



Munich Personal RePEc Archive

What is Sustainability of Farms?

Bachev, Hrabrin

Institute of Agricultural Economics, Sofia

December 2015

Online at <https://mpra.ub.uni-muenchen.de/68434/>
MPRA Paper No. 68434, posted 18 Dec 2015 12:25 UTC

What is Sustainability of Farms?¹

Hrabrin Bachev²

Abstract: This paper attempts to give answer to some important questions, on which there is no agreement among researchers, namely: „what is farm sustainability?“, „what is the relation between farm and agrarian sustainability?“, “which are critical factors of farms sustainability?”, and „how to assess farms sustainability level“. First, evolution of the “concept” of farm sustainability as alternative ideology, new strategy, system characteristics etc. is analyzed and discussed. On that base is suggested adequate definition of farm sustainability as ability of a particular farm to maintain its governance, economic, social and ecological functions in a long term. The final goal is better define farm sustainability and develop an efficient framework for assessing sustainability level of different type of farms.

Key words: farm sustainability, governance, economic, social, ecological aspects, framework for assessment

Introduction

Around the globe the issue of assessment of sustainability of agricultural farms is among the most debated by the scientific researchers, farmers, investors, policy-makers, interest groups, and public at large (Andreoli M. and V Tellarini; Bachev; Bachev and Petters; Bastianoni et al.; Cauwenbergh et al.; FAO; Fuentes; Häni et al. ; OECD; Rigby et al.; Sauvenier et al.; UN). For instance, at the current stage of development of Bulgarian agriculture the question “what is the level of sustainability of different type of farms during to present programing period of EU CAP implementation?” is very topical.

Despite the enormous progress in the theory and practice in that new area, still there is no consensus on “what is (how to define) sustainability of farm”, “what is relation between farm and agrarian sustainability”, “which are critical factors for farm sustainability”, and “how to evaluate the sustainability level of agricultural farms” in a dynamic world, where hardly there is anything actually “sustainable”³.

In professional publications, official documents and agricultural practices there is clear understanding that farms sustainability and viability is a condition and an indicator for agrarian sustainability and achievement of goals of sustainable development. Also it is widely accepted that in addition to pure production and economic dimensions, the farm sustainability has broader social and ecological aspects, which are equally important and have to be taken into account when measure the overall sustainability level. There are suggested and used numerous indicators for assessing agrarian sustainability at farm level and diverse approached for their integration and interpretation.

¹ This study has been supported by the National Science Fund under a bilateral cooperation project between Bulgaria and China (2014-2016).

² Professor, Institute of Agricultural Economics, Sofia, Bulgaria, e-mail: hbachev@yahoo.com

³ That is a part of a larger problem for defying agrarian sustainability as a whole, which led to a suggestion „to spend less time attempting to define sustainable agriculture and more time in achiving it” (Ikerd). However, is it possible at all to work for sustainale agriculture if it is not defined? Disgreement among experts is mostly in terms of “”means” for achiving agrarian sustainabiluit, rather than “goals” toward there are directed.

However, most of the assessments of agricultural sustainability are at industry/national or international level (FAO, OECD), while the important “farm level” is usually missing⁴. Besides, often the estimates of farms sustainability and the agrarian sustainability as a whole unjustifiably are equalized. The later has larger dimensions and in addition to the sustainability of individual farms includes: the importance of individual (type of) farms in the overall resources management and the socio-economic life of households, region and industry; and collective actions of diverse agrarian agents; and overall (agrarian) utilization of recourses and impacts on natural environment; and amelioration of living and working conditions of farmers and farm households; and overall state and development of agriculture and rural households; and (participation in) overall social governance; and food security and conservation of agrarian capability, etc.

For example, the experience shows, that there are many “highly” sustainable farms, which little contribute to agrarian sustainability – numerous “semi-market” holdings and subsistence farms, large enterprise based on leased-in lands, public farms etc. in Bulgaria with “low” standards for environmental protection (Bachev, 2010). On the other hand, the sustainable agrarian development is commonly associated with farms restructuring and adaptation to constantly evolving market, institutional, and natural environment. That process (pre)determines the low sustainability (non-sustainability) and the diminishing importance of farms of certain type (public, cooperative, small-scale) and modernization of another part of them (diversification of activity, transformation of family farms into partnerships, firms, vertically-integrated forms, etc.).

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

Also the critical “governance” functions of farm, the costs associated with the governance (known as transaction costs), and the relations between different aspects of farm sustainability are mostly ignored. For instance, often the level of managerial (governance) efficiency and the adaptability of farm predetermine the overall level of its sustainability independent from the productivity, social responsibility or ecological concern of activity (Bachev, 2004; Bachev and Peeters).

The farm “produces” multiple products, “private” and “public” goods like food, rural amenities (for hunting, tourism, landscape enjoyment), environmental and cultural services, habitat for wild animals and plants, biodiversity, including less desirable such as waste, harmful impacts etc. All these functions of the farm have to be taken into account when assessing its sustainability.

Besides that the farm is a major production, it is an important governance structure for organization (coordination) of activities and transactions in agriculture, with a diversity of interests (preferences, goals) of participating agents. That requires when assessing sustainability and efficiency of different type of farms (subsistent, member oriented, profit making, part-time employment, conservation of natural environment, etc.) to take also into account their comparative potential in relation to alternative market, private, public, etc. (including informal) modes of governance of agrarian activity (Bachev, 2004; Bachev and Peeters).

⁴ Consequently, the important links between farm management and impacts on agro-ecosystems and their sustainability are not studied (Sauvenier et al.).

In each particular stage of the evolution of individual countries, communities, ecosystems, sub-sectors of agriculture and type of farms, there is a specific knowledge for agrarian sustainability (e.g. for links between human 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, etc.), institutional structure (rights on clean nature and biodiversity, of vulnerable groups in society, producers in developing countries, future generations, animal welfare, etc.), and goals of socio-economic development.

Thus, understanding, content, and assessment of agrarian and farm sustainability are always specific for a particular historical moment (period of time) and for a particular socio-economic, institutional and natural environment, in which a farm is functioning. For example, many otherwise “sustainable” farms in East Europe were not able to comply with high standards and restrictions for European Union for quality, ecology, animal welfare etc. and ceased to exist or entered into “unsustainable” grey sector of economy after accession of the countries to the Union.

A majority of suggested framework for assessment apply “universal” approach for “faceless” farms, without taking into consideration the specificity of individual holdings (type, resource endowment, specialization, stage of development) and the environment, in which they function (competition, institutional support and restrictions, environmental challenges and risks, etc.). What is more, usually these 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.).

This paper tries to better define the sustainability of farms. Evolution of the “concept” of farm sustainability and the main approaches for its assessment is analyzed. On that base a more precise definition of farm sustainability is suggested which incorporates the ability of a farm to maintain its major managerial, economic, social and ecological functions. The final goal is to develop an efficient framework for assessing sustainability level of different type of farms.

Sustainability as alternative ideology and new strategy

Sustainability movements of farmers and consumers initially emerged in developed countries as a response to concern of particular individuals and groups about negative impacts of agriculture on non-renewable resources and soil degradation, health and environmental effects of chemicals, inequity, declining food quality, decreasing number of farms, decline in self-sufficiency, unfair income distribution, destruction of rural communities, loss of traditional values, etc. (Edwards *et al.*). In that relation the term “sustainable agriculture”⁵ is often used as an umbrella term of “*new*” approaches in comparison to the “conventional” (capital-intensive, large-scale, monoculture, etc.) farming, and includes organic, biological, alternative, ecological, low-input, natural, biodynamical, regenerative, bio-intensive, bio-controlled, ecological, conservative, precision, community supportive etc. agriculture.

After that in the concept of sustainability more topical “*social*” issues have been incorporated such as modes of consumption and quality of life; decentralization; community and rural development; gender, intra (“North- South”) and inter-generation equity; preservation of agrarian culture and heritage; improvement of nature; ethical issues like animal welfare, use of GM crop etc. (VanLoon et al.).

⁵ The term firstly introduced by the Australian scientists Gordon McClymont (Wikipedia).

The Rio Earth Summit addressed the *global problem of sustainable development* and adopted the Declaration of its “universal principles” (UN, 1992). They comprise: rights on healthy and productive life in harmony with nature for every individual; protecting the rights of future generation; integration of environmental, social and economic dimensions at all levels; international cooperation and partnerships; new international trade relations; application of precaution approach in respect to environment; polluter liability; environmental impact assessment; recognition of women, youth, and indigenous role and interests; peace protection, etc. In a numerous forums since that these principles have been specified, amplified and enriched. The last UN Conference on Climate Change in Paris concluded with a legally binding agreement on climate between all countries of the planet (UN, 2015).

The emergence of that “*new ideology*” has been also associated with considerable shift of the “traditional understanding” of development as theory and policy. In addition to the economic growth, the later now includes a broad range of social, ethical, environment conservation etc. objectives. The modernization of policies of EU, and different international organizations (World Bank, FAO, etc.), and the Programs for Agrarian and Rural Development are confirmation of that. What is more, in the official documents the general understanding of sustainability is specified and “translated” into language of practice in the form of laws, regulations, instruction, approaches for assessment, system of “good practices” for farmers, etc.

Apart from that general (declarative) description of sustainability, there have also appeared more “operational” definitions for sustainability. For instance, sustainability of farm is often defined as “*set of strategies*” (Mirovitskaya and Ascher). The managerial approaches that are commonly associated with it: self-sufficiency through use of on-farm or locally available “internal” resources and know how; reduced use or elimination of soluble or synthetic fertilizers; reduced use or elimination of chemical pesticides and substituting integrated pest-management practices; increased or improved use of crop rotation for diversification, soil fertility and pest control; increase or improved use of manures and other organic materials as soil amendments; increased diversity of crop and animal species, reliance of broader set of local crops and local technologies; maintenance of crop or residue cover on the soil; reduces stocking rates for animals; employment of holistic, life-cycle etc. management of farm and resources; full pricing of agricultural inputs and charges for environmental damages, etc. Accordingly, the level of sustainability of a particular farm is measured through changes in resources use (e.g. application of chemical fertilizers and pesticides) and introduction of alternative (sustainable) production methods, and their comparison with “typical” (mass distributed) farms.

However, interpreting sustainability as “an approach of farming” is not always useful for adequate assessment of sustainability and for “guiding changes in agriculture”. Firstly, strategies and “sustainable practices”, which emerge in response to problems in developed countries, are not always appropriate for specific conditions of other countries. For instance, a major problem in Bulgarian farms has been insufficient and/or unbalanced compensation with chemical fertilizers of taken with yields N, K, and P; low rate of farmland utilization and irrigation; widespread application of extensive and primitive technologies (insufficient utilization of chemicals, application of too much manual labor and animal force, gravity irrigation); domination of miniature and extensive livestock holdings, etc. (Bachev, 2010). Apparently, all these problems are quite different from the negative impacts on natural environment as a result of over-intensification of farms in the old states of the European Union and other developed countries.

Moreover, the priorities and hierarchy of goals in a particular country also change in time, which makes that approach unsuitable for comparing sustainability of farms in different subsectors, countries and in dynamic (in time). For instance, until 90s the food security and

maximization of output was a main priority, which was replaced after that by the food quality, diversity and safety; conservation and improvement of natural environment and biodiversity; protection of farmers' income; market orientation and diversification; care for animal welfare; preservation of rural communities, etc.

Secondly, such understanding may lead to rejection of some approaches associated with modern farming but nevertheless enhancing sustainability. For example, it is well-known that biodiversity and soil fertility are preserved and improved through efficient tillage rather than “zero tillage” and bad stewardship to farmland. Application of such approaches in the past led to enormous challenges and even to loosing of the “agrarian” character of many agro-ecosystems In Bulgaria and other countries alike. At the same time, there are many examples for “sustainable intensification” of agriculture in many countries around the world.

Third, such understanding makes it impossible to evaluate the contribution of a particular strategy to sustainability since that specific approach is already used as a “criterion” for defining sustainability.

Forth, because of the limited knowledge and information during implementation of a strategy it is likely to make errors ignoring some that enhance sustainability or promoting others that threaten (long-term) sustainability. For examples, the problems associated with the passion on “zero and minimum” tillage in Bulgaria are well-known. Similarly, many experts do not expect a “huge effect” on environmental sustainability from the “greening” of EU CAP during the new programing period (Hendricks).

Fifth, a major shortcoming of that approach is that it totally ignores the economic dimensions (absolute and comparative efficiency of resources utilization), which are critical for determining the level of farm sustainability. It is obvious that the most ecologically clean farm in the world would not be sustainable “for a long time” if it does not sustain itself economically.

Last but not least important, such an approach does not take into account the impact of other critical (external for the farm) factors, which eventually determine the farm sustainability – institutional environment (existing public standards and restrictions), evolution of markets (level of demand for organic products of farms), macroeconomic conditions (opening up of high paid jobs in other industries) etc. It is well known that the level of sustainability of a particular farm is quite unlike depending on the specific socio-economic and natural environment in which is functions and evolves. For instance, introduction of support instruments of EU CAP in Bulgaria (direct payments, export subsidies, Measures of NPARD) increased further sustainability level of large farms and cereal producers, and diminished it considerably for small-scale holdings, livestock farms, vegetable and fruits producers (Bachev et al.).

Furthermore, some negative processes associated with agrarian sustainability in regional and global scale, could impact “positively” the sustainability of some farms in a particular region or a country. Example, focusing on harmful emissions of a particular farm does not make a lot of sense in the conditions of a high overall (industrial) pollution in the region (contrary, it will be a greater social tolerance toward farms polluting environment); global warming increases productivity of certain farms in Bulgaria and other Northern countries since it improves cultivation conditions, reduces the risk of frost, allows product diversification, etc. (Bachev, 2013).

Sustainability as a system characteristic

Another approach characterizes sustainability of agricultural system as “*ability to satisfy a diverse set of goals through time*” (Brklacich et al.; Hansen; Raman). The goals generally include provision of adequate food (food security), economic viability, maintenance or enhancement of natural environment, some level of social welfare, etc. Numerous frameworks for assessment are suggested which include ecological, economic and social aspects of farm sustainability (Fuentes; Lopez-Ridaura, Masera, and Astier; Sauvenier et al.). According to the objectives of analysis and the possibilities for evaluation divers and numerous indicators are used for employed resources, activities, impacts, etc.

However, usually there is a “conflict” between different qualitative goals – e.g. between increasing yields and income from one side, and amelioration of labor conditions (working hours, quality, remuneration of hired labor) and negative impact on environment from the other side. Therefore, there is a standing question *which element of the system is to be sustainable* and preference is to be given on one (some) of them on the expense of others⁶. Besides, frequently it is too difficult (expensive or practically impossible) to determine the relation between the farm’s activity and the expected effects – e.g. contribution of a particular (group of) farms in climate change.

For resolution of the problem of “measurement” different approaches for “integration” of indicators in “numeric”, “energy”, “monetary” etc. units are suggested. Nevertheless, all these “convenient” approaches are based on many assumptions associated with transition of indicators in a single dimension, determining the relative “weight” of different goals, etc. Not rarely, the integration is based on wrong assumptions that diverse goals are entirely interchangeable and comparable. For instance, the “negative effects form farming activities” (environmental pollution, negative effects on human health and welfare, etc.) are evaluated in Euros and Dollars, and they are sum up with the “positive effects” (different farm products and services) to get the “total effect” of the farm, subsector, etc.

Also it is wrongly interpreted that sustainability of a system is always an algebraic sum of the sustainability levels of its individual components. In fact, often the overall level of sustainability of a particular system-the farm is (pre)determined by the level of sustainability of the (critical) element with the lowest sustainability – e.g. if a farm is financially unsustainable it breaks. It is also presumed that farm sustainability is an absolute state and can only increase or decrease. Actually, “discrete” state of non-sustainability (e.g. failure, closure, outside take over) is not only feasible, but common situation in farming around the globe.

Another weakness of this approach is that “subjectivity” of specification of goals link criteria for sustainability not with the farm itself but with value of pre-set goals depending on interests of owner and/or stakeholders, priorities of development agencies, standards of analysts, understanding of scientist, etc.). In fact, there is a great variety of type of farms as well as preferences of farmers and owners – own supply with products and services; increasing income or profit, preservation of farm and resources for future generations, servicing communities, minimization of costs for final consumers, etc.

Besides, at lower levels of analysis of sustainability (parcel, division, farm, and eco-system) most of the system objectives are exogenous and belong to a larger system(s). For example, satisfying market demands less depends on product of a particular (group of) farm(s); many ecological problems appeared on regional, eco-system, national, transnational and even global scale, etc.

Actually, individual type of farms and agrarian organizations have own “private” goals – profit, income, servicing members, subsistence, lobbying, group of public benefits (scientific, educational, demonstration, ecological, ethical, etc.). These proper goals rarely

⁶ By definition the agricultural production means destruction of natural « sustainability » of natural eco-systems, in particular destruction and demolition of natural biodiversity.

coincide (and often are in conflict) with the goals of other systems (including with the system as a whole). At the same time, the extent of achieving these specific goals is a precondition (incentive, factor) for sustainability of diverse type organizations of agrarian agents (Bachev, 2004).

Furthermore, different type of farms (individual, family, cooperative, corporative) have quite different internal structure as goals of individual participants not always coincide with the goals of the entire farm. While in individual and family farm there exist “full” harmony (owner-farmer), in more complex farms (partnership, cooperative, corporation) often there is a conflict between individual and collective goals (division of ownership from farming and/or management). For instance, in Bulgaria and around the globe there are many highly sustainable organizations with changeable membership of individual agents (partners, cooperative members, shareholders, etc.).

Therefore, the following question is to be tackled: *sustainability for whom* (in the social system) – entrepreneurs and managers of the farm, working owners of the farm, farm households, outside shareholders, hired labor, interests groups, local communities, society as a whole.

Last but not least important, many of these approaches for understanding and assessing sustainability do not include essential “time” aspect. However, if the idea for continuation in time is missing, then these goals are something different from sustainability (Hansen). The assessment of sustainability of farm has to give idea about *future*, rather than identify past and present states (the achievement of specific goals in a particular moment of time). For example, the experience demonstrates that due to the bad management, inefficiency or market orientation of the cooperative and public farms many of their members leave, fail or set up more efficient (sustainable) private structures (Bachev, 2010). Simultaneously, many farms with low sustainability in the past are with increasing socio-economic and ecological sustainability as a result of the changes in the ownership, strategy, state policy and support etc.

Another approach interprets sustainability as an “*ability (potential) of the system to maintain or improve its functions*” (Hansen; Lopez-Ridaura, Masera and Astier; Mirovitskaya and Ascher; VanLoon et al.). Accordingly, initially main system attributes that influence sustainability are specified as: stability, resilience; survivability; productivity; quality of soil, water, and air; energy efficiency; wildlife habitat; self-sufficiency; quality of life; social justice, social acceptance, etc. After that, indicators for measurement of these attributes are identified and their time trends evaluated usual for 5-10 and more years. For instance, most often for productivity indicators such as yield, product quality, profit, income etc. are used. In Agricultural Economics are also widespread models for “integral productivity” of factors of production.

The advantage of this approach is that it links sustainability with the system itself and with its ability to function in future. It also gives an operational criterion for sustainability, which provides a basis for identifying constraints and evaluating various ways for its improvement. Besides, it is not complicated to quantitatively measure the indicators, their presentation as an index in time, and appropriate interpretation of sustainability level (decreasing, increasing, unchanged). Since trends represent an aggregate response to several determinant that eliminate the needs to devise complex (and less efficient) aggregation schemes for indicators.

Suggested methods however, have significant shortcomings, which are firstly related with wrong assumption that future state of the system can be approximated by the past trends. What is more, for newly established structures and farms without (long) history is impossible to apply that approach for assessing sustainability. However, in Bulgaria and most East European countries namely such structures dominate which emerged in the last 10-20 years.

Furthermore, the “negative” changes in certain indicators (yield, income, water and air quality, biodiversity, etc.) could be result of “normal” processes of operation of the farm and larger systems, part of which the farm is (e.g. fluctuation of market prices, natural cycles of climate, overall pollution as a result of industrial development, etc.) without being related with the evolution of sustainability of the evaluated farm. For instance, despite the environmentally friendly behavior of a particular farm, the ecological state of the farm could be worsen, if the needed “collective eco-actions” of all farms in the region are not undertaken.

In order to avoid above mentioned disadvantages, it is suggested to compare the farm indicators not in time, but with average levels of farms in the sub-sector, region etc. However, positive deviation from the averages not always gives a good indication for sustainability of farms, since there are many cases when all structures in a particular (sub)sectors and regions are unsustainable – dying sectors, uncompetitive productions, “polluting” environment subsectors, deserted regions, financial and economic crisis, etc. Also there are examples for entire agro-ecosystems, of which individual “sustainable” farms are part, are with diminishing sustainability or unsustainable as a result of negative externalities (on waters, soils, air) caused by farms in other regions and/or sectors of economy, competition for resources with other industries or uses (tourism, transport, residence construction, natural parks, etc.).

In addition, an essential problem of that approach is that it is frequently impossible to find a single measure for each attribute. The later necessitates some subjective “commensuratement” and prioritizing of multiple indicators, which is associated with already described difficulties of other approached for assessment.

That approach also ignores institutional and macroeconomic dimensions, unequal goals of different type of farms and organizations, and comparative advantages and complementarity of alternative governing structures (Bachev). Namely these factors are crucial when we talk about (assessment of) sustainability of micro-economic structures – individual and family farms, agro-firms, and agro-cooperatives.

Therefore, sustainability of individual type of farms cannot be properly understood and assessed without analyzing their comparative production and governance potential to maintain their diverse function in the specific socio-economic and natural environment in which they function (Bachev, 2004; Bachev and Peeters). For instance, the high efficiency and sustainability of small-scale holdings for part-time employment and subsistency in Bulgaria and East Europe cannot be properly evaluated outside of the analysis of the household and the rural economy. Similarly, the high efficiency of cooperative farms during the post-communist transition period is caused not by the superior comparative productivity comparing to family holdings, but on possibility to organize activities with a high dependence (specificity) for members in the conditions of great institutional and economic uncertainty⁷.

As a production and management unit, the sustainability of a particular farm will be determined both from its activity and managerial decisions (efficiency, ability for adaptation to evolving environment), *and* from the changes in the external environment (market crisis, public support, extreme climate). The later are able significantly improve or deteriorate sustainability of individual farms, independent of management decision of individual holdings. Example, direct subsidies from the EU have increased considerably the sustainability of many Bulgarian farms (Bachev at al.).

Finally, there exists no farm (individual, from a certain type) or any other system, which is sustainable “forever”. Therefore, the assessment of the “sustainability” of the farm is

⁷ For evaluating the governance efficiency of the farms and agrarian organisations not always are appropriate quantitative indicators, but it is also necessary a profound qualitative (structural) analysis (Bachev, 2004, 2011).

also associated with the answer to the question *for how long – for what period of time* we are talking about.

Considering the constant evolution of the features and the concept of sustainability from one side, and the evolution of the agrarian system itself from the other side, sustainability is increasingly perceived “as a process of understanding of changes and adaptation to these changes” (Raman). According to that new understanding, the agrarian (and farm) sustainability is always specific in time, situation, and component, and characterizes the potential of agricultural systems to exist and evolve through adaptation to and incorporation of the changes in time and space. For example, in the current stage of development respecting the “rights” of farm livestock or “animal welfare” is a substantial attribute of farm sustainability.

Moreover, the incorporated internal dynamisms of the also implies an “end life” (there is no system which is sustainable forever) as a particular agrarian system is considered to be sustainable if it achieves (realizes) its “expected lifespan”. For instance, if due to augmentation of income of farm households the number of subsistence and part-time farms is decreasing while agrarian resources and effectively transferred to other (larger) structures, this process should not be associated with a negative change in sustainability of farms in the region or subsector. On the other hand, if a particular farm is not able to adapt to dynamic economic, institutional and climate changes through adequate changes in technology, product, and organization, it is to be evaluated as low sustainable.

That characterization has to be “system-oriented” while system is to be clearly specified, including its time and spatial boundaries, components, functions, goals, and importance in the hierarchy. That implies taking into account the diverse functions of agricultural farms in the current stage of development, the type and efficiency of the farm, and its links (importance, dependency, complementarity) with sustainability (economy) of the households, the agrarian organizations, the region, the eco-system and the entire sectors (industry).

It has to reflect both the internal capability of the farm to function and adapt as well as the external impact of constantly evolving socio-economic and natural environment on the operation of individual farm. However, it is to be well distinguished the features of relatively independent systems – e.g. while the “satisfaction from farming activity” is an important social attribute of the farm sustainability, the modernization of social infrastructure and services on rural areas is merely a prerequisite (factor) for the long-term sustainability of the individual farm.

Furthermore, this approach is to allow a comparative analysis of diverse agricultural systems – e.g. farms of different type and kind in the country, farms in different countries, etc. We do not accept approaches, which associate comparability only with the “continues (quantitative) rather than discrete property” of a system (Hansen ; Sauvenier et al.). In fact, 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).

Characterization of sustainability must also be predictive since it deals with future changes rather than the past and only the present. And finally, it should be diagnostic, and to *focus intervention* by identifying and prioritizing constraints, testing hypothesis, and permitting assessments in comprehensive way.

In addition, sustainability has to be a criterion for guiding changes in policies, and farming and consumption practice, agents’ behavior, for focusing of research and development priorities, etc. In that sense, analysis of levels and factors of “historical” sustainability of farms (“achieved level of sustainability”) in a region, subsector, other countries, etc. are extremely useful for the theory and practice. The assessments of past states

help us both to precise the approach and the system of indicators as well as to identify critical factors and trends of sustainability level of farms. On the later base, efficient measures could be undertaken by the managers, state authority etc. for increasing current and future level through education, public support, innovation, restructuring, etc.

Finally, sustainability is to allow facile and rapid diagnostic, and possibility for intervention through identification and prioritizing of restrictions, testing hypothesis, and giving possibility for comprehensive assessments. The later suggests that it is easy to understand and practical to use by agents without evaluation to require huge costs (economic “justification” of undertaking assessment or increasing the precision).

According it is to be worked out a system of adequate principles, criteria, and indicators for assessing the individual aspects and the overall level of sustainability of farms in the specific conditions of each country, particular subsector, region, etc. Each of the elements of this hierarchical system is to meet certain conditions (criteria) like: discriminating power in time and space, analytical soundness, measurability, transparency, policy relevance, transferability for all type of farms, relevance to sustainability issue, etc. (Sauvenier et al.).

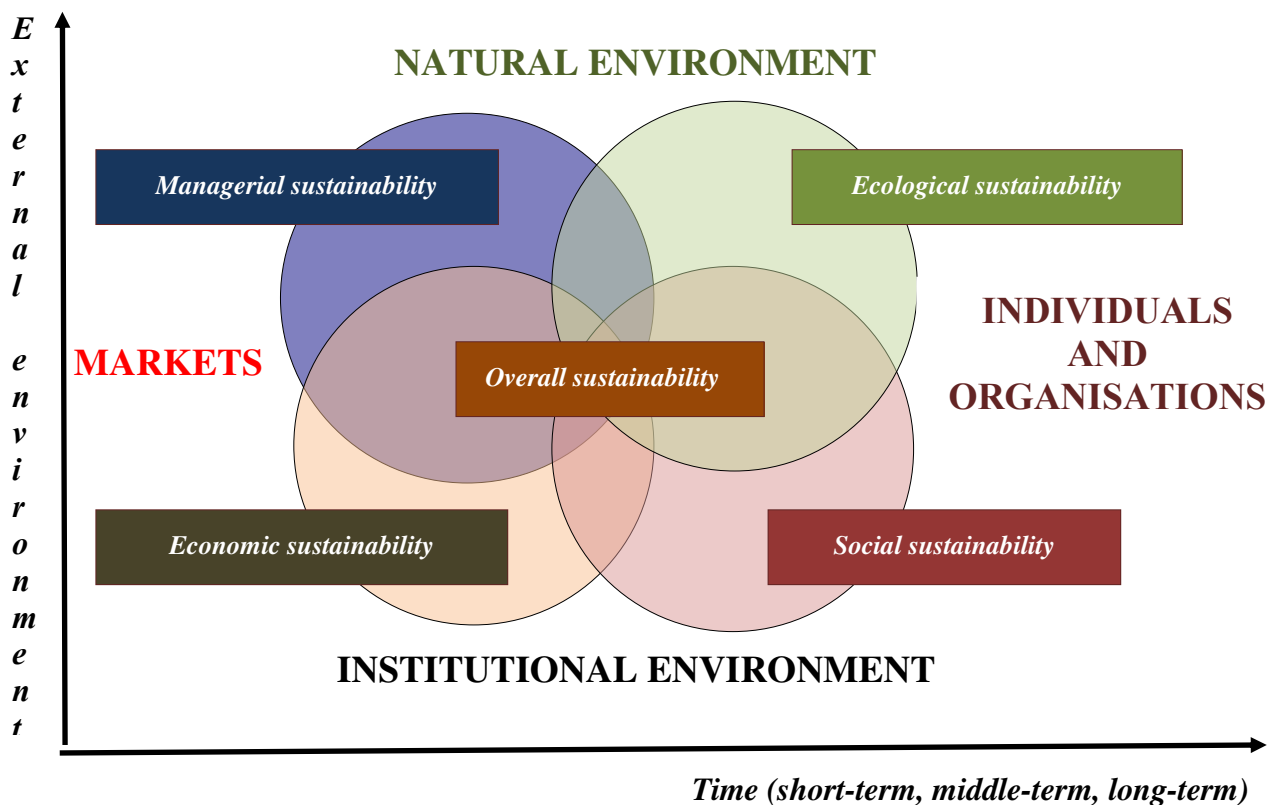
For instance, in Bulgaria like in many other countries there is no such “issue” nor institutional restrictions (norms) exists, and when assessing farm sustainability it is not important to include “contribution” to greenhouse gas emission of the livestock and machineries⁸. At the same time, the number of animals on unit of farmland is of critical importance since underutilization or over-exploitation of pastures as well as the mode of storing and utilization of manure is critical for sustainable exploitation of natural resources.

We think that definition of the sustainability of the farm has to be based on “literal” meaning of that term and perceived as a system characteristics and “ability to continue through time”. It has to characterize the major aspects of the activity of a farm, which is to be *managerially sustainable*, and *economically sustainable*, and *ecologically sustainable*, and *social sustainable* (Figure 1).

Therefore, the farm sustainability characterized the ability (internal potential, incentives, comparative advantages, importance, efficiency) of a particular farm to maintain its governance, economic, ecological and social functions in a long-term.

⁸ Despite the fact that they are a major source of emissions (EEA).

Figure 1. Sustainability of Farm



A farm is sustainable if:

- it has a good *governance efficiency* – that is to say it is a preferable for 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);
- it is *economically viable* and efficient – that is to say it allows acceptable economic return on used resources and financial stability of the enterprise;
- it is *socially responsible* in relation to farmers, labor, other 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;;
- it is *environmentally friendly* – that is to say its activity is also associated with conservation, recovery and improvement of the components of natural environment (lands, waters, biodiversity, atmosphere, climate, ecosystem) and the nature as a whole, animal welfare, etc.

Depending on the combination of all these dimensions the sustainability of a particular farm could be *high*, *good*, *insufficient* or the farm is *unsustainable*. For instance, the farm may have a high governance and economic sustainability and low ecological and social sustainability. However, in any case, the low or lack of sustainability of the farm in any of these aspects (pre)determines the overall level of farm sustainability – e.g. inferior governance efficiency means a low overall sustainability of farm.

The level of sustainability of the farm is to be evaluated in a *short-term* (programing period), *midterm* (current generation of farmers) and *long-term* (next generation) scale.

The assessment of the sustainability of the farms has to be always made in the specific socio-economic and ecological, rather than unrealistic (desirable, “normative”, ideal) context. In that sense, the employment of any “Nirvana approach” for determining the criteria for

sustainability (not related to the specific environment “scientific” norms of agro-techniques; model of farming in other regions or countries; assumptions of perfectly defined and enforced rights and restrictions; effectively working state administration; situation without missing markets and public intervention, etc.) is not correct.

Taking into account of the external socio-economic and natural factors let also identify major factors, which contribute to sustainability of a particular farm – competitiveness, adaptability, evolution of farmers and agrarian organizations, access to public programs, level of state support, institutional environment, extreme climate, plant and livestock diseases, etc.

In a long-term there exists no economic organization if it were not efficient otherwise it would be replaced by more efficient organization (Bachev 2004). Therefore, the problem of assessment of sustainability of farms is directly related to estimation of the level of governance, production and ecological efficiency of farms.

Next, it has to be estimated the potential of the farm for adaptation to the evolving market, economic, institutional, 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 efficiency and sustainability, and eventually would be either liquidated or transformed into another type of organization.

For instance, if a particular farm faces enormous difficulties meeting institutional norms and restrictions (new quality and environmental standards of EU; higher social norms; new demands of rural communities, etc.) and taking advantage from the 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), or supply of needed farmland (big demand for land from other entrepreneurs or for non-agricultural use), or funding activities (insufficient own finance, impossibility to sell equity or buy credit), or marketing output and services (changing demand for certain products or needs of cooperative members, strong competition with imported products); or it is not able to adapt to existing ecological challenges and risks (warning, extreme climate, soils acidification, water pollution, etc.), then it would not be sustainable despite the high historical or current efficiency. Therefore, *adaptability of farm* characterizes to a greater extend the farm sustainability and has to be used as a main criteria and indicator for its assessment⁹.

Conclusion

Studying out the farm as a governance (rather than merely as a production) structure becomes a key for understanding the farm sustainability. Accordingly farm sustainability is to incorporate one new important dimension – the governance efficiency and adaptability. In order to access sustainability level of different farms it is necessary to include that new criteria and appropriate indicators for its measurement and analysis. The later would require a new type of microeconomic data on agent’s preferences, transaction costs, institutional environment, etc. In a next publication we will suggest such a framework for assessing farm sustainability. The final goal is not only better define farm sustainability but develop an efficient and practically usable framework for assessing sustainability level of different type of farms.

⁹ Our suggestion to use adaptability as a criteria and indicator for sustainability has been already incorporated in the holistic System for Assessing Sustainability of Sgriculture Systems in Belgium (Sauvenier et al.).

References:

- Andreoli M. and V Tellarini (2000): Farm sustainability evaluation: methodology and practice, *Agriculture, Ecosystems & Environment*, Volume 77, Issues 1–2, 43–52.
- Bachev H. (2005): Assessment of Sustainability of Bulgarian Farms, proceedings, XIth Congress of the European Association of Agricultural Economists, Copenhagen.
- Bachev H. (2004): Efficiency of Agrarian Organizations, in *Farm Management and Rural Planning* No 5, Kyushu University, Fukuoka, 135-150.
- Bachev H. (2010): *Governance of Agrarian Sustainability*, New York: Nova Science Publishers.
- Bachev H. (2011): Needs, Modes and Efficiency of Economic Organizations and Public Interventions in Agriculture, *Review of Economics & Finance*, 3, 89-103.
- Bachev H. (2013): Risk Management in Agri-food Sector, *Contemporary Economics*, Vol. 7 (1), 45-62.
- Bachev H. and A.Peeters (2005): Framework for Assessing Sustainability of Farms, in *Farm Management and Rural Planning* No 6, Kyushu University, Fukuoka, 221-239.
- Bachev H., N.Koteva and M.Mladenova (2014): The Effects Of Implementing European Policies In Agricultural Holdings In The Republic Of Bulgaria, Vol.4, 1, 90-106.
- Bastianoni S, N. Marchettini, M. Panzieri, E. Tiezzi (2001): Sustainability assessment of a farm in the Chianti area (Italy), *Journal of Cleaner Production*, Volume 9, Issue 4, 365–373.
- Brklacich M., Bryant C. and B. Smith (1991): Review and appraisal of concept of sustainable food production systems, *Environmental Management*, 15(1): 1-14.
- EC (2001): A Framework for Indicators for the Economic and Social Dimensions of Sustainable Agriculture and Rural Development, European Commission.
- Edwards C., R. Lal, P. Madden, R. Miller and G. House (editors), (1990): *Sustainable Agricultural Systems*, Soil and Water Conservation Society, Iowa.
- FAO (2013): SAFA. Sustainability Assessment of Food and Agriculture systems indicators, FAO.
- Fuentes M. (2004): Farms Management Indicators Related to the Policy Dimension in the European Union, OECD Expert Meeting on Farm Management Indicators and the Environment, 8-12 March 2004, New Zealand
- Häni F., L. Pintér and H. Herren (2006): Sustainable Agriculture. From Common Principles to Common Practice, Proceedings of the first Symposium of the International Forum on Assessing Sustainability in Agriculture (INFASA), March 16, 2006, Bern, Switzerland.
- Hansen J. (1996): Is Agricultural Sustainability a Useful Concept, *Agricultural Systems* 50: 117-143.
- Hayati D. Z. Ranjbar, and E. Karami (2010): Measuring Agricultural Sustainability, in E. Lichtfouse (ed.), *Biodiversity, Biofuels, Agroforestry and Conservation Agriculture*, 73, *Sustainable Agriculture Reviews* 5, Springer Science+Business Media B.V., 73-100.
- Hendricks N. (2010): The Effect of Green Payments on the Diffusion of Conservation Technologies,
https://www.researchgate.net/publication/254384150_The_Effect_of_Green_Payments_on_the_Diffusion_of_Conservation_Technologies
- Ikerd J. (): On Defining Sustainable Agriculture, SARE.
<http://www.sustainable-ag.ncsu.edu/onsustainableag.htm>
- Lowrance R., P. Hendrix, and E. Odum (2015): A hierarchical approach to sustainable agriculture, *American Journal of Alternative Agriculture*

- Lopez-Ridaura S., O.Masera, and M.Astier (2002): Evaluating the Sustainability of Complex Socio-environmental Systems. MESMIS Framework, Ecological Indicators.
- Mirovitskaya N. and W.Ascher – editors (2001): Guide to Sustainable Development and Environmental Policy, Duke University Press, London.
- OECD, 2001. Environmental indicators for agriculture. Volume 3: Methods and Results. OECD, Paris.
- Raman, S. (2006). Agricultural Sustainability. Principles, Processes and Prospect., New York: The Haworth Press Inc.
- Rigby D., P. Woodhouse, T. Young, M. Burton (2001): Constructing a farm level indicator of sustainable agricultural practice, Ecological Economics, Vol. 39, Issue 3, 463–478.
- Sauvenier X., J. Valekx, N. Van Cauwenbergh, E. Wauters, H.Bachev. K.Biala, C. Biolders, V. Brouckaert, V. Garcia-Cidad, S. Goyens, M.Hermy, E. Mathijs, B.Muys, M.Vanclooster. and A.Peeters (2005): Framework for Assessing Sustainability Levels in Belgium Agricultural Systems – SAFE, Belgium Science Policy, Brussels.
- UN (1992): Report of the United Nations Conference on Environment and Development, 3-14 June 1992, Rio de Janeiro: United Nation.
- UN (2015): Paris Climate Change Conference – November-December 2015
http://unfccc.int/meetings/paris_nov_2015/meeting/8926.php
- VanLoon, G., Patil, S., and Hugar, L. (2005). *Agricultural Sustainability: Strategies for Assessment*. London: SAGE Publications.