

A Methodology for Conducting Hierarchical Analysis of the Development of Local Mono-product Markets

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Abstract

In this article, the authors propose and put into practice a methodology for conducting hierarchical analysis of the development of the crop-farming market, the scientific-methodological basis for which is the development of a factor model for assessing the interrelationship between the outcomes of engaging production potential and market infrastructure in the crop-farming sector and the modeling and adaptive forecasting of the parameters of local crop-farming markets, as well as developing forecast scenarios for the development of their potential. The methodology was tested through the example of local crop-farming markets in constituent regions of the North Caucasian Federal District (NCFD) of the Russian Federation (RF). The methodology brings to light the potential for the future growth of markets under study and enables us to compare the special aspects of reproducing crop-farming products in different regional localities, the dynamics of the development of corresponding local markets, and fluctuations in the main parameters of the markets.

Keywords: gradual analysis, local market, development factors, hierarchical analysis

1. Introduction

The process of global integration of economic relations is naturally complemented by the process of regional differentiation, which facilitates the singling out, in the aggregate flow of the development of the world market, of a set of specific branches in the evolution of local markets with a different scale, development level, and character of products circulating in them. This circumstance in full measure relates to the development of local crop-farming markets in modern Russia, oriented towards satisfying a societal need for products which form the basis of the nutrition of the population of corresponding regions. Furthermore, the sustainable development of those markets ensures the resolution of the priority objective of ensuring Russia's food security.

The sustainable development of local markets amid uncertainty and increased risks requires developing scientifically substantiated methodologies for modeling and forecasting using formalized methods of identifying patterns of development and foundational trends enabling us to take objective account of existing economic conditions and changes in the market situation (Yarkova, 2013; Tomilina et al., 2013).

Correct assessment of objective trends, substantiation of approaches to forecasting, and development of an aggregate of prognostic scenarios are really crucial for local crop-farming markets, which have long been operating in a crisis situation, the consequences of which will be long felt (Berezhnoy et al., 2014). That said, the lingering crisis is due to a number of reasons, including higher-than-expected growth in prices for seeds, equipment, and energy carriers, the expansion of imported analogous products, institutional barriers, major physical and moral wear and tear on the capital stock, and the low effectiveness of management and marketing mechanisms employed (Berezhnoy et al., 2014; Gerasimov et al., 2014; Gerasimov et al., 2014). Nevertheless, the above markets still possess substantial potential for growth, as, starting in 2000, they have demonstrated a major growth.

The author's research topic gains additional relevance due to that the true stabilization of local crop-farming markets is possible only through stepping up scientific support for this process, which will help match up the priority needs in the development of local markets with the capacity for targeted financial-investment support for them on the part of the government (Siptits et al., 2009; Sklyarov & Sklyarova, 2013; Uglitskikh & Klishina, 2013).

2. Methodology

In the course of a systemic study into the sustainable development of local crop-farming markets, the author worked out a methodology for gradual analysis of the process under study, which is grounded in comparing the special aspects of reproduction of crop-farming products in different regional localities, the dynamics of the development of corresponding local markets, and fluctuations in the main parameters of the markets; the proposed approach focuses attention on analysis of major systemic blocks in the market: the resource block, the intensity of economic relations block, and the realization block.

Markets in modern Russia formed in a specific climate of transformation of a centralized economic system, which served as a reason for many issues in its development: the weakness of the forces of competitive interaction; increased government control of professional market participants; the existence of a number of substantial institutional barriers, etc. The above issues are also inherent to the crop-farming market, in which corresponding agricultural and food industry products are circulating.

Analyzing the operation and forecasting the development of the crop-farming market requires providing a rationale for corresponding focus areas and developing corresponding indicators. Analysis indicators can, as a result of circumstantiation of the study's aims, be expanded and concretized inclusive of external and internal conditions for the operation; that said, we must take account of trends in the development of modern markets-their getting closer to a new quality of transactions, as well as ensuring the informativeness of transactions(Gerasimov et al., 2014).

Summarizing the results of an analysis of factors in the development of local crop-farming markets helps establish the main issue in the present stage of the process, which is associated with Russia's entry into the WTO-ensuring an effective interrelationship between goods and financial flows based on the formation and realization of local competitive advantages within the corresponding functional subsystem of the regional agro-industrial complex (AIC), which presupposes: the specification of the corresponding assets of professional participants in local crop-farming markets; the formation of zones of accelerated growth in the production of the given product within the region's internal environment; the use of the potential of public-private partnership for developing a regional market infrastructure and ensuring the necessary level of the investment attractiveness of the above markets (Vasilyeva & Urbanovich, 2011).

The above considerations help establish a group of factors that have a substantial impact in ensuring the sustainable development of local crop-farming markets and form within the internal economic environment of regions in modern Russia-a group of informative-adaptation factors that provide for the need for adapting the organizational mechanisms and institutes of local markets to the conditions of dynamic and deep social-economic transformation (Bobryshev et al., 2014; GorinandPavlov, 2012; Tatuev & Bahturazova, 2014).

The sustainable development of the local crop-farming market is a complex, synthetic category which reflects the impact of the entire aggregate of development factors and provides for the optimum, from the standpoint of major participants in the market, progress of its major parameters and the smoothing over of its dynamic fluctuations.

A crucial distinctive characteristic of systems analysis in market systems is its hierarchicality (Berezhnaya & Kiseleva, 2012). When used in respect of the crop-farming market, such analysis should be conducted in the following dimensions: positioning the local crop-farming market in the country's economic space; analysis of objective conditions and trends for the development of the local crop-farming market; conducting hierarchical analysis of the development of the market based on a system of indicators (Table 1).

Comparative analysis of the market under study at the first stage helps conduct an objective assessment of the effectiveness of its operation and determine the major factors impeding its development, which enables one to work out a set of activities aimed at ensuring the sustainable development of the local crop-farming market with the use of external experience.

Table 1. A Methodology for conducting hierarchical analysis of the development of a local crop-farming market

Stage 1 Comparative analysis of the local crop-farming market at different levels	<i>Venues</i> -RF, NCFD, Stavropol Krai <i>Subject</i> :-volume indicators of production (area under crops, crop yield, crop production); - pricing system (prime cost, prices); - product sales channels; <i>Methods</i> : analysis, comparison, grouping, balancing method, elimination <i>Techniques</i> : abstract-logical, graphic, monographic, retrospective, systems analysis, economic comparison, statistical analysis, averaging method
Stage 2 Analysis of natural-economic patterns in the development of the local crop-farming market in specific regions	<i>Venues</i> -Stavropol Krai <i>Subject</i> :-natural-climatic conditions for production; - land resources; - material-production resources; - sales channels; - indicators of intensity of production and sales; - pricing system <i>Methods</i> : analysis, comparison <i>Techniques</i> : systems-subsistential analysis and systems-derivative analysis, expert evaluation method
Stage 3 Factor analysis of the local crop-farming market in the region (broken down by territories)	<i>Venues</i> -Stavropol Krai <i>Subject</i> : -system of endogenous factors; - system of exogenous factors <i>Methods</i> : analysis, comparison, modeling, optimization <i>Techniques</i> : methods of factor and cluster analysis, correlation-regression analysis, econometric modeling, extrapolation

At the second stage, the analysis of objective conditions and trends for the development of the crop-farming market within a specific region is governed by the unique conditions of each region; it is impossible to assess the cumulative impact of natural factors on the development of the given market in different territories. Even within one territory, it is expedient to conduct the analysis with a breakdown into specific zones and districts. That said, the system of indicators developed for this stage must be of a universal nature and serve as a model system to be used for other territories.

At the third stage, conducting a factor analysis of the development of the crop-farming market is associated with that the choice of a specific region follows the main rule of factor analysis-the greater the number of factors under study, the more accurate the results of the analysis. The practical conducting of such analysis is possible within the frame of a specific "closed" market system, like, for instance, the Stavropol Krai system.

In the framework of the systemic approach towards exploring the sustainable development of local crop-farming markets, we must focus attention on the method of hierarchical (gradual) analysis and forecasting; its major characteristics and algorithm are provided in Figure 1.

The sustainable development of the crop-farming market is determined by a set of impacting factors, the selection of which presupposes the realization of the Pareto principle, which states that the effectiveness of market processes is determined by quite a narrow group of factors which can be selected based on the expert evaluation method.

Gradual investigation is strategically oriented towards ensuring the sustainable development of the local crop-farming market and constructing prognostic scenarios for the development of the corresponding sphere of the AIC. It is grounded in the analysis of the existing system of the operation of market establishments in the

crop-farming sector in the conditions of the given territory, the determination of major factors affecting the development of the local market, and the assessment of the economic effectiveness of the market's operation.

The investigation ends with the prognostic modeling stage, constructing prognostic scenarios for the development of crop-marking using the integral effectiveness criterion, which is inclusive of various aspects of the operation of the market under study, and choosing the optimal variant of the scenario forecast for the development of the market.

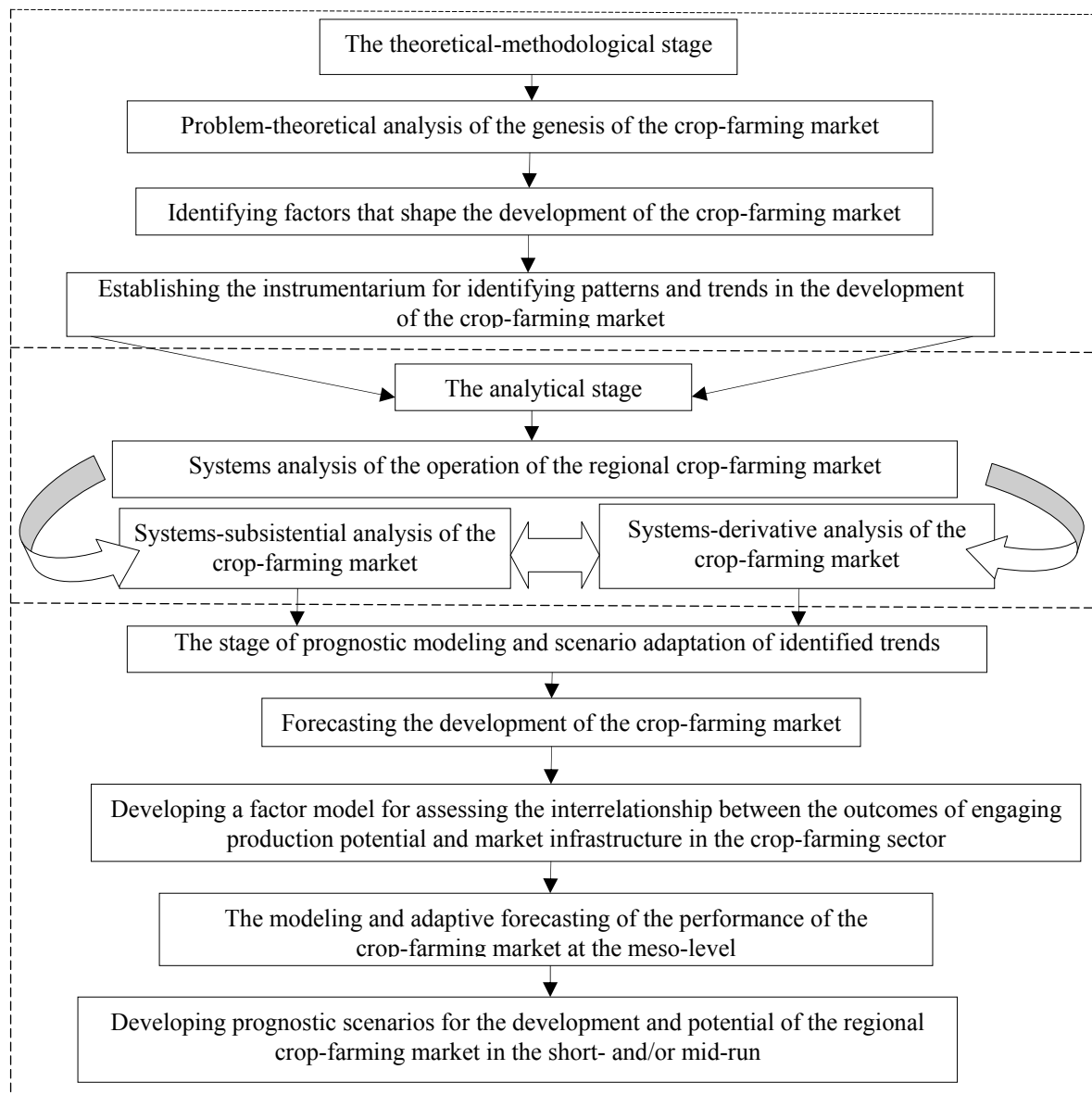


Figure 1. An algorithm for the methodology for conducting hierarchical (gradual) analysis of and forecasting conditions for the sustainable development of a crop-farming market

3. Results

The balanced development of all interrelated elements facilitates the effective development of the local market and the attainment of the end goal in the entire reproduction process it provides for-satisfying regional needs. Imbalance in one of the elements of the market under study results in a decline in the efficiency of the entire system.

The summarization of the results of gradual analysis within the setting of a specific territorial locality using the expert evaluation method at the next stage of hierarchical analysis of the development of the crop-farming market will help form groups of endogenous and exogenous factors determining the development of the given

market. At this stage, a foundational role is played by economic-mathematical methods and econometric modeling, the use of which will make it be possible to develop future scenario forecasts for the development of the crop-farming market through the example of a specific region.

The dimension of the analysis of the organizational effectiveness of the crop-farming market features link concentration analysis, which includes the exploration of interrelationships between all the structural elements of the market system. That said, we have to not just perform their quantitative assessment but assess their interaction between each other and between them and external systems in relation to the crop-farming market (e.g., the state or adjacent markets). We have highlighted the priority role of economic-mathematical methods and econometric modeling, using which we are going to carry out the development of scenario forecasts for the development of the crop-farming market (for the meso-level of economic relations) (Berezhnaya & Golikova, 2014).

The summarization of the above considerations and private inferences helps single out the major research objectives which are resolved through systems analysis in the context of the study of the market we are interested in structuring market systems; identifying links between market elements; determining the strategic system of goal-setting for the development of the crop-farming market; implementing the scenario modeling of market development inclusive of the backbone factors singled out; developing forecasts for the development of local market systems at different levels of their development; correcting, based on resulting forecasts for the market's development, managerial decisions made, etc.

The method of hierarchical (gradual) analysis and forecasting is adapted to the study of the sustainability of crop-farming markets. We have proposed an algorithm for implementing it, which helps determine the major dimensions of the development of the production potential of the territorial sphere of crop-farming, which form the basis of the evolution of the local market under study; in furtherance of scientific results obtained earlier, the proposed algorithm includes stages in the development of a factor model for the assessment of the interrelationship between the outcomes of engaging production potential and market infrastructure in the crop-farming sector, the modeling and adaptive forecasting of the parameters of local crop-farming markets, as well as the development of forecast scenarios for the development of their potential.

The consistent realization of the systemic approach to resolving the set scientific objective leads to the notion of an adapted local market system which possesses organizational mechanisms and institutes for adapting to the conditions of transformation and is capable of ensuring sustainable development. Based on the above notion, setting and resolving a set of objectives for the sustainable development of the crop-farming market is possible through the realization of progressive means-intellectual analysis of data, genetic algorithms, and cognitive modeling, which emerge in the process of inter-disciplinary interaction. Based on a gradual analysis of local crop-farming markets, we have determined the progressive characteristics of the development of these markets, which are associated with interaction between the processes of integration and differentiation of economic relations: we have brought to light the major trends in the evolution of the crop-farming sector, which are inherent to the present stage in the development of the world economy; we have provided forecasts for dynamic balances in the development of production of crop-farming products in the mid-run as applied to countries that are the major producers of the product.

In developing the concept of the sustainable development of the local market under study, there is value in the prognostic approach to scenario forecasting, which helps perform an adequate assessment of the more likely course of events and their consequences (Zakharova, 2014). As part of this approach, a scenario for the sustainable development of the local crop-farming market is a variant model for future evolution, which involves: describing a possible course of events and specifying the probabilities of their implementation; determining the major factors that need to be taken into account and specifying in what way these factors can affect the events being modeled; developing alternative strategies for the development of the local market under study. In substantiating forecast scenarios for the development of the crop-farming market, it is expedient to employ the iterative multi-scenario fusion method, which is due to the following objective circumstances: the specialization of market establishments (grain, olives, etc.) and differences in conditions for their operation in the local market.

The multi-scenario forecasting method involves putting together variant scenarios for development for each local market based on aspects that substantially affect the production of such products and the iterative process of coordinating market development scenarios on the whole inclusive of various aspects (Berezhnaya & Kiseleva, 2010).

As part of resolving the scientific objective of exploring three levels of localization of crop-farming markets, which is formed in the global economic space, we have developed a systemic analytical instrumentarium that

helps assess the conditions for the development of the above markets and is applicable at the sub-regional, regional, meta-regional, and macro-levels of the study.

Based on forecast scenarios formed, one must conduct the development and correction of strategic plans for the sustainable development of the crop-farming market, which are inclusive of the results of the analysis of the external and internal environment based on indicators selected. As one of the possible analysis methods, there is value in the content-analysis method, which presupposes the study of formalized text and graphic information on the state of the market under examination.

4. Discussion

From a heuristic perspective, ensuring sustainable development presupposes making scientifically substantiated assertions on the prospects of the market's development, which can be established as of a given point in time, as well as alternative ways and completion times to realize them. Consequently, exploring the sustainable development of a venue we are interested in presupposes assessing its potential and determining various aspects of the effectiveness of the market's operation, including the degree to which the needs of the region's population and various organizations are met, as well as the needs of the very territorial economic system. Goals set can be achieved through the productive combination of various approaches and methodologies: factor analysis, strategic planning and forecasting, territorial market regulation, etc.

A special aspect of systems analysis of market establishments is the study of the impact of the interrelationship between them, among which we could point up organizational, economic, technological, and social, which, in turn, are divided into two large groups: vertical links; horizontal links. Vertical links determine the interaction of elements at different levels of the market system, while horizontal links ensure the interaction of elements at one level. When it comes to the crop-farming market, we need to trace the interrelationship between the elements throughout the process of the product's movement—from the production of crop-farming products (agriculture and primary processing), on through the trade-sales block (agrarian marketing), and to end-consumption (retail trade).

The balanced development of all interrelated facilitates the effective development of the local market and the attainment of the end goal in the entire reproduction process it provides for-satisfying regional needs. Imbalance in one of the elements of the market under study results in a decline in the efficiency of the entire system.

We should note the growing role of the adaptability of the market system amid dynamic and deep social-economic transformations. Adaptability stands for the ability to adapt to changing conditions in economic development, which substantially alter the forms and ways of the market system's operation and development. This characteristic of the crop-farming market gains in significance due to the fact that both agricultural technology and contractual links within the market system are quite susceptible to changes in external conditions.

The approximity of the market system is due to that it has a probabilistic character, since it incorporates a set of complex processes; consequently, the direction of the development of the market under study is determined by the criss-cross action of a set of exogenous and endogenous factors which are not always determined quantitatively.

Sustainable development incorporates two major interrelated components: the notion of needs, including priority needs (dealing with the basic existence of all strata of the population) and the notion of restrictions (associated with the state of technology and organization of society, its institutes), imposed on the ability of the external environment to satisfy the present and future needs of mankind. As applied to the market under study, these components signify the necessity of regulating the need for crop-farming products, as well as the necessity of taking account of actual restrictions in the sphere. The crucial components of the theory of sustainable development are also the dynamic growth concept, the organic growth concept, and the dynamic equilibrium concept. Let us highlight what is common to all these concepts-comparing a developing economic system with a living organism, which is manifested especially clearly in the organic growth concept. Its purport is that quantitative growth does not play a defining role in the evolution of living organisms and biological and social-economic systems. What is most crucial to evolution is potential for adaptation, the power of qualitative renewal, and the ability to survive amid transformation. It is qualitative perfection and the ability to adapt to the conditions of the external environment-not quantitative growth-that determine the system's sustainability. What is more, excessive quantitative growth undermines potential for development and dooms the system to instability (Gerasimov, 2014; Zakharova, 2014).

We can define the market system, as applied to our study, as an interrelated and ordered aggregate of production, infrastructural, trade, organizational, technical, and social processes which develop based on specific patterns with a view to satisfying the population's needs for major crop-farming products and ensuring the sustainable development of market relations in a climate of transformations. The effectiveness of systems gradual analysis is substantiated by multiple results of applying it. Furthermore, systems gradual analysis is constructive when there is a set of factors that number in the dozens. Consequently, the real practical conducting of systems analysis presupposes singling out some naturally formed locality—a relatively insular market system that can be exemplified by the crop-farming market in the region Stavropol Krai region, the NCFD meta-region, and Russia's national economy. In the strict sense of the word, all these markets belong to the category of local markets.

Gradual investigation is strategically oriented towards ensuring the sustainable development of the local crop-farming market and constructing prognostic scenarios for the development of the corresponding sphere of the AIC. It is grounded in the analysis of the existing system of the operation of market establishments in the crop-farming sector in the conditions of the given territory, the determination of major factors affecting the development of the local market, and the assessment of the economic effectiveness of the market's operation.

5. Conclusion

Transformations in the Russian economy, accelerated by the global downturn, have revealed the need for adapting local markets to the conditions of a number of interweaving transformation processes, including integration, consummation of market transformations, and continuation of post-industrial transformations.

The main issue in the present stage of the process, which is associated with Russia's entry into the WTO, is ensuring an effective interrelationship between goods and financial flows based on the formation and realization of local competitive advantages within the corresponding functional subsystem of the regional agro-industrial complex (AIC), which presupposes: the specification of the corresponding assets of professional participants in local crop-farming markets; the formation of zones of accelerated growth in the production of the given product within the region's internal environment; the use of the potential of public-private partnership for developing a regional market infrastructure and ensuring the necessary level of the investment attractiveness of the above markets.

Within the framework of the proposed methodology for conducting hierarchical (gradual) analysis, the potential of forecasting conditions for the sustainable development of the local crop-farming market can be complemented by the potential of modeling, which helps realize the advantages of the mathematical approach to multi-stage processes of processing information and employ identical means of setting and resolving similar objectives, as well as the potential of computing technology. There is validity to the inference that the use of scenario forecasting methods, within the frame of the proposed methodology, ensures a higher likelihood of developing an effective solution as part of the adopted strategy for the development of the crop-farming market in situations where such development of solutions is possible (quota allocation, investment support of regional participants in the market, etc.).

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