

Journal of  
**Social and Administrative Sciences**

[www.kspjournals.org](http://www.kspjournals.org)

Volume 4

March 2017

Issue 1

**Assessing Multi-aspects and Integral Sustainability of  
Bulgarian Farms**

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**Abstract.** The issue of assessment sustainability of agricultural farms as a whole and of different type is among the most topical for researchers, farmers, investors, administrators, politicians, interests groups and public at large. Despite that practically there are no assessments on sustainability level of Bulgarian farms in conditions of European Union Common Agricultural Policy implementation. This article applies a holistic framework and assesses sustainability of Bulgarian farms as a whole and of different juridical type, size, production specialization, and ecological and geographical location. Initially the method of the study is outlined, and overall characteristics of surveyed holdings presented. After that an assessment is made of integral, governance, economic, social, environmental sustainability of farms in general and of different type and location. Next, structure of farms with different sustainability levels is analyzed. Finally, factors for improving sustainability of Bulgarian farms are identified, and directions for further research and amelioration of farm management and public intervention in the sector suggested. Our study has found out that overall sustainability of Bulgarian farms is at a good level, with superior levels for environmental and social sustainability, and inferior level for governance and economic sustainability. There are great variations in sustainability levels of farms of different type and location as well as in shares of holdings with unlike level of sustainability. Factors which stimulate to the greatest extent the actions of Bulgarian farms for improving individual aspects of sustainability are Access to Advisory Services, Professional Training of Manager and Hired Labor, Personal Conviction and Satisfaction, Positive Experience of Other Farms, Available Innovations, Financial Capability, Private Contracts and Agreements, and Registration and Certification of Products, Services, etc. National and European mechanisms of regulation and support, which affect to the greatest extent economic sustainability of Bulgarian farms are: Direct Area Based Payments, National Tops Ups for Products, Livestock, etc., Modernization of Agricultural Holdings, Green Payments, Support to Semi-market Farms.


**Keywords.** Farm sustainability, Governance, Ecological aspects, Factors of sustainability, EU CAP impact, Bulgaria.


**JEL.** Q10, Q56, R33.

## 1. Introduction

The issue of assessment of sustainability of farms is among the most topical for researcher, farmers, investors, administrators, policy-makers, interests groups and public at large around the globe ([Andreoli & Tellarini, 2000](#); [Bachev, 2005, 2006, 2016a, 2016b, 2016c, 2016d, 2016e](#); [Bachev & Petters, 2005](#); [Bachev et al., 2016](#); [Bastianoni et al., 2001](#); [EC, 2001](#); [FAO, 2013](#); [Fuentes, 2004](#); [Häni et al., 2006](#); [OECD, 2001](#); [Rigby et al., 2001](#); [Sauvenier et al., 2005](#); [UN, 2015](#)). Nevertheless, practically there are no comprehensive assessments on

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sustainability level of Bulgarian farms in the conditions of European Union (EU) Common Agricultural Policy (CAP) implementation.

This article applies a holistic framework and assesses sustainability of Bulgarian farms as a whole and of different juridical type, size, production specialization, and ecological and geographical location. Initially, methods of the study are presented.

First, we justify a new “governance” and “institutional” aspect of farm sustainability, and present methodology of the study. Next, an overall characteristics of the surveyed farms is outlined. After that, integral, governance, economic, social, and environmental sustainability of the farms in general and of different type and location is assessed. Finally, factors for improving sustainability of farms are identified, and directions for further research and practices in sustainability assessment suggested. The ultimate goal of the study is assist improvement of farm management and strategies and public intervention for sustainable development in the sector.

### 2. Methods of the study

Studying out of farm as a governance structure let properly understand efficiency and sustainability of economic organizations in agriculture (Bachev, 2004; 2005). In a long-term no economic organization would exist if it were not efficient, otherwise it will be replaced by more efficient arrangement. Therefore, the problem of assessment of sustainability of farms is directly related to estimation of level of governance, economic, social and environmental efficiency of farms.

In Traditional Economics the farm is presented as a “production structure” and analyses of efficiency is restricted to “optimization of technological factors” (“production” costs) according to marginal rule. This approach fails to explain a high sustainability and coexistence of numerous farms of different type (semi-market holdings, cooperatives, small commercial farms, large agri-firms) with great variation in “efficiency levels” in Bulgaria (and other Central and East European countries) during last two and a half decades.

In real economy with positive transition costs and institutions “that matter” farms and other agrarian organizations are not only production but major governance structures – modes for governing of activity and transactions (Bachev, 2004). Therefore, sustainability of diverse type of farming structures cannot be properly understood and estimated without analyzing their comparative production *and* governance potential. Following New Institutional Economics logic (Williamson, 1996) governance efficiency characterizes comparative potential of a particular form (type of farm) to minimize transaction costs and increase transaction benefits in relation to another feasible organization in specific socio-economic and natural environment.

Hence a farm will be efficient (sustainable) if it manages all activities and transactions in the most economical for owner(s) way. If a farm does not govern transactions (activity) effectively, it will be unsustainable since it will have high costs and difficulties for functioning in specific environment (possibilities and restrictions) *comparing* to another feasible (alternative) organization. In that case, there will be strong incentives for exploring existing potential (adapting to a sustainable state) through reduction or enlargement of farm size, or via reorganization or liquidation of farm. Consequently, some of following will take place - alternative farm or non-farm application of available resources; or farm expansion through employment of additional resources; or trade instead of internal use of owned land and labor; or taking over by or merger with another farm of business (Bachev, & Petters, 2005).

Modes of governance and acceptable (for owners, community, society) net benefits will vary according to personal preference of individual agents, entrepreneurial capability and experience, risk aversion, opportunity costs of owned resources, institutional restrictions and norms, pressure and opportunities of specific environment (competition, demand, cooperation, support, climate change), etc.

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Major types of farm activities (and transactions) subject of management are: supply and governance of labor resources; supply and governance of land and natural resources; supply and governance of material inputs; supply and governance of innovations; supply and governance of finance; and governance of marketing of products and services, etc. Sustainability assessment is to include comparative efficiency of governance of each of these activities of a farm in specific institutional, economic, social and natural environment in which that holding functions and evolves. If it is detected a lack of acceptable efficiency (significant costs and difficulties, insufficient benefits) in relation to feasible alternative(s), then farm is to be considered as low-sustainable or non-sustainable.

Next, it has to be evaluated the farm's potential for adaptation to constantly evolving market, economic, institutional, social and natural environment through effective changes in governing forms, size, production structure, technologies, and behavior. If the farm does not have potential to stay at or adapt to new more sustainable level(s) it will diminish its comparative advantages and sustainability, and (eventually) will be liquidated or transformed in to another type of organization. For instance, if a farm faces enormous difficulties meeting institutional norms and restrictions (imposed and enforced by EU new standards for quality, safety, environmental protection, animal welfare); higher social norms and requirements (for working conditions, income level, welfare of farmers and farm households; new demands of rural communities), and taking advantage of institutional opportunities (access to public support programs); or it has serious problems supplying managerial capital (as it is in a one-person farm when an aged farmer does not have a successor wishing or capable of taking over the business), or supply of farmland (big demand of farmland by other entrepreneurs or for non-agricultural use), or funding activities (insufficient town finance, impossibility for coalition, selling equity or buying credit), or marketing output and services (changing market demand for certain products or needs of co-owners and buyers, a strong competition with imported products); or it is unable to adapt to existing environmental challenges and risks (warning, extreme climate, soil acidification, waters pollution, etc.), then it will not be sustainable despite the high historical or current efficiency. Therefore, adaptability of farm characterizes to the greatest extent farm sustainability and has to be used as a main criteria and indicator for sustainability assessment<sup>1</sup>.

We have proved that definition farm sustainability has to be based on the "literal" meaning of that term and perceived as a system characteristics and "ability to continue through time" (Bachev, 2005). It has to characterize all major aspects of farming enterprise activity, which is to be managerially sustainable, and economically sustainable, and socially sustainable, and environmentally sustainable.

Therefore, sustainability characterizes the ability (capability) of a particular farming enterprise to exist in time and maintain in a long-term its governance, economic, ecological and social functions in the specific socio-economic and natural environment in which it operates and evolves (Bachev, 2006a, 2016b).

Farm sustainability has four aspects (pillars), which are equally important – governance, economic, social and environmental (Bachev, 2005, 2016a). A farm is sustainable if: i) it has a good *governance efficiency* – that is to say it is a preferable for the farmers (owners) form and has the same or greater potential for governing of activities and transactions comparing to other farms or economic organizations (Bachev, 2004; 2005); ii) it is *economically viable* and efficient – that is to say it allows acceptable economic return on used resources and a financial stability of the enterprise; iii) it is *socially responsible* in relation to farmers, hired labor, other

<sup>1</sup>Our suggestion to use adaptability as a criteria and indicator for sustainability has been already incorporated in one of the most comprehensive System for Assessing Sustainability of Agriculture Systems in Belgium – SAFE (Sauvenier *et al.*, 2005).

agents, communities, consumers and society, that is to say it contributes toward improvement of welfare and living standards of the farmer and rural households, preservation of agrarian resources and traditions, and sustainable development of rural communities and the society as a whole; iv) it is *environmentally friendly* – that is to say its activity is also associated with the conservation, recovery and improvement of the components of natural environment (lands, waters, biodiversity, atmosphere, climate, ecosystem etc.) and the nature as a whole, animal welfare, etc.

ly important: managerial (governance), economic, social and environmental. Depending on the combination of all four dimensions, sustainability of a particular farm could be high, good, low, or it is unsustainable. In this study we apply a hierarchical framework including 12 Principles, 21 Criteria, 45 Indicators and Reference Values to assess sustainability level of Bulgarian farms (Figure 1). The content, justification, modes of calculation and integration of sustainability indicators are already presented in details in our previous publication (Bachev, 2016a).

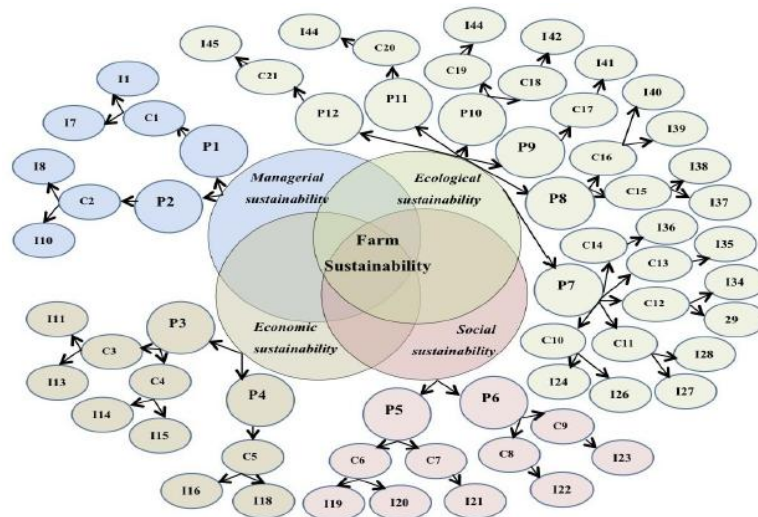


Figure 1. Framework for Assessing Sustainability of Bulgarian Farms

Assessment of sustainability of farms in the country is based on a 2016 survey with the managers of “representative” market-oriented farms of different type. The survey was carried out with the assistance of the National Agricultural Advisory Service and the major associations of agricultural producers in the country, which identified the “typical” holdings of different type and location.

Assessment of sustainability level of individual farm is based on estimates of the managers for each Indicator in four qualitative levels: “High/Higher or Better than the Average in the Sector/Region”, “Similar/Good”, “Low/Lower or Worse than the Average in the Sector/Region”, “Negative/Unsatisfactory/Unacceptable”. After that the qualitative estimates for individual farms were quantified and transformed into Sustainability Indexes for each Indicator (SI(i)) using following scales: 1 for “High”, 0,66 for “Good or Average”, 0,33 for “Low”, and 0 for “Unsatisfactory or Unacceptable”.

For classification of farms according to juridical type (Physical Person, Sole Trader, Cooperative, Company), production specialization (Field Crops, Vegetables, Flowers, and Mushrooms, Permanent Crops, Grazing Livestock, Pigs, Poultry, and Rabbits, Mix Crop-Livestock, Mix Crops, Mix Livestock), geographical and administrative regions (North-West Region, North-Central Region, North-East Region, South-West Region, South-Central Region, South-East Region), and ecological locations (Mountainous or Non-mountainous regions with Natural Handicaps, with Lands in Protected Zones and Territories) the official

typology for farming holdings in the country is used. In addition, every manager self-determined his/her farm as Predominately for Subsistence, rather Small, Middle size or Large for the sector, and located mainly in Plain, Plain-mountainous or Mountainous region. The latter approach guarantees an adequate assessment since the farms managers are well aware of the specificity and comparative characteristics of their holdings in relations to others in the region and the (sub) sector.

For the integral assessment of sustainability of a farm for every Criteria, Principle, and Aspect, and Overall level, equal weights are used for each Principle in a particular Aspect, and for each Criterion in a particular Principle, and for each Indicator in a particular Criterion. Sustainability Index for individual Criteria (SI(c)), Principle (SI(p)), and Aspect (SI(a)), and Integral Sustainability Index (SI(i)) are calculated by formulas:

$$SI(c) = \frac{\sum SI(i)}{n} \quad n - \text{number of Indicators in a particular Criteria}$$

$$SI(p) = \frac{\sum SI(c)}{n} \quad n - \text{number of Criteria in a particular Principle}$$

$$SI(a) = \frac{\sum SI(p)}{n} \quad n - \text{number of Principles in a particular Aspect}$$

$$SI(i) = \frac{\sum SI(a)}{4}$$

### 3. Overall Characteristics of Surveyed Farms

The survey with the farm managers took part in summer of 2016 and included 190 registered agricultural producers, which comprise around 0,2% of all registered under 1999 Regulation No 3 for Creation and Maintaining a Registry of Agricultural Producers in Bulgaria<sup>2</sup>.

Managers of “representative” farms of all juridical type, size, specialization and location have were surveyed. (Table 1).The structure and importance of surveyed farms approximately corresponds to the real structure of registered agricultural producers and market-oriented holdings in the country.

**Table 1. Type and Number of Surveyed Agricultural Farms (percent, number\*)**

Type and location of farms	Physical persons	Sole Traders	Cooperatives	Companies	Total
Total	80,00	4,21	6,84	8,95	190*
Mainly subsistence	11,18	0,00	0,00	0,00	8,95
Small size	57,89	37,50	0,00	5,88	48,42
Middle size	28,95	37,50	92,31	70,59	37,37
Big size	1,32	25,00	7,69	23,53	4,74
Field crops	10,53	25,00	69,23	29,41	16,84
Vegetables, flowers, and mushrooms	13,82	12,50	0,00	0,00	11,58
Permanent crops	24,34	25,00	0,00	11,76	21,58
Grazing livestock	17,76	25,00	0,00	5,88	15,79
Pigs, poultry, and rabbits	0,66	0,00	7,69	0,00	1,05
Mix crop-livestock	14,47	0,00	23,08	23,53	15,26
Mix crops	13,82	12,50	0,00	29,41	14,21
Mix livestock	4,61	0,00	0,00	0,00	3,68
Mainly plain region	51,97	50,00	53,85	64,71	53,68
Plain-mountainous	19,74	50,00	38,46	17,65	22,11
Mainly mountainous	14,47	0,00	7,69	17,65	13,68
Lands in protected zones and territories	6,58	0,00	0,00	17,65	6,84
Mountainous regions with natural handicaps	15,13	0,00	7,69	11,76	13,68
Non-mountainous regions with natural handicap	1,97	0,00	7,69	0,00	2,11
North-West region	15,79	37,50	7,69	11,76	15,79
North-Central region	21,05	0,00	23,08	23,53	20,53
North-East region	15,13	12,50	38,46	11,76	16,32
South-West region	14,47	0,00	7,69	11,76	13,16
South-Central region	19,74	12,50	15,38	29,41	20,00
South-East region	13,82	37,50	7,69	11,76	14,21

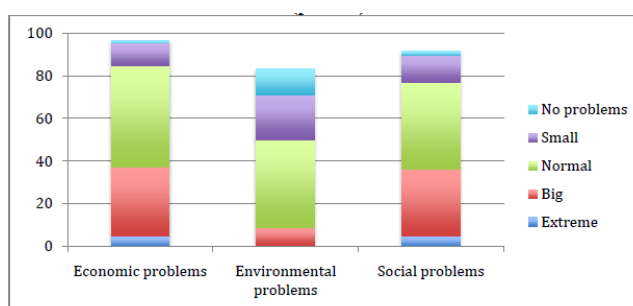
\*\* mainly Corporations and 5,88% Partnerships.

Source: Survey with managers of farms, July 2016

<sup>2</sup> According to the Ministry of Agriculture and Food during 2014/15 business year there is a significant agmentation of the number of registered agricultural producers, whcih in the end of July 2015 reached 94815 (Agrarian Report, 2015).



The survey has found out that the majority of farms are located in regions with “Normal” economic, social and environmental problems (Figure 1). However, a significant part of holdings are in regions with “Big” or “Extreme” economic, social and environmental challenges. A third of the managers indicate that their farm is located in a region with “Small” or “Without” environmental problems, while share of enterprises with similar economic and social problems is smaller. A good portion of the managers are not aware of the character or are not able to assess the level of socio-economic and environmental problems in the region, where their farm is located. The latter concerns to the greatest extent competency of farmers in regard to environmental problems in the region, followed by the social and economic challenges.

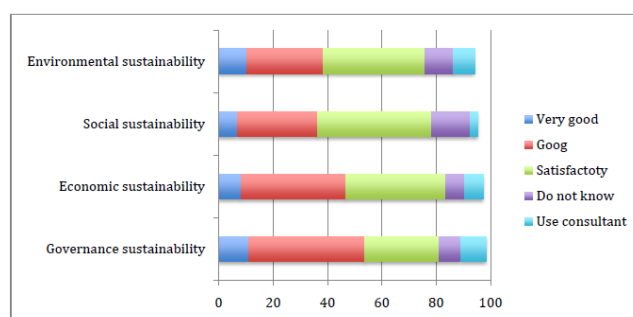


**Figure 1.** *Character of Problems in the Region, where Surveyed Farm is Located (percent)*  
**Source:** Survey with managers of farms, July 2016

The owners and/or managers of three-quarter of surveyed farms are male, and around 60% are of up to 55 old. Such gender and age structure of managers (owners) will manage the majority of Bulgarian farms in coming 10-15 and more years and contribute to one or another sustainability level of holdings.

A good number of surveyed farms are with a relatively short period of existence up to 5 year, including almost 30% of them “less than two years”. The majority of holdings however, are with a longer period of operation, including around 29% with 11 and more year effectively experience in management of farming sustainability. A little more than a half of surveyed farms indicate, that the period they put efforts for improving sustainability of farms look is up to 5 year. Another significant part of them is with a long-term experience in improving farm sustainability, including 19% with 11 and more year.

Awareness and respecting of major principles of sustainable agriculture is a base for effective management of farm sustainability. Majority of farms know Well or Very good the principles of governance and economic sustainability (Figure 2). At the same time, most holding acknowledge that their knowledge of principles of social and environmental sustainability is Satisfactory or entirely Absent.



**Figure 2.** *Extent of Knowledge of Principles of Governance, Economic, Social and Environmental Sustainability by Farm Managers in Bulgaria (percent)*  
**Source:** Survey with managers of farms, July 2016

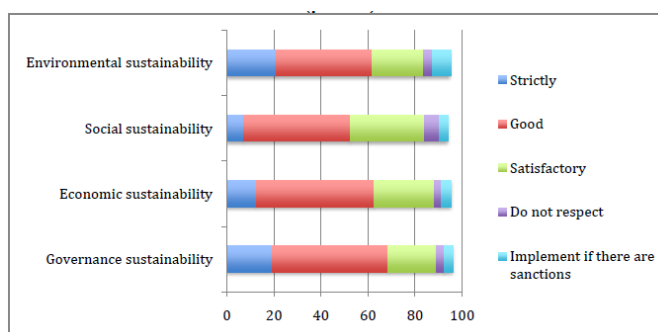
A good portion of surveyed farms increase their capability for management of sustainability through hiring a consultant, as the biggest share of this mode is as far governance, environmental and economic sustainability is concerned.

With relatively the greatest own (internal) capability for management of diverse aspects of sustainability are Cooperatives, out of which a considerable fraction know Very well or Well the principles of governance, economic, social and environmental sustainability. Internal knowledge regarding sustainability principles is also high for Sole Traders and Companies, while for Physical Persons it is relatively lower. To the greatest extent consultants are used for enhancing knowledge of economic and environmental sustainability by Sole Traders (by 12%) and Physical Persons (accordingly 12% and 9%).

Competency of sustainability principles increase along with the size of farms and larger holdings tend to know better governance, economic, social and environmental sustainability. There is also a differentiation of competency according to specialization of holdings as those in Field Crops, Grazing Livestock, Pigs, Poultry and Rabbits, and Mix Crop-Livestock are with a bigger competency of governance sustainability, specialized in Pigs, Poultry and Rabbits, and Mix Crop-Livestock with the best awareness of economic sustainability, and those with Mix Livestock with the highest competency in respect to environmental sustainability. Similarly, the share of holdings with a high competency on sustainability principles is the greatest for those with Lands in Protected Zones and Territories, and farms located in South-West Region of the country.

In the future more efforts are to be directed to improving competency of farms with low culture in regard to principles of agrarian sustainability through education, training, consultation, advices, exchange of positive experiences, etc.

Due to incomplete knowledge and other economic, technological, agronomical, behavioral, etc. reasons, and in different period of time, farmers not always apply strictly principles of sustainable agriculture. According to the best part of the managers in farms are applied Strictly or Well principles of governance, economic, social and environmental sustainability (Figure 3). Nevertheless, a significant fraction of holdings respect principles of social, economic, environmental and governance sustainability only Satisfactorily. What is more, a part of holding indicates that they do not Respect such Principles, or respect there merely If Sanctions are Applied. (reaching up to 8% for environmental sustainability).



**Figure 3.** Extent in which Farms Implement Principles of Sustainable Agriculture (percent)  
 Source: Survey with managers of farms, July 2016

To the greatest extent principles of agrarian sustainability are integrated (applied) in the overall management by Cooperatives and Companies. Around 8% of Cooperatives apply principles of environmental sustainability only if there are sanctions. Relatively smaller scale of Sole Traders and Physical Persons apply principles of social sustainability to a great extent. A good segment of Physical Persons respect principles of sustainable agriculture only if there are sanctions - 9% of them for environmental sustainability, 5% for economic sustainability and by 5% for governance and social sustainability. All these data demonstrate, that sanctions of state, local authority, owners, members, etc. induce business behavior for

amelioration of environmental sustainability for certain type of farms like Cooperatives and Physical Persons. Application of sustainability principles increases along with the size of holdings and as a rule larger farms respect better governance, economic, social and environmental sustainability. Regarding principles of sustainability is most common for farms specialized in Field Crops, Grazing Livestock, Mix Crop-Livestock and Mix Crops, and holdings with Lands in Protected Zones and Territories, and located in Non-mountainous Regions with Natural Handicaps, and South-West Region of the country. For all groups of farms the share of those which respect well or strictly the principles of agrarian sustainability overpass the portion of these which know well or very well these principles. Therefore, there is questionable how some holdings apply effectively principles, which they do not know well.

#### 4. Sustainability Level of Agricultural Farms

Multi-indicators assessment of sustainability level of surveyed farms indicates, that the Index of Integral Sustainability of holdings is 0,55, which represents a *good* level of sustainability of Bulgarian farms (Figure 4). With the highest levels are Indexes of Environmental (0,61) and Social (0,57) Sustainability of holdings, while Indexes of Governance (0,52) and Economic (0,5) Sustainability are at the border with a low level. Therefore, improvement of the latter two is critical for maintaining a good sustainability of farming enterprises in the country.

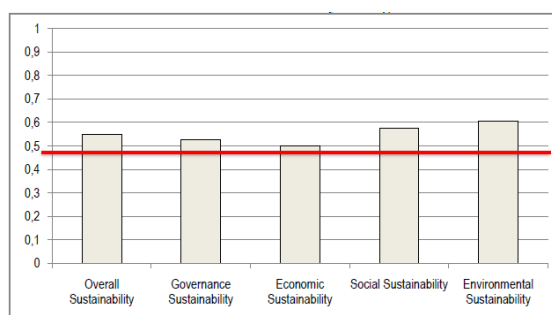


Figure 4. Indexes of Integral, Governance, Economics, Social and Environmental Sustainability of Bulgarian Farms

Source: Survey with managers of farms, July 2016

Analysis of individual Indexes for major sustainability Principles, Criteria and Indicators let identify components contributing to diverse aspects of farms' sustainability in the country. For instance, governance and economic sustainability of Bulgarian farms are relatively low because of the fact that the Index of Governance Efficiency (0,49) and the Index of Financial Stability (0,47) of holdings are low (Figure 5). Similarly, it is clear that despite that the overall environmental sustainability is relatively high, the Index of Preservation of Agricultural Lands (0,52) and the Index of Preservation of Biodiversity (0,56) are relatively low and critical for maintaining the achieved level.

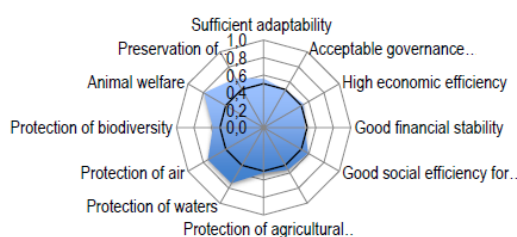


Figure 5. Index of Sustainability of Bulgarian Farms for Major Principles for Governance, Economics, Social and Environmental Sustainability

Source: Survey with managers of farms, July 2016



In depth analysis for individual Criteria and Indicators further specifies the elements, which enhance or reduce farms' sustainability level. For instance, insufficient Comparative Governance Efficiency and Financial Capability (Figure 6) are determined accordingly by: a low Comparative Efficiency of Supply of Short-term Inputs in relations to alternative organizations (0,28), and unsatisfactory Profitability of Own Capital (0,41) and Overall Liquidity (0,48) of farms (Figure 7). Similarly, low levels of Indexes of Preservation of Agricultural Lands and Preservation of Biodiversity are determined accordingly by insufficient Application of Recommended Irrigation Norms(0,46), high level of Soils Water Erosion (0,55), and lowered Number of Wild Animals on Farm Territory (0,53).

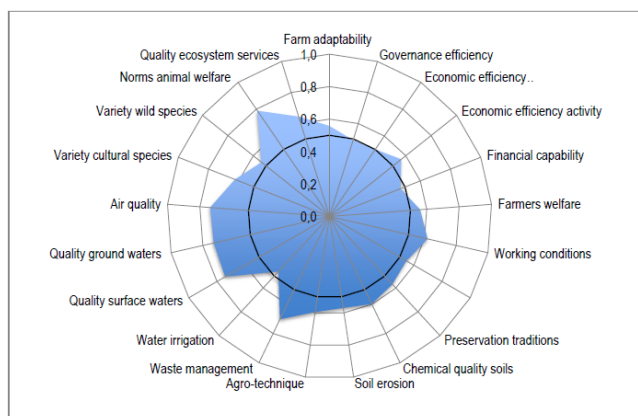


Figure 6. Level of Sustainability of Bulgarian Farms for Individual Criteria for Governance, Economics, Social and Environmental Sustainability

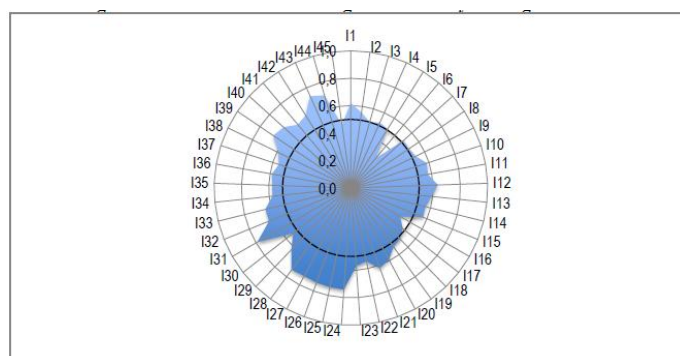


Figure 7. Indicators\* of Assessing Sustainability of Bulgarian Farms

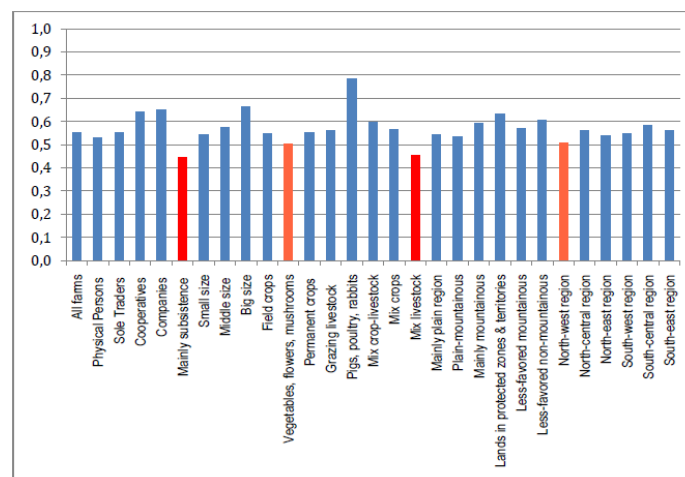
**Notes:** \*\*I1-Level of Adaptability to Market Environment; I2-Level of Adaptability to Institutional Environment; I3-Level of Adaptability to Natural Environment; I4-Comparative Efficiency of Supply and Governance of Labor Resources; I5-Comparative Efficiency of Supply and Governance of Natural Resources; I6-Comparative Efficiency of Supply and Governance of Short-term inputs; I7-Comparative Efficiency of Supply and Governance of Long-term Inputs; I8-Comparative Efficiency of Supply and Governance of Innovation; I9-Comparative Efficiency of Supply and Governance of Finance; I10-Comparative Efficiency of Governance of Marketing of Products and Services; I11-Land productivity; I12-Livestock Productivity; I13-Level of Labor productivity; I14-Rate of Profitability of Production; I15-Income of Enterprise; I16-Rate of Profitability of Own Capital; I17-Overall Liquidity; I18-Financial Autonomy; I19-Income per Farm-household Member; I20-Satisfaction of Activity; I21-Compliance with Working Conditions Standards; I22-Contribution to Preservation of Rural Communities; I23-Contribution to Preservation of Traditions; I24-Nitrate Content in Surface Waters; I25-Pesticide Content in Surface Waters; I26-Nitrate Content in Ground Waters; I27-Pesticide Content in Ground Waters; I28-Extent of Air Pollution; I29-Number of Cultural Species; I30-Number of Wild Species; I31-Extent of Respecting Animal Welfare; I32-Extent of Preservation of Quality of Ecosystem Services; I33-Soil Organic Content; I34-Soil Acidity; I35-Soil Soltification; I36-Extent of Wind Erosion; I37-Extent of Water Erosion; I38-Crop Rotation; I39-Number of Livestock per ha of Farmland; I40-Norm of Nitrogen Fertilization; I41-Norm of Phosphorus Fertilization; I42-Norm of Potassium Fertilization; I43-Extent of Application of Good Agricultural Practices; I44-Type of Manure Storage; I45-Irrigation Rate

**Source:** Survey with managers of farms, July 2016

Low levels of indicators identify the specific areas for improvement of sustainability of farms through adequate changes in management strategy and/or public policies. For instance, despite that the overall Adaptability of Farms is relatively high (0,56), the Adaptability of Farms to Changes in Natural Environment (climate, extreme events, etc.) is relatively low (0,5). Therefore, effective measures are to be undertaken to improve the latter type of adaptability through education, training, information, amelioration of agro-techniques, structure of production and varieties, technological and organizational innovations, etc.

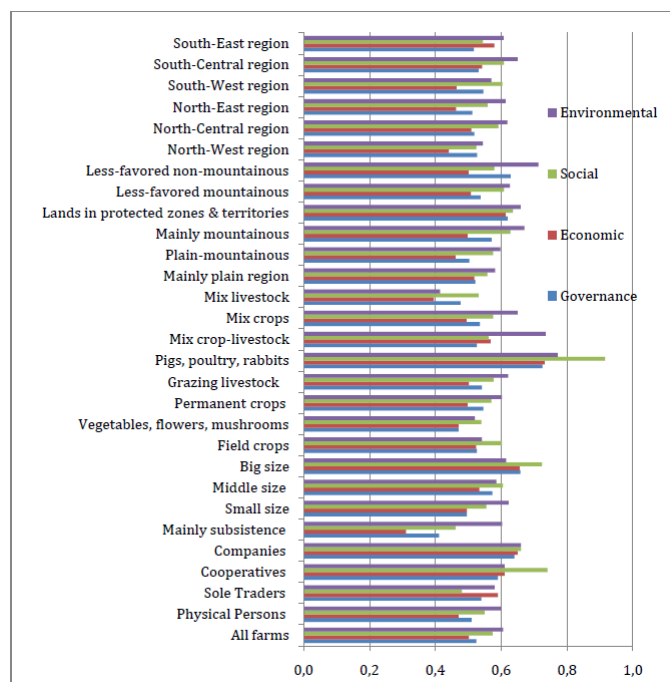
On the other hand, superior levels of certain indicators show the absolute and comparative advantages of Bulgarian farms related to sustainable development. At the current stage of development the latter are associated with respecting Animal Welfare standards, Preservation of Quality of Surface and Ground Waters from contamination with nitrates and pesticides, Preservation of Air Quality, implementation of Good Agricultural Practices, reduced Number of Livestock per unit of Farmland, acceptable Labor Conditions and comparative Satisfaction from Farming Activity, optimal Productivity of Livestock, good Adaptability to Market (prices, competition, demands), and Comparative Governance Efficiency of Marketing of Products and Services.

There is a great variation in sustainability levels of farms of different type and location (Figure 8). Only holdings Predominately for Subsistence and Mix Livestock are with low sustainability. Economic, governance, and social sustainability of first ones are particularly low (Figure 9). The second group is with low economic, environmental and governance sustainability, and a marginal social sustainability.



**Figure 8.** Index of Sustainability of Bulgarian Farms of Different Type and Location  
**Source:** Survey with managers of farms, July 2016

Another category of farms is with a good sustainability, but with levels on or close to the border with inferior one. In the latter group are holdings specialized in Vegetables, Flowers and Mushrooms having a low governance and economic sustainability, and not a particularly good social and environmental sustainability. In that group are also Physical Persons and farms located in North-West Region of the country. Former are with a low economic sustainability and a marginal social and governance sustainability. The latter are with a low economic sustainability and not particularly good social, governance and environmental sustainability. For all these enterprises effective measures have to be undertaken for improving all aspects of sustainability.



**Figure 9.** Levels of Governance, Economic, Social and Environmental Sustainability of Bulgarian Farms of Different Type and Location  
**Source:** Survey with managers of farms, July 2016

With a low economic sustainability are also farming enterprises with Small size, those specialized in Mix Crops and Permanent Crops, and holdings situated in Mountainous Regions, and in North-East and South-West Regions of the country. Consequently, overall sustainability of these farms is close to the border with inferior level. For all these enterprises effective measures are to be undertaken for increasing their economic sustainability in order to improve overall long-term sustainability.

With a low social sustainability are merely farming enterprises of Sole Traders for which adequate measures are to be introduced for improvement of that aspect such as training, stimulation, regulation, support, etc.

With the best overall sustainability are Companies, Cooperatives, and farms with Big size, all having high levels of governance, economic, social and environmental sustainability. Holdings specialized in Pigs, Poultry and Rabbits are with highest sustainability, having very good levels for governance, economic and environmental aspects. The latter are the only type of enterprises, having a high level of sustainability of a certain aspect.

Farming enterprises with Lands in Protected Zones and Territories, and those located in Non-mountainous Regions with Natural Handicaps and in South-Central Region are with superior levels of sustainability. Former group are with high governance, economic, social and environmental sustainability.

On the other hand, Holdings in Non-mountainous Regions with Natural Handicaps and in South-Central Region are with relatively good levels of certain aspects of sustainability – governance and environmental for the first ones, and environmental and social for the latter. The rest aspects of sustainability of all these farming enterprise are with relatively low levels – accordingly for the former ones economic and social sustainability, and for the latter ones governance and economic sustainability. The other aspects of sustainability of these categories of holdings are with relatedly low levels – accordingly for former ones in regard to economic and social sustainability, and for the latter ones for governance and economic sustainability. Similarly, Mix Crop-Livestock farms are with a relatively high environmental sustainability, but with a lower level of governance

sustainability. The latter necessitates undertaking adequate measures to improve sustainability in aspects with critical inferior levels for these types of farms.

### 5. Sustainability Indicators for Farms Enterprises of Different Type

There is a great variation in levels of individual sustainability indicators for farms of different juridical type (Figure 10).

Most sustainability indicators of Physical Persons are low and lead to a decrease in sustainability for individual aspects and overall sustainability. In governance aspect of sustainability of these enterprises are low: Level of Adaptability to Natural Environment (0,49), and Comparative Efficiency of Supply and Governance of Labor Resources (0,49), Natural Resources (0,49), Long-term Inputs (0,48) and Innovations (0,49), and extremely low Comparative Efficiency of Supply and Governance of Short-term Inputs (0,26). In the economics aspect sustainability of Physical Persons is particularly low in respect to Livestock Productivity (0,34), Rate of Profitability of Own Capital (0,36), Overall Liquidity (0,44), and Financial Autonomy (0,48). In social perspective sustainability of these enterprises is only low in relation to Income per Farm-household Member (0,49) while in environmental plan in respect to complying with norms for Number of Livestock per ha (0,39), Type of Manure Storage (0,39), Extent of Respecting Animal Welfare (0,43) and Irrigation Rate (0,49). In all these directions adequate measures have to be undertaken by managers and state authority in order to improve aspect and overall sustainability of that type of farms.

At the same time, a number of indicators for environmental sustainability of Physical Persons are with relatively high positive positions within the good level: Nitrate and Pesticides Content in Surface and Ground Waters, Extent of Air Pollution, and Extent of Application of Good Agricultural Practices. All these advantages of Physical Persons are to be maintained and enhanced, while other indicators for eco-efficiency increased in order to preserve and increase aspect and overall sustainability of these types of holdings.

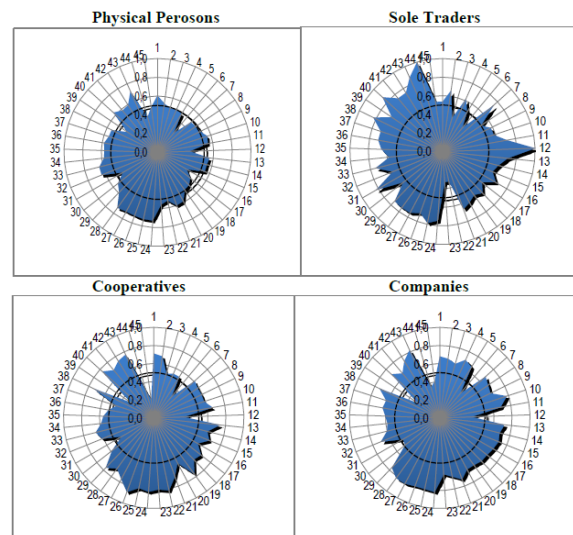


Figure 10. Sustainability Indicators of Farms of Different Juridical Type in Bulgaria  
Source: Survey with farm managers, July 2016

Sole Traders are with low values for governance sustainability in respect to Level of Adaptability to Natural Environment (0,37) and Comparative Efficiency of Supply and Governance of Short-term inputs (0,33), and for social sustainability in respect to their Contribution to Preservation of Rural Communities and Preservation of Traditions (by 0,33).

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Simultaneously, Sole Traders have high sustainability for eco-aspects of activity in relation to Type of Manure Storage, Norm of Nitrogen Fertilization, and Extent of Application of Good Agricultural Practices, and marginal to the highest level for implementation of effective Crop Rotation. What is more, enterprises with livestock are with a high sustainability for Livestock Productivity as well as a marginal to the highest level for Extent of Respecting Animal Welfare Standards. Furthermore, many indicators for environmental sustainability of Sole Traders are with high positive values within the borders of good level: Nitrate and Pesticides Content in Surface and Ground Waters, Extent of Air Pollution, Number of Cultural Species, Soil Organic Content, Extent of Wind and Water Erosion, and application of recommended Norms of Potassium and Phosphorus Fertilization. Sole Traders are also with a high position, within the borders of a good level, for Comparative Efficiency of Supply and Governance of Long-term Inputs, Level of Labor Productivity, and Land Productivity. All that also contributes to a growth in their governance and economic sustainability.

For Cooperatives, in the borders of a good sustainability level, the highest indicators values are for governance, social and economic sustainability: Level of Adaptability to Market Environment, Level of Labor Productivity, Income per Farm-household Member, Contribution to Preservation of Rural Communities and Preservation of Traditions. Numerous of the environmental indicators of cooperative enterprises are also with superior levels – a high eco-sustainability for Nitrate Content in Ground Waters, and a good eco-sustainability for Nitrate and Pesticide Content in Surface Waters, Pesticide Content in Ground Waters, Number of Cultural Species, Extent of Application of Good Agricultural Practices, efficient Crop Rotation, and application of Norms of Nitrogen and Phosphorus Fertilization. All these positive aspects of the activity of Cooperative enterprises are to be maintained and expended.

On the other hand, Cooperatives are environmentally unsustainable in respect to Irrigation Rate (0,2) and with low levels for Comparative Efficiency of Supply and Governance of Short-term Inputs (0,3), Livestock Productivity (0,33), required Number of Livestock per ha (0,31), Type of Manure Storage (0,31), Extent of Respecting Animal Welfare (0,41), and Extent of Water Erosion (0,43). These parts of Cooperatives' activity have to be considerably improved in order to increase governance, economic, environmental and integral sustainability of these enterprises.

For Companies, within the borders of a good sustainability, the highest are levels for indicators of governance sustainability: Comparative Efficiency of Supply and Governance of Labor Resources, and Comparative Efficiency of Governance of Marketing of Products and Services. In respect to economic sustainability the best levels are for Labor Productivity and Income of Enterprise, while for social sustainability for Compliance with Working Conditions Standards. For environmental suitability superior are indicators for Nitrate and Pesticides Content in Surface and Ground Waters, Extent of Air Pollution, Extent of Application of Good Agricultural Practices, efficient Crop Rotation, Number of Cultural Species, application of Norms of Nitrogen and Phosphorus Fertilization, and Extent of Preservation of Quality of Ecosystem Service.

With the lowest values for Companies are indicators for governance and economic sustainability: Comparative Efficiency of Supply and Governance of Short-term Inputs (0,35) and Livestock Productivity (0,35), and indicators for eco-sustainability: permissible Number of Livestock per ha (0,29), Type of Manure Storage (0,35), Extent of Respecting Animal Welfare (0,41), Irrigation Rate (0,41) and Number of Wild Species on the Territory of Farm (0,49). These sides of activity of corporative enterprises have to be improved in order to increase their governance, economic, environmental and integral sustainability.

Farms with different size are characterized with a big differentiation in levels of sustainability as a whole and for individual indicators (Figure 11).



Holdings Predominately for Subsistence are with a low Level of Adaptability to Market (0,47), Institutional (0,45), and Natural (0,45) Environment, insufficient Comparative Efficiency of Supply and Governance of Labor (0,39) and Natural (0,39) Resources, Long-term Inputs (0,37), Innovations (0,41), Finance (0,39), and Marketing of Products and Services (0,45), and they are unsustainable regarding Comparative Efficiency of Supply and Governance of Short-term Inputs (0,19). Besides, these farms are with a low Land Productivity (0,39), Level of Labor Productivity (0,41), Rate of Profitability of Production (0,35), Income Return of Enterprise (0,43), Overall Liquidity (0,31), and Financial Autonomy (0,35), and they are unsustainable in respect to Livestock Productivity (0,17), and Rate of Profitability of Own Capital (0,17). These holdings also have inferior indicators for social sustainability like: Income per Farm-household Member (0,33), and Contribution to Preservation of Rural Communities (0,41) and Preservation of Traditions (0,49). Similarly, some indicators for eco-sustainability are with low levels such as: Extent of Wind (0,41) and Water (0,47) Erosion, Soil Acidity (0,49), Type of Manure Storage (0,35), and Number of Livestock per ha (0,37).

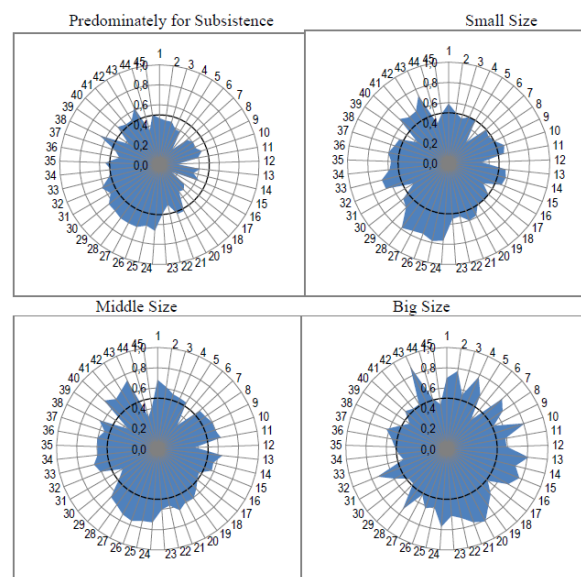


Figure 11. Sustainability Indicators of Farms of Different Size in Bulgaria  
Source: Survey with farm managers, July 2016

At the same time, semi market holdings have relatively high indicators, within a good sustainability level, for: Nitrate Content in Surface and Ground Waters, Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, efficient Corp Rotation, Number of Cultural Species, and Number of Wild Species on the Territory of the Farm.

Farms with Small size for the sector are with a low Level of Adaptability to Natural Environment (0,46), Comparative Efficiency of Supply and Governance of Short-term Inputs (0,27) and Innovations (0,47), Livestock Productivity (0,32), Rate of Profitability of Own Capital (0,39), and Income per Farm-household Member (0,49). Furthermore, a number of main indicators for governance and economic sustainability are on the border low a level of sustainability - Comparative Efficiency of Supply and Governance of Labor and Natural Resources, Long-term Inputs, and Finance as well as Overall Liquidity. Some indicators for eco-sustainability are also with low levels such as: Extent of Respecting Animal Welfare (0,4), Number of Livestock per ha (0,37), Type of Manure Storage (0,4), and Irrigation Rate (0,49). Other parts of indicators for environmental sustainability are with relatively good levels like: Extent of Air Pollution, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of

Application of Good Agricultural Practices, Soil Organic Content, Extent of Preservation of Quality of Ecosystem Services, and Norm of Nitrogen Fertilization.

Farms with Middle size for the sector have low Comparative Efficiency of Supply and Governance of Short-term Inputs (0,3), Livestock Productivity (0,37), Rate of Profitability of Own Capital (0,47), as their Overall Liquidity is marginal to low level of sustainability (0,5). Certain indicators for eco-sustainability are also at low levels like: Type of Manure Storage (0,33), Number of Livestock per ha (0,35), Extent of Respecting Animal Welfare (0,4), Irrigation Rate (0,41), Number of Wild Species on the Territory of the Farm (0,48). The highest for the Middle size enterprises are indicators: Nitrate and Pesticides Content in Surface and Ground Waters, Extent of Application of Good Agricultural Practices, Norm of Nitrogen Fertilization, Extent of Air Pollution, application of Norms of Phosphorus Fertilization, and Level of Adaptability to Market Environment.

Farms with Big size for the sector are highly sustainable regarding Extent of Application of Good Agricultural Practices, and have superior level, within good sustainability borders, for indicators: Comparative Efficiency of Governance of Marketing of Products and Services, Level of Labor Productivity, Satisfaction of Activity, Level of Adaptability to Institutional and Market Environment, Comparative Efficiency of Supply and Governance of Long-term Inputs and Labor Resources, Income Return of Enterprise and Rate of Profitability of Production, Compliance with Working Conditions Standards and Income per Farm-household Member, Contribution to Preservation of Rural Communities, Nitrate Content in Surface Waters, Extent of Air Pollution, and Extent of Preservation of Quality of Ecosystem Services.

Simultaneously, large-scale enterprises are little sustainable in respect to Comparative Efficiency of Supply and Governance of Short-term Inputs (0,37), and a number of eco-indicators such as: Soil Organic Content (0,44), Irrigation Rate (0,44), Number of Livestock per ha (0,44), Number of Cultural Species (0,48), Number of Wild Species on the Territory of the Farm (0,48), and Soil Acidity (0,48).

There are also significant differences in the levels of individual sustainability indicators for farming enterprises with different production specialization (Figure 12, Figure 13).

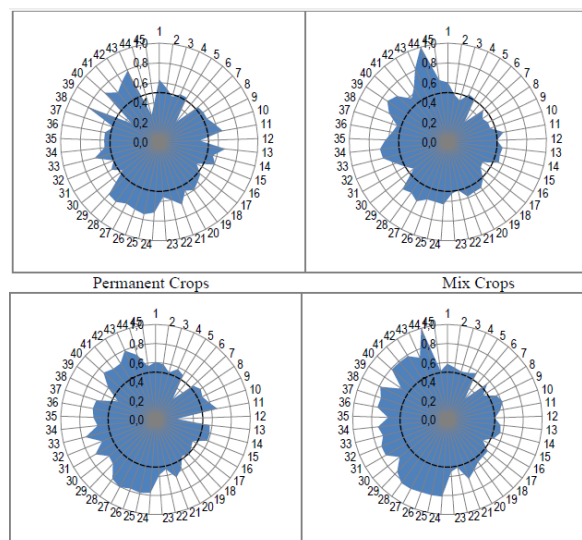


Figure 12. Sustainability Indicators of Farms of Different Crop Specialisation in Bulgaria  
Source: Survey with farm managers, July 2016

For enterprises specialized in Field Crops the highest socio-economic indicators, within a good sustainability level, are: Level of Labor Productivity, Land Productivity, Income Return of Enterprise, Compliance with Working Conditions

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Standards, Income per Farm-household Member, and Contribution to Preservation of Rural Communities. At the same time, that type of enterprises are low sustainable in respect to Level of Adaptability to Natural Environment (0,48), Comparative Efficiency of Supply and Governance of Short-term Inputs (0,26), Rate of Profitability of Own Capital (0,43), and those among them with livestock operations for Livestock Productivity (0,41).

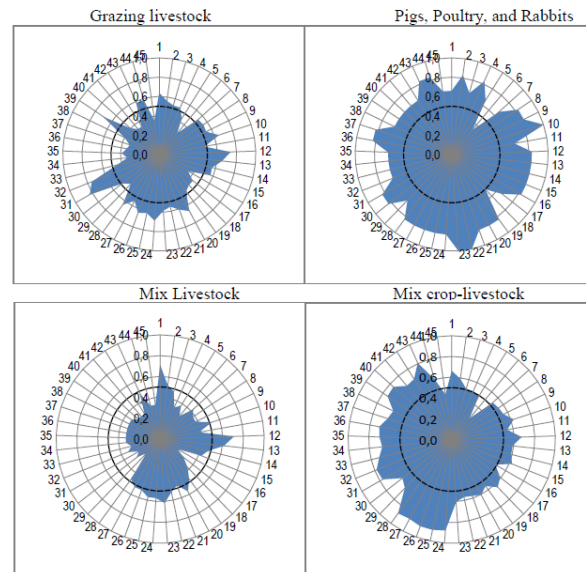
The best values for eco-sustainability of farms in Field Crops are for Implementation of efficient Crop rotation, Extent of Application of Good Agricultural Practices, Extent of Air Pollution, Number of Cultural Species, Nitrate and Pesticides Content in Surface and Ground Waters, and application of Norms of Nitrogen and Phosphorus Fertilization. On the other hand, these enterprises are low sustainable in respect to Irrigation Rate (0,38), Number of Wild Species on the Territory of the Farm (0,47), and Extent of Water Erosion (0,49), while those with livestock also for Type of Manure Storage (0,28) and Number of Livestock per ha (0,33).

Farms specialized in Vegetables, Flowers, and Mushrooms are with low governance sustainability regarding Adaptability to Natural (0,44) and Institutional (0,48) Environment, Comparative Efficiency of Supply and Governance of Short-term (0,26) and Long-term (0,48) Inputs, Innovations (0,42), Finance (0,45), and Marketing of Products and Services (0,45). Moreover, they are with low economic sustainability for Rate of Profitability of Own Capital (0,41) and Overall Liquidity (0,42), while those with livestock have their Livestock Productivity at the border with a low level (0,5). Eco-sustainability is only low for Number of Wild Species on the Territory of the Farm (0,44).

For these enterprises the highest values are for a number of indicators for eco-sustainability as the Extent of Application of Good Agricultural Practices is on the border with the highest level, while others at relatively good levels - Soil Acidity, application of Norms of Nitrogen Fertilization, Soil Organic Content, Pesticide Content in Ground Waters, efficient Crop Rotation, and Number of Cultural Species. Enterprises with livestock in that group have a high sustainability for Type of Manure Storage, and relatively good for Number of Livestock per ha.

Farms specialized in Permanent Crops are low sustainable in respect to Comparative Efficiency of Supply and Governance of Short-term Inputs (0,27), Rate of Profitability of Own Capital (0,45) and Overall Liquidity (0,48), Income per Farm-household Member (0,47), efficient Crop Rotation (0,44), while those with livestock also to Livestock Productivity (0,22).

At the same time, that group of enterprises has comparatively good values for a number of indicators for eco-sustainability such as: Extent of Application of Good Agricultural Practices, Nitrate Content in Surface and Ground Waters, Extent of Air Pollution, Soil Organic Content, application of Norms of Nitrogen, Potassium and Phosphorus Fertilization. Holdings of this type with livestock also have good values for Extent of Respecting Animal Welfare, and Type of Manure Storage.



**Figure 13.** Sustainability Indicators of Farms of Different Livestock Specialisation in Bulgaria

Source: Survey with farm managers, July 2016

Farms specialized in Grazing livestock are with a low level of sustainability for numerous indicators: Efficiency of Supply and Governance of Short-term Inputs (0,29) and Natural Recourses (0,44), Land Productivity (0,47), Rate of Profitability of Own Capital (0,34), Overall Liquidity (0,44), Financial Autonomy (0,44), Income per Farm-household Member (0,47), Number of Cultural Species (0,42), Number of Wild Species on the Territory of the Farm (0,49), Soil Acidity (0,33), Soltification (0,39) and Organic Content (0,45), Extent of Wind (0,34) and Water (0,32) Erosion, application of Norms of Nitrogen (0,41), Potassium (0,34) and Phosphorus (0,34) Fertilization, Irrigation Rate (0,35), and practicing efficient Crop Rotation (0,4).

Simultaneously, these enterprises have relatively good levels for indicators: Livestock Productivity, Satisfaction of Activity, Extent of Preservation of Quality of Ecosystem Services, Number of Livestock per ha, and Nitrate Content in Surface Waters, while the Extent of Respecting Animal Welfare is on the border with a high sustainability level.

Farms specialized in Mix Crops are low sustainable in regard to Efficiency of Supply and Governance of Short-term Inputs (0,28) and Innovations (0,45), and Rate of Profitability of Own Capital (0,43), and these with livestock to Livestock Productivity (0,5).

Simultaneously, for that type of enterprises the best indicators are for eco-sustainability: Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, application of Norms of Nitrogen, Potassium and Phosphorus Fertilization, implementation of efficient Crop Rotation, Number of Cultural Species, Extent of Preservation of Quality of Ecosystem Services, and Extent of Wind Erosion, and for those with livestock operations - Extent of Respecting Animal Welfare. What is more, the latter sup-group is highly sustainable as far as Type of Manure Storage is concerned.

Farms enterprises specialized in Pigs, Poultry, and Rabbits are low sustainable solely in respect to Efficiency of Supply and Governance of Short-term Inputs (0,33), while the level of Financial Autonomy is at the border with a low zone (0,5).

On the other hand, that group of enterprises is highly sustainable regarding Comparative Efficiency of Governance of Marketing of Products and Services as well as Contribution to Preservation of Rural Communities and Preservation of Traditions. Furthermore, they have marginal values to a high sustainability level for multiple indicators - Adaptability to Institutional Environment, Comparative



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Efficiency of Supply and Governance of Labor Resources, Innovations, and Finance, Livestock Productivity, Level of Labor Productivity, Rate of Profitability of Production, Income Return of Enterprise, Rate of Profitability of Own Capital, Income per Farm-household Member, Satisfaction of Activity, Compliance with Working Conditions Standards, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, Number of Wild Species on the Territory of the Farm, Extent of Respecting Animal Welfare, Extent of Wind and Water Erosion, Extent of Application of Good Agricultural Practices, and Type of Manure Storage.

Farms specialized in Mix Livestock are unsustainable in regards to Rate of Profitability of Own Capital (0,19), and Number of Cultural Species (0,19). Furthermore, that category of farms are low sustainable in respect to a number of important socio-economic and governance indicators like: Adaptability to Natural Environment (0,47), Efficiency of Supply and Governance of Short-term (0,28) and Long-term (0,43) Inputs, Labor (0,33) and Natural (0,38) Resources, Innovations (0,38) and Finance (0,38), Land Productivity (0,38), Overall Liquidity (0,28), Financial Autonomy (0,38), Income Return of Enterprise (0,43), Rate of Profitability of Production (0,47), Income per Farm-household Member and Satisfaction of Activity (by 0,47).

Moreover, mix-livestock enterprises are with a low eco-sustainability for numerous indicators such as: Respecting Animal Welfare (0,24), Number of Wild Species on the Territory of the Farm (0,28), Soil Organic Content (0,28), application of Norms of Nitrogen, Potassium and Phosphorus Fertilization (by 0,28), Extent of Preservation of Quality of Ecosystem Services (0,33), Soil Acidity and Soltification (by 0,33), Extent of Wind and Water Erosion (by 0,33), practicing efficient Crop Rotation (0,33), Number of Livestock per ha (0,33), Type of Manure Storage (0,33), Irrigation Rate (0,33), Extent of Air Pollution (0,47), and Extent of Application of Good Agricultural Practices (0,47). On the other hand, the best indicators for that group of enterprises are: Adaptability to Market Environment, Livestock Productivity, Level of Labor Productivity, and Contribution to Preservation of Traditions.

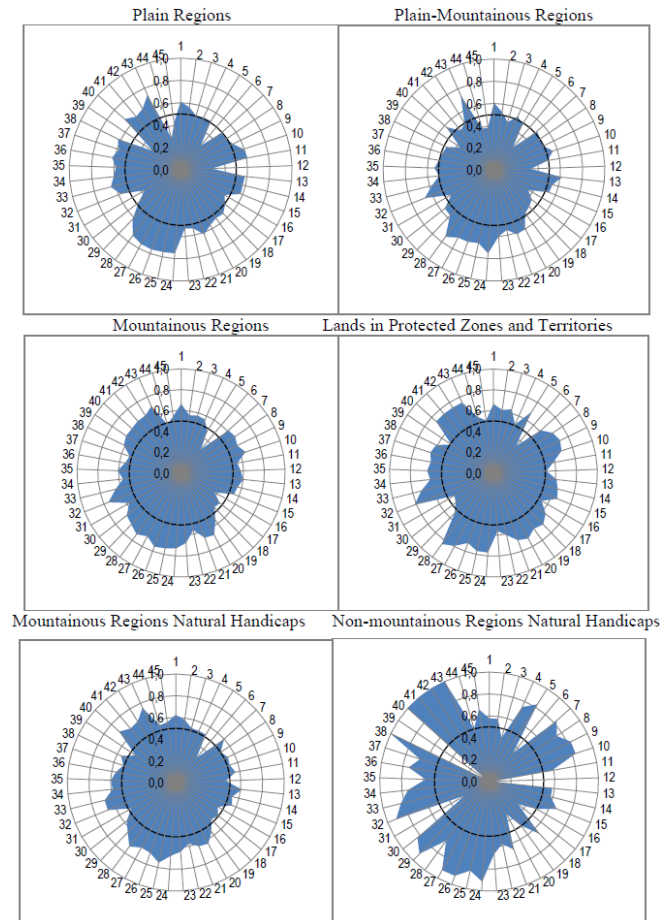
Farms specialized in Mix Crop-Livestock are unsustainable for Efficiency of Supply and Governance of Short-term Inputs (0,26), Rate of Profitability of Own Capital (0,49), and Irrigation Rate (0,44), while Comparative Efficiency of Supply and Governance of Natural Recourses is at the border with a low level. At the same time, that category of enterprises is highly sustainable in environmental aspect regarding Nitrate and Pesticide Content in Surface and Ground Waters, and Extent of Air Pollution. These enterprises have also very good values for: Extent of Application of Good Agricultural Practices, Extent of Preservation of Quality of Ecosystem Services, compliance with Norm of Nitrogen Fertilization, Number of Livestock per ha, Soil Organic Content, Extent of Wind Erosion, and Soil Soltification.

There is also a great variation in levels of individual sustainability indicators for farms located in different type of ecosystems, and geographical regions of the country (Figure 14, Figure 15).

Farms located mainly in Plain Regions of the country are low sustainable in respect to Efficiency of Supply and Governance of Short-term (0,28) and Long-term (0,49) Inputs, and Innovations (0,49), Livestock Productivity (0,28), Rate of Profitability of Own Capital (0,45), Type of Manure Storage (0,29), Number of Livestock per ha (0,3), Extent of Respecting Animal Welfare (0,37), Irrigation Rate (0,42), Number of Wild Species on the Territory of the Farm (0,48), and at the border with a low level for Adaptability to Natural Environment (0,5).

The best for that type of holdings are indicators for eco-sustainability: Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, Extent of Application of Good Agricultural Practices, and application of Norms of Nitrogen Fertilization.





**Figure 14.** Sustainability Indicators of Farms Located in Different Type of Ecosystems in Bulgaria

Source: Survey with farm managers, July 2016

Farms located in Plain-Mountainous Regions of the country are low sustainable in regard to Adaptability to Natural Environment (0,45), Efficiency of Supply and Governance of Short-term Inputs (0,26) and Natural Resources (0,49), Livestock Productivity (0,33) and Land Productivity (0,49), Rate of Profitability of Own Capital (0,35), Overall Liquidity (0,43), Financial Autonomy (0,48), Income per Farm-household Member (0,48), Number of Livestock per ha (0,36), Type of Manure Storage (0,39), Irrigation Rate (0,39), application of Norm of Potassium Fertilization (0,47), efficient Crop Rotation (0,47), Extent of Water Erosion (0,49), and Extent of Respecting Animal Welfare (0,44).

Besides, some indicators of that enterprise type are on the border with a low sustainability level - Efficiency of Supply and Governance of Finance and Innovations, Soil Acidity, application of Norm of Phosphorus Fertilization, and Extent of Wind Erosion. The best for this category enterprises are indicators for eco-sustainability: Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Application of Good Agricultural Practices, Extent of Air Pollution, and Extent of Preservation of Quality of Ecosystem Services.

Farms located mainly in Mountainous Regions of the country are with low governance and economic sustainability in relations to: Efficiency of Supply and Governance of Short-term Inputs (0,29) and Natural Resources (0,47), Rate of Profitability of Own Capital (0,37), Overall Liquidity (0,47), and Financial Autonomy (0,46), and insufficient eco-sustainable for Type of Manure Storage (0,48).

Simultaneously, the best values for mountainous enterprises are indicators for social sustainability like: Satisfaction of Activity, Contribution to Preservation of

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Traditions, and Compliance with Working Conditions Standards. These enterprises have also relatively a high levels of eco-sustainability, particularly for: Extent of Preservation of Quality of Ecosystem Services, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, Extent of Application of Good Agricultural Practices, Number of Cultural Species, and Number of Wild Species on the Territory of the Farm.

Farms with Lands in Protected Zones and Territories have a number of good indicators for governance and socio-economic sustainability - Adaptability to Market Environment, Efficiency of Supply and Governance of Natural Resources, Innovations, and Finance, of Marketing of Products and Services, Financial Autonomy, Income per Farm-household Member, Satisfaction of Activity, and Compliance with Working Conditions Standards.

Farms in such zones and territories are with high environmental sustainability in respect to Extent of Air Pollution while simultaneously have good levels for Extent of Preservation of Quality of Ecosystem Services, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Application of Good Agricultural Practices, application of Norms of Nitrogen, Phosphorus and Potassium Fertilization, and Soil Organic Content. On the other hand, that category of enterprises are relatively low sustainable in regard to Efficiency of Supply and Governance of Short-term Inputs (0,33), Extent of Respecting Animal Welfare (0,43), Number of Wild Species on the Territory of the Farm (0,46), and Number of Livestock per ha (0,48).

Farms located in Mountainous Regions with Natural Handicaps have low sustainability in respect to Efficiency of Supply and Governance of Short-term Inputs (0,29), Rate of Profitability of Own Capital (0,45), Number of Livestock per ha (0,45), Livestock Productivity (0,46), Financial Autonomy (0,47), and Extent of Respecting Animal Welfare (0,47) as well as marginal with a low level (0,5) for Efficiency of Supply and Governance of Innovations, and Overall Liquidity.

At the same time, enterprises in such regions have the best positive values for environmental sustainability for: Extent of Application of Good Agricultural Practices, Extent of Air Pollution, Nitrate and Pesticide Content in Surface and Ground Waters, application of Norm of Nitrogen Fertilization, Extent of Preservation of Quality of Ecosystem Services, and Soil Organic Content.

Farms located in Non-mountainous Regions with Natural Handicaps are with low sustainability regarding Adaptability to Natural Environment (0,41), Efficiency of Supply and Governance of Short-term Inputs (0,33), Livestock Productivity (0<sup>3</sup>), Overall Liquidity (0,33), Satisfaction of Activity (0,33), and Extent of Respecting Animal Welfare (0,25), and Number of Livestock per ha (0<sup>4</sup>). For a number of indicators sustainability levels of that type of enterprises are at the border with a low level - Rate of Profitability of Own Capital, Income per Farm-household Member, and Type of Manure Storage.

On the other hand, that type of enterprises is with maximal or high values for sustainability for numerous eco-indicators: practicing effective Crop Rotation, application of Norms of Nitrogen, Phosphorus and Potassium Fertilization, Extent of Application of Good Agricultural Practices, Nitrate Content in Surface Waters, Nitrate and Pesticide Content in Ground Waters, Number of Cultural Species, and Extent of Preservation of Quality of Ecosystem Services. What is more, for a number of indicators sustainability levels of these enterprises are at the border with a high level - Efficiency of Supply and Governance of Natural Resources, Long-term Inputs, Finance, and of Marketing of Products and Services, Pesticide Content in Surface Waters, Number of Wild Species on the Territory of the Farm, and Soil Organic Content. These holdings have also good positive levels for Efficiency of Supply and Governance of Labor Resources, and Innovations, Soil Acidity, and Extent of Wind Erosion.

<sup>3</sup> “0” means unacceptable for farmer/owner.

<sup>4</sup> “0” means unsatisfactory.

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Finally, there is also a differentiation of levels of sustainability indicators of farms in different administrative regions of the country (Figure 15).

For farms located in North-West Region of the country the best values of sustainability indicators are for: Adaptability to Market Environment, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, and Number of Cultural Species.

At the same time, sustainability of enterprises in this region is low in respect to Adaptability to Natural Environment (0,48), Efficiency of Supply and Governance of Short-term Inputs (0,36), Natural Resources (0,44), and Innovations (0,46), Livestock Productivity (0,28), Income Return of Enterprise (0,45), Rate of Profitability of Own Capital (0,43), Overall Liquidity (0,44), Financial Autonomy (0,39), Contribution to Preservation of Rural Communities and Traditions (by 0,47), Extent of Respecting Animal Welfare (0,35), Number of Livestock per ha (0,25), Type of Manure Storage (0,3) and Irrigation Rate (0,4). Besides, two indicators are at marginal with a low level - Rate of Profitability of Production, and Extent of Preservation of Quality of Ecosystem Services.

Farms located in North-Central Region of the country are low sustainable in regard to Efficiency of Supply and Governance of Short-term Inputs (0,25), Livestock Productivity (0,36), Rate of Profitability of Own Capital (0,46), Extent of Respecting Animal Welfare (0,38), Number of Livestock per ha (0,44), Type of Manure Storage (0,42) and Irrigation Rate (0,36), while for Overall Liquidity they are at the border with a low level.

Superior for farms in this region are indicators for eco-sustainability: Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, Extent of Preservation of Quality of Ecosystem Services, and Extent of Application of Good Agricultural Practices.

Farming enterprises located in North-East Region of the country are low sustainable regarding Adaptability to Natural Environment (0,43), Efficiency of Supply and Governance of Short-term (0,27) and Long-term (0,45) Inputs, Labor Resources (0,48), Livestock Productivity (0,4), Rate of Profitability of Own Capital (0,27), Overall Liquidity (0,42), and Financial Autonomy (0,49), Income per Farm-household Member (0,46), Number of Livestock per ha (0,41), Extent of Water Erosion (0,47), and Soil Soltification (0,49).

Furthermore, Efficiency of Supply and Governance of Finance, and Irrigation Rate are at the border of a low level. On the other hand, the best sustainability indicators for the holdings in this region are: Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Application of Good Agricultural Practices, Extent of Air Pollution, and Norm of Nitrogen Fertilization.

Farms located in South-West Region of the country are with low governance, economic and environmental sustainability regarding Efficiency of Supply and Governance of Short-term Inputs (0,26) and Natural Resources (0,44), Livestock Productivity (0,48), Rate of Profitability of Own Capital (0,37), Overall Liquidity (0,4), and Financial Autonomy (0,42), Number of Wild Species on the Territory of the Farm (0,42), Extent of Wind (0,49) and Water (0,48) Erosion, and Type of Manure Storage (0,45).

For farms in this region the best indicators' levels are for: Adaptability to Market Environment, Satisfaction of Activity, Extent of Application of Good Agricultural Practices, Extent of Preservation of Quality of Ecosystem Services, Soil Organic Content, application of Norm of Nitrogen Fertilization, and Nitrate Content in Surface Waters.

Farms located in South-Central Region of the country are low sustainable in respect to Efficiency of Supply and Governance of Short-term Inputs (0,25), Livestock Productivity (0,23), Rate of Profitability of Own Capital (0,42), and are at marginal with a low level of sustainability for Efficiency of Supply and Governance of Finance (0,5). Moreover, they have low values for indicators for eco-sustainability related to livestock operations: Extent of Respecting Animal Welfare (0,38), Number of Livestock per ha (0,3), and Manure Storage (0,34).

For farms in this region with the best values are indicators for eco-sustainability: Extent of Application of Good Agricultural Practices, Nitrate and Pesticide Content in Surface and Ground Waters, Extent of Air Pollution, application of Norms of Nitrogen, Phosphorus, and Potassium Fertilization, and Extent of Preservation of Quality of Ecosystem Services.

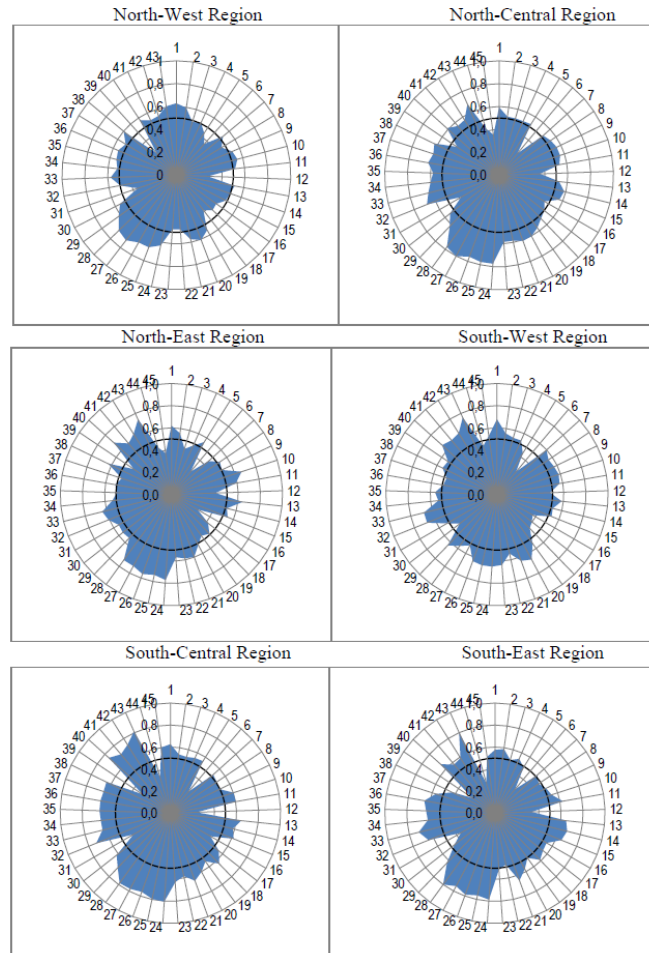


Figure 15. Sustainability Indicators of Farms Located in Different Administrative Regions in Bulgaria

Source: Survey with farm managers, July 2016

Farms located in South-East Region of the country are with insufficient governance and socio-economics sustainability regarding Efficiency of Supply and Governance of Short-term Inputs (0,28), Innovations (0,48), and Natural Resources (0,49), Livestock Productivity (0,33), and Contribution to Preservation of Rural Communities (0,48), and they are on the border with a low level (0,5) for Adaptability to Natural Environment, and Income per Farm-household Member.

Moreover, farms in the region are low eco-sustainable for Number of Livestock per ha (0,25), Type of Manure Storage (0,28), Extent of Respecting Animal Welfare (0,36), application of efficient Crop Rotation (0,43), and Number of Wild Species on the Territory of the Farm (0,47). Simultaneously the enterprises in that region have very good levels for Rate of Profitability of Production, and a number of eco-indicators like: Extent of Application of Good Agricultural Practices, Extent of Air Pollution, Nitrate and Pesticide Content in Surface and Ground Waters, and Soil Organic Content.



## 6. Share of Farms with Different Levels of Sustainability

The overall and partial levels of farms' enterprises do not give a full picture about the state of all holdings since there is a great variation in the share of farms with different sustainability levels. The biggest portion of Bulgarian farms is with a good sustainability and only under 2% with a high sustainability (Figure 16). At the same time, 30% of agricultural holdings in the country are with a low sustainability or unsustainable at all.

The greatest share of farming enterprises with a good and high sustainability is among Companies, following by Cooperatives, and Sole Traders, The smallest is the fraction of holdings with a good sustainability among Physical Persons, where merely less than 1% is highly sustainable. Furthermore, more than a third of latter holdings are with a low sustainability or unsustainable at all. Every fourth of Sole Traders is with a low sustainability, like 15% of Cooperatives, while only 6% of Companies are in the group of low sustainable enterprises.

There are also considerable differences in the portion of farms with unlike sustainability depending on the size of holdings. While all farms with Big size for the sectors are with a good sustainability, more than a half of holdings Predominately for Subsistence are with a low sustainability or unsustainable. Around a third of farms with Small size and almost a quarter of those with Middle size are with a low sustainability or unsustainable.

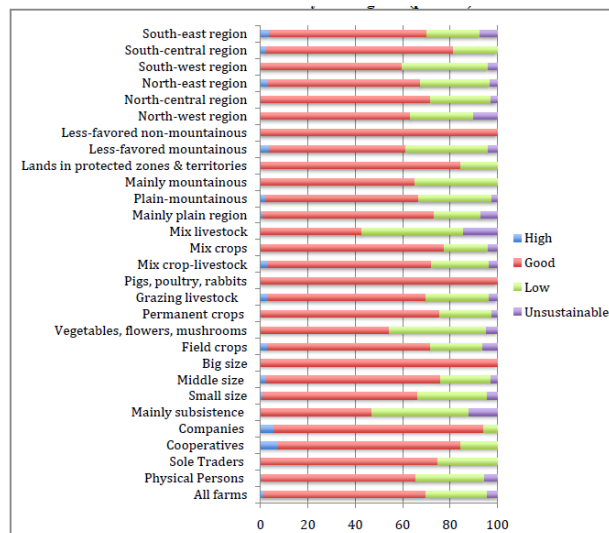


Figure 16. Structure of Farms of Various Type and Location with Different Levels of Overall Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

Among farms with diverse specialization, the share of holdings with a good and high sustainability is the greatest for Pigs, Poultry and Rabbits, Mix-crops, Permanent Crops, Mix Crop-livestock, Field Crops and Grazing Livestock. On the other hand, majority of holdings in Mix-livestock are with a low sustainability (43%) or unsustainable (14%). A good portion of the farms specialized in Vegetables, Flowers and Mushrooms is also low sustainable (41%) or unsustainable (4%).

The share of farms with a good and high sustainability is significant among those located in Non-mountainous Regions with Natural Handicaps, with Lands in Protected Zones and Territories, in Plain Regions, in South-Central, North-Central, and South-East Regions of the country. Simultaneously, 40% of holdings in South-West Region with low sustainability or unsustainable, similar to 37% of those in North-West and 32% in North-East Region. North-West Region is the leader in segment of unsustainable farms, where every tenth is unsustainable. Many holdings in Mountainous Regions with Natural Handicaps (38%), and Mountainous Regions



(35%), and a third in Plain-mountainous Regions are low sustainable or unsustainable.

Data for dispersion of farms of different type in groups with diverse level of sustainability has to be taken into account when forecast the number and importance of holdings of each kind, and modernize public (structural, sectorial, regional, environmental, etc.) policies for supporting agricultural producers of certain type, sub-sectors, eco-systems, and regions of the country.

Analysis of structure of farms with different level of sustainability for each aspect gives important information about the long-term sustainability of farms and factors for its improvement. Our assessment shows that 40% of holdings in the country are with a low governance sustainability or managerially unsustainable (Figure 17). That means that the comparative governance efficiency for supply of labor, land, finance, etc. and/or marketing of produce in these farms is lower than another feasible organization, and that the adaptability to evolving socio-economic, institutional and natural environment is insufficient.

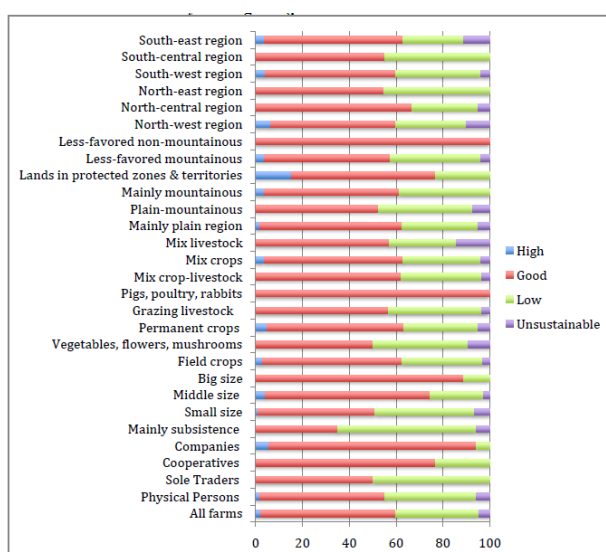


Figure 17. Structure of Farms of Various Type and Location with Different Governance Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

Furthermore, 42% of all farms are with a low economic sustainability or unsustainable at all (Figure 18). That means that economic and financial efficiency of activity and resource utilization in a good portion of Bulgarian farms is low and do not correspond to the modern management and competition requirements.

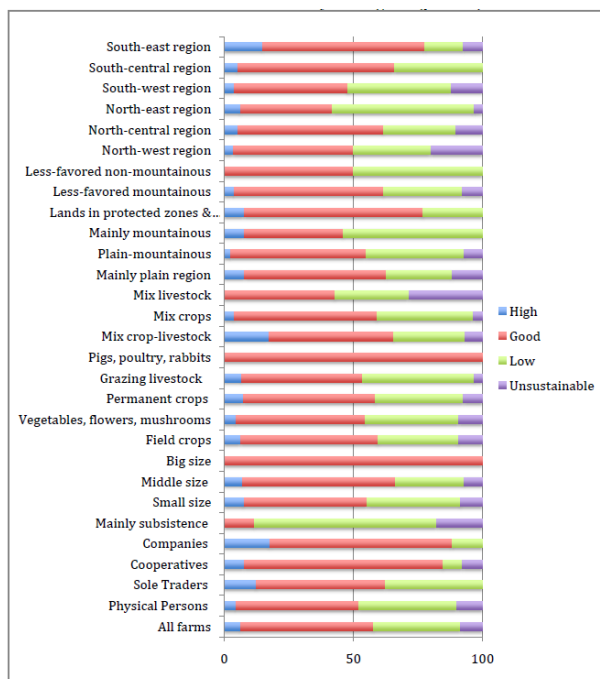


Figure 18. Structure of Farms of Various Type and Location with Different Economics Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

The biggest is the share of farms with a good and high governance sustainability among Companies and Cooperatives, holding with Big and Middle size for the sector, these specialized in Pigs, Poultry and Rabbits, Permanent Crops, Mix Crops, Field Crops, and Mix Crop-Livestock as well as located in Non-mountainous Regions with Natural Handicaps, with Lands in Protected Zones and Territories, Plain Regions, Mountainous Regions with Natural Handicaps, and in North-Central, South-East, North-West and South-West Regions of the country. With the greatest portion of farms with a low or lack of governance sustainability are Sole Traders (50%) and Physical Persons (45%), holdings Predominately for Subsistence (65%) and Small size for the sector (49%), specialized in Vegetables, Flowers and Mushrooms (50%), and situated in Plain-Mountainous Regions (48%), and those in North-East and South-Central Regions of the country (by 45%).

All that means that a considerable fraction of Bulgarian farms are with insufficient governance sustainability for meeting contemporary socio-economic, institutional and natural challenges, and they have to modernize or they will cease to exist in a middle term.

The biggest share of farms with a good or superior economic sustainability is among Companies, Cooperatives, and Sole Traders. Moreover, a significant portion of firms is with a high economic sustainability. Besides, all enterprises with Big size for the sector are with a good economics sustainability. All these prove the comparative economic advantages of registered holdings and those with large scale.

The relative share of farms with a good and high economic sustainability is also considerable for farms with Middle size for the sector, specialized in Pigs, Poultry and Rabbits, Mix Crop-Livestock, Field Crops, Mix Crops, and Permanent Crops, and these with Lands in Protected Zones and Territories, located in Plain Regions, and Mountainous Regions with Natural Handicaps, and in South-East, South-Central, and North-Central Regions of the country.

The greatest fraction of farms with a low or lack of economic sustainability are among Physical Persons (48%), most part of holdings Predominately for Subsistence (88%), and among specialized in Mix-Livestock (57%), Grazing Livestock (47%), and Vegetables, Flowers and Mushrooms (45%) as well as located in Mountainous (54%) and Plain-Mountainous (45%) Regions, and those in

North-East (58%) and South-West (52%) Regions of the country. Moreover, a significant portion of latter category of holdings are currently economically unsustainable, which concerns almost every tenth of Physical Persons, 29% of farms with Mix-Livestock, each fifth farm located in North-West Region and 12% of those in South-West Region of the country, 18% of holdings Predominately for Subsistence, 9% of specialized in Vegetables, Flowers and Mushrooms, almost 9% of holdings with Small size, and 7% of those located in Plain-Mountainous regions of the country.

All these indicates that, a great part of Bulgarian farms currently are with low economic sustainability or economically unsustainable, and most likely they will cease to exists in near future or in coming years, unless effective measures are taken (public support regulations, etc.) for improving their economic sustainability.

As far as social aspect of sustainability is concerned the majority of surveyed farms in the country are with a good or high sustainability (Figure 19). Despite that holdings with a low social sustainability are numerous (almost 18%), and each tenth one is socially unsustainable. That demonstrates that social efficiency of enterprises for farmers, communities and society and a whole do not correspond to contemporary requirements and standards.

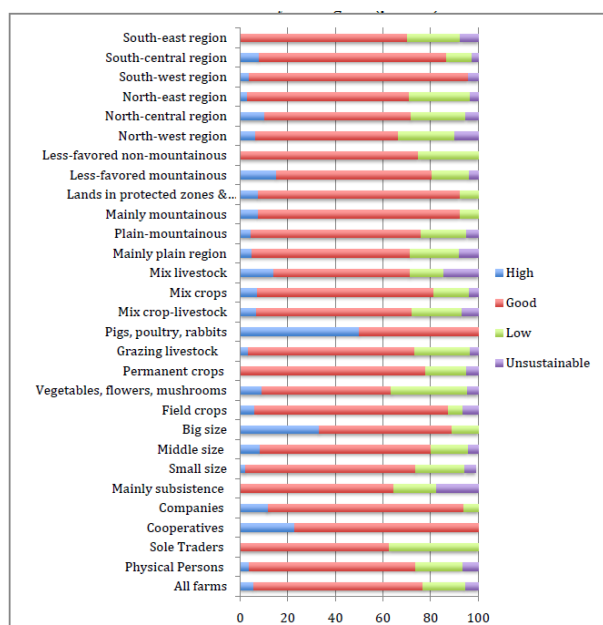


Figure 19. Structure of Farms of Various Type and Location with Different Social Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

A considerable part of Cooperatives is with a good social sustainability, and the rest 23% are with a high social sustainability. The share of Companies with a good and high social sustainability also is impressive, as merely 6% of them are low sustainable in social sense. A significant portion of Physical Persons is also with a good or high social sustainability. Despite that, each fifth of the latter holdings are socially low sustainable, while 7% are unsustainable in social plan. With the greatest fraction of low sustainable in social aspect enterprises are Sole Traders – around 38% of the total number.

The level of social sustainability increases along with the size of farms. Every third of enterprises with Big size for the sector are with a high social sustainability, and another major segment is with a good social sustainability. For enterprises with Middle size dominates those with a good and high social sustainability as almost each fifth is socially low sustainable or unsustainable. Contrary to the traditional perception with the largest portion of low sustainable or unsustainable in social

aspect farms are semi-market ones (Predominately for Subsistence), including 18% unsustainable, as well as every fourth of Small size farms.

In groups with diverse specialization the largest is the share of farms with a good and high social sustainability in Pigs, Poultry and Rabbits, Field Crops, and Mix Crops. On the other hand, 37% of specialized in Vegetables, Flowers, and Mushrooms are with low social sustainability or socially unsustainable, followed by holdings with Mix Livestock, out of which 29% are with inferior social sustainability (including around 14% unsustainable).

With a good or high social sustainability are farms located in Mountainous Regions and in Protected Zones and Territories, and in South-West, South-Central, and North-Central Regions of the country. At the same time, most numerous socially low sustainable or unsustainable enterprises are located in Plain and Plain-Mountainous Regions as well as in North-West, South-East, and North-East Regions of the country.

All these data show, that a good portion of Bulgarian farms currently are with a low social sustainability or socially unsustainable, which compromises their overall middle and long-term sustainability. Therefore, effective measures have to be undertaken to improve income, labor and living conditions of farmers and farm households as well as their importance for preservation of rural communities and traditions.

Environmental sustainability of the majority of surveyed farms is good or superior, while a considerable portion is with a low sustainability (18%) or environmentally unsustainable (4%) (Figure 20). The latter two figures clarify that eco-efficiency in a large number of Bulgarian farms do not meet contemporary norms and standards for preservation of lands, waters, air, biodiversity, ecosystem services, and animal welfare.

A big share of Companies and a good number of Physical Persons and Cooperatives are with a high environmental sustainability, while majority of enterprises in these categories are with a good eco-sustainability. Despite that, main portion of these holdings are with low sustainability (accordingly 24%, 18% and 23%), as every twentieth of Physical Persons is even environmentally unsustainable. All of Sole are with a good level of eco-efficiency.

The largest is the portion of farms with good and high eco-sustainability among holdings Predominately for Subsistence, with Small size for the industry, and Big farms. The greatest part of holdings with a low or unacceptable eco-sustainability is in groups of Middle and Big sizes.

The fraction of strongly environmentally sustainable farms is significant among those specialized in Crop-Livestock, Grazing Livestock, Mix Crops, and Permanent Crops. All holdings specialized in Pigs, Poultry and Rabbits, most of those in Mix Crops and by three-quarters in Crop-Livestock and Permanent Crops are with a good environmental sustainability.

At the same time a considerable portion of enterprises specialized in Vegetables, Flowers, and Mushrooms are with a low eco-sustainability (32%) or eco-unsustainable (14%), similarly to those in Mix Livestock (accordingly 29% and 14%) and Field Crops (accordingly 31% and 3%). The share of environmentally unsustainable farms is also considerable among those specialized in Permanent Crops (a little more than 7%) as well as a low sustainable in environmental regard holdings among those in Grazing Livestock.

All farms located in Non-mountainous Regions with Natural Handicaps are with a good environmental sustainability as well as most with Lands in Protected Zones and Territories. The biggest share of holdings with a high eco-sustainability is in Plain Mountainous and Mountainous Regions as well as in Mountainous Regions with Natural Handicaps. At the same time, the greatest fraction of enterprises with a low eco-sustainability or eco-unsustainable are in Plain-Mountainous (26%) and Plain (25%) Regions as well as in Mountainous Regions with Natural Handicaps (19%). The biggest part of enterprise with a high and good eco-sustainability is in North-Central and South-Central Regions of the country while of these with a low

eco-sustainability or eco-unsustainable in South-West, North-West, South-East and North-East Regions.

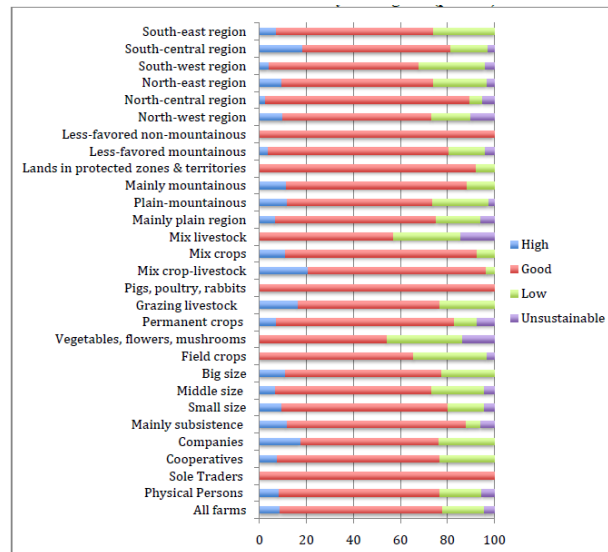


Figure 20. Structure of Farms of Various Type and Location with Different Environmental Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

All these data indicates, that a good number of Bulgarian farms are with a low eco-sustainability or environmentally unsustainable, which also compromises their overall long-term sustainability. Therefore, effective measures have to be undertaken to improve eco-efficiency in these groups through training, informing, stimulation, sanctions, etc.

## 7. Factors for Farms Sustainability in Bulgaria

Diverse social, economic, market, ideological personal, etc. factors in various extent stimulate or restrict activities of agricultural farms for sustainable operations and development. According to managers of surveyed farms, factors which to the greatest extent stimulate their actions for increasing governance sustainability of holdings are: Access to Advisory Services, Professional Training of Manager and Hired Labor, Personal Conviction and Satisfaction, Positive Experience of Other Farms, Available Innovations, Financial Capability, Private Contracts and Agreements, and Registration and Certification of Products, Services, etc. (Figure 21).

Factors which to the greatest extend stimulate actions of most farms for improving economic sustainability are: Market Demand and Prices, Received Direct State Subsidies, Market Competition, Financial Capability, Participation in Public Support Programs, Possibilities for Benefits in Present Moment, Possibilities for Benefits in Near Future, Tax Preferences, Possibilities for Benefits in Long-term, and Integration with Buyer of Product. For the biggest part of farms the factors which to the greatest extent stimulate their actions for enhancing social aspect of sustainability are: Personal Conviction and Satisfaction, Social Recognition of Contribution, Immediate Benefits for Other Persons and Groups, Community Initiatives and Pressure in Region, Access to Advisory Services, Policies of European Union, and Existing Problems and Risks in the Region. Factors which to the greatest extent stimulate farming enterprises for increasing environmental sustainability are: Existing Problems and Risks in Global Scale, Official Regulations, Standards, Norms, etc., Existing Problems and Risks in the Region, and Policies of European Union.



All these specific incentives for Bulgarian farms as a whole and of different type has to be taken into account in the process of modernization od public policies and programs for sustainable development.

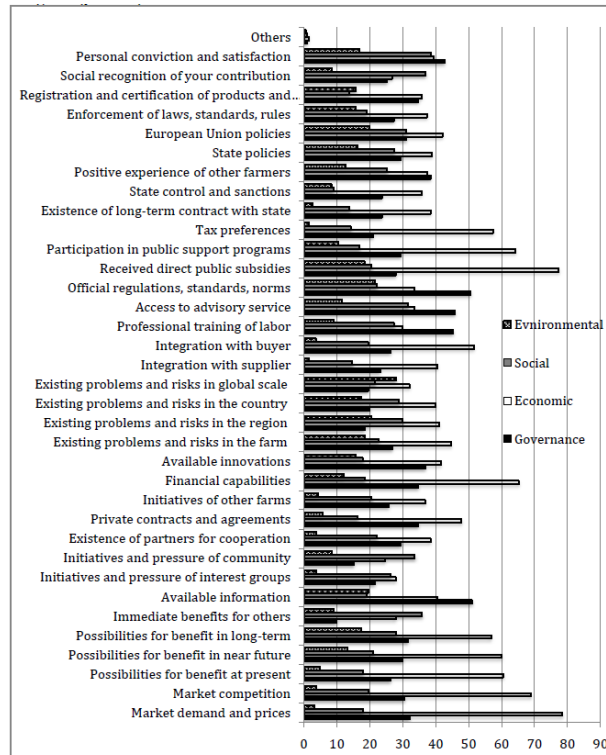


Figure 21. Factors Mostly Stimulating Farms Actions for Improving Sustainability in Bulgaria (percent)

Source: Survey with farm managers, July 2016

Our survey has found out that public policies relatively weakly affect governance sustainability of Bulgarian farms (Figure 22). National and European Union mechanisms of regulation and support, which to the greatest extent increase governance sustainability of surveyed holdings are: Professional Training and Advices, Obligatory Standards, Norms, Rules and Restrictions, Modernization of Agricultural Holdings, and Setting up Produces Organizations. On the other hand, the impact on governance aspect of sustainability of smallest number of farms is from measures such as: Afforestation and Restoration of Forests, Natural Handicap Payments to Farmers in Non-mountain Areas, Payments for Natura 2000, and Restoration and Development of Residential Areas.

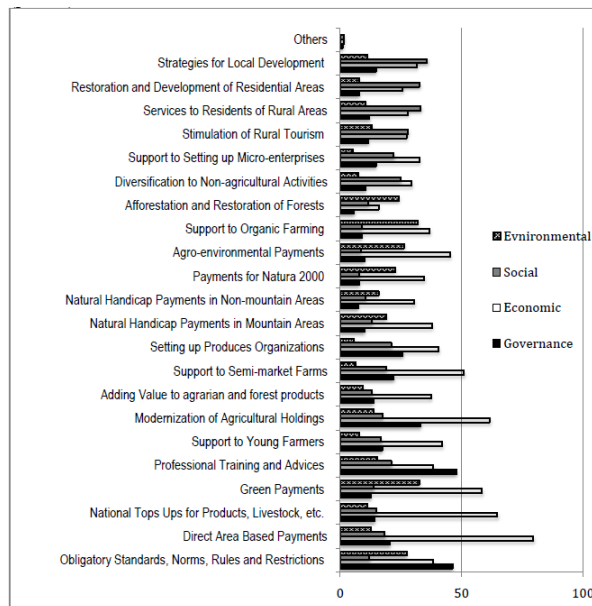


Figure 22. Public Policies Mostly Affecting Farms Sustainability in Bulgarian (percent)  
 Source: Survey with farm managers, July 2016

Diverse mechanisms of public support to the greatest extent improve economic sustainability of farms in the country. Instruments, which impact the economic sustainability of the most part of surveyed enterprises are: Direct Area Based Payments, National Tops Ups for Products, Livestock, etc., Modernization of Agricultural Holdings, Green Payments, Support to Semi-market Farms. At the same time, measures such as Afforestation and Restoration of Forests, Restoration and Development of Residential Areas, Stimulation of Rural Tourism, and Services to Residents of Rural Areas affect considerable economic sustainability of small amount of holdings.

The impact of national and European policies on social and environmental sustainability of Bulgarian farms is relatively smallest. Instruments, which augment social sustainability of most farms are: Strategies for Local Development, Services to Residents of Rural Areas, Restoration and Development of Residential Areas, and Stimulation of Rural Tourism. Simultaneously, social sustainability of least number of holdings is improved by “eco-measures” like: Payments for Natura 2000, Agro-environmental Payments, and Support to Organic Farming.

For improving environmental sustainability of farms most important are: Green Payments, Support to Organic Farming, Obligatory Standards, Norms, Rules and Restrictions, and Agro-environmental Payments. On the other hand, public instruments with the least impact on eco-sustainability of Bulgarian farms at the current stage of development are: Support to Setting up Micro-enterprises, Setting up Produces Organizations, Support to Semi-market Farms, Diversification to Non-agricultural Activities, Support to Young Farmers, and Restoration and Development of Residential Areas.

There is differentiation of impacts of individual instruments of public policies on sustainability of farms of different type and location. Mechanisms and instruments of national and European policies, which to the greatest extent affect improvement of sustainability of Bulgarian farms are: Obligatory Standards, Norms, Rules and Restrictions in respect to governance sustainability of Big size enterprises (66,67%) and environmental sustainability of enterprises specialized in Pigs, Poultry and Rabbits (100%); Direct Area Based Payments for economic sustainability of Sole Traders (87.50%), Cooperatives (84.62%), Companies (82.35%), holdings with Small size for the sector (81.52%), enterprise specialized in Pigs, Poultry and Rabbits (100%), Mix Crops (88,89%) and Permanent Crops (87,8%), and those located in Non-mountainous Regions with Natural Handicaps

(100%), with Lands in Protected Zones and Territories (100%), in mainly on Mountainous Regions of the country (92,31%), in Mountainous Regions with Natural Handicaps (88,46%), South-West (88,%) and South-Central (84,21%) regions of the country; National Tops Ups for Products, Livestock, etc. in regard to economic sustainability of Companies (82.35%), holdings Predominately for Subsistence (76.47%), and those specialized in Grazing Livestock (80%), mainly in Mountainous Regions (88,46%) and with Lands in Protected Zones and Territories (76,92%), and located in North-Central (74,36%) and South-West (72%) regions of the country; Green Payments for economic sustainability of enterprises located in Mountainous Regions, and with Lands in Protected Zones and Territories (by 69,23%), and those in South-West Region of the country (68%); Professional Training and Advices for Big size enterprises (66,67%); Modernization of Agricultural Holdings in relations to economic sustainability of Sole Traders (87,5%), Companies (76,47%), and specialized in Mix Livestock (71,43%) and Mix Crops (70,37%), and located in Mountainous Regions (76,92%), and North-Central (76,92%) and South-Central (71,05%) regions of the country; Support to Semi-market Farms and Setting up Produces Organizations for economic sustainability of holdings Predominately for Subsistence (accordingly 76,47% and 70,59%); Natural Handicap Payments to Farmers in Mountain Areas for economic sustainability of farming enterprises located in such areas (73,08%).

All these data for real impact of individual mechanisms and instruments of public support on different aspect of sustainability of Bulgarian farms are to be taken into account when improve support policies and programs in the sectors and enterprises of diverse type and location.

We have also studied out relations between the personal characteristics of farmmanagers (such as age, gender, competency on sustainability issues, etc.), the type of problems in the region, and the level of holdings sustainability. For surveyed farms share of male managers whose holdings are with a “good or high” sustainability is significant (70,5%) and bigger than of the female managers (57,89%). Nevertheless, the high levels for both genders indicate that there are not significant differences in regards to sustainable management of farms in the country.

There exists a strong correlation between the age of the manager and the sustainability of farm, as the highest is the portion of holdings with a superior sustainability of managers above 65 (83,33%) and younger than 40 (82,35%). Relatively smaller share of managers between 56 and 65 with a good and high sustainability of holdings shows, that the latter category either focus of pure economic vitality of enterprises (a strategy for profiting or survival) or they are not interested in a long-term sustainability (due to a plan for exit farming activity, lack of heir ready to undertake the farm, etc.).

Estimates on links between sustainability of farms and the character of problems in the region, where the holding is located, demonstrate that they are not important. For surveyed farms there exist no significant differences in the share of holdings with a good and high sustainability in regions with various social, economic and environmental problems. Therefore, levels of sustainability of farms depend primarily on managerial capability and strategy of managers as well as other important external factors (public policies, etc.) rather than on the specific socio-economic and environmental challenges in the region of farms.

There is a strong correlation between the levels of competency of farm managers and respecting the principles of governance, economic, social and environmental sustainability, and the levels of sustainability of farms. For all aspects of sustainability is extremely great the portion of farms with a good and high sustainability, which know and implement well or very good principle of sustainable agriculture. Therefore, increasing competency, culture and practices of sustainable farming is a crucial factor for improving sustainability of agricultural holdings.

Analysis of surveyed farms found out that, the biggest share of holdings with a good and high sustainability is among farms with a longer period of existence and implementing actions for improving sustainability – with maximum values for holdings with a period between 11 and 15 years (accordingly 75% and 87,5%). The latter proves that sustainable farming requires a long-term strategy and targeted actions for amelioration of individual aspects of sustainability. Relatively smaller fraction of holdings with a good and high sustainability among those, taking actions more than 15 years (55%) is probably a consequences of a lack of effective modernization in strategies corresponding to constantly changing socio-economic, institutional and natural environment in the past years.

Our analysis also found out a big share of farms with a good and high sustainability for all instruments of policies, which according to the managers to the greatest extent increase governance, economic, social, and environmental sustainability of their holdings. Political mechanisms and instruments, which to the greatest extent have actually affected sustainability of Bulgarian farms are: Support to Organic Farming in respect to social (100%) and governance (94,12%) sustainability, Adding Value to Agricultural and Forests Products for governance sustainability (92,31%), Diversification to Non-agricultural Activities for governance (90%) and environmental (85,71%) sustainability, in regard to social sustainability Natural Handicap Payments to Farmers in Mountain Areas (88%), Agro-environmental Payments (87,5%), and Natural Handicap Payments to Farmers in Non-mountain Areas (85%), and National Tops Ups for Products, Livestock, etc. in respect to governance sustainability (85,18%).

### 8. Conclusion

Our survey includes “typical” and to a certain extent “sustainable” (perspective) agricultural farms, which means that sample sustainability level is higher than the real (average) for the country. Despite that undertaken first large-scale study on sustainability of Bulgarian farms let us make some important conclusions about the level of holdings sustainability in the country, and recommendations for managerial and assessment practices.

Suggested holistic framework gives a possibility to improve assessment, analysis and management of sustainability of individual farms and holdings of different type in general and for major aspects, principles, criteria and indicators of governance, economic, social and environmental sustainability. That approach has to be further discussed, experimented, improved and adapted to the specific conditions of operation and development of farms of different type, subsector of production, geographical region and ecosystem as well as the special needs of decision-makers at various levels.

Overall sustainability of Bulgarian farms is at a good level, with superior levels for environmental and social sustainability, and inferior level for governance and economic sustainability. Thus improvement of the latter two is critical for maintaining sustainability of Bulgarian holdings. Governance and economic sustainability of Bulgarian farms are low because of the fact that Governance Efficiency and Financial Stability of holdings are low. Furthermore, low Comparative Efficiency of Supply of Short-term Inputs in relations to alternative organizations, and unsatisfactory Profitability of Own Capital and Overall Liquidity of farms, determine the latter. Simultaneously despite that the overall environmental sustainability is relatively high, Preservation of Agricultural Lands and Biodiversity are relatively low and critical for maintaining the achieved level. Insufficient Application of Recommended Irrigation Norms, a high level of Soils Water Erosion, and lowered Number of Wild Animals on farm territory, determines the latter inferior levels.

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There are great variations in sustainability levels of farms of different type and location as well as in shares of holdings with unlike level of sustainability. Distribution of farms of different type in groups with diverse levels of sustainability has to be taken into account when forecast the number and importance of holdings of each kind, and modernize public (structural, sectorial, regional, environmental, etc.) policies for supporting agricultural producers of certain type, sub-sectors, eco-systems and regions of the country.

Factors which stimulate to the greatest extent the actions of Bulgarian farms for improving individual aspects of sustainability are quite distinct, but the most important are: Access to Advisory Services, Professional Training of Manager and Hired Labor, Personal Conviction and Satisfaction, Positive Experience of Other Farms, Available Innovations, Financial Capability, Private Contracts and Agreements, and Registration and Certification of Products, Services, etc., Market Demand and Prices, Received Direct State Subsidies, Market Competition, Participation in Public Support Programs, Possibilities for Benefits in Present Moment, Possibilities for Benefits in Near Future, Tax Preferences, Possibilities for Benefits in Long-term, Integration with Buyer of Product, Social Recognition of Contribution, Immediate Benefits for Other Persons and Groups, Community Initiatives and Pressure in Region, Policies of European Union, Existing Problems and Risks in Region, Existing Problems and Risks in Global Scale, Official Regulations, Standards, Norms, etc. All these specific incentives for Bulgarian farms as a whole and of different type have to be taken into account in improving public policies and programs of sustainable development.

National and European mechanisms of regulation and support, which affect to the greatest extent economic sustainability of the most Bulgarian farms are: Direct Area Based Payments, National Tops Ups for Products, Livestock, etc., Modernization of Agricultural Holdings, Green Payments, Support to Semi-market Farms. Impacts of national and European policies on governance, social and environmental sustainability of Bulgarian farms is relatively weak. There are strong differentiations in impacts of individual policy instruments on sustainability of holdings of different type and location.

Having in mind the importance of holistic assessments of sustainability of farms and the enormous benefits for farm management and agrarian policies, such studies are to be expended and their precision and representation increased. The latter require a close cooperation between all interests parties and participation of farmers, agrarian organizations, local and state authorities, interest groups, research institutes and experts, etc. Moreover, the precision of estimates has to be improved and besides on assessments of managers to incorporate relevant information from field tests and surveys, statistical and other data, and expertise of professionals in the area.



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