REGULATION OF THE PROVISION OF PUBLIC GOODS FROM AGRICULTURE: ECONOMIC VALUE BASED MODEL

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The paper focuses on the provision of agricultural public goods and its economic regulation. Beyond supplying food and fiber, agricultural activity can also be instrumental in forming the landscape, providing natural resources, and preserving biodiversity. Furthermore, agriculture contributes to the achievement of societal goals such as the viability of rural areas and their development, food security, and preservation of cultural heritage. Agriculture may also have positive spillover effects on other economic sectors such as tourism. Positive externalities of agriculture result in the emergence of the said public goods, whereas intensive environmentally unbalanced agricultural activity causes damage to the environment. The need of boosting the positive agricultural externalities, creating a provision system of agricultural public goods, and keeping under control the negative externalities cannot be ignored.

In the context of the provision of public goods from agriculture, scientists encounter difficulties with evaluating those goods. No markets exist for them, it is not possible to exclude them from public consumption or to impose a tax on their use. Moreover, valuation problems result from a number of factors, namely: agricultural economic processes are coherent with biological processes, production proceeds on a large territory, etc. When the demand and supply conditions of agricultural public goods are unknown, problems with estimating their value and importance readily occur. No volume of similarly provided public goods can be defined as optimal with regard to a society. The absence of scientifically reasoned methodological principles or a specific valuation methodology for agricultural public goods prevents from rationalizing the economic regulation of the provision of public goods from agriculture and securing the quantities of agricultural public goods required by the consumers.

To ensure economically grounded volumes of agricultural public goods, it is essential to develop an efficient economic regulation system for the provision of public goods and to produce an economic value based model of the regulation of agricultural public goods provision.

Key words: agriculture, externalities, public goods, regulation, economic value.

JEL codes: D61, D62, Q51, Q58.

Introduction

Lately there have been major changes in the attitudes of European citizens towards rural areas and agriculture. The rural area is no longer regarded merely as a production site but also as a place of consumption; whereas the role of agriculture is thought to have expanded from production of commodity goods to forming open spaces and active cultural landscapes, taking care of monuments and promoting a live expression of the ethnoculture. The current changes in relevant thinking patterns, observed among the European citizens, when “quantity at the lowest price” yields grounds of paramount importance to such things as food quality, consumers’ health, value of biodiversity, rural landscape and environmental resources as well as preservation of family farms and local cultural and rural traditions have prompted scientists and politicians to search for new tools that are conductive to the internalization of agricultural externalities and security of optimal levels of provision of agricultural public goods. Over the last two decades, research on the economic regulation of agricultural externalities and the provision of public goods has notably expanded.

Most scientists dealing with the issues of agricultural economics (R. Almas, M. Bohman, M. Bredahl, L. Casini, D. Hellerstein, J. Lankoski, C. Nickerson, P. Paarlberg, E. Romstad, A. Vatn, et al), recognize the multifunctional character of agriculture and highlight its versatile influence on the environment next to the production of agricultural commodity. Positive externalities result in the emergence of agricultural public goods, whereas intensive environmentally unbalanced agricultural activity causes damage to the environment. The necessity of providing tools for boosting the positive agricultural externalities, creating agricultural public goods, and keeping under control the negative externalities has become apparent.

Unfortunately, the regulation of agricultural externalities encounters serious difficulties. Most agricultural externalities are excluded from market relations. Agricultural production prices often reflect the commodity production costs incurred by a private producer but do not show the costs and benefits of the externality. In the case

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of positive externalities, the demand for agricultural products downgrades the benefit of agriculture. Whereas a negative externalities’ supply of agricultural products fails to reflect all the costs. An inefficient distribution of resources is evident: overproduction of goods with negative externalities and underproduction of those with positive externalities. In the market, the combination of marketable and non-marketable products maximizing the welfare of the members of the society is not secure. Thus, public regulation is imperative, however there is a lack of both theoretical background for the achievement of a desired result and rational measures of economic policy. The absence of scientifically reasoned methodological principles and a specific methodology for the valuation of agricultural public goods prevents from rationalizing the economic regulation of the provision of agricultural public goods and securing the volumes of agricultural public goods required by the consumers.

It is becoming increasingly important to creating a generally acceptable system and to find the best methods of regulating agricultural externalities and provision of public goods and it requires immediate action. Those should be based on scientifically grounded volumes of agricultural public goods (measured with regard to the demand and supply of such goods, alternative creation costs, and economic value) which are optimal from the standpoint of the consumers.

The aim of the research is to create an economic regulation model of agricultural public goods provision, based on the methodology of public goods valuation.

Research objectives:
1) to justify the necessity of economic regulation of agricultural public goods;
2) to analyse the methods of economic regulation of externalities and public goods provision, and their applicability in the agricultural sector;
3) following the methodology of public goods evaluation, to identify methods for the evaluation of different types of agricultural public goods;
4) to produce an economic regulation model for the provision of agricultural public goods based on economic value.

Methods

A systematic comparative and logical analysis of research papers is used to analyse the theoretical and methodological aspects of the economic regulation of the provision of agricultural public goods, whereas graphic modelling is used to conceptualise the model of economic regulation.

The analysis of economic regulation of agricultural public goods provision and the choice of relevant political instruments are based on welfare economics and public choice theories.

Results and Discussions

Historical development of the significance of externalities and public goods provision in agricultural economics


goods and the economic regulation of their provision received insufficient attention.

Most research on the problems of the valuation of agricultural public goods is rather fragmentary, i.e. the focus is placed on single methods or their groups and their application. That fails to reveal the suitability of the method for the valuation of different type public goods.

In Lithuania, some aspects of the economic regulation of agricultural externalities and the provision of public goods were analyzed by M. Treinys, V. Vincūnienė, V. Vitunskienė. However, the problems of the valuation of agricultural public goods and the rationalization of their provision have not received thorough investigation. The aforesaid Lithuanian scientists presented their research results in the monograph “Agricultural Multifunctionality: Transformation Aspects” (2009), reports of the applied research work “Modeling of Multifunctional Agriculture in the Course of Agricultural and Rural Development Policy Implementation” (2004-2006), and scientific articles.


Literature analysis suggests that scientific works lack a systematic approach to the economic regulation of agricultural public goods, they fail to provide a consistent economic regulation model for the provision of agricultural public goods, which would include regulation of agricultural externalities and rationalization of public goods provision based on the methodology of public goods valuation.

**Exigency of agricultural public goods provision regulation based on economical value**

Scientific literature refers to the theory of market failure and the concept of agricultural multifunctionality to justify the need for agricultural public goods provision regulation based on economic value. Market failures occur when agricultural production market prices do not reflect the cost or benefit of the externality. The need for economic regulation of the provision of agricultural public goods is essentially determined by the fact that in the case of positive agricultural externalities the demand for agricultural products fails to reflect all the benefits from agriculture. Since positive agricultural externalities manifest themselves in the form of public goods, to produce whereof farmers have neither material nor moral prerequisites, the market does not ensure the creation of a combination of marketable and non-marketable production, which maximizes the welfare of the society.

The concept of agricultural multifunctionality represents a combined production process in agriculture where marketable and non-marketable results in agriculture – public goods and bads – are created simultaneously to form the basis for satisfying the need for economic regulation of public goods provision.

Agricultural multifunctionality means realisation of different functions of agricultural system with a view to the desirable economic, environmental, social, and cultural effect. Scientific literature (Almas, 1999; Romstad, 2000; Lanskoski, 2003; Prestegard, 2003; Yrjola, Kola, 2004; Boody, 2005; Kallas, 2007; Randall, 2007) describes agriculture as multifunctional, when next to the main function i.e. food, fiber, energy, and raw material production it plays one or several other roles. Those additional functions of agriculture include securing national long-term food supplies, vitality of rural areas, employment and stable income among the population, preservation of natural resources, biodiversity and cultural heritage, maintenance of rich cultural landscape, and safeguarding food safety and quality.

Researchers often use indirect economic benefits of agricultural public goods production to the inhabitants of rural areas to reveal the economic impact of the implementation of additional agricultural functions. The synergy effect, resulting from economic value based rewards for positive agricultural externalities, determines the desired volumes of agricultural public goods as well as higher employment and income levels among farmers, lower poverty levels in the rural areas, population and vitality of villages, and more favorable environment for setting up new businesses (related to rural tourism and recreation, in particular) in the rural areas.

The European model of agriculture was framed on the basis of the concept of agricultural multifunctionality. The EU agricultural policy is based on the provisions of the development of agricultural multifunctionality, i.e. a balance between marketable and non-marketable production and between production of private and public goods. Efforts are made to reduce the overproduction of traditional marketable products, the creation whereof has a negative environmental impact and impairs international trade relations, and to increase other results of multifunctional farming, i.e. agricultural public goods. Support to agriculture is not associated with the maintenance of farmers’ income but rather with the positive impact of sustainable agriculture on the environment, landscape and biodiversity. The development of agricultural multifunctionality and the regulation of their implementation are universally called the European model of agriculture.

**Methodological background to the model of regulation of agricultural public goods provision based on economic value formation**

Investigations of agricultural externalities receive a serious consideration since in agriculture public goods are created as a positive externality of the main commodity production and their provision directly depends on the
economic regulation of agricultural externalities. As distinct from food products or their raw materials, externalities of an agricultural activity usually do not enter market relations. That justifies the search for new instruments enabling internalization of agricultural externalities and ensuring optimal supply of agricultural public goods.

The analysis of the economic regulation of agricultural public goods provision and the selection of relevant political instruments is based on the approaches of welfare economics and public choice. The theory of welfare economics evaluates the political and economic instruments to be used to maximize the economic welfare related to agricultural externalities. According to this theory, public expenses and state activity based on rational research can correct market imperfections caused by externalities. Welfare economics evaluates the efficiency of farming systems taking into account not only the products realized in the market but also those, which are not realized therein, i.e. public goods. The public choice theory analyses the ways of solving economic problems by changing the state regulation measures and, thus, maximizing the public utility.

The provision of agricultural public goods directly depends on the economic regulation of agricultural externalities, which is a process where the external marginal costs and benefits are included into the marginal costs and benefits of the production or consumption of a good in order to supply the market with an amount of such good required by the consumers.

The analysis of traditional methods of the economic regulation of externalities and the provision of public goods enables to produce a tool frame for the economic regulation of the provision of agricultural public goods. Such tool frame minimizes the gap between the producers’ costs or benefit and the public costs and benefit, and thus boosts relevant production volumes of goods and services, which are considered useful by the consumers.

Economic literature (Baumol, 1988; Samuelson, 1997; Dolan, 1992; Mankiw, 1999; Pretty, 2001, et al) distinguishes the following main methods of externalities regulation: establishment and transfer of proprietary rights to the resources of production, taxation of negative externalities, subsidizing positive externalities, and imposing administrative control. Administrative measures are mostly applied to regulate the negative externalities in agriculture, while the positive externalities are usually stimulated with subsidies. Subsidies are recognized to be one of the most efficient methods of the economic regulation of the provision agricultural public goods: the support to environmental technologies and farming methods is more economically efficient than spending money to restore degraded natural resources. In the process of agricultural public goods provision, subsidies to agricultural producers are often related to the environmental protection, food safety and animal welfare requirements and dissociated from marketable production. Scientists of many countries (Almas, 1999; Pretty, 2001; Vatn, 2002, Treins, 2002) agree that payments for creating public goods/services should be related to the provision of an appreciable benefit such as a continuous pro-active land exploitation and management, production of high quality food products, sales of those products in local markets (shorter food supply chains), protection and active management of the environment and heritage (above the progressive farming provided by the law), and the availability of territories to the society.

Dissociation of subsidies to agricultural producers from the production and its close relation with the environmental, food safety and animal welfare requirements make the core of Common Agricultural policy reforms. Support to agricultural public goods provision is based on the emergence of additional costs, related to the creation of public goods, and partial loss of farmers’ income.

The performed analysis of the economic regulation methods of the provision of agricultural public goods shows that the security of the desired level of agricultural public goods supply requires to develop an effective system of economic value based economic regulation of the provision of public goods, which derives from the following:

- prices of agricultural products and services reflecting the benefit from agricultural externalities and defraying the costs of creating the same;
- cancellation of all subsidies deprived of social or economic reasoning;
- dissociation of subsidies from the production and linking them to the provision of public goods;
- tax system based on rating environment polluters and users of non-renewable energy resources.

The issue of the evaluation of agricultural public goods is highly important as it provides for a rational economic regulation of the provision of agricultural public goods and secures an optimal size of those goods. Scientifically unsound economic regulation of agricultural public goods provision (irrespective of their demand, supply, and economic value) may have a serious influence on the distortions in the agricultural products market and international trade. Too strong support to the providers of agricultural public goods (who have overestimated the public goods) may cause an unreasonable increase in exports of agricultural products and a rise in food products prices in the domestic market.

That is why the regulation of the provision of agricultural public goods should be based on public goods evaluation methodology. Recently various public goods evaluation methods were described by Hanemann (1994), Pruckner (1995), Krumalova (2002), Lankoski (2003), Nilsson (2004), Yrjola, Kola (2004), Kubičkova (2004),
Aizaki (2006), Kallas (2007), Nielsen (2007), and Randall (2007), however there is still no generally accepted methodology for agricultural public goods evaluation. Since most emphasis should be placed on the contingent valuation and hedonic (travel cost evaluation, comparison of real estate prices, public presence at the good) methods used to determine the demand for agricultural public goods and the willingness to pay for those goods as well as to methods of evaluation of the agricultural public goods production costs (preventive, reconstructive, and alternative).

Economic literature identifies two groups of methods for determining the value of agricultural public goods. On the one hand, the methods of valuation of agricultural public goods are related to their supply combined with the commodity, on the other hand they depend on the demand and the willingness to pay for them. The methods are either based on cost or benefit evaluation. The cost evaluation methods are used to estimate the direct, indirect, and alternative costs, incurred by a public goods provider. The methods of the received benefit estimate the number of the public goods users and their willingness to pay for those public goods (for the purpose of working out an acceptable price for using those goods if they were provided by a private market). To arrive at the most objective value of public goods, both groups of methods should be applied. As a result, the agricultural public goods supply level acceptable to the society can be established. A comparison of public goods and market goods with similar properties can give rise to adjustments in the value of agricultural public goods.

The contingent valuation method is one of direct methods frequently used to estimate the economic values of goods created in agriculture. This survey is based on an economic method designed to establish the value of non-marketable goods. The main technique used by the research is the consumer interview or questionnaire on the priorities/choices regarding agricultural public goods. This method helps to create a hypothetic market of public goods. The main objective is to measure the consumer willingness to pay for this public good i.e. the amount of money an individual is ready to pay for positive quantitative and qualitative changes of the good. This process often involves asking the consumers to evaluate specific state policy actions aimed at maintaining or improving the conditions of public goods and to express their willingness to make additional payments in the form of taxes for any positive changes in the public goods condition. The contingent valuation method is a kind of voting by the respondents about the relevance of political measures.

The contingent valuation method enables to estimate the demand for agricultural public goods and contributes to the establishment of agricultural public goods economic regulation measures and the size and forms of compensations to farmers. When determined by the contingent valuation method, the willingness to pay for agricultural public goods at a certain level of additional costs can be used to establish the volume of agricultural public goods provision, which is considered optimal by the consumers.

The main fault of the contingent valuation method is the frequently occurring overestimation of public goods: respondents do not evaluate any alternative uses of their own means. On the other hand, Randall (2002) and Lankski (2003) state that in some cases such “overestimation” of agricultural public goods is logical. The willingness to pay for agricultural public goods is sometimes increased by the trust in the future value of the good and by the consumer’s satisfaction with knowledge about the existence of such good. Hence, the economic value of goods consists of usable and unusable value.

Hedonic price methods are usually applied to establish the value of agricultural public goods characterized by aesthetic and recreational qualities. They are based on the assumption that a demand for real estate, travel services or traditional local products is related to the recreational or aesthetic value of environmental goods. The evaluation methods of goods provision costs are usually used to assess goods of the natural environment and to determine the loss of the farmer’s income or the emergence of additional costs related to sustainable farming.

Systematization and critical estimation of the valuation methods of agricultural public goods revealed that the value of agricultural public goods is defined by combining the methods of agricultural public goods supply and demand valuation. The methods of agricultural public goods supply evaluation measure the alternative costs incurred by the provider. The demand evaluation methods estimate the public presence at the public good and the numbers of users and their willingness to pay for this public good.

When based on economic value, the evaluation of agricultural public goods and the regulation of their provision enable to resolve market failure problems arising from agricultural externalities and also to prevent limitations in the state regulation. An irrational economic regulation of the provision of agricultural public goods failing to measure or consider their demand and supply can have a serious effect on the agricultural product market and cause international trade distortions.

**Model of the regulation of agricultural public goods provision based on economic value and its empirical investigation**

The conducted investigation of the market failure and externalities theories and the analysis of the economic regulation problems of agricultural public goods provision enable to create a model of the regulation of agricultural public goods provision based on economic value, which embraces the regulation of agricultural external-
Economics and Rural Development

The necessity of a coherent system embracing a positive justification of the reasons determining the importance of the economic regulation of agricultural public goods provision, the selection of the regulation tools, and the appraisal of the consequences to the society, the rural development, economic entities, and households presupposes the structure of the presented concept model (Fig. 1).

Source: created by the author

Fig. 1. Structure of the model of agricultural public goods provision regulation based on economic value
The model focuses on the resolution of the agricultural public goods evaluation problem. To achieve this objective, the model employs techniques of public goods demand and supply evaluation and justifies the best evaluation methods for different types of agricultural public goods.

The development of the system of economic regulation measures for agricultural public goods provision is based on a critical evaluation of the traditional methods of economic regulation of externalities and public goods provision, the possibilities of their selection and application, and the adaptation of those methods to the agricultural sector. The analysis of the problems of the economic regulation of agricultural public goods provision adheres to the theories of welfare economics and public choice.

The model emphasizes the dependence of the public utility of agricultural public goods on the number of the consumers of the good. Therefore, certain marketing measures, such as providing information on the existing public goods (increasing public awareness, promotion) and the development of the infrastructure (construction of access roads, tracks, and routes, playgrounds, etc.) to improve the physical accessibility of the public goods can increase the public utility of agricultural public goods. Here investment projects aimed at increasing the supply of public goods where the mass media is used to inform the population of the existence of public goods play a vital role and those cases are rather common in the European Union. Such state support stimulates public interest and attendance in the places of public goods allocation.

The evaluation of the outcomes of the economic regulation of agricultural public goods provision should take into consideration the synergy effects arising from the regulation in the rural areas. The implementation of the provisions of the suggested concept model can not only ensure appropriate volumes of public goods and a rational use of natural resources but it can also increase the farmers’ employment and income levels, affect the vitality of rural areas, and provide conditions for the development of new trades in the rural areas (particularly those related to rural tourism and recreation).

The empirical investigation was based on the created method. It used the methods of contingent valuation and cost valuation of the provision of public goods to evaluate an agricultural public good – agrarian landscape. Proposals on rationalization of the economic regulation of the provision of agrarian landscape public goods were presented.

The contingent valuation method used in the questionnaire survey measured the willingness to pay for the landscape goods created in agriculture. Before the respondents were offered the questionnaire, they were informed of the existing landscape conditions and the amount of money allocated by the Ministry of Environment to landscape management through various agricultural development programmes. Then they were introduced to different landscape management alternatives. And only after that the respondents were asked about their readiness to make additional payments for agrarian landscape management (where the answer was positive, they were asked how much they are ready to pay).

The empirical investigation of the demands of the agrarian landscape aims to reveal the demands of urban population and visitors to rural areas for the goods of agrarian landscape, to determine the role of the agrarian component (agricultural activity) in creating those goods. For this purpose, the interviews included the citizens of five largest cities of Lithuania.

During the empirical investigation, the main focus was placed on the following:

- whether people prefer an open active landscape, strongly influenced by agricultural activity, to a natural landscape?
- what is the opinion of the population of the role of agriculture in landscape formation?
- what is the level of willingness to pay for landscape goods created by agriculture (whether the consumer prefers an attractive or a decayed landscape and whether the consumer is ready to pay for changing it)?

The results of the agrarian landscape supply investigation show that most respondents (94%) approve of purposive agriculture support measures to improve the landscape conditions. However, only slightly over 50% of the respondents are ready to make additional payments for positive changes in the natural environment and landscape. The investigation found that the amount of LTL139.3 per year represents the average willingness to pay for agrarian landscape public goods. The distribution of willingness to pay for agricultural landscape public goods is provided in Figure 2. The willingness to pay for agrarian landscape goods depends on the income level, education, environmental awareness, and the relation with agricultural activity.

The empirical investigation of the willingness to produce agrarian landscape goods includes alternative cost valuation methods and analysis of economic, social, and environmental efficiency of the economic regulation measures of agricultural public goods provision applied in the EU. The conducted investigation shows that the provision of agricultural public goods determines higher farming costs and profit losses, and therefore state financing is indispensable to secure the desired volumes of public goods. Farmers are willing to take part in the EU measures for the provision of agricultural public goods provided that the alternative costs of environmental farming are covered. The EU measures for the economic regulation of agricultural public goods provision applied in Lithuania have made a weighty contribution to the improvement of the landscape, preservation of the biodiversity, providing conditions for the development of rural
tourism, and an increase in the income of rural population. The impact of the support on the sustainability of the traditional farming methods, land use (maintenance of meadows and pastures in particular), and the crop structure determines the efficiency of the measures in the field of agrarian landscape improvement.

The conducted investigations allowed bringing forward proposals on the improvement of the economic regulation measures for agricultural public goods provision. Subject to coordination with the European Commission, Lithuania can introduce further measures for the economic regulation of the provision of agricultural public goods. Those measures should be directed at maintaining the continuity of agricultural activities in the areas that are less favorable for agriculture, characterized by fast rates of deagrarization, where agricultural activity has a positive effect on the landscape, biodiversity, stability of ecosystems, cultural heritage, and viability of rural areas.

The research emphasized that the amounts allocated for financing those measures should depend on the willingness of the consumers to pay for agrarian landscape goods, whereas the payments to agricultural producers should be based on the analysis of agricultural producers’ alternative costs incurred from organic farming and expenses related to the agricultural areas of organic production and environmental requirements or the implementation of good farming practices.

**Conclusions**

- Scientific literature provides the theory of market failure and the concept of agricultural multifunctionality as the basis for the need for economic regulation of agricultural public goods provision. The need for agricultural public goods provision regulation based on the economic value is essentially determined by the fact that in the case of positive agricultural externalities the demand for agricultural products does not reflect the whole benefit received from agriculture, thus revealing an inefficient distribution of resources, i.e. the products determining the creation of public goods are underproduced. State intervention is necessary to secure the supply of public goods. Agriculture being recognized as a multifunctional activity gives rise to the need of an economic value based regulation of the provision of agricultural public goods targeted at the desired economic, social, environmental, and cultural effect.

- A critical evaluation of the traditional methods for the economic regulation of externalities and public goods provision and the possibilities of their selection and application in agriculture brings to the conclusions that to secure a desired level of agricultural public goods supply it is necessary to create an economic value based regulation system for agricultural public goods provision, which takes account of the conditions of the development of the agricultural public goods demand and supply; subsidies, reflecting the benefit from agricultural public goods and alternative costs of their creation; cancellation of any subsidies with no social or economic justification; dissociation of direct payments from the production and linking support to the provision of public goods; and a taxation system, based on the identification of environment polluters and users of non-renewable energy sources.

- The created model of the economic value based regulation of the provision of public goods from agriculture allowed to integrate the factors determining the need of the economic regulation of agricultural public goods provision into a coherent system, to choose the regulation tools, and to evaluate the effects on the society, the rural development, and economic entities.

- The conducted empirical investigations revealed that linking the analysis of the public goods production
costs with the analysis of the willingness to pay for the provided public goods results in an objective basis for rationalizing the economic regulation of public goods provision.

- Rationalization proposals for the economic regulation of agrarian landscape goods provision can be based on the created model and the conducted empirical investigations. Subject to coordination with the European Commission, Lithuania can introduce further measures for the economic regulation of the provision of agricultural public goods. Those measures should be directed at maintaining the continuity of agricultural activities in the areas that are less favorable for agriculture, characterized by fast rates of deagrarization, where agricultural activity has a positive effect on the landscape, biodiversity, stability of ecosystems, cultural heritage, and viability of rural areas. The amounts allocated for financing those measures should be based on the willingness of the consumers to pay for agrarian landscape goods, whereas the payments to agricultural producers should be based on the analysis of agricultural producers' alternative costs incurred from organic farming and related to the agricultural areas of organic production and environmental requirements or the implementation of good farming practices.

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