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# Eco-governance in Bulgarian Agriculture

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## Abstract

This paper presents the evolution of diverse modes of environmental management in Bulgarian agriculture, and assesses their efficiency and likely prospects of development. First, it analyzes the pace of development and the impact(s) on individual behavior of the major modes of environmental governance - institutional environment (distribution and enforcement of property, user, trading etc. rights and rules); private and collective modes (diverse private initiatives, and contractual and organizational arrangements); market modes (various decentralized initiatives governed by “free” market price movements and market competition); public modes (different forms of Government, community, international etc. intervention). Second, it assesses the impact(s) of dominating system of governance on the state of environment and identifies major eco-challenges, conflicts and risks – increased competition for natural resources, degradation and contamination of farmland, pollution of surface and ground waters, loss of biodiversity, deterioration of (agro)eco-systems services etc. Third, it projects likely evolution of environmental management in the specific “Bulgarian” economic, institutional and natural environment, and estimates its probable effect on environmental security, and suggests recommendations for institutional modernization and public policies improvement.

*Keywords: environmental governance, market, private, public and hybrid modes, Bulgarian agriculture*

## 1. Introduction

There has been a fundamental transformation of Bulgarian agriculture since 1989 when transition from a centrally planned to a market economy started (Bachev 2010). New private rights on major natural resources (farmland, forestry, water, eco-system services) has been introduced or restored, markets and trade liberalized, new farming structures evolved, and modern public support and regulations introduced. All that has affected enormously the impact(s) of agricultural on and from the state of environment. Nevertheless, with very few exceptions (Bachev 2008, 2009) there are no comprehensive studies on environmental management in Bulgarian agriculture during post-communist transition and EU integration.

The goal of this paper is to present the evolution of diverse modes of environmental management in Bulgarian agriculture, and assesses their efficiency and likely prospects of development.

First, an analysis is made on the pace of development and the impact(s) on individual and collective behavior of diverse modes of environmental governance including:

- institutional environment (“rule of the game”) – that is distribution and enforcement of property, user, trading etc. rights and rules;
- private and collective modes (private order) – various private initiatives, and contractual and organizational arrangements;

- market modes (market order) – diverse decentralized initiatives governed by “free” market price movements and competition;
- public modes (public order) – different forms of Government, community, international etc. intervention.

Second, an assessment is made on the impact(s) of dominating system of governance on the state of environment as major eco-challenges, conflicts and risks in Bulgarian agriculture are identified.

Third, a projection is made on likely evolution of environmental management in the specific economic, institutional and natural environment of Bulgarian agriculture, and on probable effect on environmental security.

Finally, recommendations are suggested for institutional modernization and public policies improvement for effective environmental management in Bulgarian agriculture.

The framework of interdisciplinary New Institutional Economics (combining Economics, Organization, Law, Sociology, Behavioral and Political Sciences) is incorporated into analysis of Bulgarian agriculture to identify diverse modes and mechanisms of governance, and assess their potential to deal with various environmental challenges and risks.

## **2. Evolution of eco-governance during transition and EU integration**

### **2.1. Institutional environment**

During most of the transition, the rights on major agrarian resources (e.g. farmland) and diverse environmental rights (on clean and aesthetic nature, preservation of natural resources, biodiversity) were not defined or were badly defined and enforced (Bachev 2008). Inefficient public enforcement of laws, and absolute and contracted rights have been common. All that has negative consequences on development of farming structures and efficiency of environmental management. For instance, privatization of agricultural land and non-land assets of ancient public farms took almost 10 years to complete. During a good part of that period, the management of critical resources (farmland, water) was in ineffective and “temporary” structures (organizations under privatization, liquidation or reorganization) with no interests in effective and sustainable exploitation. The short-lease of natural resources and material assets was a major form for farm extension.

Out-dated and sectoral system of public policing, regulations and control dominated until recently, which corresponded little to the contemporary needs of environmental 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 was not available.

There existed neither social awareness of the “concept” of sustainable development nor any “need” to include it in public policy and/or private and community agenda. The lack of culture and knowledge of sustainability has also impeded the evolution of voluntary measures, and private and collective actions (institutions) for effective environmental governance.

Before EU accession, country’s laws, standards and institutions were harmonized with Community Acquis. That introduced a modern framework for the environmental governance including new rights (restrictions) on the protection of environment, integrated territory, water and biodiversity management, polluter pay principle as well as corresponding public institutions for controlling, monitoring and assessment (e.g. Executive Environmental Agency, Executive Hydro-melioration Agency etc.).

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

The external demand, monitoring, pressure and likely sanctions by EU leads to better enforcement of laws and standards. For instance, in 2008, EC blocked payments for Special Assistance Program for Agriculture and Rural Development (SAPARD) because of the considerable mismanagement and corruption. Internal collective actions and social demand for a good governance have also got momentum leading to improvement of public management. Recent success of eco-organizations in putting a ban on GM crops, the timely reaction against violation of eco-standards in protected zones, and revoking unlawful “exchanges” of valuable public agricultural and forestry lands, all are good examples in that respect.

Nevertheless, a good part of the new “rules of the game” are not well-known or clearly understood by various public authorities, private organizations and individuals. Generally, there is not enough readiness for an effective implementation of the new public order because of the lack of information and experience in agents, adequate administrative capacity, and/or practical possibility for enforcement of novel norms (lack of comprehension, deficient court system, widespread corruption). In many instances, the enforcement of eco-standards is difficult since the costs for detection and penalizing of offenders are very high, or there is no direct links between the performance and the environmental impact. For example, although the burning of fields has been banned for many years, this harmful practice is still widespread in the country. Subsequently, a permanent deterioration of soil quality, wasting of accumulated through photosynthesis soil energy, extermination of soil micro flora and habitats, a significant contribution to green-house emissions, multiplying instances of forests fires, and a diminished visibility, all they come out as a result (EEA 2009).

Modernization of institutions is also associated with new conflicts between private, collective and public interests. The results of public choices have not always been for the advantage of effective environmental management. For instance, the strong lobbying efforts of particular agents have led to a 20% reduction in numbers and a 50% reduction in the area of initially identified sites for the pan-European network for preservation of wild flora, fauna and birds NATURA 2000.

## **2.2. Private and market modes**

During much of the transition, newly evolving market and private structures have not been efficient in dealing with economic and environmental issues. Most farming activities have been carried out in less efficient and sustainable structures – public farms, part-time and subsistence farms, production cooperatives, huge business farms based on provisional lease-in contracts (Table 1). As many as 97% of newly evolved livestock holdings are miniature “unprofessional farms” breeding 96% of the goats, 86% of the sheep, 78% of the cattle, and 60% of the pigs (MAF). Farms adjustments have been associated with a significant decrease in the number of unregistered, cooperative and livestock holdings (since 1995) without adequate transfer of land, livestock, and eco-system services management to other structures.

**Table 1. Evolution of farming structures in Bulgaria**

Indicators	Year	Public farms	Unregistered farms	Cooperatives	Agro-firms	Total
Share in total farms (%)	1989	0.13	99.9			1,602,101
	1995		99.7	0.1	0.1	1,777,000
	2000		99.3	0.4	0.3	760,700
	2007		98.6	0.3	1.1	465,084
Share in total 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
	2007		32.2	24.7	43.1	100
Average size (ha)	1989	2,423.1	0.4			3.6
	1995	338.3	1.3	800	300	2.8
	2000	357.7	0.9	709.9	296.7	4.7
	2007		2.2	613.3	364.4	6.8

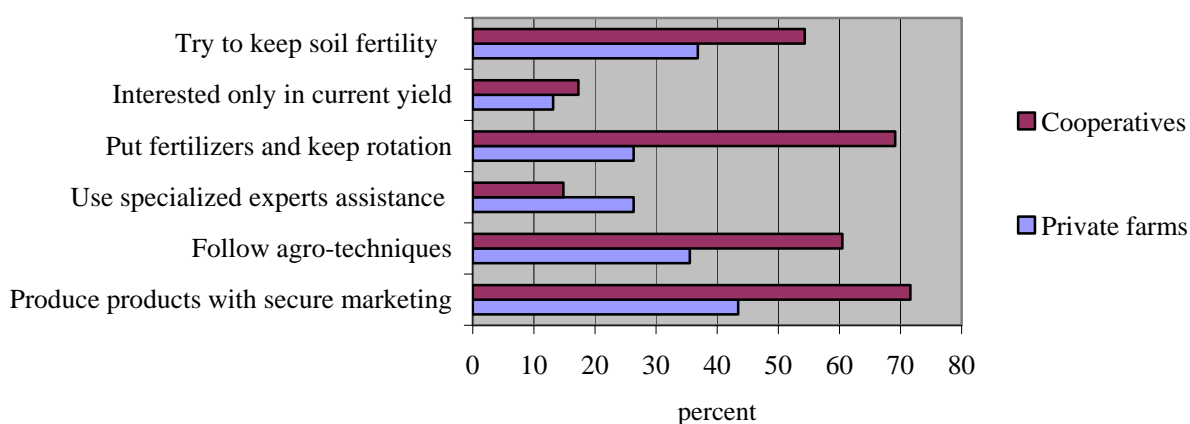
Source: National Statistical Institute, Ministry of Agriculture and Food.

Most farms have had little incentives for long-term investment to enhance productivity and eco-performance. Cooperative's big membership makes individual control on management very difficult. That focuses managerial efforts on current indicators, and gives a great possibility for mismanagement. Since most members are small shareholders, older in age, and non-permanent employees, the incentives for long-term investment for renovation of assets and eco-preservation and improvement have been low.

Small-scale and subsistent farms possess insignificant internal capacity for investment and little potential to explore economy of scale and scope (big fragmentation, inadequate scale). Besides, there are no incentives for non-productive (environment conservation) spending due to the lack of public control on informal sector. Therefore, primitive and labor incentive technologies, and low compliance with modern agronomic, safety and eco-standards are widespread. Dairy farming is particularly vulnerable since only 1.4% of the holdings with 17% of all cows meet EU standards (MAF).

The larger farms operate mainly on leased land and concentrate on high pay-off investment with a short pay-back period (cereals, industrial). They are most sensitive to market demand and institutional regulations since largely benefit or lose from timely adaptation to new standards and demand. They also have higher capacity to fund and adapt to new requirements. Nevertheless, survivor tactics rather than a long-term strategy toward sustainability are common among commercial farms (Figure 1).

**Figure 1. Share of farms implementing different strategies in Bulgaria (percent)**



Source: Survey data

Smaller size, owner operating and extensive nature of the majority of farms let avoid certain problems of large public enterprises from the past (over-intensification of production, lost natural landscape and biodiversity, chemical contamination, huge livestock and manure concentration, uncontrolled erosion); revived some local (and more sustainable) technologies, varieties and products; and avert emergence of mad cow disease and bird flue epidemic. Private mode has introduced incentives and possibilities for integral environmental management (including revival of eco- and cultural heritage, anti-pollution, esthetic, comfort etc. measures; investing in eco-system services, origins, labels) profiting from inter-dependent activities such as farming, fishing, agro-tourism, recreation, processing, marketing and trade. There are good examples for private introduction and enforcement of top quality and eco-standards by individual farms (voluntary and trade initiatives), a vertical integrator (dairy and vine processor, food chain, exporter), or direct foreign investor (cereals, oil crops). Private management has been 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 air and water (Bachev 2009).

Since 2001, state irrigation assets have been transferred to newly-evolving Water Users Associations. Around 70 associations have been formally registered servicing 30% of the total equipped for irrigation area. Expected “boom” in efficiency from collective management of irrigation has not materialized because of 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. Evolution of farmers and eco-associations has been hampered by the big number of agrarian agents and their diversified interests - different size of ownership and operation, type of farming, preferences, age and horizon.

Market-driven organic farming has emerged and registered a significant growth in recent years but it is restricted to 432 farms, processors and traders, and covers less than 3% of the Utilized Agricultural Area (UAA). 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 (80%). There are also 242677 ha approved for gathering wild organic fruits and herbs (MAF 2009). Eco-labeling of processed farm products (relying on self-regulation) has appeared,

which is more a part of marketing strategy of certain companies rather than a genuine action for environmental improvement (Bachev 2008).

The organic form has been introduced by business entrepreneurs who managed to organize this new venture, arranging costly certification and marketing of highly specific output. Produced bio fruits, vegetables, essential oil plants, herbs, spices, and honey are predominately for export since only a tiny market for organic products exists in the country. The later is due to the higher prices of products and limited consumer confidence in the authentic character of products and certification.

### **2.3. Public modes**

During transition public intervention in eco-management was not significant, comprehensive, sustainable, or related to the matter. Eco-policies were fragmented and largely reactive to urgent problems (floods, storms, drought) with different agencies responsible for individual aspects of natural resources management. In past years a number of national programs have been developed to deal with specific eco-challenges - 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 system of environment is also set up and mandatory eco-assessment of public programs introduced. However, bad coordination, gaps, and ineffective enforcement are still typical for public management .

During the entire transition agrarian long-term credit market was practically blocked while newly evolving farming structures left as one of the least supported in Europe. Aggregate Level of Support to Agriculture was close to zero until 2000, and very low afterward with a small proportion of farms benefiting from public assistance (Bachev 2007).

Until recently multifunctional role of farming was not recognized, and provision of “environmental service” funded by society. SAPARD measure “Agro-ecology” was not approved by the end 2006, only 201 projects selected, and none funded by the end of 2008. Due to mismanagement SAPARD was suspended by EC (2008), and a considerable funding lost.

CAP implementation has introduced a considerable support to farming for direct payments, market support, and agrarian and rural development . This amount of resources let more farms get access to public support and fund new essential activities (e.g. commercialization and diversification; introduction of organic farming; maintaining land productivity and biodiversity; agri-environment protection, animal welfare; support for less-favored areas and regions with environmental restrictions; eco-training etc). Funding for special environmental measures amounts for 27% of the budget of National Plan for Agrarian and Rural Development (NPARD).

There is a mandatory requirement for farms to “keep farmland’s good agricultural and environmental status” in order to receive public support. Area-based direct payments also induce farming on abandoned lands and improve environmental situation. However, EU support unevenly benefits different farms as bulk of public subsidies go to small number of large farms. Due to the bad design, restricting criteria , complicated and costly procedures, and lack of formal title on land management, most (small-scale) farms can not participate in public support schemes. For instance, less than 16% of all farms received area based payments and 13% got national top-ups as farms specialized in field crops touch the largest public support (MAF 2009). Registered beneficiaries of direct payments with farms size

bigger than 1000 ha are only 13% but they obtain support for more than 54% of totally subsidized farmland in this group. Similarly, unregistered beneficiaries with farm size smaller than 5 ha are more than 60% but they get payments for merely 9% of supported area in the group.

There has been a considerable progression in implementing special environmental measures for less-favorite regions and agro-ecology but it is still below the established targets (Table 2).

**Table 2. Progression of environmental payments in Bulgarian agriculture**

Environmental measures (211, 212, 214)	2007	2008			
	Farms	Farms	Target (%)	Area (ha)	Target (%)
Less-favored mountainous regions	19806	20257	33	237975	60
Less-favored non-mountainous region	7273	10017	-	na	-
Agro-ecology	1038	1127	2.6	42339	26

Source: Ministry of Agriculture and Food

Up to date the level of utilization of funds for agrarian and rural development is merely 10% (MAF 2010). Complicated paper work, related high coo-financing and transaction costs, restricting criteria, and huge mismanagement are responsible for the slow progress in public support. What is more, all surveys show that many of the specific EU regulations are not well known by implementing authorities and majority of farmers. Our recent survey proves that as much as 47% non-cooperative farms and 43% of cooperatives are still “not aware or only partially aware” with support measures of CAP different from area-based payments. As much as 62% of farms report they will not apply for CAP support due to the “lack of financial resources” (26%), “not compliance with formal requirements” (18%), and “clumsy bureaucratic procedure” (17%).

### **3. Agricultural impact on environment**

Post-communist development has changed considerably the agricultural pressure and impact on environment.

Market and private governance has led to a sharp decline in all crop (except sunflower) and livestock (but goat) productions while some traditional varieties and breeds have been recovered. Considerable portion of agricultural lands have been left uncultivated for a long period of time - in some years of transition abandoned land reached one third of the total (MAF). Currently, almost 10% of all agricultural lands are unutilized while fallow land accounts for 9.5% of arable land. Average yields for all major products shrunk to 40-80% of the pre-reform level. The number of cattle has decreased with 61%, pigs with 77%, sheep with 81%, and poultry with 53% (NSI). By 1995 tractors and combines employed in the sector diminished by 54% and augmented to 64% of the 1989 number presently. Now only 5,6% of farms own tractors and 0,7% harvesters while 40,6% and 30,3% hire or use tractors and harvesters in association (MAF).

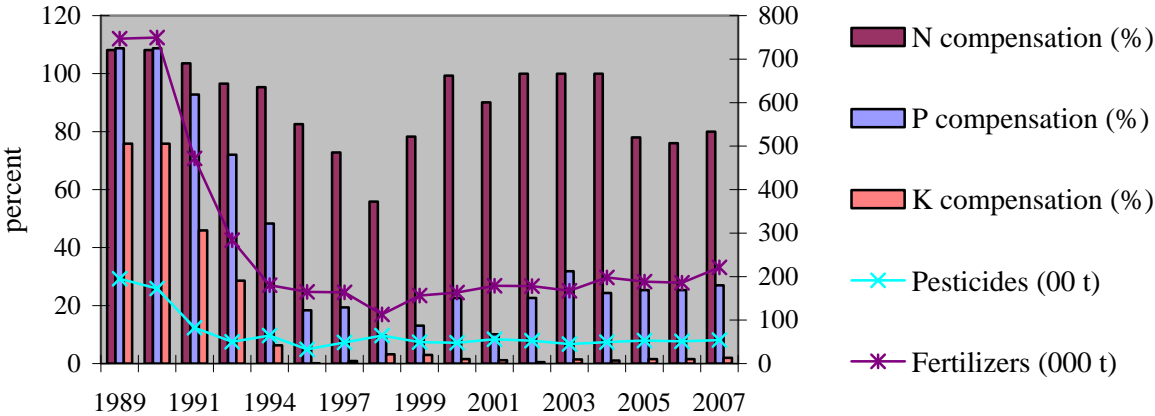
All that has relaxed the overall agricultural pressure on environment. However, improper practices also caused erosion and uncontrolled development of some species and



suppressing others. Some of the most valuable ecosystems (such as permanent natural and semi-natural grassland) have been severely damaged . Part of the meadows has been left under-grazed or under-mowed, and intrusion of shrubs and trees into the grassland took place. Some of the fertile semi-natural grasslands have been converted to cultivation of crops, vineyards or orchards. This has resulted in an irreversible disappearance of plant species diversity. Meanwhile, certain municipal and state pastures have been degraded by unsustainable use (over-grazing) by private and domestic animals. Reckless collection of valuable wild berries, herbs, flowers, snail, snakes, and fish has led to destruction of some natural habitats. Degrading impacts of agriculture on biodiversity has been significant - all 37 typical animal breeds have been endangered during the last several decades as 6 among them are irreversibly extinct, 12 are almost extinct, 16 are endangered and 3 are potentially endangered (MEW 2009).

The total amount of chemicals used in agriculture has declined considerably, and now their per hectare application represents merely 22% and 31% of the 1989 level (Figure 2). Currently, N, P and K fertilizers are applied barely for 37,4%, 3,4% and 1,9% of UAA. This trend diminished drastically the pressure on environment and risk of chemical contamination of soils, waters, and farm produce. A good part of farm production has received unintended “organic” character obtaining reputation for products with high quality and safety. Nonetheless, a negative rate of fertilizer compensation of N, P and K intakes dominate being particularly low for phosphorus and potassium. Accordingly, an average of 23595,4 t N, 61033,3 t P<sub>2</sub>O<sub>5</sub> and 184392 t K<sub>2</sub>O have been irreversibly removed annually from soils since 1990 (MAF). Unbalance of nutrient components has been typical with application of 5.3 times less phosphorus and 6.7 times less potassium with the appropriate rate for the nitrogen used during that period. Moreover, a monoculture or simple rotation has been constantly practiced by large operators concentrating on few crops. All these practices further contributed to deterioration of soil quality and soil organic matter content.

**Figure 2. Chemical application and rate of fertilizer compensation in Bulgarian agriculture**



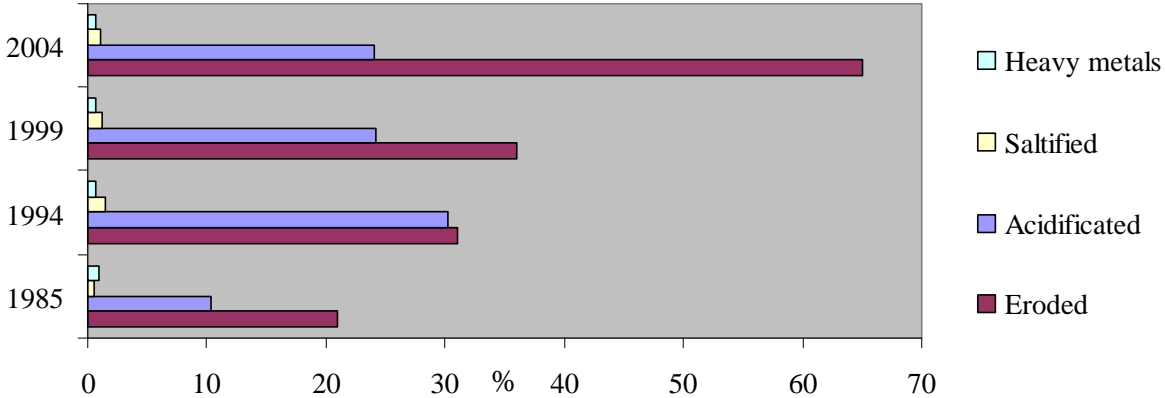
Source: National Statistical Institute and Ministry of Agriculture and Food

Nitrate Vulnerable Zones cover 60% of country’s territory and around 7% of UAA. The lack of effective manure storage capacity and sewer systems in majority of farms contributes significantly to the persistence of the problem. Only 0.1% of livestock farms possess safe

manure-pile sites, around 81% of them use primitive dunghills, and 116 thousands holdings have no facilities at all (MAF). Also decreasing amount of manure has been used for fertilization of merely 0.17% of utilized farmlands in recent years.

There has been a considerable increase in agricultural land affected by acidification (Figure 3) as a result of a long-term application of specific nitrate fertilizers and unbalanced fertilizer application. After 1994 the percentage of acidified soil decreased, but in recent years there has been a reverse tendency along with gradual augmentation of nitrate use. As much as 4.5% of acidified farmlands are with level harmful for crops. The fraction of salinized land doubled after 1989 but it is still insignificant part of the total farmland. There has been taken no effective measures to normalize soil acidity and salinity throughout the period.

**Figure 3. Share of degraded agricultural lands in Bulgaria**



Source: Executive Environment Agency

Erosion has been a major factor contributing to land degradation (Figure 3) and its progressing level has been adversely affected by dominant agro-techniques, deficiency of anti-erosion measures, and uncontrolled deforestation. Around one-third of arable lands are subjected to wind erosion and 70% to water erosion (EEA 2009). Since 1990, erosion has affected between 25-65% of farmland and total losses varied from 0.2 to 40 t/ha in different years. 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.

Serious environmental challenge has been posed by inadequate storage and disposal of the expired and prohibited pesticides as 28% of all polluted localities in the country are associated with these dangerous chemicals (EEA 2009). Despite progression in management there are still 333 abandoned storehouses in 324 locations for 2050 t pesticides. Polluted with heavy metals and pesticides soils currently represents bellow 1% of agricultural lands. Re-cultivation of degraded farmlands has been under way, but it accounts for merely 200-250 ha per year (MAF 2009).

Number of illegal garbage dumps in rural areas has noticeably increased reaching an official figure of 4000, and farms contribute extensively to waste “production” bringing about air, soil and water pollution (EEA 2009).

There has been more than 21 folds decline in water used in agriculture comparing to pre-reform level, which contributed to reduction of water stress . In recent years, sector “Agriculture, hunting, forestry and fishery” comprises merely 3,17% of total water use and 0,34% of generated waste waters (NSI 2009). Restructuring of farms and agricultural

production has been accompanied with a sharp reduction in irrigated farmland and considerable physical distortion of irrigation facilities (Table 3). Negative impact of intensive irrigation on overall erosion and salinization diminished significantly after 1990. Nevertheless, primitive irrigation techniques are widespread and augment inefficiency of water use and local soil erosion. Decline in irrigation has also had a direct harmful effect on crop yields and structure of rotation. The level of irrigation depends on humidity of a particular year but has not been effectively used to counterbalance the effect of global warming on farming and degradation of agricultural land.

**Table 3. 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 has been a considerable amelioration of quality of ground and underground waters. The nitrate and phosphate content in ground water decreases throughout the transition and currently only 0.7% of samples exceed the Ecological Limit Value (ELV) for nitrate (EEA 2009). In drinking water around 5% of analyses show deviation of nitrates up to 5 times above appropriate level. The later is mostly restricted to small residential locations but it is also typical for almost 9% of big water collection zones. Improper use of nitrate fertilizers, inappropriate crop and livestock practices, and non-compliance with specific rules for farming in water supply zones, are responsible for that problem.

Monitoring of water for irrigation shows that in 45% of samples, nitrate concentrations exceed the contamination limit value by 2-20 folds (MAF 2009). Nitrates are also the most common pollutants in underground water with N levels only slightly exceeding the ecological limit in recent years. Trend for reduction in concentration of pesticides in underground water is reported with occasional cases of triasines over the ELV since 2000.

In recent years utilization of the sludge from purified waste waters was initiated in agriculture and for recultivation of degraded lands comprising accordingly 20% and 7% of the total amount (EEA 2009).

There has been almost five times reduction of overall green-house gas emissions from agriculture since 1988 (Vassilev et al. 2007). The N<sub>2</sub>O emissions comprise 59% of the total emissions from agriculture and there is a slight enlargement of the share since 2000. Agriculture has been a major ammonia source accounting for two-thirds of the national emission. The majority of NO<sub>2</sub> emissions come from agricultural soils (87%), and manure management and burning of stubble fields (13%). The methane emission from agriculture represents about a quarter of the national. The biggest portion of CH<sub>4</sub> comes from fermentation from domestic livestock (72%) and manure management (24%).

#### **4. Prospects of eco-management and policy recommendations**

Deepening the EU integration and CAP implementation will improve the institutional environment for Bulgarian agriculture – specification and enforcement of various rights and rules, management of public programs, progression in eco-monitoring and assessment etc.

There will be a significant improvement of sustainability of farming structures as public support will gradually increase (augmentation of area based payments, better utilization of public funds), reach more legitimate beneficiaries, and cover a larger part of farms activity (including eco-management). For instance, according to the plan, the support to unfavorable mountainous regions will cover 60000 farms and 328000 ha, agri-ecology measures will involve 40000 farms with 110000 ha, area under sustainable use will reach 110000 ha for maintaining biodiversity and 160000 ha for improvement of soils quality, contracts for water quality enhancement will expand to 1000 (MAF).

Experience of EU countries demonstrates that some eco-standards and terms of eco-contracts are very difficult to enforce and dispute. In Bulgaria the compliance rate will be even lower because of unequal regional capability to introduce and control new rules, ineffective court system, domination of “personal” relations and bribe. Thus, more farms than otherwise would enroll will participate in such schemes (including biggest polluters and offenders) .

Direct costs (lost income) for conforming to requirements of special programs in different farms vary considerably, and they have unequal incentives to participate. Having in mind voluntary character of most CAP support instruments, the biggest producers of negative impacts (large polluters and non-compliant with eco-standards) will stay outside of these schemes since they have highest eco-enhancement costs. Small contributors will like to join since they do not command great additional costs comparing to supplementary net benefit. Government is less likely to set up high performance standards because of perceived “insignificant” environmental challenges, strong internal political pressure from farmers, and possible external problems with EU control (and sanctions) on cross-compliance. Therefore, CAP implementation will probably have a modest positive impact on the environment performance of Bulgarian farms.

There will be evolution and expansion of private and collective modes for environmental management – voluntary initiatives, codes of professional behavior, eco-contracts and cooperation, quasi or complete integration. Some environmental, infrastructural, and rural development projects requiring large collective actions and coalition of resources will be effectively initiated, coordinated, and carried by the existing cooperatives and business forms. The later will further enhance sustainability of these organizations. Furthermore, some economic or ecological needs will bring about further changes in farm size, forms and type of eco-governance. For instance, a big interdependency of activities in eco-system services will require concerted actions (cooperation) for achieving certain effect; asset dependency between livestock manure supplier and nearby organic crop farms will necessitate direct coordination; a high mutual capacity, cite, time of delivery, product specificity etc. dependency between a processor and suppliers will tighten vertical integration; specific needs of drinking water company will justify a private agreement (eco-contract) with farmers etc.

Special governing size or mode is also imposed by institutional requirements – a minimum scale of activities is set for taking part in public programs like marketing, agri-ecology, organic farming, tradition and cultural heritage; signing a 5 year public eco-contract dictate a long-term lease or purchase of managed land etc. Our recent survey has proved that

as much as 41% of non-cooperative farms and 32% of cooperatives are investigating possible membership in professional organizations.

There will be further development of market modes such as organic farming, industry driven eco-initiatives (eco-labeling, standards, professional codes of behavior), protected products and origins, system of fair-trade, production of alternative (wind, manure) energy at farm etc. For instance, significant EU market, lower local costs, and growing national demand create strong incentives for organic and specific productions by larger enterprises (including joint venture with non-agrarian and foreign capital). According to the plan organic farming will reach 5% of the production and 8% of UAA by 2013 (MAF). Similarly, new incentives for production of bio-fuel and clean energy would induce development of new area of farm activity associated with that new public and market demand.

The process of farms adaptation will be associated with concentration of natural resource management and intensification of production. Besides, global climate change would affect severely agricultural development. All these will revive or deepen some of the environmental problems unless pro-environmental governance (public order, hybrid mode) is put in place to prevent that from occurring.

Few livestock farms are able to adapt to new EU restrictions, and related reduction of farms and animals and improved manure management will be associated with a drop of environmental burden by formal sector. Besides, newly introduced quota system for cow milk will limit animals increase and direct efforts into less intensive sheep, goat, and buffalo productions.

A few (semi)subsistence farms will undertake market orientation because of high costs for farm enlargement and adjustment (no entrepreneurial capital and resources available, low investment and training capability of aged farmers, insufficient demand for farm products). The measure "Support to semi-market farms" is having no great effect (insufficient demand, restricting criteria) and its redesign is being considered. For authority it is (technically and politically) impossible to enforce the official standards in the huge informal sector of economy. Thus, massive (semi)subsistence farming with primitive technologies, poor safety, environmental and animal welfare standards will persist in years to come.

Finally, most farm managers have no adequate training and managerial capability, and are old in age with small learning and adaptation potential. The lack of readiness, experiences, and potential for adaptation in public and private sectors alike will require some time lag until "full" implementation of CAP in "Bulgarian" conditions. There will be also significant inequalities in application (and enforcement) of new laws and standards in diverse farms, sub-sectors, and regions of the country.

There is growing interdependency and competition for environmental resources between different industries, social groups, and regions. That will push further overtaking natural resources away from farm management and transfer to urban, transport, industry etc. use. The needs to compete for, share, and sustain natural resources will require a special governance (cooperation, public order, hybrid form) at eco-system, regional, national and transnational scales to reconcile conflicts and coordinate eco-actions.

Having in mind the state, trends and challenges of eco-management in Bulgarian agriculture following policy recommendations can be suggested:

First, environmental policy is to be better integrated in the overall and agrarian and rural development policies while effective design and enforcement of environmental measures are to get a high priority. Presently most public efforts are put on addressing current socio-economic problems while improvement of eco-management is perceived as less important. Accordingly, no measures are taken to mitigate or prevent various environment related risks in agriculture (e.g. likely negative impacts from climate change). Furthermore, there is to be more stability and certainty about eco-policy (a long-term public commitment) in order to

induce effective private and collective actions. One of the major reasons for low investments in green energy production has been frequent changes and uncertainty about long-term policy development in that new area.

Second, proclaimed integral approach of soil, water and biodiversity management is to be completely applied in planning, funding, management, monitoring, controlling and assessment of sustainable use of resources and wastes. Moreover, it is to be extended to integral management of all natural resources in a particular eco-system, territory, region as all stakeholders (community leaders, farmers, businesses, residents, interest groups, consumers) are to be involved in decision-making process. Individual elements, aspects and responsibilities of eco-management are usually divided between various agencies and agents with poor coordination, conflicting interests, and inconsistency, controversies, gaps and inefficiency of actions. Furthermore, neglected eco-system, eco-system services, life-cycle, environmental accounts and other modern approaches are to be incorporated into design of public intervention and program management.

Third, property, user, management, trading, discharge etc. rights on natural resources, eco-system services and wastes are to be better defined, and further privatized, collectivized and regulated as in the case of irrigation water, provision of environmental preservation and eco-system services, supply of renewable energy, (nitrate, GHG) emissions and waste discharge and trade etc. Furthermore, a greater range of diverse public instruments is to be used including appropriate pricing, quotas, public support, taxing, interlinking etc. Prospective incentives (including funding of eco-actions and taxation on overuse of eco-resources) are to be introduced to prevent over-intensification and support farms adaptation.

Forth, adequate and internationally comparable environmental data collection, and independent assessment of driving forces, pressure, impacts and responses are to be organizationally and financially secured. There is insufficient data on environment in general, and agricultural linkages with (contribution to, affection by) the state of environment - soil, water and air contamination; waste production and decomposition; total social costs, energy intensity, eco-foot print, and benefits of agricultural production; effect on environmental conservation and improvement; renewable energy production; impacts of climate change; existing and likely risks etc. For instance, Bulgaria is 2d worst in Europe in Total Energy Intensity of GDP and improvement of that indicator is very important. Also mechanisms for comprehensive and timely disclosure of eco-information are to be assured, and effective methods for communication to decision-makers and stakeholders at all levels and public at large introduced.

Five, different CAP instruments are to be better adapted to the specific conditions (needs) of Bulgarian agriculture such as: immense small-scale and subsistent farming, domination of small-size livestock holdings, fragmented and dispersed farmlands, low adaptability of farms, domination of tight horizontally and vertically integrated forms in certain sub-sectors, ineffective administration etc. Accordingly, public support to prospective business and non-for profit ventures as well as informal modes complying with size, environmental etc. requirements is to be given; direct payments to (landless) livestock farms is to be institutionalized; access to EU support (area-based payments) of public organizations (e.g. research institutes, universities) given; application of the EU criteria (“enormous” for Bulgaria size of 2400 Euro) for supporting “Young farmers” and “Semi-market” farms is to be reconsidered; funding from unpopular measure “Support to semi-market farms” re-directed to perspective measures like “Young farmers” and “Modernization of farms”; support to restoration of abandoned farmland and organic livestock farming to be introduced (currently only organic forage production is supported); support to eco-innovation, farm adaptation, and mitigation of existing and likely risks provided etc.

Six, more hybrid modes (public-private, public-collective) are to be employed given coordination, incentives, and control advantages. (Pure) public organization, funding and enforcement of most environmental, animal welfare, biodiversity etc. standards are very difficult or impossible at all. It is particularly true for the huge informal sectors of the economy and remote areas of the country. Individual “punishments” often do not work well while overall damages from the in-compliance are immense. Policies are to be oriented to market orientation of subsistence farms, support and incentives for diverse (including new, specific, not-traditional) private and collective eco-modes, and eco-programs for informal farms, groups and other ventures. Public support to voluntary environmental initiatives of farmers, rural and community organizations (informing, training, assisting, funding) and assistance in cooperation at grass-root, eco-system, trans-regional and trans-border level will be more efficient in terms of incentive, coordination, enforcement, and disputing costs. Practical involvement of farmers and other stakeholders in priority setting, management, assessment and disputing of public programs and regulations at all levels is to be institutionalized in order to decrease information asymmetry and possibility for opportunism, diminish costs for coordination, implementation and control, and increase overall efficiency and impact.

Seven, special attention is to be given to improvement of agrarian and environmental education (training) of students, farmers, administrators, rural entrepreneurs and residents, and consumers. That will require a fundamental modernization of education system and the National Agricultural Advisory Service. The latter is to be re-oriented to farmers and rural agents (rather than bureaucracy) needs; reach all agrarian and rural agents through introduction of effective methods of education, advice and information (TV, radio and on line information; demonstration; sharing experiences) suited to specific needs and capability of different type of farmers (prospective, young, semi-market, business) and rural agents; establish a system of continuous (life-long) rather than occasional training; include environmental and waste management, and rural development issues; cooperate closely with research institutes, universities, and private and collective organizations; involve farmers and other stakeholders in management, implementation and assessment of its program etc.

Eight, modernization of eco-management will not be achieved without significant improvement of overall institutional environment and public governance – perfection of law and contract enforcement system, combating mismanagement and corruption in public sector, removing restrictions for effective market, private and collective initiatives etc.

Nine, more support is to be given to multidisciplinary and interdisciplinary research on various aspects and impacts of environmental management, including on factors and forms of eco-governance and their impact on individual and collective eco-behavior. Currently, uni-disciplinary approach dominates, and efforts of researchers in Ecology, Technology, Economics, Law, Sociology, Behavioral and Political Sciences are rarely united; most studies are focused on the governance of individual (economic or social or environmental) aspect of sustainability, or on formal modes and mechanisms; they are typically restricted to a certain form (contract, cooperative, industry initiative, public program), or management level (farm, eco-system), or particular location (region); uni-sectoral analyses are broadly used separating the governance of farming from the governance of overall households and rural activities. “Normative” (to some ideal or model in other countries) rather than comparative institutional approach between feasible alternatives is broadly employed, and significant social costs associated with the governance (the transaction costs) are ignored. Consequently, understanding on institutional, cultural, economic, behavioral, technological, ecological, international etc. factors of agrarian sustainability is impeded - spectrum of feasible formal, informal, market, private, public, integral, multilateral etc. modes of governance can not be identified, and efficiency, potential, complementarities, and prospects of existing and other

possible (including imported) modes of management assessed. All these restrict possibilities to assist public policies and the effective design of public intervention, and support individual, collective and business actions for sustainable development.

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