is the case with Danon baying milk from big dairy farms (and enforcing safety, quality, environmental and animal welfare standards), a Japanese investors financing organic apiaries and exporting bio-honey, a leading restaurant chain integrating dairy farming and processing.

Cooperatives have been typical mode having great potential to organize highly specific to members transactions (supply of critical inputs and services, processing, marketing), explore economies of scale and scope, mediate relations between landowners and users, adapt to requirements of banks and public institutions. Moreover, they implement better environmental strategies preserving soil fertility and observing crop-rotation and agro-techniques requirements (Figure 8).

Figure 8: Share of farms implementing different strategies (%)



Source: Survey data, 2008

Market and private voluntary, non-for profit or for-profit forms contribute significantly to improvement of eco-governance but their scope is usually restricted to portion of agro-ecosystems (services). For instance, a fifth of agricultural lands have been abandoned which caused uncontrolled "development" of species allowing expansion of some and suppressing others. Furthermore, part of permanent natural and semi-natural meadows have been left under-grazed or under-mowed, and intrusion of shrubs and trees into grassland took places putting pressure on priority species (like *Souslik*) and related chain (*Marbled Polecat*) (Grigorova and Kazakova). Some of fertile semi-natural grasslands have been converted to cultivation (crops, berries, vineyards, orchards) which caused irreversible disappearance of plant species diversity. Meanwhile, communal and private pastures close to settlements have been degraded by unsustainable use (over-grazing). In addition, reckless collection of certain wild plants (berries, herbs, flowers) and animals (snail, snakes) have led to destruction of natural habitats. Besides, erosion has been major factor for land degradation as a result of inappropriate agro-techniques, deficiency of anti-erosion measures, and uncontrolled deforestation (EEA). Damages are further enhanced by dominating negative rate of fertilizer compensation of N, P and K intakes and unbalance application of nutrient components (MAF). In addition, lack of effective manure storage capacities in most farms[53], and modern sewer and garbage collection systems in rural areas bring about air, soil and water pollution, and affect beauty of scenery.

What is more, most cooperatives have shown serious disadvantages (ineffective management, low incentives for long-term investment, small adaptability to members and market needs) and 60% of them have gone bankrupt after 2000. Similarly, majority of dairy farms and processors have failed to adapt to tough EU (safety, hygiene, environment, animal

[53] 0,1% of livestock farms possess safe manure-pile sites, around 81% use primitive dunghills, and rest have no facilities at all (MAF).

welfare) standard and had to cease commercial activity. Finally, private interests of particular individuals (groups) have harmed legitimate public rights to ecosystem services due to restricting access, conversion of proper use (farm/forest land into construction), or escaping public order on natural resource management[54].

Until 2007 EU accession, country's environmental and other laws, programs and standards were harmonized with immense Community Acquis. There have appeared new opportunities to get public support for divers private and collective activities related to agro-ecosystem services. For instance 2007-2013 National Plan for Agricultural and Rural Development (NPARD) provides significant funding for area-based and agro-environmental payments (organic farming, management of agricultural lands with high natural value, traditional livestock, protection of soils and water, and preservation of landshaft features[55]); modernization of farms, processing and marketing; diversification of activity; infrastructural development; keeping traditions; training etc. Moreover, requirement for "cross-compliance" (with modern quality, safety, environmental, animal welfare etc. standards[56]) for receiving public support is introduced. Funding for projects related to eco-system services is also available from Fund LIFE+ and Operational Programs "Environment", "Fishery and Aquaculture" and "Regional Development".

However, implementation of new public order is not effective because of lack of agents awareness and experience, inadequate administrative capacity, and mismanagement (Bachev, 2008). For instance, SAPARD[57] measure "Agro-ecology" was not approved until September 2006 and few projects were actually funded. What is more, in 2008 European Commission suspended SAPARD because of corruption, and considerable funding lost. Furthermore, due to restricting criteria[58], complicated procedures, and high transacting costs, majority of farms (small-scale and subsistent holdings) have not been able to participate in diverse support schemes. For example, less than 5% of all farms from ZSP, comprising 18% of grasslands and 8% of arable land, are registered in Land Parcels Identification System (indicating land eligible for CAP support). From SAPARD agro-ecological measures benefited less than 100 farms from ZSP while other supports went predominately to large farms and most developed regions (MAF). Up-to-date Programs "Environment" funded no biodiversity projects (MWE). In some cases, enforcement of environmental standards is difficult since costs for detection of offenders are high. For instance, forbidden practice of burning of (stubble) fields is widespread causing deterioration of soil quality, extermination of micro-flora and habitats, contribution to green-house emissions, multiplying forests fires, and diminishing visibility (EEA). Likewise, requirement for minimum-maximum number of animals on pastures is very difficult to enforce (only 5 % of beneficiaries subject to inspection).

Conclusion

Agro-ecosystem services have always been an important factor for human welfare. Their specific character and evolution depends both on "Rule of nature" and development of society (progress in demand and technologies, "rules of the game"). Effective supply of agro-ecosystem services is eventually determined by the efficiency of specific governance which (is to) includes preset formal and informal rules (institutions environment), voluntary

[54] Lobbying efforts led to reduction in numbers and area of initially identified sites for NATURA 2000.
[55] 5 year contracts with payments according to type of activity and farm size.
[56] For receiving direct payments land must be kept in "good agronomic and ecological condition".
[57] EU Special Assistance Program for Agriculture and Rural Development (2000-2006).
[58] For direct and agro-ecological payments minimum farm size is 1 ha (permanent crops 0,5 ha) and 0,5 ha as 0,1 ha parcel size also applies (landless livestock holdings are not eligible). NPARD does not provide support for restoration of abandoned farmland and organic livestock (but forage) production.

initiatives, "invisible hand of market", negotiated or set by "manager's hand" private order, collective actions (cooperation, codes of behavior), public modes (public order, support, provision), and hybrid organizations (trilateral and multilateral modes). In order to improve eco-behavior of individuals we have to assess comparative efficiency of alternative modes of governance of agro-ecosystem services - their potential to protect interests and minimize costs of transacting of beneficiaries, contributors, destructors etc. Analyses of institutional and transaction structure let us identify market, private and public "failures" and needs for (new) public intervention as well as evaluate efficiency of feasible modes for public involvement (assistance, regulations, property rights modernization) and predict likely failures in agro-ecosystem services.

Post-communist transition and EU integration has brought about significant changes in the state and governance of agro-ecosystems services in Bulgaria. Newly evolved market, private and public governance has led to significant improvement of part of agro-ecosystems services in mountainous ZSP introducing modern eco-standards and public support, enhancing environmental stewardship, desintensifying production, recovering landscape and traditional productions, diversifying quality, products, and services. At the same time, novel governance is associated with some new challenges such as unsustainable exploitation, lost biodiversity, land degradation, water and air contamination. What is more, implementation of EU common policies would have no desired impact on agro-ecosystem services unless special measures are taken to improve management of public programs, and extend public support to dominating small-scale and subsistence farms.

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