Agri-environmental Management during EU Integration of Bulgaria

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This paper suggests a holistic framework for analyzing the forms and efficiency of agri-environmental management; assesses evolution of market, private, public and hybrid modes of agri-eco-governance during transition and EU integration in Bulgarian; evaluates the impacts of EU CAP on environmental sustainability of Bulgarian farms; specifies major environmental challenges in Bulgarian agriculture, and suggests recommendations for improvement of public policies for effective environmental management. First, it incorporates interdisciplinary New Institutional Economics and suggests a comprehensive framework of analyzing the eco-management in agriculture. Second, it presents the evolutions of diverse forms of eco-management during post-communist transition and EU integration of Bulgarian agriculture, and analyzes their impact(s) on agents' behaviour and efficiency. Third, it assesses the impact(s) of dominating system of management and the new public (EU, national) measures on the state of environment, and identifies major eco-challenges, conflicts and risks. Forth, it evaluates the impacts of EU CAP implementation on eco-performance of Bulgarian farms. Finally, it suggests recommendations for institutional modernization and for improvement of public policies for effective environmental management.

Keywords: agri-eco-governance; market, private, public modes; agricultural transition; eco-effects of EU CAP; Bulgaria

Introduction

There has been a fundamental transformation of Bulgarian agriculture for the last 20 years which has affected profoundly agricultural impact(s) on the environment. With few exceptions (Bachev, 2008, 2009, 2012a) there are no publications on modes and efficiency of environmental management during transition and EU integration of the country.

This chapter suggests a holistic framework for analyzing the forms and efficiency of environmental management in agriculture; assesses evolution of market, private, and public modes during transition and EU integration of Bulgarian agriculture; specifies major challenges and suggest recommendations for improvement of public policies for effective environmental protection. First, it incorporates the interdisciplinary New Institutional Economics and suggests a comprehensive framework of analyzing the eco-management in agriculture. Second, it presents evolutions of various market, private, and public forms of eco-management during post-communist transition and EU integration of Bulgarian agriculture, and analyzes their impact(s) on agents' behaviour and efficiency. Third, it assesses the impact(s) of dominating system of management and the new public (EU, national) measures on the state of environment, and identifies major eco-challenges, conflicts and risks. Finally, it suggests recommendations for institutional modernization, and for improvement of public policies for effective environmental protection.

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1. Framework of analysis of agri-environmental management

Agri-eco-management modes

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

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

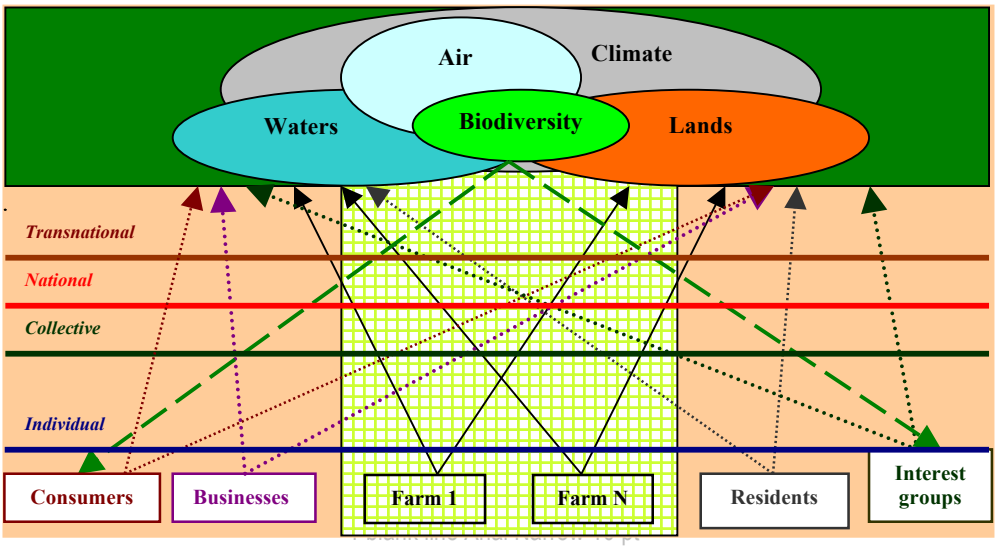

Figure 1. Structure of environmental management in agriculture

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

However, the effective environmental management often necessitates *concerted (collective) actions* of a number of farms as it is in the case of sustainable use of a common pasture and limited water supply, protection of local biodiversity etc. Furthermore, modern

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

farming activity is frequently associated with significant (positive and/or negative) externalities which require *managing relations* (cooperation, reconciling conflicts, recovery of costs) between different farms, and increasingly between farmers and non-farmers. For example, adverse effects of agricultural activities on water and air quality are often felt by residents and businesses in neighbourhood or more remote regions. Similarly, agricultural contribution to ecosystem services benefits a large number of residents, visitors, consumers, businesses, and interest groups requiring certain collective actions for sustainable supply. In all these instances, environmental management goes beyond simple (technical, agronomic, ecological) "relations with nature" and embraces the *governance of relations* and *collective actions* of agents with diverse interests, power positions, awareness, capabilities etc. in large *geographical, sectoral*, and *temporal* scales.

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

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

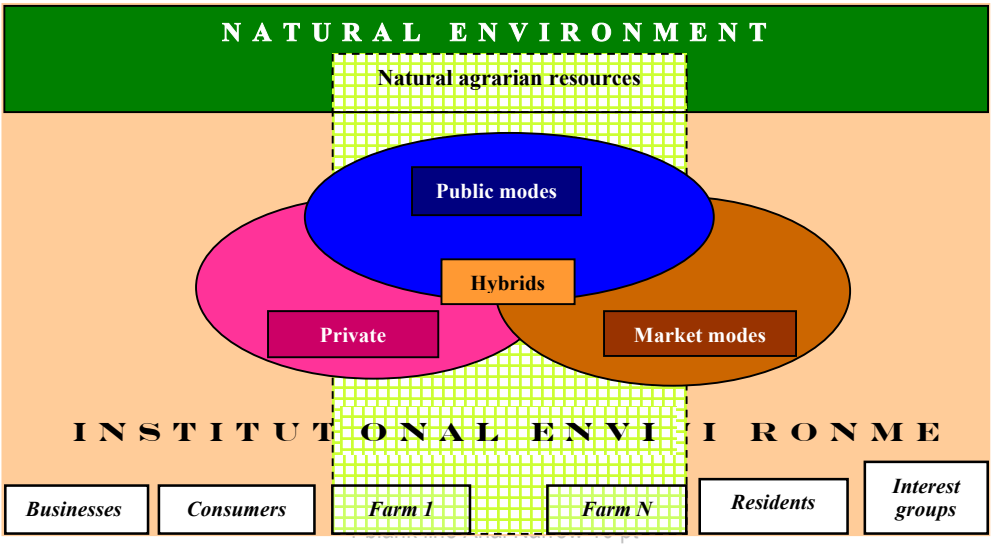

Figure 2. Modes of environmental management in agriculture

First, *institutional environment* ("rules of the game") - that is the distribution of rights between individuals, groups, and generations, and the system(s) of enforcement of these rights and rules (Furuboth and Richter; North). The spectrum of rights could embrace material assets, natural resources, intangibles, certain activities, clean environment, food security,

intra- and inter-generational justice etc. A part of the rights and rules are constituted by formal laws, regulations, standards, court decisions etc. In addition, there are important informal rules and rights determined by tradition, culture, religion, ideology, ethical and moral norms. Enforcement of rights and rules is done by the state, community pressure, trust, reputation, private modes, and self-enforcement.

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.[3]

The institutional "development" is initiated by the public (state, community) authority, international actions (agreements, assistance, pressure), and the private and collective actions of individuals. It is associated with the modernization and/or redistribution of the existing rights; and the evolution of new rights and the emergence of novel (private, public, hybrid) institutions for their enforcement. In modern society a great deal of individuals' activities and relations are regulated and sanctioned by some (general, specific) formal and informal institutions. However, there is no perfect system of preset outside rules that can manage effectively the entire eco-activity of individuals in all possible (and quite specific) circumstances of their life and relations associated with the natural environment.

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

The importance of free market for the coordination (direction, correction) and stimulation of economic activities, exchanges and allocation of resources is among fundamentals of the Economic theory. Individual agents use (adapt to) markets profiting from the specialization and mutually beneficial exchange (trade) while their voluntary decentralized actions govern the overall distribution of efforts and resources between activities, sectors, regions, eco-systems, countries etc. Nevertheless, there are many instances of lack of individual incentives, choices and/or unwanted exchanges related to conservation of natural environment - e.g. missing markets, monopoly and power relations, positive or negative externalities etc. Consequently, free market "fails" to manage effectively the entire eco-activity, exchanges, and investments of individuals.

Third, *private modes* ("private or collective order") – those are diverse private initiatives and special contractual and organizational arrangements – e.g. voluntary eco-actions, codes of eco-behaviour, eco-contracts, eco-cooperatives etc.

Individual agents take advantage of economic, market, institutional etc. opportunities and deal with institutional and market deficiency by selecting or designing mutually beneficial private modes (rules) for governing their behaviour, relations and exchanges. The private mode negotiates own rules or accepts (imposes) existing private or collective order, transfers existing rights or gives new rights to counterpart(s), and safeguards absolute[4] and/or contracted rights. In modern society a great part of the agrarian activity is managed by

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

[4] assigned by the dominating institutions.

voluntary initiatives, private negotiations, "visible hand of the manager", or collective decision-making. Nevertheless, there are many examples of private sector deficiency in governing of socially desirable activity such as environmental preservation, eco-system services etc.

Forth, *public modes* ("public order") – these are various forms of public (community, government, international) intervention in market and private sectors - e.g. public guidance, regulation, taxation, assistance, funding, provision, property right modernization etc.

The role of public (local, national, and transnational) governance has been increasing along with the intensification of activity and exchange, and growing interdependence of socio-economic and environmental activities. In many cases, effective management of individual behaviour and/or organization of certain activity through a market mechanism and/or a private negotiation would take a long period of time, be very costly, could not reach a socially desirable scale, or be impossible at all. Thus a centralized public intervention could achieve the willing state faster, cheaper or more efficiently. Nonetheless, there are a great number of bad public involvements (inaction, wrong intervention, over-regulation) leading to significant problems of sustainable development around the globe (Bachev, 2010b).

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

The efficiency of individual management modes is quite different since they have unlike potential to: induce eco-friendly behaviour, reconcile eco-conflicts and coordinate eco-actions of different parties, impact environmental sustainability and mitigate eco-risks, and minimize the overall environment management (conservation, third-party, transaction) costs, for agents with different preferences and capability, and in the specific (socio-economic, natural) conditions of each eco-system, community, industry, region, and country. For instance, appropriate information would be enough to induce voluntary actions by a "green" farmer, while most commercial enterprises would need outside incentives (price premium, compensation, punishment); market prices would usually coordinate well relations between water suppliers and users, while regulation of relations of water polluters and users would require a special private or public order, etc.

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

Stages of agri-eco-management analysis and improvement

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

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

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

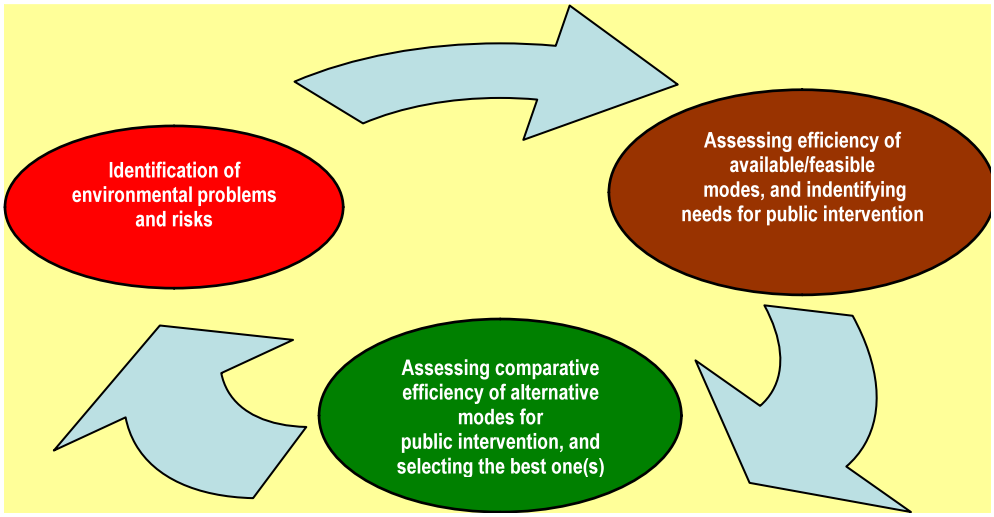

Figure 3. Stages in analysis and improvement of eco-management in agriculture

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

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

Efficiency of individual modes are to be evaluated in terms of their *potential* to induce eco-friendly behaviour and cooperation, detect eco-problems and risks, reconcile eco-conflicts, stimulate eco-activity and protect eco-investment, save overall environmental (conservation, recovery, enhancement, transaction etc.) costs, and contribute to sustainable exploitation of environmental resources. Furthermore, efficiency of individual forms can not be fully understood without analyzing the *complementarities* between different forms – e.g. a high complementarities between family farms and farm cooperatives for certain activities.

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

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

modes) efficiency of diverse management modes. For instance, often dominating public organisations "work well" but they are less efficient (in terms of incentives, overall costs, adaptation and investment potential) in comparison to private, market or hybrid (public-private partnership) structures.

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

Third, alternative and practically possible modes for new public intervention able to correct market, private and public failures are to be identified, their comparative efficiency assessed, and the most efficient one(s) selected. Only technically, economically, and politically *feasible* modes of new public intervention in environmental management are to be specified. Their comparative (goal achieving, coordinating, stimulating, costs-minimizing) efficiency to and complementarities with other practically possible modes of public involvement (assistance, public-private partnership, property rights modernization etc.) is to be assessed, and the best one(s) introduced.

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

Factors of agri-eco-management choice

Most environmental activity and exchange in agriculture could be managed through a great variety of *alterative* forms. For instance, a supply of environmental preservation service could be governed as: voluntary activity of a farmer; though private contracts of the farmer with interested or affected agents; though interlinked contract between the farmer and a supplier or processor; though cooperation (collective action) with other farmers and stakeholders; though (free) market or assisted by a third-party (certifying and controlling agent) trade with special (eco, protected origins, fair-trade) products; though a public contract specifying farmer's obligations and compensation; though a public order (regulation, taxation, quota for use of resources/emissions); within a hierarchical public agency or by a hybrid form.

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

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

- *formal and informal institutions* - often the choice of management mode is (pre)determined by the institutional restrictions as some forms for carrying out farming,

environmental etc. activities could be socially unacceptable or illegal[5]. For instance, market trade of farmland, natural resources, and (some) eco-system services are not allowed.

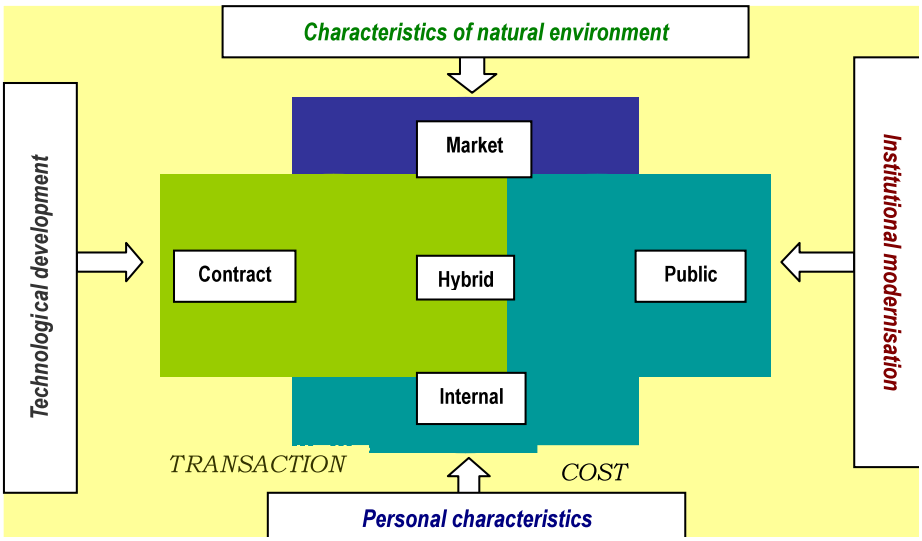

Figure 4. Factors for eco-management choice in agriculture

Furthermore, institutional environment considerably affects the level of management costs and thus the choice of one or another form of organization. For instance, in conditions of well-working public system of regulations (quality standards, guarantees) and laws and contract enforcement, a preference is given to spotlight and classical (standard) contracts. On the other hand, when rights on major agrarian and natural resources are not defined or not well defined, and absolute and contracted right effectively enforced, then high transaction costs could create difficulties (block) effective eco-management - costly unsolvable disputes between polluting and affected agents, disregards of interests of certain groups or generations etc. Consequently, the institutional structures for carrying out agrarian and environmental activities become an important factor, which eventually determines the outcome of the system (efficiency) and the type of development (sustainability).

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

Different management modes are alternative but *not equally efficient* modes for the organization of eco-activities. Each form has distinct *advantages* and *disadvantages* to protect eco-rights and investment, coordinate and stimulate socially desirable eco-behaviour and activities, explore economies of scale and scope, save production and transaction costs. Therefore, available forms are to be assessed in terms of the absolute and the comparative

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

potential (limits) of protect eco-rights and investments of agents, assure socially desirable level of environmental conservation (enhancement), minimize overall costs, coordinate and stimulate eco-activities, reconcile conflicts, and recover long-term costs for organizational development in the specific economic, institutional and natural environment.

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

Special contract form ("private ordering") permits a better coordination and intensification of activity, and safeguard of agent's rights and investments. However, it may require large costs for specification (and writing) contract provisions, adjustments with constant changes in conditions, enforcement and disputing of negotiated terms etc.

Internal organization allows a greater flexibility and control on activity (direct coordination, adaptation, enforcement, and dispute resolution by a fiat). However, extension of internal mode beyond family and small-partnership boundaries (allowing achievement of minimum technological or ecological requirements; exploration of technological economies of scale and scope) may command significant costs for development (initiation, design, formal registration, restructuring), and for current management (collective decision making, control on coalition members opportunism, supervision and motivation of hired labour).

Separation of the ownership from the management (cooperative, corporation, public farm/firm) gives enormous opportunities for growth in productivity and management efficiency – internal division and specialization of labour; achieving ecosystem's requirements; exploration of economies of scale and scope; introduction of innovation; diversification; risk sharing; investing in product promotion, brand names, relations with customers, counterparts and authorities. However, it could be connected with huge transaction costs for decreasing information asymmetry between management and shareholders, decision-making, controlling opportunism, adaptation etc. The *cooperative and non-for profit* form also suffers from a low capability for internal long-term investment due to non-for-profit goals and non-tradable character of shares (so called "horizon problem").

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

However, environmental management is usually associated with considerable transaction costs[6]. For example, agents have costs for identification and protection of various rights; complying with diverse institutional restrictions (norms, standards, rules); finding best partners and prices; negotiating conditions of exchange; contract writing and registration; enforcing negotiated terms through monitoring, controlling, measuring and safeguarding; disputing through a court system or another way; adjusting or termination along with evolving conditions of exchange etc.

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

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

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

Figure 5. Principle modes for environmental management in agriculture

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

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[6] Transaction costs have two *behaviour* origin – agents *bounded rationality* and *tendency for opportunism* (Williamson).

[7] *Frequency, uncertainty",* and *asset specificity* are identified as critical factors of transaction costs by Williamson (Williamson) while *appropriability* added by Bachev and Labonne (Bachev and Labonne).

Transactions and activity with high frequency, big uncertainty, great assets specificity, and high appropriability, have to be managed within *internal organization*. Very often the effective scale of specific investment in eco-management (minimum required for eco-impact, exploring economies of scale and scope) exceeds borders of traditional agrarian organizations (family farm, small partnership). If specific capital (knowledge, technology, equipment, funding) cannot be effectively organized within a singe organization[8], then effective *external form(s)* is to be used – e.g. joint ownership, interlinks, cooperative, lobbying for public intervention. For instance, environmental cooperatives are very successful in some European countries. Nevertheless, costs for initiation and maintaining collective organization for overcoming unilateral dependency are usually great (big number of coalition, different interests of members, opportunism of "free-riding" type) and it is unsustainable or does not evolve at all.

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

Respecting others rights or granting out additional rights could be managed by *"good will"* or *charity actions*. For instance, a great number of *voluntary* environmental initiatives ("codes of behaviour") have emerged driven by farmers' preferences for eco-production, competition in industries, and responds to public pressure for a sound environmental management. However, voluntary and charity initiatives could hardly satisfy the entire social demand especially if they require considerable costs. Besides, environmental standards are usually "process-based", and "environmental audit" is not conducted by independent party, which does not guarantee a "performance outcome".

Most environmental management requires large organizations with diversified interests of agents (providers, consumers, destructors, interest groups etc.). Emergence of special large-members organizations for dealing with low appropriability is slow and expensive, and they are not sustainable in long run ("free riding" problem). Therefore, there is a strong need for *a third-party public* (Government, local authority, international assistance) intervention to make such eco-activity possible or more effective (Bachev 2009, 2012b).

Public modes of agri-eco-management

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

Interventions with a low uncertainty and assets specificity would normally require a *smaller public organization* - more regulatory modes, improvement of the general laws and

[8] coalition made, minimum scale of operations reached, economy of scale and scope explored.

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

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

Figure 6. Principle modes for public intervention in environmental management

Initially, existing and emerging problems (difficulties, costs, risks, failures) in the organization of market and private transactions are specified (Figure 5). The appropriate pubic involvement would be to create an environment for: decreasing uncertainty surrounding market and private transactions, increasing intensity of exchange, protecting private rights and investments, and making private investments less dependent. For instance, State establishes and enforces quality, safety and eco-standards for farm inputs and produces, certifies producers and users of natural resources, transfers water management rights to farms associations, sets up minimum farm-gate prices etc. All these facilitate and intensify (market and private) transactions and increase efficiency of economic organizations.

Next, practically possible modes for increasing appropriability of activity (transactions) have to be considered. The low appropriability is often caused by unspecified or badly specified private rights (Bachev, 2004). In some cases, the most effective government intervention would be to introduce and enforce *new private property rights* – e.g. rights on natural, biological, and environmental resources; rights on issuing and trading eco-bonds and shares; tradable quotas for polluting; private rights on intellectual agrarian property and origins etc. That would be efficient when privatization of resources or the introduction and enforcement of new rights is not associated with significant costs (uncertainty, recurrence, and level of specific investment are low).

That public intervention effectively transfers the organization of transactions into the market and private management, liberalizes market competition and induces private incentives (and investments) in certain activities. For instance, tradable permits (quotas) are used to control the overall use of certain resources or level of a particular type of pollution. They give flexibility allowing farmers to trade permits and meet their own requirements according to their adjustment costs and specific conditions of production. That form is efficient when a particular target must be met, and the progressive reduction is dictated through

permits while trading allows the compliance to be achieved at least costs (through a private management). The later let also a market for environmental quality to develop[9].

In other instances, it would be efficient to put in place *regulations* for trade and utilization of resources and products – e.g. standards for labour safety, product quality, environmental performance, animal welfare; norms for using natural resources, introduction of foreign species and GM crops, and (water, soil, air, comfort) contamination; a ban on application of certain chemicals or technologies; regulations for trading ecosystem service protection; foreign trade regimes; mandatory eco-training and licensing of farm operators etc.

The large body of environmental regulations in developed countries aim changing the farmers behaviour and restricting the negative impact on environment. It makes producers responsible for the environmental effects (externalities) of their products or the management of products uses (e.g. waste). This mode is effective when a general improvement of the performance is desired but it is not possible to dictate what changes (in activities, technologies) is appropriate for a wide range of operators and environmental conditions (high uncertainty and information asymmetry). When the level of hazard is high, the outcome is certain and the control is easy, and no flexibility exists (for timing or the nature of socially required result), then the bans or strict limits are the best solution. However, the regulations impose uniform standards for all regardless of the costs for compliance (adjustment) and give no incentives to over-perform beyond a certain level.

In other instances, using the incentives and restrictions of *tax system* would be the most effective form for public intervention. Different sorts of tax preferences (exception, breaks, credits) are widely used to create favourable conditions for certain (sub)sectors and regions, forms of agrarian organization, or specific types of activities. The environmental taxation on emissions or products (inputs or outputs of production) is also applied to reduce the use of harmful substances. The later impose the same conditions for all farmers using a particular input and give signals to take into account the "environmental costs" inflicted on the rest of society. Taxing is effective when there is a close link between the activity and the environmental impact, and when there is no immediate need to control the pollution or to meet the targets for reduction. However, an appropriate level of the charge is required to stimulate a desirable change in farmers' behaviour. Furthermore, some emissions vary according to the conditions of application and attempting to reflect this in tax system often result in complexity and high administrating costs.

In some cases, a *public assistance and support* to private organizations is the best mode for intervention. The public *financial* support for environmental actions is the most commonly used instrument for improving environment performance of farmers. It is easy to find a justification for the public payments as a compensation for the provision of an "environmental service" by farmers. However, the share of farms covered by various agri-environmental support schemes has not been significant. That is a result of voluntary (self-selection) character of this mode which does not attract farmers with the highest environment enhancement costs (most intensive and damaging environment producers). In some cases, the low-rate of farmers' compliance with the environmental contracts is a serious problem. The later cannot be solved by augmented administrative control (enormous enforcement costs) or introducing bigger penalty (politically and juridical intolerable measure). Principally, it

[9] Permits can be taken out of market in order to raise the environmental quality above the "planned" (by the Government) level.

is estimated that the agri-environmental payments are efficient in maintaining the current level of environmental capital but less successful in enhancing the environmental quality.

Another disadvantage of "payment system" is that once introduced it is practically difficult ("politically unacceptable") to be stopped when goals are achieved or there are funding difficulties. Moreover, withdraw of subsidies may lead to further environmental harm since it would induce the adverse actions (intensification, return to conventional farming). Other critics of subsidies are associated with their "distortion effect", negative impact on "entry-exit decisions" from polluting industry, unfair advantages to certain sectors in the country or industries in other countries, not considering the total costs (such as transportation and environmental costs, "displacement effect" in other countries).

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

Usually, specific public modes are effective if they are applied alone with other modes of public intervention. The necessity of *combined intervention* (a governance mix) is caused by: the complementarities (joint effect) of individual forms; restricted potential of some less expensive forms to achieve a certain (but not the entire) level of socially preferred outcome; possibility to get an extra benefits (e.g. "cross-compliance" requirement for participation in public programs); particularity of problems to be tackled; specific critical dimensions of managed activity; uncertainty (little knowledge, experience) associated with likely impact of new forms; needs for "precaution"; practical capability of State to organize (administrative potential to control, implement) and fund (direct budget resources and/or international assistance) different modes; and dominating (right, left) policy doctrine (Bachev, 2010b).

Besides, the level of an effective public intervention (management) depends on the kind of problem and the scale of intervention. There are public involvements which are to be executed at local (farm, ecosystem, community, regional) level, while others require nationwide management. And finally, there are activities, which are to be initiated and coordinated at international (regional, European, worldwide) level due to the strong necessity for trans-border actions (needs for a cooperation in natural resources and environment management, for exploration of economies of scale/scale, for prevention of ecosystem disturbances, for governing of spill-overs) or consistent (national, local) government failures.

The public (regulatory, inspecting, provision etc.) modes must have built special mechanisms for increasing the competency (decrease bounded rationality and powerlessness) of bureaucrats, beneficiaries, interests groups and public at large as well as restricting the possible opportunism (opportunity for cheating, interlinking, abuse of power, corruption) of public officers and other stakeholders. That could be made by training, introducing new monitoring, assessment and communication technologies, increasing transparency (e.g. independent assessment and audit), and involving experts, beneficiaries, and interests groups in management of public modes at all levels. Furthermore, applying *"market like"* mechanisms (competition, auctions) in public projects design, selection and implementation would significantly increase the incentives and decrease the overall costs.

Principally, a pure public organization should be used as a *last resort* when all other modes do not work effectively (Williamson). "In-house" public organization has higher (direct and indirect) costs for setting up, running, controlling, reorganization, and liquidation. What is

more, unlike market and private forms there is not automatic mechanism (competition) for sorting out the less effective modes[10]. Here a public "decision making" is required which is associated with high costs and time, and it is often influenced by strong private interests (power of lobbying groups, policy makers and their associates, employed bureaucrats) rather than the efficiency. What is more, widespread "inefficiency by design" of public modes is practiced to secure (rent-taking) positions of certain interest groups, stakeholders, bureaucrats etc. Along with development of general institutional environment ("The Rule of Law", transparency) and monitoring, measurement, communication etc. technologies, the efficiency of pro-market modes (regulation, information, recommendation) and contract forms would get bigger advantages over the internal less flexible public arrangements.

Usually *hybrid modes* (public-private partnership) are much more efficient than pure public forms given coordination, incentives, and control advantages. In majority of cases, involvement of farmers, farmers organizations and other beneficiaries increases efficiency - decreases asymmetry of information, restricts opportunisms, increases incentives for private costs-sharing, and reduces management costs (Bachev, 2004). For instance, a hybrid mode would be appropriate for carrying out the supply of preservation of environment, biodiversity, landscape, historical and cultural heritages etc. That is determined by the farmers information superiority, strong interlinks of activity with traditional food production (economy of scope), high assets specificity to the farm (farmers competence, high cite-specificity of investments to the farm and land), and spatial interdependency (needs for cooperation of farmers at a regional or wider scale), and not less important – farm's origin of negative externalities. Furthermore, enforcement of most labour, animal welfare, biodiversity etc. standards is often very difficult or impossible at all. In all these cases, stimulating and supporting (assisting, training, funding) private voluntary actions are much more effective then mandatory public modes in terms of incentive, coordination, enforcement, and disputing costs.

If there is a strong need for a third-party public involvement but an effective (government, local authority, international assistance) intervention is not introduced in a due time, then the agrarian "development" is substantially deformed. Thus public (Government) failure is also possible and often prevails. In Bulgaria, there have been a great number of bad examples for public under- and over-interventions in agrarian sector during post-communist transition now (Bachev, 2010b). Consequently, a primitive and uncompetitive small-scale farming; predominance of over-integrated and personalized exchanges; ineffective and corrupted agrarian bureaucracy; blocking out all class of agrarian transactions (innovation and extension supply, long-term credit supply, supply of infrastructure and environmental goods); and development of a large informal (gray) sector, all they have come out as a result.

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

[10] It is not rare to see highly inefficient but still "sustainable" public organizations around the world.

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.

2. Evolution of agri-environmental management in Bulgarian

Institutional environment for agri-eco management

During most of transition, rights on agrarian resources (farmland, water) and diverse eco-rights (on clean, aesthetic nature; preservation of nature resources, biodiversity) were not defined or were badly defined and enforced (Figure 7). Inefficient public enforcement of laws, and absolute and contracted rights was common. That has negative consequences on the development of farming structures and efficiency of eco-management (Bachev, 2010b).

Privatization of farmland and assets of ancient public farms took almost 10 years to complete. During a good part of that period, the management of critical agrarian resources was in ineffective and "temporary" structures (organizations under privatization, liquidation or reorganization; Land commissions etc.) with no interests in effective and sustainable exploitation. Besides, short-term lease of natural resources and material assets was a major form for the farm extension (Bachev, 2010b).

Out-dated and sectoral system of public policing, regulations and control dominated until recently, which corresponded little to the contemporary needs of eco-management. There was no modern system for monitoring the state of soil, water, and air quality, and credible information on the extent of environmental degradation. There was no awareness of the "concept" of sustainable development and any needs to include it in the public policy, and private and community agenda. The lack of "culture of sustainability" has also impeded the evolution of voluntary measures, and private and collective actions (and institutions) for effective eco-management.

Before the EU accession, country's laws, standards and institutions were harmonized with the Community Acquis. That introduced a modern framework for eco-governance including new rights (restrictions) on protection of environment, integrated territory, water and biodiversity management, preservation of traditional varieties and breeds, animal welfare, polluter pay principle s well as corresponding control, monitoring, and assessment institutions (e.g. Executive Environmental Agency, Hydro-melioration Agency[11] etc.).

The EU accession introduces and enforces a "new order" - strict regulations and control; tough quality and environmental standards; financial support for eco-conservation and market instability etc. Huge European markets are opened which enhances competition and lets local farms explore their comparative advantages (low costs, high quality, specificity and purity of produce) and give strong incentives for investments in farm modernization and conforming to high product, technology and eco-standards.

The external demand, monitoring, pressure, and sanctions by the EU lead to better enforcement of laws and standards. Internal collective actions and social demand for good governance have also got momentum leading to improvement of public management – e.g.

[11] Closed in 2010 and activity transferred to the MAF Department of Hydro-melioration.

success of eco-organizations putting a 5-year ban on GM crops, timely reaction against eco-violation in protected zones, revoking unlawful "exchanges" of valuable public lands etc.

Institutions	Private modes	Market modes	Public modes
Post-communist transition (1989-2000)			
Not well defined eco- and resource rights, bad enforcement; No sustainability concept	Provisional lease in contracts on natural resources; Unregistered farms; Firms; Cooperatives	Trade with informal brands, origins, and ecosystem services; Free (monopoly) agricultural water pricing	State and cooperative farms; Organization under privatization, liquidation and reorganization; Outdated system of eco-regulations, monitoring and information
Pre-accession to EU (2001-2006)			
Better defined and badly enforced rights on agrarian and eco-resources, and contracts	Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes	Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing	Special Accession Program for Agrarian and Rural Development; Cross-compliance; Environmental regulations, standards, and agencies; Regulations for organic farming; Agricultural Advisory Service
EU membership (since January 1, 2007)			
Well-defined rights, and better enforcement; EU Community Acquis; Collective institutions	Unregistered farms; Firms; Cooperatives; Water User Associations; Vertically integrated modes; NGOs; Codes of behavior; Eco-labels	Trade with formal brands, origins, organic products, and ecosystem services; Free (monopoly) agricultural water pricing; Insurance against natural disasters	EU eco-regulations and standards; EU Operational Programs; National programs for eco-management; National Plan for Agrarian and Rural Development; Direct payments; Advisory Service; Eco-monitoring and assessment; Protected zones (NATURA); Compensations for natural disasters

Figure 7. Evolution of environmental management in Bulgarian agriculture

Nevertheless, new "rules of the game" have not been clearly understood by public authorities, private organizations and individuals. There is not yet readiness for effective implementation of new public order because of the lack of information and experience or administrative capacity (lack of comprehension, deficient court system, corruption). Often, enforcement of eco-standards is difficult since costs for detection and penalizing of offenders are high, or there is no direct links between the performance and eco-impact – e.g. banned fields burning after harvesting is still widespread in the country (EEA).

The institutional modernization has been also associated with new conflicts between diverse private, collective and social interests. However, the results of the public choices have not always been for the advantage of effective eco-management. For instance, strong lobbying efforts of certain private groups and businesses led to a 20% reduction in numbers and 50% reduction in the area of initially identified sites for pan-European network NATURA 2000 (MWE).

Private modes of agri-eco-management

Newly evolving market and private structures were inefficient in dealing with various economic and eco-issues. Privatization of farmland and assets of ancient public farms took 10 years to complete while some state assets (e.g. irrigation, services etc.) were not effectively reorganised until recently. During much of the period, the management of farmland, land related assets (permanent crops; buildings; irrigation, drainage and flood protection facilities), eco-systems and water-resources, was in ineffective "temporary" structures (organisation under privatisation, liquidation or reorganisation; Privatization Boards, Liquidation Councils, Land Commissions etc.). Sales and long-term lease markets for land and other natural resources did not emerge until 2000, and annual leasing was the major form for management until recently. That was combined with high economic and institutional uncertainty and a big inter-dependency of agrarian assets (Bachev, 2010b).

Much of the farming activities were carried in inefficient and unsustainable structures – public farms, part-time and subsistence farms, production cooperatives, and huge business farms based on provisional lease-in contracts (Table 1). Most livestock holdings are also miniature "unprofessional" breading the majority of animals in the country (Table 2).

Farms adjustments and intensifying competition have been associated with a significant decrease in number of unregistered, cooperative and livestock holdings without adequate transfer of land, livestock, and environmental management to other structures. Despite some augmentation of average farm size, the share of abandoned agricultural lands and primitive domestic livestock operations has been considerable from the beginning of transition now.

Dominating modes for carrying out farming activities have had little incentives for current and long-term investment to enhance productivity and environmental performance (Bachev, 2008).

The cooperative's big membership makes individual and collective control on management very difficult and costly. That focuses managerial efforts on short-term indicators, gives a great possibility for mismanagement and using cooperatives in the best private (managers and associates) interests. Besides, there are differences in the investment preferences of diverse coops members due to the non-tradable nature of the cooperative shares ("horizon problem"). Given the fact that most members are small shareholders, older in age, and non-permanent employees, the incentives for long-term investment for land improvement, environmental conservation, and renovation of material and biological assets have been low. "Member-oriented" (non-for-profit) nature of the cooperatives also prevents them to adapt to diversified needs of members, and market demand and competition.

Table 1. Number, size and importance of different farms in Bulgaria

	Public	Unregistered	Cooperatives	Agro-firms	Total
Number of farms					
1989	2101	1600000	na	na	1602101
1995	1002	1772000	2623	2200	1777000
2000	232	755300	3125	2275	760700
2010		350900	900	6100	357900
Share in number (%)					
1989	0.13	99.9			100
1995		99.7	0.1	0.1	100
2000		99.3	0.4	0.3	100
2010		98.0	0.25	1.7	100
Share in farmland (%)					
1989	89.9	10.1			100
1995	7.2	43.1	37.8	11.9	100
2000	1.7	19.4	60.6	18.4	100
2010		33.5	23.9	42.5	100
Average size (ha)					
1989	2423.1	0.4			3.6
1995	338.3	1.3	800	300	2.8
2000	357.7	0.9	709.9	296.7	4.7
2010		2.9	807	211.6	8.5

Source: National Statistical Institute

Table 2. Number and size of livestock holdings

Type of holdings	Share		Share		Share		Average heads
	farms	heads	farms	heads	farms	heads	
Dairy cows	*1-2*		*3-9*		*20 and >*		
2003	87.3	56.3	11	23.3	0.6	13.5	1.9
2009	79.6	30.1	14.6	20.0	2.3	36,3	3.3
Buffalo cows							
2003	85.3	47.5	11.4	20.6	1.2	23	2.3
2009	63.5	11.4	21.6	11.5	6.9	60,7	7.3
Ewes	*1-9*		*10-49*		*100 and >*		
2003	56.7	89.3	26	9.6	9.5	0,4	5.9
2009	29.8	82.8	22.6	13.2	33.2	1,7	10
She-goats							
2003	98.2	86.8	1.2	5.8	0.1	3	2.6
2009	96.2	67.3	3.3	20.2	0.01	5	3.1
Breeding pigs	*1-2*		*3-9*		*200 and >*		
2003	87.1	34.5	10.2	14.0	0.2	35.1	3.0
2009	78.8	12.8	14.9	8.8	0.5	57.4	7.8

Source: Ministry of Agriculture and Food

On the other hand, small-scale and subsistent farms[12] possess insignificant internal capacity for investment, and small potential to explore economy of scale and scope (big fragmentation and inadequate scale). Besides, they have little incentives for non-productive environment and biodiversity conservation, animal welfare etc. spending. Moreover, there has been neither administrative capacity nor a political will to enforce the quality and eco-standards in that vast informal sector of the economy. Primitive technologies and low compliance with modern agronomic, safety and eco-standards are widespread. Dairy sector is particularly vulnerable since only one-third of holdings meet formal EU standards (MAF).

Larger business farms operate mainly on leased land and concentrate on high pay-off investment with a short pay-back period (e.g. cereals, sunflower). They are more sensitive to market demand and institutional regulations since largely benefit or lose from timely adaptation to new standards and market preferences. Besides, these enterprises have higher capacity to fund and adapt to new formal and market requirements. However, until recently, there has been no effective outside (authority, community) pressure for respecting eco-rules by the business enterprises.

Restructuring of commercial farms continues as most of them apply survival tactics ("concentration on products with secure marketing") rather than a long-term strategy toward sustainability (preserving soil fertility, observing crop rotation and agro-techniques requirements) (Figure 8). What is more, a great portion of subsistent, smaller commercial farms and cooperatives are unable to adapt to evolving market, institutional and natural environment – intensified market competition; new EU quality, safety, and eco-standards; challenges associated with climate change etc. Our survey has found out that more than a quarter of farms are with a low potential for adaptation to new state and EU quality, safety, and environmental standards, almost 37% of them are less adaptable to market demand, prices and competition, and every other one is inadaptable to evolving natural environment (warning, extreme weather, droughts, floods, etc.)

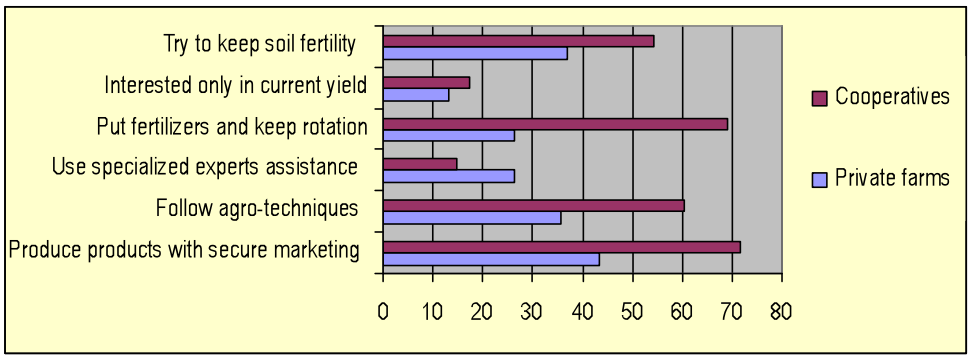

Figure 8. Share of farms implementing different strategies in Bulgaria (percent)
Source: interviews with farm managers, 2009

Medium-term sustainability of farms is estimated as low for unregistered holdings,

[12] Subsistence and semi-market farms comprise the best part of farms as almost 1 million are involved in farming mostly on a part-time base and for "supplementary" income (MAF).

grazing livestock, and pigs and poultry farms (Figure 9). Less that 7% of all farms "forecast" a high sustainability. A particular type of firms (companies) is the only exception where majority of enterprises envisages being highly sustainable in years to come. The later reflects both the environmental sustainability and the ability of holdings to manage eco-projects.

Smaller size, owner operating and extensive nature of majority of farms let avoid certain problems of large public enterprises from the past such as over-intensification, lost natural landscape, biodiversity, nitrate and pesticide contamination, huge livestock and manure concentration, and uncontrolled erosion. Subsistent and small-scale farming has also revived some traditional and more sustainable technologies, varieties, and products, and avert Mad cow disease and Avian flu epidemic.

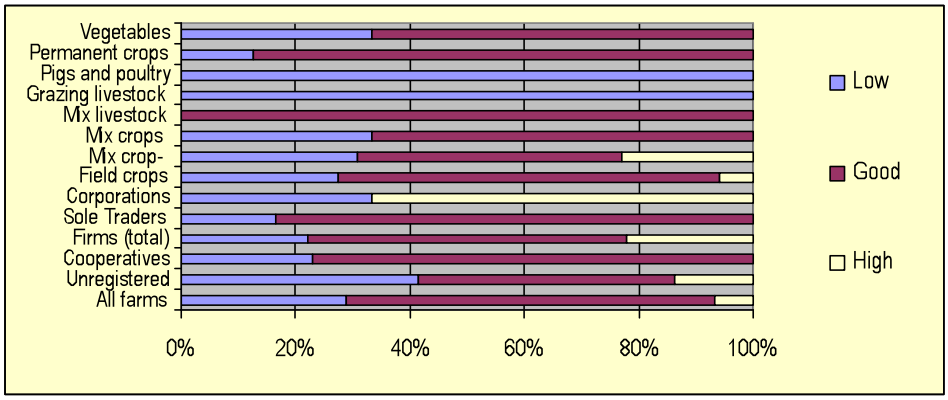

Figure 9. Share of farms with different levels of medium-term sustainability in Bulgaria
Source: interviews with farm managers, 2010

Private mode has introduced incentives and possibilities for integral eco-management (including revival of eco- and cultural heritage; anti-pollution, esthetic, an comfort measures), investing in eco-system services, origins, labels, and profiting from inter-dependent activities such as farming, fishing, agro-tourism, processing, and marketing. There are good examples for private introduction and enforcement of quality and eco-standards by individual farms (voluntary and trade initiatives), a vertical integrator (dairy and vine processor, retailer, exporter), or a foreign investor (cereals, oil crops).

Private management is associated with improved environmental stewardship on owned and marketed resources, but less concern to manure and garbage management, over-exploitation of leased and common resources, and contamination of soils, waters and air. The process of farms adaptation leads to intensification of production which could revive or deepen some eco-problems unless a pro-environmental management is put in place. Moreover, free market management of giant and semi-monopoly servicing (water, insurance etc.) companies usually comes with unfavourable pricing and terms for majority of farms.

In 1990s the State monopoly "Irrigation Systems" was reorganized into a Joint-stock company owned by the Ministry of Agriculture and responsible for the management of state assets, provision of irrigation and drinking water, drainage and flood protection. Furthermore, the Union of Water Users was initiated and 176 Water User Associations (WUA) emerged. This collective form was unable to improve efficiency (low incentives, lack of ownership) and

deal with monopoly position of 21 semi-autonomous regional branches of Irrigation Systems.

Since 2001 the user-rights on irrigation assets of Irrigation Systems have been freely transferred to newly-reestablished WUA. Around 70 WUA are formed servicing 30% of the total equipped for irrigation area. However, expected "boom" in efficiency from collective management of irrigation has not materialized because of the semi-monopoly situation (terms, pricing) of regional water suppliers, few incentives for water users to innovate facilities and expand irrigation, and uncompleted privatization of state assets (Bachev, 2011).

Evolution of various farmers and eco-associations in the country has been hampered by the big number and diversified interests of agents – a different ownership size, operation, type of farming, preferences, age, and horizon. However, there are few examples for effective agrarian organizations mostly with small-membership and strong common interests of participants (e.g. tobacco, silk-warm, bee-honey etc.). Furthermore, in recent years some environmental organisations have been quite successful in eco-monitoring, campaigns against GM crops cultivation and removal of restrictions in protected areas, and other actions such as garbage cleaning. For instance, among other activities Bulgarian Association of Bird Protection monitors the birds species varieties and numbers in different type of territories.

Market modes for agri-eco management

Market-driven organic farming has emerged recently and registered a significant growth. There has been 11 folds increase in the number of organic operators[13] since 2003, and the organic producers comprise the largest part (74%) of the organic operators totaling 432 farms, processors, and traders (EUROSTAT).

There is enormous augmentation of organic areas and livestock but they are a tiny portion of the Utilized Agricultural Area (UAA) and livestock (Table 3). "Fully converted organic areas" accounts for 25.4% of total organic areas with Industrial crops, Pastures and meadows, and Permanent crops comprising the biggest shares of fully converted areas (EUROSTAT). There are few livestock farms and apiaries certified for bio-production with highest growth in organic goats and sheep, and a lion share of bees. There are also 242677 ha approved for gathering of wild organic fruits and herbs (MAF).

Organic form has been introduced by business entrepreneurs who managed to organize and fund this new venture arranging independent certification and finding buyers for highly specific output. Produced bio-fruits, vegetables, oil plants, herbs, spices, and honey are mostly for export since a tiny market for organic products exists in the country. The slow development of organic market is caused by the high prices of products, and limited consumer confidence in the authentic character of products and certification.

Eco-labeling of processed farm products (self-regulation) has also appeared but it is perceived more as a part of the marketing strategy of companies rather than a genuine eco-action. What is more, (free) market management of semi-monopoly servicing companies comes with unfavorable pricing and terms for farmers, and only few among them purchase water or insurance against natural disasters (draughts, floods etc).

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[13] Organic operator is any natural or legal person who produces, prepares, imports, exports or deals with organic products (EUROSTAT, 2010).

Table 3. Evolution of organic production in Bulgaria

Organic indicators	2003	2004	2005	2006	2007	2008
Farming area, ha	650	1113	2432	3061	11808	16663
% in UAA	0.01	0.02	0.05	0.06	0.23	0.33
Wild herbs, fruits, ha	-	-	-	110143	397835	397835
Cattle	na	na	395	na	395	470
% in all cattle			0.11		0.11	0.14
Sheep	na	na	294	na	1690	2471
% in all sheep			0.02		0.14	0.21
Goats	na	na	32	na	1058	na
% in all goats			0.01		0.12	
Bees colonies	na	na	23508	na	35747	na

Source: Ministry of Agriculture and Food, EUROSTAT

Public modes for agri-eco-management

During the transitional period public (Government and local authority) intervention in environmental management was not significant, comprehensive, sustainable, or even related (Bachev, 2008). Eco-policies were fragmented and reactive to urgent problems (natural disasters) with different agencies responsible for individual aspects of eco-management.

In passed years a number of national programs have been developed to deal with specific eco-challenges such as: preservation of biodiversity and environment; limitation of emissions of Sulphur Dioxide, VOC, Ammonia; waste management; development of water sector; combating climate change; developing organic agriculture; management of lands and fights against desertification; agrarian and rural development etc. National monitoring systems of environment and biodiversity are also set up, and mandatory eco-assessment of public programs introduced. Nevertheless, actual eco-policies rest fragmented and largely reactive to urgent eco-problems (floods, storms, drought) rather that based on a long-term strategy for sustainable development. As a result of inefficient priority setting, management and enforcement (bad coordination, gaps, incompetence, ineffective enforcement, corruption), and administrative capability[14] a minor impact of public programs prevails.

National expenditures for protection and restoration of environment are merely 1.9% of GDP, and agriculture is getting a tiny portion of the total public eco-spending (MEW). What is more, recent financial and economic crisis further deteriorated funding of public (including environmental) projects. For instance, recultivation of degradated farmlands by MAF was initiated recently but it accounts only for 200-250 ha per year (EEA). Similarly, serious eco-challenge is still caused by the state deficiency in storing and disposal of out-of-dated pesticides which are responsible for a good part of all polluted localities in the country (EEA).

[14] e.g. due to organizational and financial reasons Ministry of Water and Environment often does not get the relevant water information from the institutes of Bulgarian Academy of Sciences (EEA).

There has been a numerous international (UN, EU, NGOs etc.) assistance projects to "fill the gap" in local failures but they have been limited in scale, unsustainable in time; often overtaken by local groups, funding improperly used; and with no significant positive impact.

Agrarian education and the National Agricultural Advisory Service (NAAS) has not been effectively reorganized and provide modern and continues training on rural development and eco-, climate change, and water-management issues. They do not reach all agents via effective methods of education, advice and information suited to the specific needs of different agents.

Furthermore, the integral approach of soil, water and biodiversity management in planning, funding, management, monitoring, controlling and assessment is not applied, and stakeholders involved in decision-making process at all levels. Neither modern eco-system services, life-cycle, water accounts, and other modern approaches have been incorporated into program management.

Environmental data collection and monitoring have significantly improved in the last few years caching up with the modern EU standards. However, adequate information and independent assessment has not been secured yet and include: agricultural benefits and impacts; waters quality; total costs; eco- and water-foot prints; impacts of climate change; existing and likely risks etc. Nor mechanisms for timely disclosure and effective communication of data to decision-makers, stakeholders and public at large are assured.

Agrarian and environment related research has not been modernized and severely underfunded in last twenty years. Consequently, agro-environmental innovation as well as the understanding of the agricultural use and impacts on natural environment, and various aspects, factors and efficiency of eco-management greatly deterred.

Furthermore, during most of the transition agrarian long-term credit market was practically blocked while newly evolving farming structures left unassisted by the government. Until 2000 the Aggregate Level of Support to Agriculture was close to zero, and very small afterward (Bachev, 2010b). Besides, the multifunctional role of farming was not recognized, and the provision of "environmental service" funded by society.

There has been enormous progress in public support in recent years – e.g. National Fund Agriculture, EU Special Pre-accession Program for Agrarian and Rural Development (SAPARD), EU CAP measures etc. SAPARD introduced measure "Agro-ecology" but it was not approved by the end 2006 and few projects were actually supported. In 2008 EC suspended SAPARD due to mismanagement and a significant funding lost.

EU accession brought new opportunities for public support to private and collective agrarian and eco-activities. CAP and the National Plan for Agrarian and Rural Development 2007-2013 (NPARD) provide significant funding for EU area-based payments and national top-ups; agro-environmental measures (organic farming, management of agricultural lands with high natural value and handicaps, traditional livestock, protection of soils and water, preservation of landshaft); modernization of farms, processing, and marketing; diversification of activity; infrastructural development; keeping traditions; training etc. Specialized budget of NPARD directed for various eco-measures accounts for 27% of the total. Funding for eco- and other projects is also available from EU Fund LIFE+ and the Operational Programs "Environment", "Fishery and Aquaculture", and "Regional Development".

The "cross-compliance" (with safety, animal-welfare, environmental etc. standards) for receiving a public support has been also introduced. Consequently, area-based direct

payments and other subsidies improved farms income and eco-performance, induced farming on abandoned lands, and brought about some amelioration of environmental situation.

However, it becomes difficult to reform the inefficient system of management of public programs. In 2007 no public payment was made for projects associated with NPARD measures but area-based payments for regions with handicaps. Progression in the implementation of public support has been slow and far behind the targets (Table 4). While measures "Setting up of young farmers" and "Payments to farmers in regions with handicaps" are successful, the number of approved and funded projects in other areas is insignificant.

Table 4. Progress in implementation of 2007-2013 NPARD in Bulgaria (percent of target)

Measures	Dec. 31, 2008		Dec. 31, 2009		Aug. 23, 2010	
	Projects	Euro	Projects	Euro	Projects	Euro
111 Training and information	0	-	0	-	na	-
112 Setting up young farmers	11.25	-	55.20	-	99.73	-
121 Modernization of farms	6.77	6.27	27.86	16.09	35.62	25.49
122 Economic value of forests	0	0	0	0	0	0
123 Value to agricultural and forestry products	0	0	0	0	5.81	4.41
141 Semi-subsistence farm	0	-	0	-	3.37	-
142 Producer groups	0	0	0	0	0	0
143 Advice and consultation	3.62	-	9.30	-	24.38	-
211 Payments to mountainous areas with handicaps	40.04	-	43.50	-	43.50	-
212 Payments to other areas with handicaps	100.17	-	107.85	-	107.85	-
214 Environment payments	2.80	-	4.45	-	4.45	-
223 First afforestation	0	-	1.00		1.85	-
226 Restoring forestry	0	-	0.90	-	2.30	-
311 Diversification into non-agricultural activities	0	-	0	-	0.09	0
312 Business development	0	-	0	-	2.09	-
313 Agro and rural tourism	0	0	0	0	0	0
321 Rural services	0	-	4.77	-	8.15	46.19
322 Village development	0	-	18.00	-	19.50	43.07
431-32 Local cooperation	0	-	0	-	7.92	-

Source: Ministry of Agriculture and Food

Due to the restrictive criteria[15], lack of formal land management titles, complicated and costly procedures, and widespread mismanagement, the new public support is not effectively utilized and benefits unevenly different farms. Mostly bigger farms participate in public programs because of the superior entrepreneurial experience, available resources, and capability for adaptation to formal requirements and for wining projects.

[15] For area-based payments the minimum farm size is 1 ha (for permanent crops 0.5 ha), and for agro-ecological payments 0.5 ha, while landless livestock holdings are not-eligible for these type of support.

Up to date experience shows that the bulk of public subsidies go to few large agri-firms and cooperatives specialized in field crops. At the same time, many effective small-scale farms receive no or only a tiny fraction of the public support. For instance, despite it increased number only 24% of all farms currently receive area based payments, and merely 6% of cattle holdings, 4% of sheep and pig holdings, and 3% of poultry farms (MAF). Moreover, less than 7% of beneficiaries get the lion share (more than 80%) of all direct payments. Similarly, around 2% of the biggest farms (more than 500 ha) manage around 60% of supported by the environmental measures 211 and 212 areas (MAF).

The overall support to agriculture continues to rest low, and a small proportion of farms benefits from public aid most of them being large enterprises from regions with less socio-economic and eco-problems. Recent assessment indicates that there is a good or significant impact of CAP implementation on economic, social and environmental sustainability of large farms, agri-firms, and farms specialized in field crops, while the CAP effect on other type of farms is insignificant or neutral (Bachev 2012a). Therefore, public assistance further enlarges "transitional" disparities between different farms, sub-sectors, eco-systems, and regions. The minor amount of supported farms and agro-ecosystems, deficiency of clear criteria for eco-performance, and the lack of effective control leads to little contribution of new public (CAP) measures to improvement of eco-situation in the country.

3. Efficiency of agri-environmental management in Bulgaria

Efficiency of land management

A by-product from the new market and private management has been considerable disintensification of agriculture, ease of general eco-pressure and pollution comparing to the pre-reform level.

Market adjustment has been associated with a sharp decline in all crop (but sunflower) and livestock (but goat) productions since 1989[16]. Some traditional crop varieties and livestock breeds have been also recovered. A considerable portion of agricultural lands has been left uncultivated for a long period - in some years abandoned land reached one third of the total (MAF). In recent years, unutilized farmlands are 10% of the total while fallow land accounts for 9% of the arable land. The average yields for major products shrunk to 40-80% of the pre-reform level.

The number of livestock has also decreased significantly – 51% for cattle, 53% for poultry, 80 % for pigs, and 81% for sheep (MAF). Consequently, the Aggregate Livestock Index[17] in the country has been one of the smallest in Europe - 0.4 in recent years (EEA).

Tractors and combines employed in agriculture have diminished by 64%, and now 5.6% of farms own tractors and 0.7% harvesters while 30-40% hire or use them in association (MAF). All these have relaxed the overall agricultural pressure on the environment.

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[16] For potatoes by 33%, wheat 50%, corn and burley 60%, tomatoes, Alfalfa hay and table grape 75%, apples 94%, pig meat 82%, cattle meat 77%, sheep and goat meat 72%, poultry meat 51%, cow milk 45%, sheep milk 66%, buffalo milk 59%, wool 85%, eggs 45%, and honey 57% (NSI).

[17] the number of livestock units (equines, cattle, sheep, goats, pigs, poultry and rabbits) per UAA.

The amount of fertilizers and pesticides used in agriculture has declined considerably, and now their per ha application is 22% and 31% of the 1989 level (Figure 10). In recent years N, P and K fertilizers are applied for 37.4%, 3.4% and 1.9% of UAA (MAF). A sharp reduction in chemical use has diminished drastically the risk of chemical contamination of soils, waters, and farm produce. A good part of farm production has got (semi) "organic" character obtaining a good reputation for high quality and safety locally and internationally.

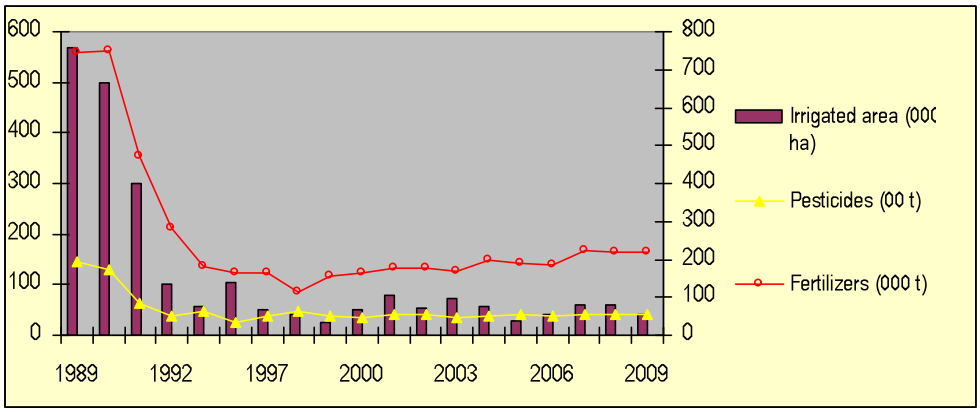

Figure 10. Irrigation and chemical application in Bulgarian agriculture
Source: National Statistical Institute

However, a negative rate of fertilizer compensation of N, P, K intakes dominate and average of 23595,4t N, 61033,3t P_20_5 and 184392t K_20 have been irreversibly removed annually from soils since 1990 (EEA). Unbalance of nutrient components has been typical with application of 5.3 times less P and 6.7 times less K with the appropriate N rate. What is more, monoculture or simple rotation has been constantly practiced by large operators concentrating on few profitable crops (sunflower, cereals etc.). All these practices further contributed to deterioration of soil quality and soil organic matter content.

There has been considerable increase in farmland affected by acidification (Figure 11). That is a result of the long-term application of specific nitrate fertilizers and unbalanced fertilizer application without adequate input of phosphorus and potassium The share of acidified soil decreased after 1994, but in recent years there is a reverse tendency along with the augmentation of N use. As much as 4.5% of acidified farmlands are with level harmful for crops.

Fraction of salinized land doubled after 1989 but it is merely 1.1% of the total farmland (EEA). Widespread application of primitive irrigation techniques, and inappropriate crop choice, rotation and agro-techniques augment inefficiency of water use and local soil erosion.

Since 1990 no effective measures are taken to normalize soil acidity and salinity.

Pollution of soil and water from industrial activities, waste management, and improper farming activities is also a serious environment and health risk. Illegal garbage yards in rural areas have noticeably increased reaching an official figure of 4000 with a real number far bigger than reported amount (EEA). Farms contribute extensively to waste "production" with organic and industrial materials contributing significantly to local pollution of air, water, soils,

and disturbing population comfort (noise, odor, dirty roads etc.). Nevertheless, data for the last years show that soils in the country are in good ecological state both in terms of organic content and contamination with heavy metals and metalloids. Polluted with heavy metals and pesticides soils represents bellow 1% of the farmlands (EEA).

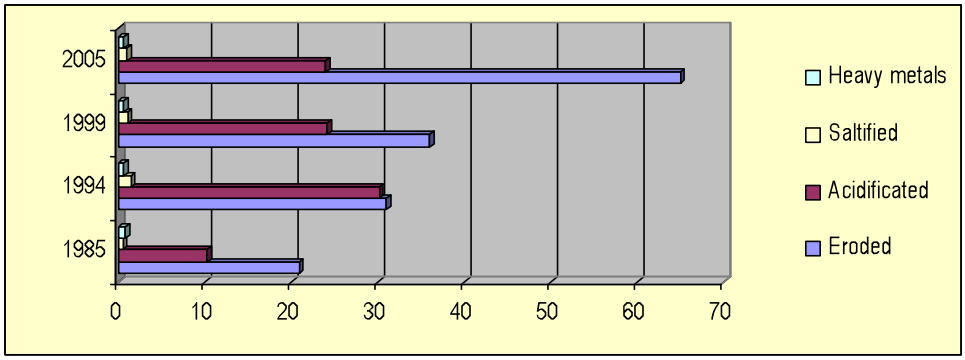

Figure 11. Share of degradated agricultural lands in Bulgaria (percent)
Source: Executive Environment Agency

Erosion has been a major factor contributing to land degradation (Figure 12). Its progressing level is a result of extreme weather but it has been also adversely affected by the dominant agro-techniques, deficiency of anti-erosion measures, uncontrolled deforestation, and recultivation of permanent grasslands. Due to ineffective management 34% of arable lands are subjected to wind erosion and 64% to water erosion (EEA). Since 1990, erosion affects 25-65% of farmland and losses varied from 0.2 to 40 t/ha in different years. Annual losses of earth masses from water erosion are estimated at 145Mt and two-third of it comes from the arable land. Soil losses from water erosion depend on cultivation practices and range from 8 t/y for permanent crops to 48 t/y for arable lands. Losses from wind erosion are around 30 t/y and depend on deforestation, uncontrolled pasture, ineffective crop rotation, plowing pastures etc.

Soil compression affects (mostly) agricultural lands due to untimely transportation and inappropriate agro-techniques (e.g. using heavy machineries when soil moisture is high). It is considered as a threat for soils but no data are available for the extent in agricultural lands.

Efficiency of water management

Restructuring of farms and production has been accompanied with a sharp reduction in irrigated farmland and a considerable distortion of irrigation facilities (Figure 10). There has been more than 21 folds decline in water used in agriculture comparing to 1989 (Table 5). In recent years, sector “Agriculture, hunting, forestry and fishery” comprises merely 3.2% of the total water use, and 0.3% of generated waste waters (NSI). All these contribute to a considerable reduction of water stress in the country - since 1990 the Water Exploitation Index declined considerably from 55% (the second in Europe) to 33% (EEA).

Table 5. Evolution and agricultural use of water resources in Bulgaria

Indicators	1988-1992	1993-1997	1998-2002	2003-2007
Total water resources ($10^9/m^3$/year)	21	21	21	21
Water resources per capita (m^3/inhabitant/year)	2427	2562	2661	2748
Total water withdrawal ($10^9/m^3$/year)	14,04	na	8,674	na
Agricultural water withdrawal ($10^9/m^3$/year)	3,058	0,141	0,144	0,143
Share of agricultural water withdrawal in total (%)	21.78	-	1.66	-
Share of total actual renewable water resources withdrawn by agriculture (%)	14.36	0.66	0.68	0.67
Area equipped for irrigation (1000 ha)	1263	789	622	104,6
Share of cultivated area equipped for irrigation (%)	29.17	17.55	17.36	3.18
Area equipped for irrigation actually irrigated (%)	na	5.42	4.96	51.29

Source: FAO, AQUASTAT

There is a huge reduction of irrigated farmland after 1990 as 2-5% of the irrigation network has been actually used[18]. What is more, a considerable physical distortion of irrigation facilities has taken place affecting most part of the internal canals. As a result the area equipped for irrigation in agriculture substantially decreased. Furthermore, primitive irrigation techniques have been widespread and augmented inefficiency of water use and local soil erosion. Water losses in the irrigation system amount 70% as consequence of the poorly maintained facilities, low efficiency, and water stealing (Alexandrov). Nevertheless, the overall negative irrigation impact of irrigation on erosion and salinization has been diminished considerably after 1990 (EEA).

The decline in irrigation has also had a direct harmful effect on crop yields and structure of rotation. The level of irrigation depends on the humidity in each year, kind of irrigated crops and water prices. Irrigation has not been effectively used to correct inappropriate seasonal and regional distribution of rainfalls, and mitigate effect of climate change[19] on farming and land degradation. Farms little capability for adaptation has resulted in huge crop, livestock and property losses during recent droughts and floods.

There has been a considerable amelioration of the quality of surface and ground waters as a result of unintended decrease of negative impact of agriculture and the sharp decline in chemical fertilizers and pesticides application. This trend has diminished drastically the pressure on environment and the risk of chemical contamination of soils and waters.

Nitrate and phosphate content in surface water decreased throughout transition and slightly increase in the last 3 years (EEA). Currently only 0.7% of samples exceeds the Ecological Limit Value (ELV) for nitrate. Despite improvement, many water eco-systems are

[18] Irrigation water accounts for the major share in total agricultural water use – 74.2% (NSI).

[19] Eighteen of the past 21 years are with positive anomalies in average temperatures and there is a trend for increasing soils' water deficiency (EEA). According to climate forecasts temperature will continue to increase, rains quantity to decrease, more extreme events (thunderstorms, floods, droughts, hurricane winds) to occur, and water stress experienced around the country.

at risk cased by the agricultural emissions in water and increasing application of chemicals. In drinking water around 5% of analyses show deviation of nitrates up to 5 times above the appropriate level (EEA). The later is mostly restricted to 400 small residential locations but it is also typical for almost 9% of the big water collection zones. Improper use of nitrate fertilizers, inappropriate crop and livestock practices, and non-compliance with the specific rules for farming in water supply zones, are all responsible for that problem.

Around a quarter of riverlength does not meet the standards for water quality (MAF). Monitoring of water for irrigation shows that in 45% of samples, the nitrates concentration exceeds contamination limit 2-20 folds (EEA). Nitrates are also the most common polluter of ground waters with slight excess over the ecological limit (EEA). A moderate concentration of N (bellow 25 mg per liter) in different levels of underground waters dominates with increasing trends in shallow waters and downward trends in others. Besides, around country a tendency for reduction in pesticides concentration in underground water is reported with occasional cases of Triasines over the ELV after 2000. There is further improvement since 2007 and the concentration of pesticides in all samples has been bellow the water quality standards.

Nitrate Vulnerable Zones cover 53% of country's territory and 68% of UAA (MAF). The lack of effective manure storage capacity and sewer systems in majority of farms, challenge posed by inadequate storage and disposal of expired and prohibited pesticides, and illegal garbage dumps in rural areas, all contributes significantly to the persistence of the problem. Most part of the post-communist livestock activity is carried out by a great number of small and primitive holdings often located within residential borders. Moreover, only 0.1% of the livestock farms possess safe manure-pile sites, around 81% of them use primitive dunghills, and 116 thousands holdings have no facilities at all (MAF). Besides, decreasing amount of manure has been used for fertilization of merely 0.2% of utilized farmlands in recent years.

Serious eco-challenge has been posed by inadequate storage and disposal of expired and prohibited pesticides which amount has augmented since 2001(EEA). A good portion of country's polluted localities (28%) is associated with these dangerous chemicals. Despite progression in management (modernization of storehouses, safe capsulation, exporting for deactivation) in the past years there are still 298 abandoned storehouses (57% of all) in 292 locations containing 1956t old pesticides (15.3% of the total amount).

In the last several years a stable amount of nullified sediments from industrial and residential waters have been utilized in agriculture and for recultivation of degradated lands. In 2010 the applied sediments in agriculture and for recultivation of degradated lands (13644t dry content) increased up to 49% share of the totally utilized sediments in the country (EEA).

Efficiency of biodiversity management

Since 1990 the amount of protected areas in the country almost doubled (NSI). Specially introduced rules for agricultural practices in NATURA territories and CAP eco- and other measures additionally created conditions for improvement of biodiversity management.

Furthermore, market and private initiatives led to recovering of some traditional (and more sustainable) livestock breeds and plants varieties as well as introducing new crops and livestock (novel food, industrial and energy crops; exotic animals like ostrich etc.) increasing agricultural biodiversity.

Nevertheless, the widespread lack of proper eco-management has affected negatively biodiversity in some agro- and related ecosystems. For instance, the intensive cereal and industrial crop enterprises have paid little attention to biodiversity protection in enormous fields of operations. On the other hand, considerable portion of farmlands have been left uncultivated for a long time or entirely abandoned, and some agro-ecosystems lost their "agro" character turning into natural ecosystems. That has caused uncontrolled "development" of species allowing development of some of them and suppressing others.

Some of the most valuable ecosystems (natural grassland) have been also severely damaged[20]. Part of the meadows has been left under-grazed or under mowed, and intrusion of shrubs and trees took places. Some fertile semi-natural grasslands have been converted to cultivation of crops, vineyards, or orchards. This has resulted in irreversible disappearance of plant species diversity. In addition, certain municipal and state pastures (with official and/or practical "common access" status) have been degraded by unsustainable use (over-grazing) by private and domestic animals. Besides, a reckless collection of valuable wild plants (berries, herbs, flowers) and animals (snail, snakes, fish) have led to destruction of all natural habitats.

The Index of Birds in Agricultural Lands in the country is negative and for the last 5 years the variety of bird species under monitoring living in agricultural lands has decreased by 10% (EEA). The birds in agricultural territories are with the largest amount of diminishing number (including moderate and strong tends) but there are no studies on factors for these trends.

During the last decades there has been significant degrading impacts of agriculture on biodiversity as all 37 typical animal breeds have been endangered, among them 6 are irreversibly extinct, 12 are almost extinct, 16 are endangered, and 3 are potentially endangered (MEW).

Efficiency of air and green-house gas management

Agriculture practices contribute to dust and odor contamination of air in some areas. Particularly disturbing are the small-scale and domestic livestock operations often located within residential territories (villages, town) and increasing local odor and noise pollution.

Agriculture is also responsible for considerable emissions of certain harmful substances in the air. It releases approximately 75% of Ammonia (NH_3) and 11% of Non-methane organic compounds (NMVOC) in the country (Figure 12). The biggest sources of NH_3 are cattle (dairy cows and buffalo cows) and for NMVOC - one-year crops with fertilization (EEA). Agricultural contribution to Nitrogen oxides (NOx) and Carbon monoxide (CO) is insignificant – 2.3% and 0.4% accordingly.

There has been enormous reduction of overall green-house gas (GHG) emissions from agriculture[21] since 1988 (Figure 13). Moreover, the decline in the sector's contribution has

[20] 20% of agricultural lands in Bulgaria are lands of High Nature Value (MAF).

[21] GHGs from Agriculture" result from production and processing of agricultural products, soil fertilization, animal manure processing and preservation. Emissions from combustion processes for energy production and from agricultural machines are not reported but they are insignificant amount.

been higher than the national. That has come as "unintentional" outcome of the post-communist restructuring of the sector and the new models of farm management.

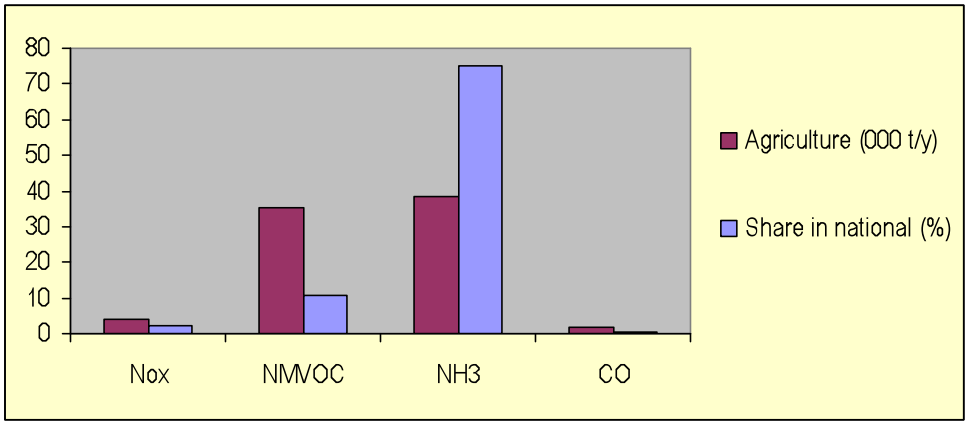

Figure 12. Harmful emissions in air from Bulgarian agriculture (2009)
Source: Executive Environment Agency

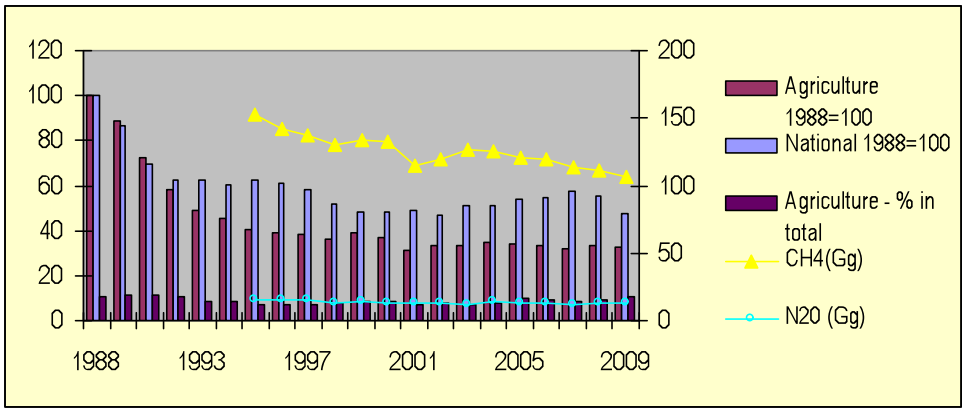

Figure 13. Trends in green-house gas emissions from Bulgarian agriculture
Source: National Inventory Report for Greenhouse Gas Emissions

During 2000-2004 there was a period of an increase and since then a stable trend for diminishing agricultural GHG emissions. The sector is the second biggest emitter of GHGs contributing between 7-10% of the total amount during the last decade. The main factors of agricultural GHGs have been agricultural soils (56%), enteric fermentation (22%), and manure management (19%) (EEA).

Agriculture mostly produces N_2O and CH_4 emissions. In the last decade the majority of N_2O emissions comes from agricultural soils, manure management, and fields burning. The methane emission is 36% of the agricultural GHGs and the biggest portion comes from enteric fermentation from domestic livestock and manure management. Reduction of livestock number is responsible for considerable decrease in agricultural CH_4 emission in past

years. On the other hand, there is a six-fold increase of CH_4 from rice cultivation since 1999 as a result of the partial recovery of this sub-sector.

Illegal field burning of residues and crops also emits GHGs-precursors which are not significant but they doubled since the period before 1990.

4. Impacts of EU CAP on eco-performance of Bulgarian Farms

Overall impact of EU CAP on farms eco-sustainability

According to the most experts[22] the overall impact from implementation of diverse EU CAP instruments (common market; new standards and restrictions; direct payments from EU and national top-ups; support measures of NPARD; mechanisms of market support of different sub-sectors and exports) on economic, social and environmental sustainability of large farms, firms, and farms specialized in field crops is good or significant (Figure 15). The overall effect of CAP on sustainability of other type of farms is estimated as insignificant or neutral.

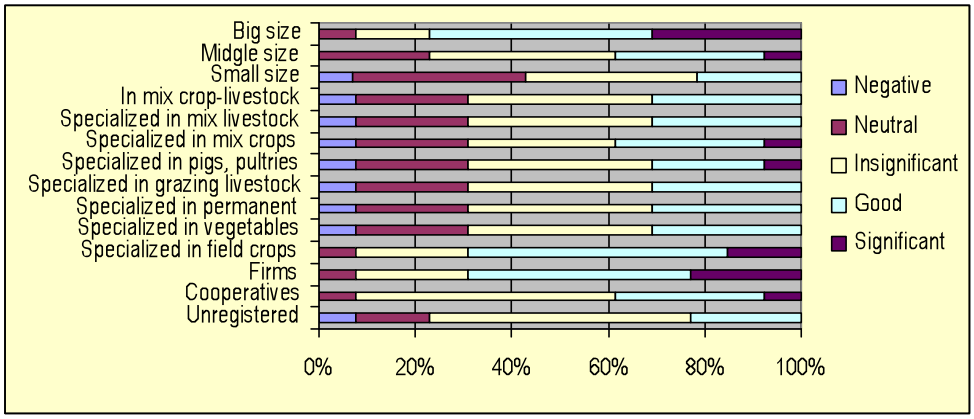

Figure 15. Impact of EU CAP on economic, social and environmental sustainability of Bulgarian farms

Source: Expertise with leading national experts

According to the more than a half of surveyed farms[23] EU CAP implementation is having a positive impact, mostly evaluated as good by the managers (Figure 16). The favourable effect of CAP on eco-sustainability is felt by all farms with areas with natural handicaps, forth-fifth of holdings in vegetables and mountainous regions, three-quarters of farms in crop-livestock production, more than two-third of farms with grazing livestock, more

[22] Expertise was carried out in the end of 2011 with the 13 leading experts on farm structure and policies in Bulgaria.

[23] A survey with 84 managers of "representative" commercial farms of all type of juridical status, sizes, specializations, and geographical locations was conducted in the spring of 2012. The structure of surveyed farms approximately correspond to the current structure of commercial farms in the country.

than 69% of farms in plan-mountainous regions, 60% of Physical Persons, more than 58% of cooperative, and every other farm with small and middle sizes, in field crops, mix crops, and pigs, poultry and rabbits.

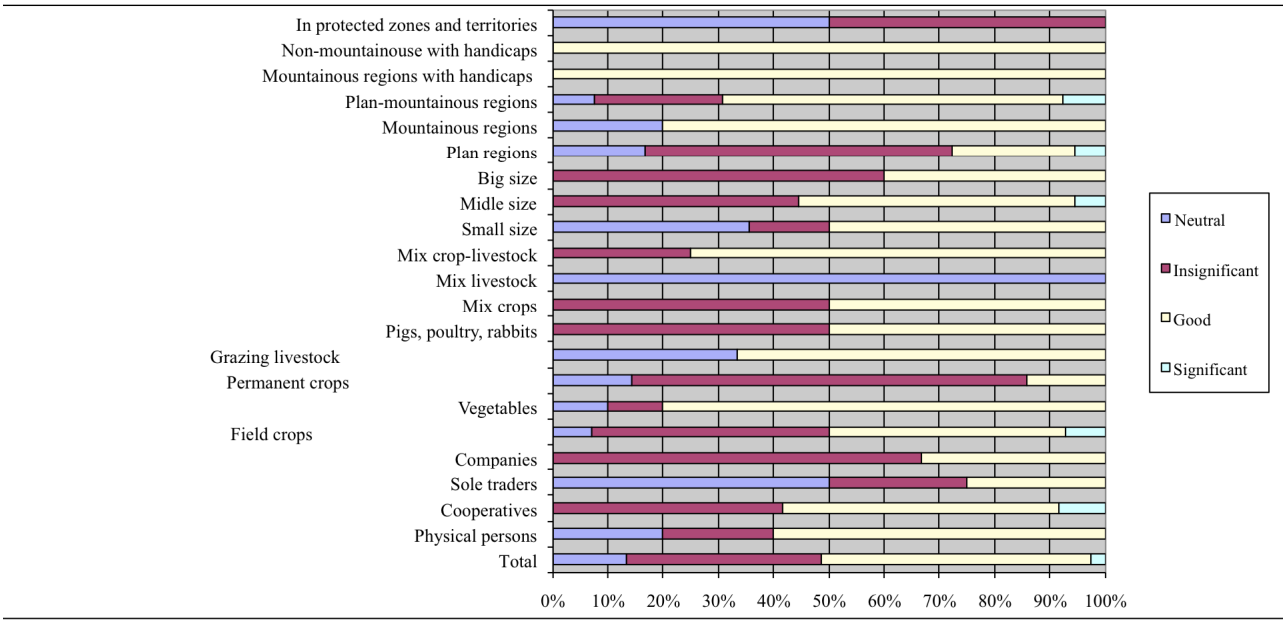

Figure 16. Impact of EU CAP on environmental sustainability of Bulgarian farms
Source: Interviews with farm managers

None of surveyed farms do not report a negative impact of CAP on environmental aspects of their activity. Nevertheless, for all holdings with mix livestock and with areas in protected zones and territories, and the majority of farms with permanent crops, plan regions, and big sizes, the effect from implementation of CAP instruments on environmental sustainability is insignificant and/or neutral.

The greatest share of surveyed farms indicates an increased level of a part of the main indicators in the present time comparing to the levels in the period before EU CAP implementation (Figure 17). For instance, higher or considerable higher is the level of the total income, costs, investments, profit, labour productivity, efficiency of the production and management in the majority of surveyed farms. Also the biggest portion of holdings has an improved access to public support, and augmented amount of subsidies for production, income and investment support. At the same time, the share of farms with lower total indebtedness comparing to the pre-accession period is 38%, while with a higher one bellow 18%.

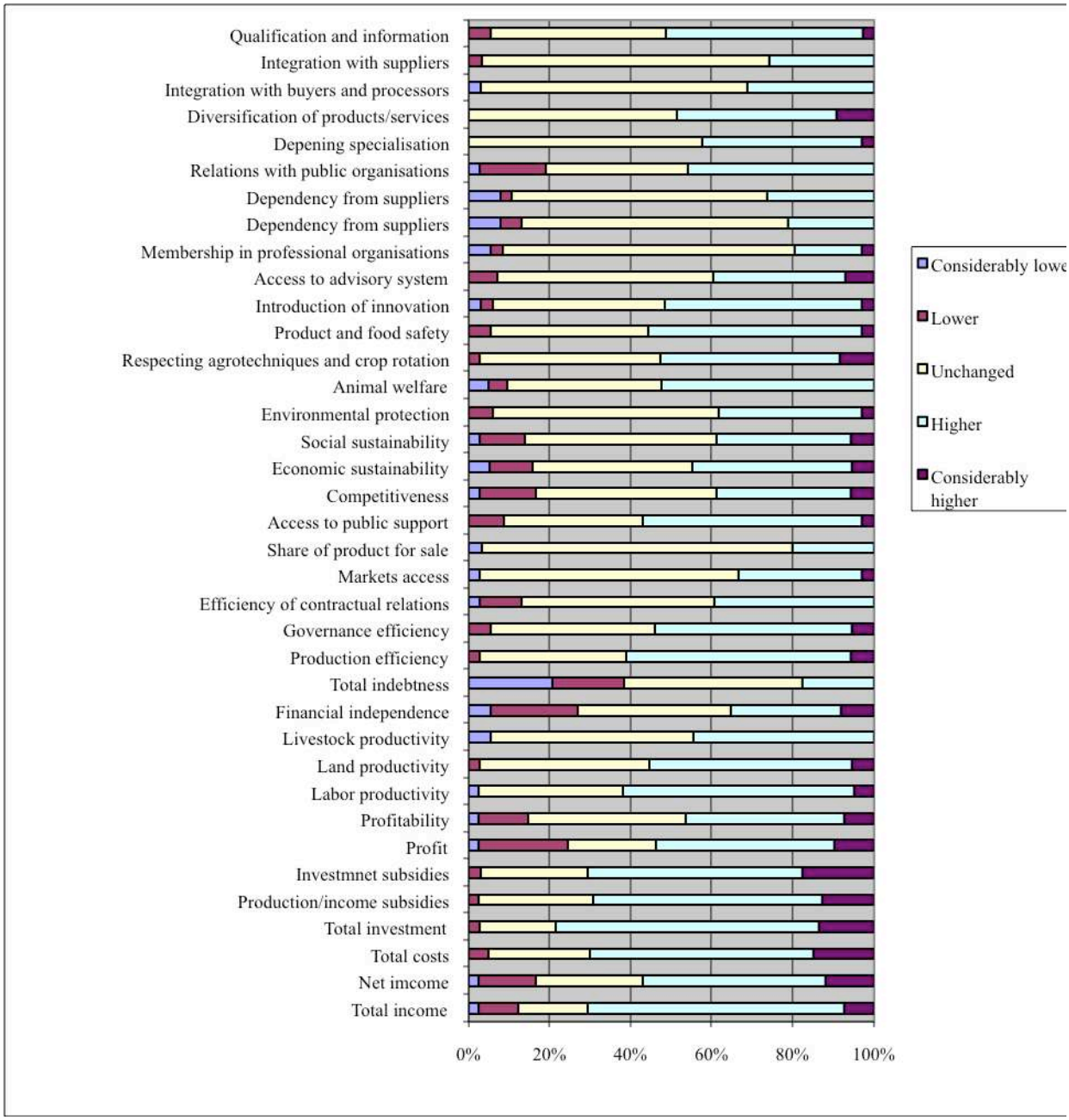

Figure 17. Level of farms major indicators comparing to level before EU CAP implementation in Bulgaria

Source: Interviews with farm managers

According to the more than a half of farms they have an improved qualification and information, agro-techniques and crop rotation, and livestock conditions, as well as increased product and food safety, and innovation activity comparing to the period before CAP

implementation. All that is a direct or indirect result of the favourable impact on different CAP mechanisms on the key aspects of the activities of majority of surveyed farms.

However, a good fraction of farms report lack of change in share of sold output, market access, diversification of products and services, deepening of specialization, and in environmental preservation. Also a big part of farms have no changes in their dependency from suppliers and buyers, increased integration with suppliers and buyers, and improved involvement in professional organizations and access to the agricultural advisory system.

Furthermore, a big portion of holdings do not report changes in the profitability, land and livestock productivity, overall indebtedness and financial independency, efficiency of production, management and contractual relations, competiveness, economic and social sustainability, agro-techniques and crop rotation, livestock conditions, product and food safety, introduction of innovation, qualification and information. Besides, more than a third of farms have no improvement in the relations with state organizations and in the access to public support in comparison to the pre-accession period.

Therefore, implementation of diverse instruments of CAP does not lead to a progressive change in the man indicators of a good part of farms. The later is either due to the lack of positive effect from CAP on a portion of holdings (for example, lack of effective public support) or due to neutralized effect of CAP on other negative factors which could have deteriorated even further the state of farms (in conditions of lack of counterbalancing the existing negative trends CAP instruments).

For a considerable share of farms the current level of the main indicators is lower or significantly lower comparing to the level before CAP introduction. For instance, 27% of surveyed holdings indicate deteriorated financial independence, more than 24% are with diminished profit, almost 17% are with reduced net income and competitiveness, around 16% are with inferior economic sustainability, almost 15% are with lower profitability, and 14% are with deteriorated social sustainability. Similarly, nearly 19% of farms are with worsened relations with the state organizations, above 13% of them have decreased efficiency of contractual relations, every tenth is with inferior livestock conditions, almost 9% of holdings are with decreased access to public support, and more than 8% are with reduced membership in professional organizations.

All these show that CAP implementation is associated with deterioration of main indicators of a considerable portion of farms. This is either because of the negative effects of CAP on a party of farms, or due to the lack of effective mechanisms for assisting the farms adaptation and for compensating the influence of other negative factors (e.g. competition with heavily subsidized imported products at the national and international markets, high interest rates of bank credits, big market price fluctuations etc.).

Impact of EU CAP individual components on farms sustainability

According to most of experts the effect of EU direct payments and national top-ups on economic, social and environmental sustainability of big farms, firms, and farms specialized in field crops is good or significant (Figure 18). At the same time, the majority of exerts assess as insignificant or neutral the impact of direct payments and national top-ups on sustainability on the rest type of holdings. Nevertheless, almost a half of experts believe that direct

payments have good effect on economic, social and environmental sustainability of cooperatives.

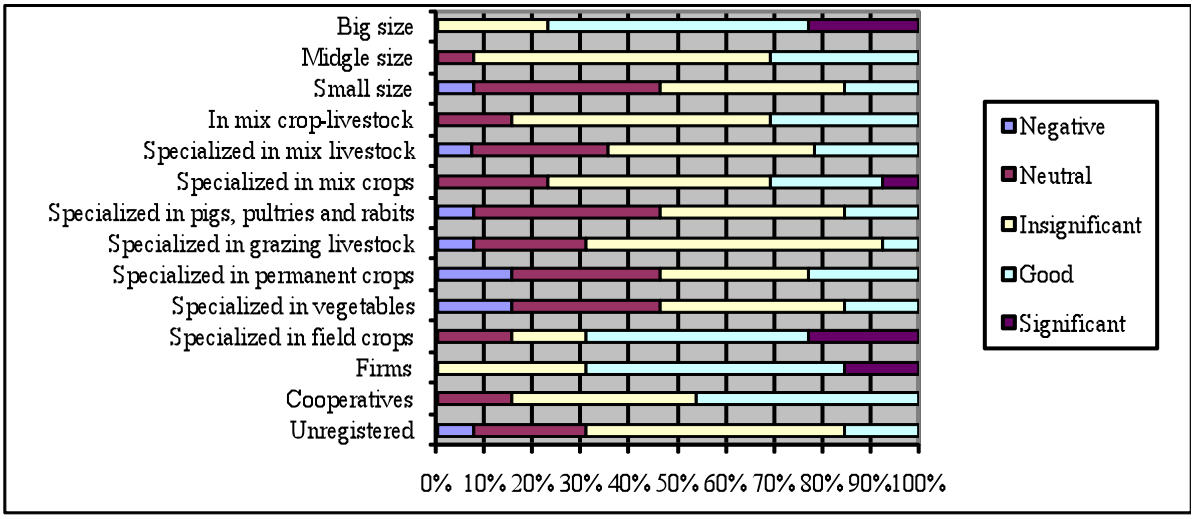

Figure 18. Impact of area-based direct payments and national top-ups on sustainability of Bulgarian farms
Source: Expertise with leading national experts

According to the managers of surveyed farms direct payments and national top-ups have got more significant positive effects on environmental sustainability only for holdings with natural handicaps (all farms) and in mountainous regions (75% of respondents). A half of supported cooperatives, and farms with mix corps and crop0livestock specialisation also report good or significant impact of these instruments on their environmental sustainability.

On the other hand, all assisted with that measure Sole Traders, and holdings specialised in permanent crops, pigs, poultry and rabbits, and the majority of the other type of farms assess the impact of these instruments on their environmental sustainability as neutral or insignificant.

Similarly, implementation of the individual measures of NPARD has got unequal effect on farms in the country. According to majority of experts impact of measures associated with payments for less-favoured areas in mountainous and non-mountainous regions (211 and 212) is good (Figure 19). What is more, most experts estimate that measures "Modernization of agricultural holdings" (121), "Setting up of young farmers" (112), "Village renewal and development" (322), and „Basic services to rural population and economies" (321) are with good or significant impact in relations to agricultural farms.

On the other hand, impact of all other measures is evaluated by experts as neutral or insignificant. Furthermore, around a half of experts assess as neutral the effect on farms in the country of measures "Producer groups" (142), "Improvement of the economic value of forests" (122), "Semi-subsistence farming" (141), and "Implementing local development strategies and cooperation projects" (411/412/413/431).

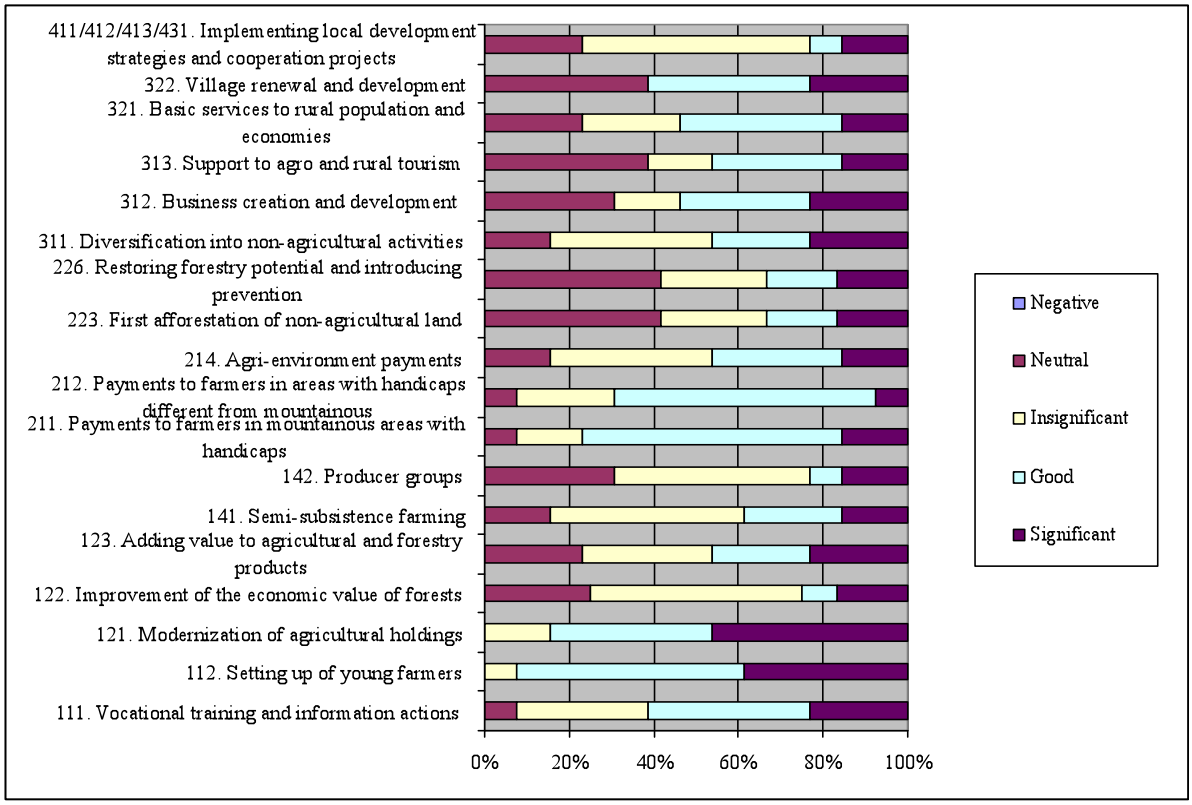

Figure 19. Impact of NPARD support measures on Bulgarian farms
Source: Expertise with leading national experts

According to the supported farm managers the NPARD measures with the greatest impact on their farms are: “Modernization of agricultural holdings” (121), “Setting up of young farmers” (112), and “Professional training, information and advisory service” (111) (Figure 20). For instance, 54,2% of the managers of assisted farms evaluate as good the impact of Measure 121 on their holdings, and 12,5% report that effects of these measure in significant. Every 6 out 10 participants in the Measure 112, and 45% of supported with Measure 111 and Measure 141 assess as good the impact on their farms.

More than a third of farms, receiving agro-environmental payments (Measure 123) also estimate as good the impact of that kind of support on their farm. Similarly, a good portion of holdings with payments for mountainous regions with natural handicaps (Measure 121) and in regions different from mountainous (Measure 122) assess as good (15,4% and 8,3% accordingly) or significant (7,7% and 8,3% accordingly) the impact of these measures on their farms.

Effects of the all other measures for the majority of supported holdings is estimated as insignificant or nil.

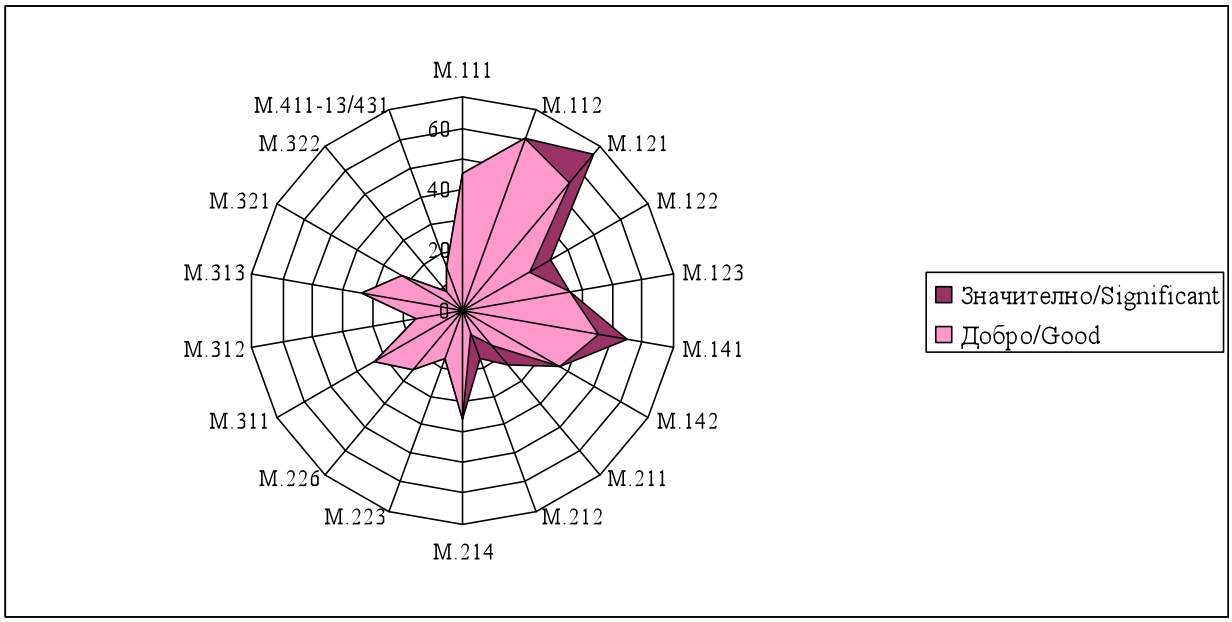

Figure 20. Share of Bulgarian farms evaluating as good or significant NPARD measures impact on their farms (percent)

Source: Interviews with farm managers

The impact of "Payments for farms in less-favoured mountainous regions" (Measure 211) is assessed by the majority of experts as good and significant for farms of all juridical types, farms with middle and big size, and farms specialized in field crops, grazing livestock, mix crops, and mix crop-livestock. As far as the effect of support under that measure on small farms, and farms specialized in vegetables, fruits, pigs, poultry and rabbits, and mix livestock, it is estimated as insignificant or neutral by most experts.

According to the less that a quarter of the managers of farms supported by Measure 211, the effect of that measure on their holdings in good or significant. The strongest is the impact of these payments for farms with small sizes, Physical Persons, and holdings specialized in permanent crops and vegetables. The positive effect of that type of payment involves two-third of small-scale farms, every other unregistered holding and specialised in permanent crops, and 40% of farms specialised in vegetables.

The official data for supported farms also indicates that most of them are small-scale holdings (Figure 21) as the number, area, and support to farms less than 50 ha increased for 2007-2009 by 16%, 10% and 22% accordingly (MAF). Nevertheless, around 2% of the biggest farms manage more than 57 % of supported by the measure area.

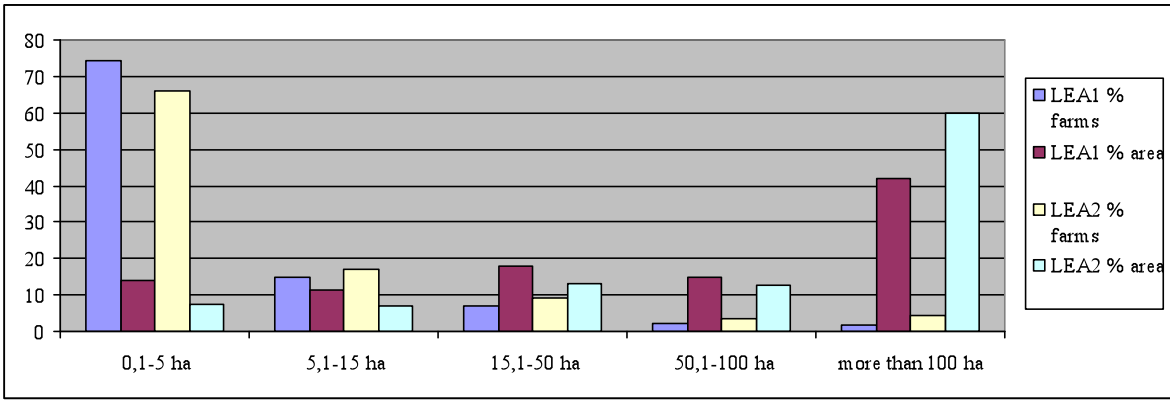

Figure 21. Distribution of beneficiaries for payments for less-favoured areas in Bulgaria (2008)
Source: MAF, State Fund "Agriculture"

As far as the effect of "Payments to farmers in areas with handicaps different from mountainous" (Measure 212) is concerned, it is estimated by most experts to be good or significant for firms and farms with big size. For mix-crops and mix crops-livestock farms impact of these payments is assessed as good by most experts. According to majority of experts the impact of payments of that type on cooperatives, and specialized in vegetables farms, is insignificant. Around a half of expert evaluate as insignificant the effect of these payments on holdings with small size, and farms specialized in permanent crops, grazing livestock, pigs, poultry and rabbits, mix livestock, and filed crops. The impact of these payments on unregistered farms is estimated by the most experts as neutral or insignificant.

According to the less than 17% of the managers of supported farms, the impact of the Measure 212 e good or significant. The positive impact of that instrument of CAP is felt only by holdings specialized in permanent crops and vegetables, the unregistered farms, and the holdings with small and middle size.

The official data for the supported farms also shows that most of them are small scale holdings (Figure 21) as the number and area of supported farms less than 50 ha increased for 2007-2009 by 15% and 10% accordingly (MAF). Nevertheless, a little more than 2% of the biggest farms manage more than 60 % of supported areas under that measure.

The impact of "Agri-environment payments" (Measure 214) on firms, farms with large size, and farms specialized in mix-crops is evaluated by the most experts as good. More than the half of experts also suggests that there is a good effect of that type of payments on cooperatives, and farm specialized in field crops, permanent crops, and grazing livestock. The impact of agri-environmental payments" on farms with middle size is estimated as insignificant by more than the half of experts. As far as other types of farms are concerned, the effect of these payments is assessed as neutral or insignificant by most experts.

According to the two-third of the managers of supported cooperatives the effect of Measure 214 is good. As good is assessed the impact of these payments by the half of holdings with small-scale, the agri-corporations, and farms specialised in vegetables and permanent crops, 40% of holdings specialized in field crops, every third farms with big size

and crop-livestock specialisation, and less than 29% of unregistered farms and middle-sized holdings.

For all other categories of supported farms the impacts of agri-environmental payments is insignificant or neutral, including for all Sole Traders, specialised livestock holdings, and farms with lands in protected zones and territories.

5. Conclusion and policy recommendations

Our analysis has demonstrated that suggested new framework for studying agro-environmental management 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.

We have also showed that post-communist transition and EU integration has brought about significant changes in agri-environmental management in Bulgaria. Newly evolved market, private and public governance has led to a significant improvement of eco-management and eco-impacts of agriculture introducing modern eco-standards and public support, enhancing environmental stewardship, disintensifying production, recovering landscape and traditional productions, and diversifying quality, eco-products and services. Agrarian transition and integration has been also associated with some new challenges such as unsustainable exploitation of natural resources, lost biodiversity, land degradation, water and air contamination etc.

Furthermore, implementation of the “common” EU policies has been having unlike results in the specific “Bulgarian” conditions. Up to date (and likely in a short and medium term) it enlarges income, technological, and eco-discrepancy between different farms, sub-sectors, and regions. In a longer-term eco-hazard(s) caused by agriculture will likely expand unless effective public and private measures are taken to mitigate existing eco-problems and risks. Moreover, the specific structures for management of farming activity (small commercial, semi-market, and subsistence farms, production cooperatives, large business firms) will continue to dominate in years to come and have to incorporate the eco-management needs.

Therefore, a significant improvement of public (Government, EU) interventions in agrarian and eco-management is needed to enhance sustainability of prospective farms and sustainable agrarian and rural development. Implementation of the EU common (agricultural, environmental, regional etc.) policies would have no desired impacts on environmental conservation and improvement unless special measures are taken to improve eco-information and assessments; modernize the system of property rights, public regulations and enforcement; perfect management of public organisations, programs and services; and extend public support to and partnerships with dominating farming (including small-scale and subsistence) structures etc.

We have identified a number major problems, challenges and risks in eco-management of Bulgarian agriculture at the current state of development including: the lack of appropriate information and assessments on eco-pressures, states, impacts and risks available for all farmers and other agents related with natural environment; ineffective system of formal property rights (rules) and public enforcement of laws, contracts and official standards; farmland degradation (exhaustion, erosion, contamination, compression); ineffective water utilisation and waters contamination; air pollution; adverse effect on natural biodiversity; poor waste management (burning fields, illegal garbage dumping and yards,

ineffective storing and disposal of old chemicals); not-motivated, incapable and/or unsustainable farming structures; lack of effective eco-organisations able to mitigate existing and emerging eco-conflicts and risks; lack of sufficient eco-education in farmers and other stakeholders; lack of effective system of eco-innovations; ineffective forms of public involvement such as inadequate, under or over-intervention, gaps in planning, coordination and regulations, high controversy, unpredictability and costs, insufficient capability and funding, large-scale mismanagement, lack of participation of and partnership with other stakeholders etc.

Therefore, further improvement of institutional environment, public policies and modes of public intervention is necessary to modernize the system of eco-management in agriculture. More particularly public policy attention is to be directed to:

First, better integration of environmental (including neglected eco-system services, ground water etc.) policy in agrarian and development policies as effective design and enforcement of long-term eco-measures get a high priority. Up to date most public efforts have been put on addressing urgent socio-economic (e.g. financial) problems while improvement of eco-management is perceived as unimportant. Accordingly, no measures are taken to mitigate or prevent various eco-risks (e.g. impacts of climate change, constant practicing of monoculture, re-intensification etc.). Furthermore, it is to be stability and certainty in eco-policy (long-term public commitment rather than frequent changes) in order to induce effective private and collective actions. For instance, a major reason for low investments in otherwise efficient agricultural green energy (energy crops; manure, biomass and wind energy production) has been the big uncertainty about the long-term policy in the area.

Second, complete application of integral approach of soil, water and biodiversity management in planning, funding, management, monitoring, controlling and assessment at all levels with stakeholders' involvement in decision-making. Moreover, eco-system services, life-cycle, eco-, energy and water accounts and footprints, and other modern approaches are to be incorporated into program design and management at all levels.

Third, improving coordination and efficiency of actions of various public and private agents involved in eco-management. Individual elements and responsibilities in public eco-management are usually divided between various agents and organisations with poor coordination, conflicting interests, and inconsistency, controversies, gaps and inefficiency of actions.

Forth, better defining, regulating and further privatizing (collectivizing) property, user, management, trading, discharge etc. rights and assets related to eco-resources, eco-system services, renewable energy supply, (N, GHG) emissions, waste discharges etc.

Five, employing a greater range of economic instruments including appropriate pricing, quotas, public funding and insurance, taxing, interlinking etc. to improve eco-resources use efficiency and risk-sharing, prevent over-intensification and pressure on natural resources, and support farms adaptation to changing market, institutional and natural environment.

Six, organizationally and financially securing adequate eco-data collection, monitoring, and independent assessment, including agricultural linkages with the state of environment: soil, water and air contamination; impacts on biodiversity; waste production and decomposition; total social costs, energy intensity, eco- (water) foot-print, benefits from farming; effect on eco-conservation and improvement; renewable energy production; impacts of climate change; existing and likely risks etc. What is more, adequate mechanisms to

assure timely disclosure and effective communication of available information to decision-makers, stakeholders and public at large are to be put in place.

Seven, better adapting EU CAP and national instruments to the specific Bulgarian conditions through greater support to farm modernization and adaptation, eco-innovations, and prospective business and non-for profit modes; relaxing the EU criteria for semi-market and young farmers; directing funds to prospective (Farm modernization and adaptation, Young farmers, environmental), and unsupported (Organic livestock, restoration of abandoned farmland) measures and organizations (livestock, public academic centres); and better implementing planed eco- measures.

Nine, improving eco-education and training of farmers, administrators, other stakeholders and public at large through modernization of agrarian education and Agricultural Education and Advisory Service. The later are to reach all agents via effective methods of education, advice, and information (TV, radio, on line information; demonstration) suited to their specific needs; set up a system of continues training and sharing experiences; include eco-, water, waste management, climate change and rural development issues; cooperate with other (public and private) academic institutions and private organizations; involve farmers and stakeholders in programs management, implementation and assessment at all levels.

Eight, employing more hybrid (public-private, public-collective) modes given their coordination, incentives, and control advantages. Public organization and enforcement of most eco-standards is very difficult (especially in huge informal sectors and remote areas). Public support to voluntary initiatives of professional, community and non-governmental organizations (informing, training, assisting, funding, risk-sharing), and assistance in cooperation at grass-root, eco-system, watershed, trans-regional, trans-border levels is much more efficient. Accordingly, real participation of farmers and stakeholders in priority setting, management, and assessment of public programs and regulations at all levels is to be institutionalized.

Ten, improving the overall institutional environment and public governance perfecting property rights protection, laws and contracts enforcement, combating against mismanagement and corruption in public sector, removing restrictions for market, private and collective initiatives etc.

Eleven, giving more public support to multidisciplinary and interdisciplinary research on all aspects and impacts of eco-management, including factors and forms of eco-management, and their impact on individual and collective eco-behaviour and environmental preservation. Up to date efforts of Ecologists, Technologists, Economists, Law, Sociologists, Behavioural and Political Scientists have been rarely united; most studies focus on individual aspect(s) of sustainability, or certain form(s) of management, or management level, or geographical location. What is more, the governance of farming is usually separated from the management of households and rural activities; and “normative” (to some “ideal” or “model in a foreign country”) rather than comparative (between feasible alternatives) approach is broadly employed; and significant social (third-party, recovery, transaction etc.) costs largely ignored. Consequently, institutional, behavioural, economic, ecological, international etc. factors of environmental sustainability are not properly understood, spectrum of feasible management modes properly identified, and efficiency, complementarities, and prospects of development adequately assessed.

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