

SUSTAINABILITY LEVEL OF BULGARIAN FARMS

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Abstract

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Evaluation of farms' sustainability is among the most topical academic, and farm management and policies forwarded issues. Nevertheless, there are no studies on sustainability of Bulgarian farms during current stage of EU CAP implementation. This article suggests a holistic framework for assessing integral, governance, economic, social, and environmental sustainability of Bulgarian farms, and assesses sustainability of holdings in general and of different juridical type, size, specialization, and location. Initially, a hierarchical framework for assessing farm sustainability is presented including a system of principles, criteria, indicators, and reference values. Next, assessment is made on overall, governance, economic, social, and environmental sustainability of Bulgarian farms based on a 2016 survey with managers of 190 typical farms. Our study has found out that the overall sustainability of Bulgarian farms is good, with superior levels for environmental and social sustainability, and inferior levels for governance and economic sustainability. With highest sustainability are Companies, Cooperatives, and farms with Big size, holdings in Pigs, Poultry and Rabbits, with Lands in Protected Zones and Territories, and located in Non-mountainous regions with handicaps, and South-Central region, while those Predominately for Subsistency and Mix-livestock specialization are with lowest sustainability. There is a great variation in portion of farms with different sustainability in each category as 30% of all farms are with low sustainability or unsustainable at all, including 34% of Physical Persons, a quarter of Sole Traders, 15% of Cooperatives, 57% of holdings with Mix-livestock and 45% in Vegetable, Flowers and Mushrooms, a half of Semi-market and a third of Small-size holdings, 39% of farms located in Mountainous regions with handicaps, and 40% of farms in South-West region. Sustainability assessments have to expand, and precision and representation increased. In addition to estimates of farm managers, assessments are to incorporate information from field tests, statistical data, and expertise of specialists in the area.

Key words: governance; economic; social; environmental sustainability; Bulgarian farms

Introduction

Assessment of sustainability of agricultural farms is among the most topical academic, and farm management and policies forwarded issue (Andreoli and Tellarini, 2000; Bachev, 2005, 2006, 2016; Bachev and Petters, 2005; Bastianoni et al., 2001; EC, 2001; FAO, 2013; Fuentes, 2004; Ivanov et al., 2009; Häni et al., 2006; OECD, 2001; Rigby et al., 2001; Sauvenier et al., 2005; UN, 2015). Despite that there are practically no studies on sustainability of Bulgarian farms during current stage of agricultural development and EU CAP implementation.

In academic publications, official documents and agricultural practices there are a number of major approaches for defining and assessing agrarian sustainability: as an alternative ideology (Edwards et al., 1990; VanLoon et al., 2005); as a new (set of) strategy/ies (Mirovitskaya and Ascher, 2001); as a characteristics of agrarian systems such as “ability to satisfy a diverse set of goals through time” (Brklacich et al., 1991; Hansen, 1996) or “ability (potential) to maintain or improve its functions” (Lopez-Ridaura et al., 2002; Lewandowski et al., 1999); as a “process of learning about changes and adapting to these changes” (Raman, 2006), etc.

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In literature and managerial practice there is a clear understanding that “farms sustainability and viability” is a condition and an indicator for agrarian sustainability and achievement of sustainable development goals. It is widely accepted that in addition to “pure” production and economic dimensions, farm sustainability has broader social and ecological aspects, which are equally important and have to be taken into account. There are suggested and used numerous indicators for assessing agrarian sustainability at “farm level” and diverse approaches for their integration and interpretation (Sauvenier et al., 2005).

However, most of the assessments of agricultural sustainability are at industry, national or international level (FAO, 2013; OECD, 2001), while important “farm level” is usually missing. Consequently, the critical links between farm management and impacts on rural and agro-ecosystems and their sustainability are not properly studied. Besides, estimates of farms sustainability and agrarian sustainability are often equalized. The latter has larger dimensions and includes: overall socio-economic development of agriculture; “agrarian” utilization of resources and impacts on natural environment; amelioration of living and working conditions of farm households; involvement in social governance; food security conservation of agrarian capability, etc. (Bachev, 2016).

In most cases a holistic approach is not applied, and “pure” economic (income, profitability), “pure” production (land, livestock and labor productivity), “pure” ecological (eco-pressure, harmful emissions, eco-impact), and “pure” social” (social responsibility) aspects of farm development are assessed independently. In most frameworks for sustainability assessment there is no hierarchical structure or systemic organization of aspects and components of farm sustainability, which (pre)determines the random selection of sustainability indicators.

Furthermore, critical “governance” functions of the farm, and costs associated with the governance (known as “transaction costs”), and relations between different aspects of farm sustainability are mostly ignored. Nevertheless, very often the level of managerial (governance) efficiency and adaptability of farm predetermine the overall level of sustainability independent from productivity, social or ecological responsibility of activity (Bachev, 2005, 2013). Now it is broadly recognized that the farm “produces” multiple products, “private” and “public” goods, environmental and cultural services, habitat for wild animals and plants, biodiversity, including less desirable ones such as waste, harmful impacts etc. Therefore, all these socio-economic and ecological functions of farm have to be taken into account when assessing its sustainability.

Most frameworks for sustainability assessment apply

“universal” approach for “faceless” farms, without taking into consideration specificity of individual holdings (type, resource endowment, specialization, stage of development) and environment in which they function (farmers preferences, market competition, institutional support and restrictions, environmental challenges and risks) (Bachev, 2005). In each particular stage of evolution of individual country, communities, eco-systems, sub-sectors and farms, there is specific knowledge for agrarian sustainability (e.g. links between farming activity and climate change), individual and social value system (preferences for “desirable state” and “economic value” of natural resources, biodiversity, human health, preservation of traditions), resource endowment and possibilities, institutional structure (rights on clean nature and biodiversity, of vulnerable groups, future generations, animal welfare), and goals of socio-economic development. Understanding, content, and assessment of farm sustainability are to be always specific for a particular historical moment and socio-economic, institutional and natural environment. Taking into account (external) socio-economic and natural factors let determine major sustainability factors – competition with import, on international markets, for resources with other sectors; evolution of agrarian institutions, social demands, extent of public support, extreme climate, animals and crops diseases, etc.

Finally, most systems cannot be practically used by farms and managerial bodies, since they are “difficult to understand, calculate, and monitor in everyday activity” (Hayati et al.).

The goal of this article is to suggest a holistic and practical framework for assessing integral, governance, economic, social, and environmental sustainability of Bulgarian farms, and apply it in assessing sustainability level of holdings in general and of different juridical type, size, specialization, ecological and geographical location.

Materials and Methods

Farm sustainability characterizes the ability (internal capability) of a particular farm 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, 2006, 2016). Farm sustainability has four aspects (pillars), which are equally important:

– *managerial* – farm has to have a good or high absolute and comparative efficiency for organization of its activity and relations, and a high adaptability to evolving socio-economic and natural environment, according to the specific preferences and capability of farm owners;

– *economic* – farm has to have a good or a high productivity for utilization of natural, personal, material, and financial resources, “acceptable” economic efficiency and competitiveness, and “normal” financial stability of activity;

– *social* – farm has to have a good or a high social responsibility regarding farmers, workers, other agents, communities, and consumers, and contribute to conservation of agrarian resources and traditions, improving welfare and living standards of farm households, and for development of rural communities and society;

– *environmental* – farm has to have a good and high ecological responsibility and its activity to be associated with “socially desirable” conservation, recovery and improvement of natural environment, respecting animal welfare, and other social standards related to nature.

Depending on the combination of all four dimensions, the sustainability of a particular farm could be *high*, *good*,

low, or farm is *unsustainable*.

Hierarchical levels, which facilitated formulation of the system for assessing sustainability of Bulgarian farms, include selected by the 10 leading experts in the area 12 Principles, 21 Criteria, 45 Indicators and Reference values (Figure 1). Principles are states of sustainability to be achieved – e.g. Acceptable governance efficiency, High economic efficiency, Good social efficiency for farmers and farm households, Protection of agricultural lands for each Aspects of Farms sustainability. Criteria are resulting state when a Principle is realized – e.g. Efficiency for governing of activity in relation to other organization, Economic efficiency of resource utilization, Farmers welfare, Soils chemical quality for each of previous Principles. Indicators are variables measuring compliance with Criteria – e.g. Comparative efficiency for supply and management of natural resources, Level of labor productivity, Income per

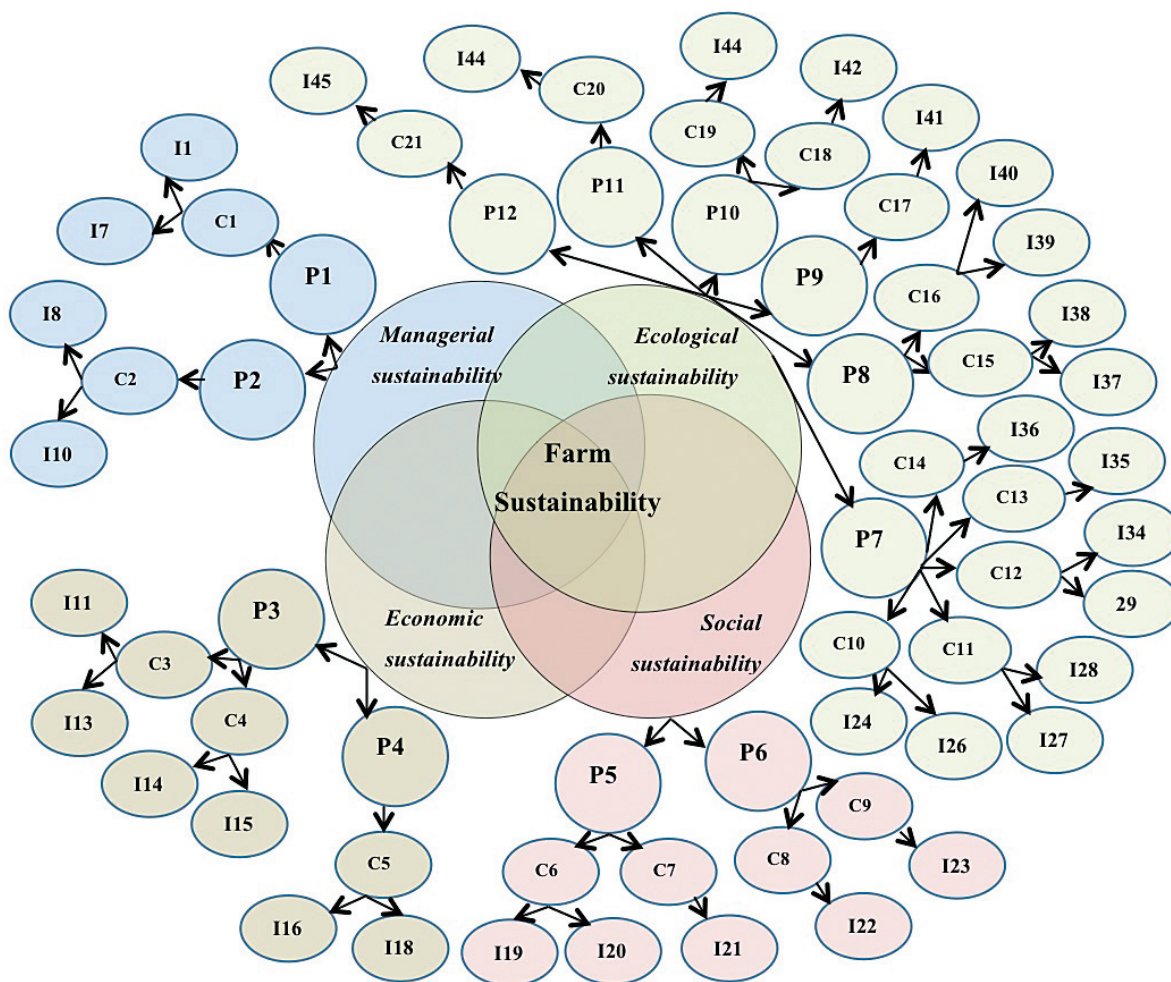


Fig. 1. Framework for understanding and assessing sustainability of farms

member of farm household, Soil organic content for each of previous Criteria. Reference Values are desirable levels of Indicators – e.g. Similar to alternative organization, Similar to sector's average, Similar to other sectors in the region, Organic content maintained or improved for each of previous Indicators.

Principles are universal, Criteria are more specific, while Indicators and Reference values are quite specific for conditions of Bulgarian agriculture. All elements of the hierarchical system met certain criteria: discriminating power in time and space, analytical soundness, measurability, transparency, policy relevance, transferability for all type of farms, relevance to sustainability issue, etc. (Lowrance et al., 1986; Sauvenier et al., 2005). For instance, in Bulgaria there is no “issue” nor institutional restrictions exists, and when farm sustainability assessment is performed it is not important to include “contribution” of livestock and machineries to the greenhouse gas emissions. At the same time, the number of animals on unit of farmland is of critical importance since underutilization or over-exploitation of pastures as well as mode of storing and utilization of manure is critical for sustainable exploitation of natural resources. Indicators selection process is presented in details in our previous publications (Bachev, 2016).

Our framework allows a comprehensive assessments and comparative analysis of farms of different type and location. It rejects approaches associating comparability only with “continues (quantitative) rather than discrete property” since there is no reason to believe that sustainability of an agricultural system could only increase or decrease – Discrete features (“sustainable”-“non-sustainable”) are possible, and of importance for farm managers, interests groups, policy makers (Bachev and Peeters, 2005). Our sustainability assessment framework is diagnostic, and focuses on intervention by identifying and prioritizing constraints and opportunities related to sustainability improvement. This it gives criteria for guiding changes in policies, farming practices, agents' behavior, for focusing of research and development priorities, etc. It is easy to understand and practical to use by agents without evaluation to require huge costs. Finally, our characterization of sustainability is predictive since it deals with future changes rather than the past and only the present. Principally farm's sustainability level could be evaluated in a short-term (programming period), midterm (current generation of farmers) and long-term (next generation) scales, and our framework intends to focuses on the first one.

Assessment of sustainability of Bulgarian farms is based on a first-hand information provided by the managers of 190 “typical” farms of different juridical type, size, specializa-

tion and location type collected in summer of 2016 (Table 1). The selection of surveyed farm was done by the National Agricultural Advisory Service, National Union of Agricultural Cooperatives, National Association of Grain Producers, Association of Producers of Decorative Plants, and Association for Breeding of Bulgaria Dairy Sheep. The structure of surveyed farms approximately corresponds to the real structure of registered agricultural producers and market oriented holdings in the country.

Managers of surveyed farms were asked to give assessments for each Indicator in four qualitative levels: High, Good/Average, Low, Unsatisfactory/Unacceptable. The qualitative estimates for each farm are 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 integral assessment of sustainability of a farm for each Criteria, Principle, Aspect and Overall level equal weights are used for each Principle in a particular Aspect, and for each Criteria in a particular Principle, and for each Indicator in a particular Criteria. Individual Criteria ($SI_{(c)}$), Principle ($SI_{(p)}$), Aspect ($SI_{(a)}$), and Integral Sustainability Index ($SI_{(i)}$) are calculated by formulas:

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

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

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

$$SI_{(i)} = \sum YU_{(a)} / 4$$

For interpretation of quantitative levels following sustainability levels of farms are distinguished by the experts: “High” – range between 0,84 and 1, “Good” – range between 0.5 to 0.82, “Low” – range 0.22 to 0.49, and “Non-sustainable” – between 0 and 0.2.

The overall and particular (aspect, principle, criterion, indicator) sustainability of farms of a specific type and location is an arithmetic average of individual farms in that particular group.

The integration of indicators does not diminish the analytical power since it makes it possible to compare diverse aspects of sustainability of individual farm and holdings of different type and the sector. Depending on the final users and objectives of analysis the extent of integration of indicators is to be differentiated – while farm managers, investors, researchers, etc. prefer detailed information for each indicator or criteria, decision-makers at higher level need more aggregated data for certain type of farms, major aspects or principles of sustainability, etc.

Table 1
Type and number of Surveyed 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, 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
Less-favored mountainous regions	15.13	0.00	7.69	11.76	13.68
Less-favored non-mountainous regions	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

Results and Discussion

Multi-indicators' assessment of sustainability level of Bulgarian farms indicates a *good* level (Figure 2). Environmental and social sustainability of holdings are highest, while governance and economic sustainability are at the border with low level. Therefore, improvement of the latter two

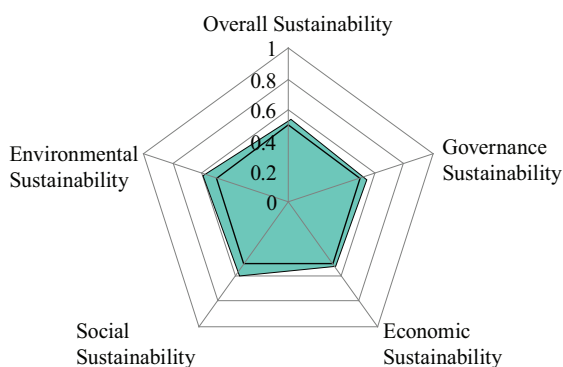


Fig. 2. Index of sustainability of Bulgarian farms
 Source: survey with farm managers, July 2016

is critical for maintaining good sustainability of farms in the country.

Analysis of sustainability levels for Principles, Criteria and Indicators let identify components contributing to individual aspects of farms' sustainability. For instance, governance and economic sustainability of Bulgarian farms are low because of fact that Governance Efficiency and Financial Stability of holdings are low (Figure 3).

Similarly, it is clear that 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.

In depth analysis for individual Criteria and Indicators further specifies the elements, which enhance or reduce farms' sustainability level. For instance, low Comparative Governance Efficiency and Financial Capability (Figure 4) are determined accordingly by insufficient Comparative Efficiency of Supply of Short-term Inputs in relations to alternative organization, and unsatisfactory Profitability of Own Capital and Overall Liquidity of farms (Figure 4, 5).

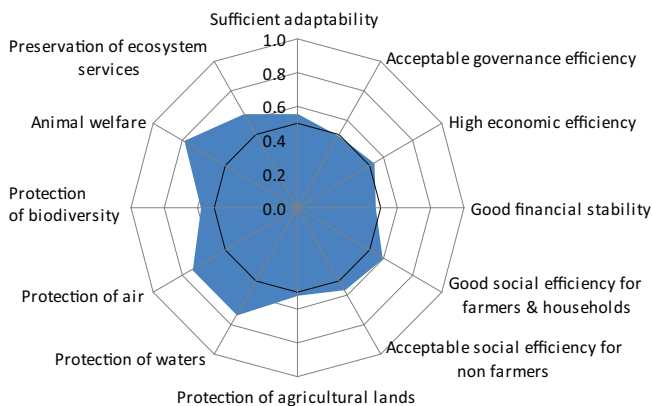


Fig. 3. Index of sustainability of Bulgarian farms for major principles

Source: survey with farm managers, July 2016

Similarly, low levels of Preservation of Agricultural Lands and Biodiversity are determined accordingly by insufficient Application of Recommended Irrigation Norms, high level of Soils Water Erosion, and lowered Number of Wild Animals on farm territory.

Low levels of indicators identify the specific areas for improvement of sustainability levels of farms through adequate change of management strategy and/or public policies. For instance, despite that the overall Adaptability of Farms is relatively high, Adaptability of Farms to Changes in Natural Environment (climate, extreme events, etc.) is relatively low. Therefore, measures are to be undertaken to improve that

type of adaptability through education, training, information, amelioration of agro-techniques, structure of production and varieties, technological and organizational innovations, etc.

Superior levels of certain indicators show the absolute and comparative advantages of Bulgarian farms related to sustainable development. At the current stage they are associated with respecting Animal Welfare standards, Preservation of Quality of Surface and Ground Waters in respect of 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.

There is a great variation in sustainability levels of farms of different type and location (Figure 6). Only holdings Predominately for Subsistence and Mix Livestock are with low sustainability. Economics, governance, and social sustainability of first ones are particularly low (Figure 7). The second group is with low economic, environmental and governance sustainability and marginal social sustainability.

Another category of farms is with a good sustainability, but with levels on or close to the border with inferior (low) level. 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 Physical

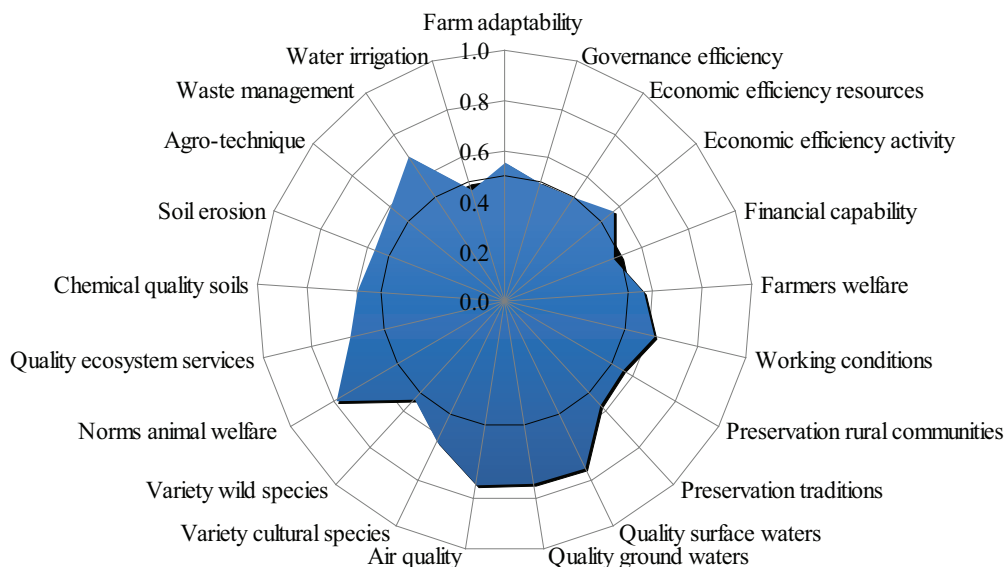


Fig. 4. Level of sustainability of Bulgarian farms for individual criteria

Source: survey with farm managers, July 2016

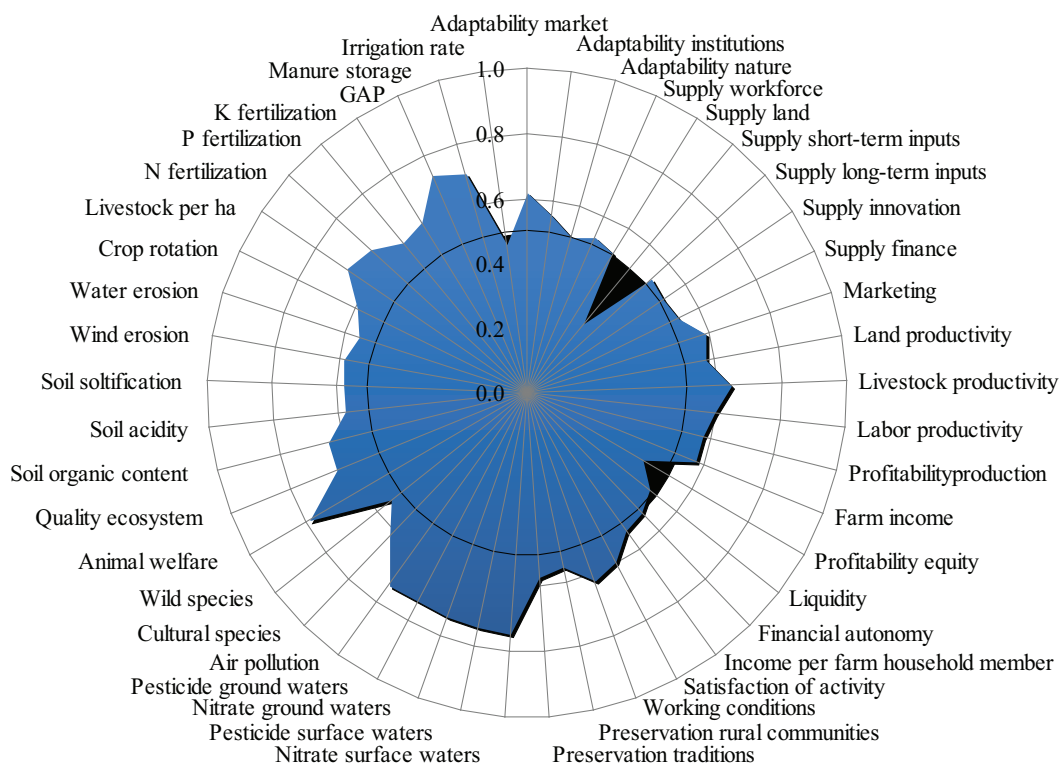


Fig. 5. Indicators of assessing sustainability of Bulgarian farms

Source: survey with farm managers, July 2016

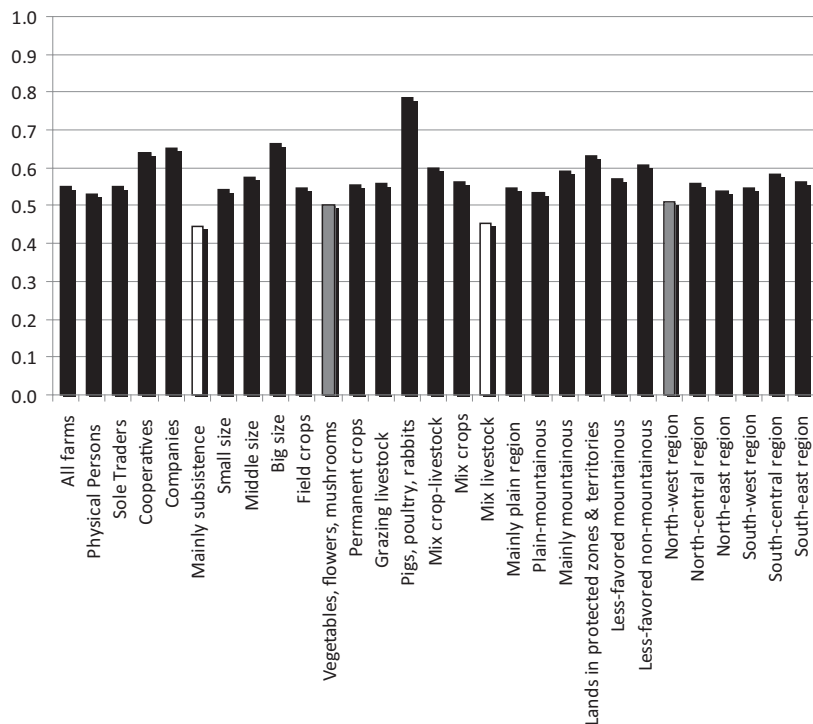


Fig. 6. Index of sustainability of Bulgarian farms of different type and location

Source: survey with farm managers, July 2016

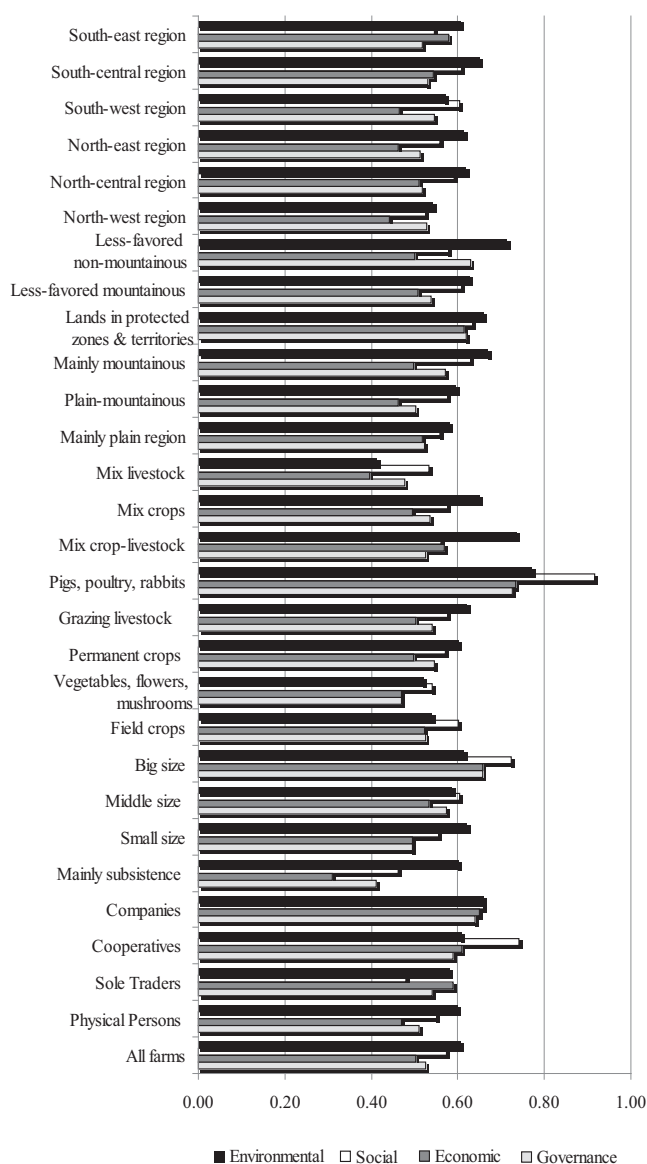


Fig. 7. Governance, economic, social and environmental sustainability of Bulgarian farms

Source: survey with farm managers, July 2016

Persons and farms located in Northwest 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 farms measures have to be undertaken for improvement all aspects of sustainability.

With a low economic sustainability are also farms with Small size, specialized in Mix Crops and Permanent Crops,

and those situated in Mountainous Regions, and in Northeast and Southwest regions of the country. Consequently, overall sustainability of these farms is close to the border with inferior level. For all these holdings measures are to be undertaken for increasing their economic sustainability in order to improve the overall long-term sustainability. With a low social sustainability are merely farms 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 the highest sustainability, having very good levels for governance, economic and environmental aspects. Farms with Lands in Protected Zones and Territories, and those located in Non-mountainous Regions with Handicaps and in South-Central region are with superior levels of sustainability. Former group are with a high governance, economic, social and environmental sustainability. Holdings in Non-mountainous Regions with 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 farms are with relatively low levels – accordingly for the former ones economic and social sustainability, and for the latter 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 measures to improve sustainability in aspects with critical inferior levels for these types of farm.

Holding of Physical Persons are the most numerous and to a great extent they (pre)determine the “average” sustainability level of all farms in the country. Consequently, the level of integral sustainability of Physical Persons of different type deviates insignificantly from the average sustainability levels of respective groups in the country (Figure 8).

There are significant variations in sustainability of Physical Persons depending on their size, specialization, ecological and geographical location. That indicates that the size, product specialization and location of Physical Persons are more important factors for their sustainability than their juridical status.

With the best sustainability, within the good level, are holdings of Physical Persons with Big size, specialized in Pigs, poultry and Rabbits, these with Lands in Protected Zones and Territories, and located in the South-Central region of the country. At the same time, with low sustainability

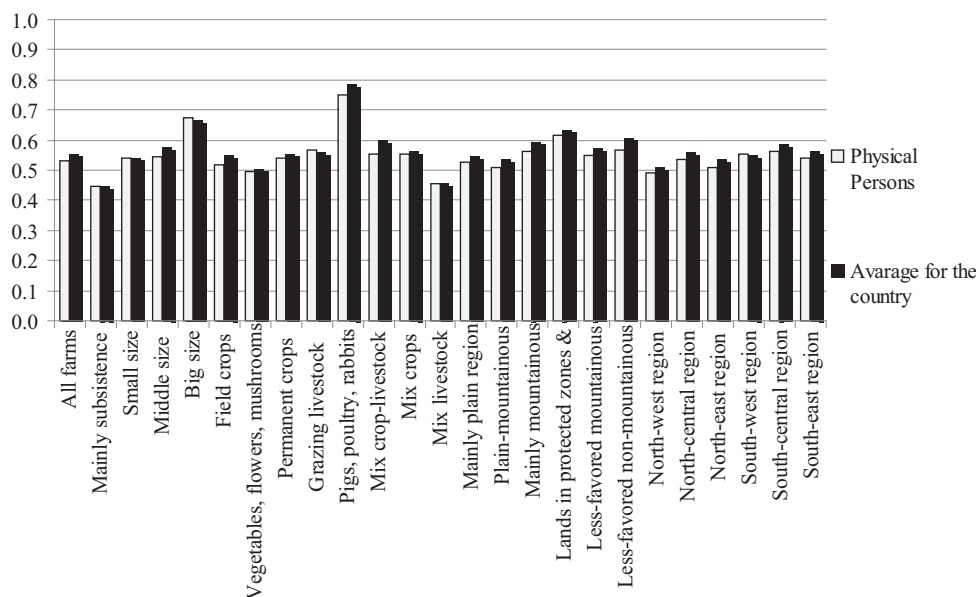


Fig. 8. Levels of sustainability of holdings of physical persons of different type in Bulgaria

Source: survey with farm managers, July 2016

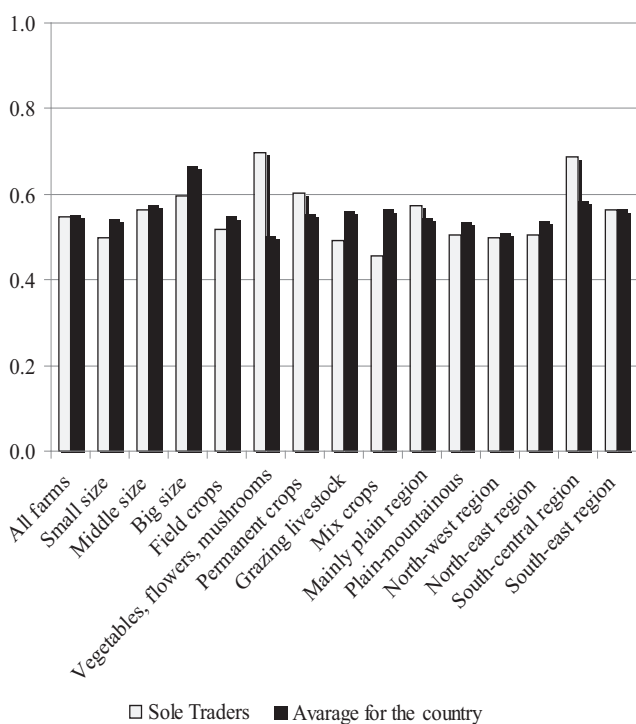


Fig. 9. Levels of sustainability of holdings of sole traders of different type in Bulgaria

Source: survey with farm managers, July 2016

are Physical Persons which are Predominately for Subsistency, those specialized in Mix-Livestock and in Vegetables, Flowers and Mushrooms, and located in the North-West region of the country. According to the ecological location, the lowest (within the good level) is sustainability of Physical Persons situated in Plain-mountainous regions of the country.

For Sole Traders there are also variation in sustainability level dependent on size, specialization, ecological and geographical location. With the highest sustainability are Sole Traders with Big size, specialized in Vegetables, Flowers and Mushrooms, and located in Plain regions, and in South-Central region of the country (Figure 9).

Simultaneously, with low sustainability are Sole Traders specialized in Mix-crops and in Grazing Livestock, and in the border with the inferior level those with Small size, and located in Plain-mountainous and North-West region of the country.

In Sole Traders' groups with the lowest and the highest levels of sustainability there are significant deviations from the average levels of sustainability in respective groups in the country. That demonstrates that the specific juridical status of Sole Trader is a critical (and more important) factor determining the level of sustainability in this group, rather than the classification of holdings to a certain group. On the other hand, in other groups of Sole Traders the levels of sustainability are close to the average in the country, which

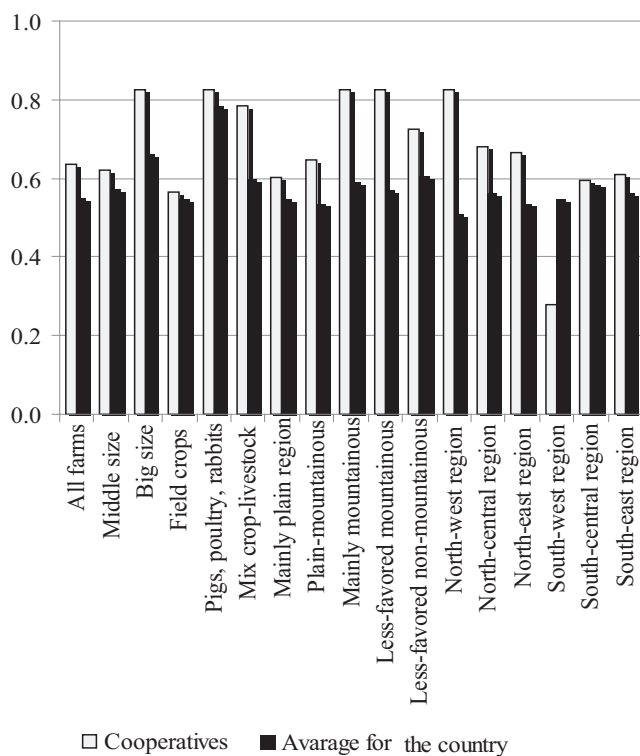


Fig. 10. Levels of sustainability of cooperative farms of different type in Bulgaria

Source: survey with farm managers, July 2016

shows that for these Sole Trades the size, specialization and location are dominating for formation of one of another sustainability level.

For Cooperatives there exists considerable differentiation in sustainability level depending on the size, specialization and location of the farms. With the best sustainability (close to the border with high level) are cooperatives with Big size, those specialized in Pigs, Poultry and Rabbits, located in Mountainous regions, Mountainous Regions with Handicaps, and in North-Central region of the country (Figure 10).

With the lowest sustainability are cooperatives located in South-West region of the country. The levels of sustainability of most Cooperatives of different type deviate considerably from the average levels for sustainability in these groups of holdings in the country.

That proves that specific “Cooperative forms” (the juridical status of Cooperative) is critical factor determining sustainability levels of cooperative farms of a particular type, rather than their belonging to certain category of holdings in the country.

There are significant specificity and variation in sustainability levels of Companies with different size, specialization and location (Figure 11).

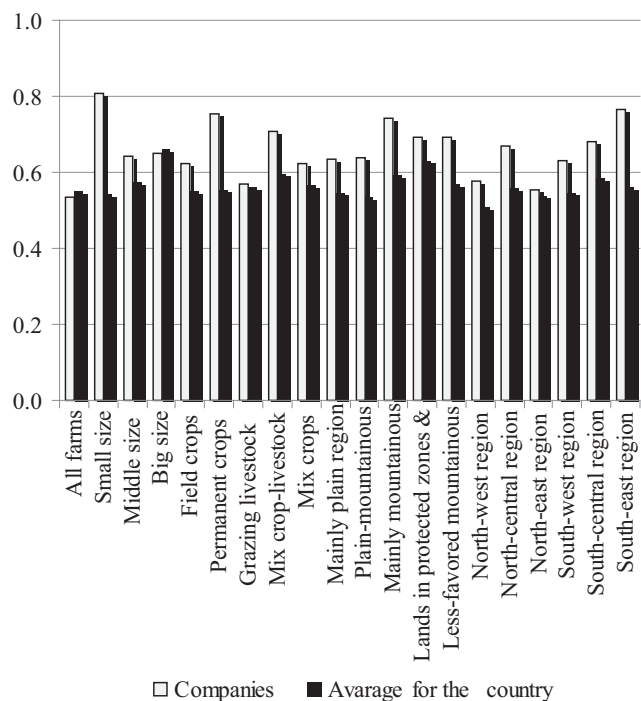


Fig. 11. Levels of sustainability of companies of different type in Bulgaria

Source: survey with farm managers, July 2016

With the highest sustainability are Companies with Small size, specialized in Permanent crops, located in Mountainous regions, and in South-East region of the country. Simultaneously, farms of that juridical type specialized in Grazing Livestock, and located in North-West region of the country are with lower levels of sustainability.

There are great elevations in sustainability levels of Companies in all type with an exception of firms with Big size, specialized in Grazing livestock, and located in North-East region of the country.

That means that for most categories of Companies the specific juridical status is critical for one or another level of sustainability.

Sole exceptions are mentioned above three groups of firms, where belonging to farms with particular (big) size, specialization (grazing livestock) and location (North-East Bulgaria) is an important factor for sustainability formation.

Furthermore, there is a significant differentiation in the levels of sustainability indicators for farms of different juridical type, size, specialization and location (Bachev, 2016).

Assessment of sustainability of individual holdings indicates, that there is a great variation in the share of farms

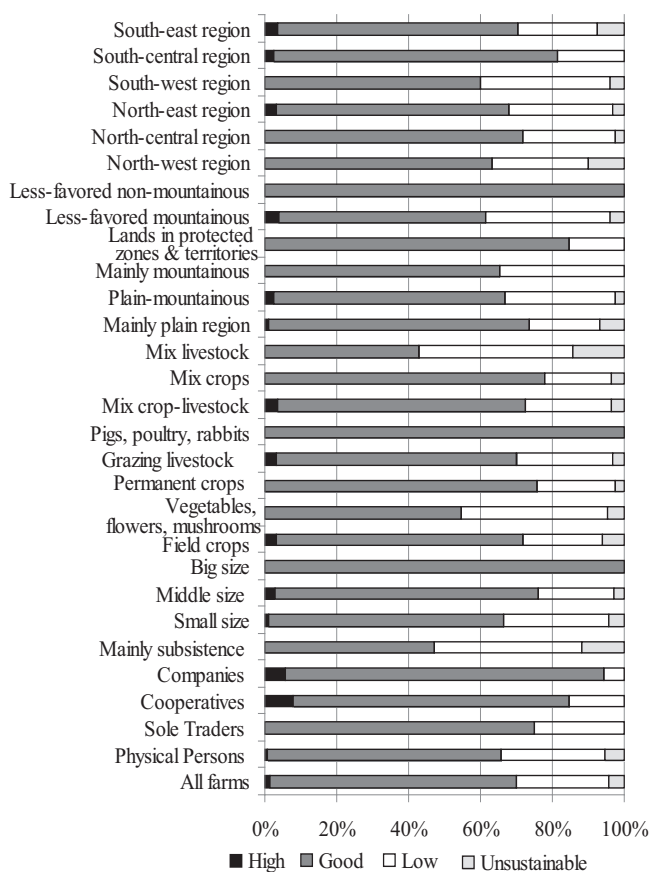


Fig. 12. Share of Bulgarian farms with different levels of sustainability

Source: survey with farm managers, July 2016

with different levels of sustainability. The biggest portion of Bulgarian farms is with a good sustainability (68%) and only an insignificant part (under 2%) is with superior sustainability (Figure 12).

At the same time, 30% of agricultural farms in the country are with low sustainability (26%) or unsustainable at all (4%).

The greatest share of farms with a good and high sustainability is among Companies, following by Cooperatives, and Sole Traders while the smallest share of holdings with a good sustainability is among Physical Persons.

Furthermore, more than a third of latter farms are with a low sustainability or unsustainable at all. Every fourth of Sole Traders is with low sustainability, like 15% of Cooperatives, and merely 6% of Companies.

There are also considerable differences in the portion of holdings with unlike sustainability depending of farm size. While all farms with Big size are with a good sustainability,

more than a half of holdings Predominately for Subsistence are with low sustainability or unsustainable. Around a third of farms with Small size and 24% of those with Middle size are with low sustainability or unsustainable.

Among farms with diverse specialization, the share of holdings with a good and high sustainability is 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 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 Southwest region with low sustainability or unsustainable, similar to 37% of those in Northwest and 32% in Northeast region. Northwest region is the leader in segment of unsustainable farms, where every tenth is unsustainable. Many farms in Mountainous Regions with 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 the 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.

Furthermore analysis of structure of farms with different level of sustainability for each aspects gives an 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 (35%) or managerially unsustainable (5%). That means that comparative governance efficiency for supply of labor, land, finance, etc. and/or marketing of produce in these farms is lower than other feasible organization, and adaptability to evolving socio-economic, institutional and natural environment is insufficient. At the same time, 42% of all farms are with a low economic sustainability (34%) or unsustainable at all (8%). 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 modern management and competition requirements.

As far as social aspect is concerned the majority of farms

(77%) are with a good (71%) or high (6%) sustainability. Despite that holdings with a low social sustainability are numerous (18%), and each tenth one is socially unsustainable. 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, 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 Bulgarian farms is good (69%) or superior (9%), while a considerable portion is with a low sustainability (18%) or environmentally unsustainable (4%). These figures clarify that eco-efficiency in a large number of farms do not meet contemporary norms and standards for preservation of lands, waters, air, biodiversity, ecosystem services, and animal welfare. That 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, measures have to be undertaken for improving the eco-efficiency in these groups of farms through training, informing, stimulation, sanctions, etc.

Conclusions

Suggested holistic framework gives a possibility to improve assessment, analysis and management of farms' sustainability. It has to be further discussed, experimented, improved and adapted to specific conditions of different farms, and special needs of decision-makers in various levels. The first large-scale assessment of sustainability of Bulgarian farms has found out that its overall level is good, 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. With the highest sustainability are Companies, Cooperatives, and farms with Big size, holdings specialized in Pigs, Poultry and Rabbits, with Lands in Protected Zones and Territories, and those located in Non-mountainous Regions with Handicaps, and in South-Central region, while holdings Predominately for Subsistency and Mix-livestock specialization are with lowest sustainability. There is a great variation in portion of farms with different sustainability levels in each type as every forth of Bulgarian holdings is with a low sustainability and 4% are unsustainable at all. Having in mind the importance of farms' sustainability assessments, such calculations have to be expanded, and their precision and representation increased.

The latter requires a closer cooperation of all related parties and involvement of farmers, agrarian organizations, local and state authorities, interest groups, research institutes and experts. Assessment precision has to be also improved, and in addition to estimates of farms' managers to incorporate information from field studies and tests, statistical, etc. data, and expertise of specialists in the area.

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