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## Potential Areas of Financial Incentives for the Development of Scientific and Innovation Clusters

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► **Abstract.** Currently, cluster associations are one of the most effective forms of organisation of innovation processes in the region, in which not individual enterprises compete in the market, but entire complexes that reduce their costs through cooperation. Such associations help to increase labour productivity, accelerate the pace of innovation in production, promote the competitiveness of various sectors of the economy, do not require significant funds and consist of various initiatives to encourage participants to cooperate. The establishment of the cluster allows the development of a specific economic space designed to expand free trade, increase exports of the cluster's products, and free movement of capital and human resources. The purpose of the study – summarise the mechanisms of support for cluster developments abroad. To expose modern aspects of the national institutional environment to stimulate the genesis of scientific and innovative agro clusters and identify the main possible areas of financial support for their development. General scientific and specific methods of empirical research were used: comparative-historical and monographic, which allowed evaluation of the dynamics of the development of state support for clustering processes in the European Union and Ukraine, and to identify the sources of their financial incentives; systematic approach - contributed to the study of the mechanisms of interaction of the cluster as a system with the surrounding social environment, to perceive the cluster development as a dynamic, constantly evolving integrity; analysis and synthesis provided an opportunity to identify potential financial methods of cluster support and to integrate approaches to the development of a mechanism for stimulating cluster associations; cognitive operations of comparison and description were used; the abstract and logical method was used for theoretical generalisations and conclusions. The implementation of modern cluster policies in the countries of the European Union is analysed. It is established that, despite the specificity of the development and implementation of cluster programs and their dependence on the context and validity of national/regional policies in different territories, the analysed approaches have some progressive similarities. The priority opportunities of smart specialisation of the region are presented, in the design of which cluster developments are the main "blocks". The best European projects related to the socio-economic growth of regions that stimulate the development of clustering are highlighted. The components of sustainable financing of regional cluster development in Ukraine are defined, which primarily involves start-up state support. The possibility of stimulating the clustering process with funds allocated from the state budget for the development of the regions, and for financing the Sectoral Policy Support Program was assessed. The possibility of self-financing and self-crediting scientific and innovative agricultural clusters, which will be established based on interregional scientific centres of NAAS, was confirmed. The conceptual foundations for the design of sources of financial support for the establishment and development of scientific and innovative cluster

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models based on interregional research centres of NAAS were developed. Based on successful European experience, the theoretical and methodological approaches to the development of financial clustering mechanisms in Ukraine have been improved. The areas of financial incentives for clustering processes within the framework of national, sectoral and regional strategies, in particular, strategies for the smart specialisation of regions and territorial communities, strategies to support small and medium-sized businesses as the main element of entrepreneurial initiative and the basic driver of cluster establishment are proposed

► **Keywords:** state support, clustering, regional development, financial mechanism, incentives, interregional scientific centre, smart specialisation

### ► Introduction

The issue of increasing competitiveness and ensuring innovative development of the agro-industrial complex of Ukraine is one of the most urgent for the national economy. Therefore, new forms of development of economic relations are being developed and implemented in the state, and the search for the most efficient use of available resources continues.

In particular, the Laws of Ukraine's "On Innovative Activity", "On Science Parks" and several other legal acts were adopted to establish and develop innovative structures of various types, intensify the processes of development, implementation, and production of new products both in domestic and foreign markets. In this context and in pursuance of the Program for the Implementation of the Concept of Reforming Agrarian Science, to improve coordination and intensification of scientific research and implementation of innovative developments based on the requirements of the regions, the National Academy of Agrarian Sciences of Ukraine (NAAS) in 2019 established five Interregional Scientific Centers, which included scientific and educational institutions, local authorities, representatives of agribusiness, public organisations, etc.

Therewith, the proposed cluster form of cooperation, which, given the international experience of recognition of its advantages, can ensure effective interaction of all structural units of interregional research centres to obtain a synergistic effect, remains unregulated in Ukraine [1, 2]. Therewith, for the successful implementation of cluster models, as international experience demonstrates, the determining factors are the development and implementation of appropriate strategies and programs to support the clustering process at the state level [3].

Moreover, the budgetary support of clusters, and any organisational form of production, is possible only under the condition of a balanced national policy, coordinated with the policy of regional development, innovation policy, and clearly defined modern tools to support the processes of economic clustering and further development of clusters.

The prospect of clustering was recognised at the state level in 2001 [4]. However, as is known, the practical implementation of this process is too delayed in time, primarily due to the weak state financial support in the form of public investment, budget financing, and loans guaranteed by the government or local governments. In addition, at the stage of cluster model development in Ukraine, the opportunities to receive assistance from international financial institutions are used very limitedly both in the form of cash grants and in the form of technical assistance, consulting services, etc.

As noted earlier [2], in recent years, in particular, government documents have demonstrated the necessity of promoting innovation in all promising areas of economic activity (namely, the agricultural sector of the economy has now become such), the establishment of scientific-innovative-production clusters based on the commercialisation of their scientific developments using unused production capacities of state-owned enterprises and sectoral research institutes. Therewith, back in 2013, it was envisaged to define and legislate a clear procedure for financing (co-financing) of clusters, priority projects, and transparent distribution of profits and assets based on the results of activities [6]. However, in 2021, experts of the European Cluster Collaboration Platform (ECCP), assessing the cluster policy of Ukraine, note that the implementation of the relevant program should be implemented through

financial instruments, but there is no information on the distribution of financial resources among the beneficiaries of the programme (cluster organisations, research institutions, academic institutions, technology centres, etc.) [7]. Thus, financial mechanisms for regulating the activities of clusters, especially scientific and innovative ones, in Ukraine require theoretical research and practical adaptation to economic activity.

#### ► Analysis of recent studies and publications

Several significant developments are known in the study of mechanisms for stimulating scientific and innovation activities in Ukraine. In particular, the prospects and new opportunities for stimulating the innovative development of the macro-region by improving the relevant mechanisms based on the results of monitoring the innovative sphere of the region's economy and forecasting trends in the development of new technologies are identified by the foresight method in S.D. Shchehliuk's research [6]. Scientists O. E. Kuzmin, O.O. Maslak, and T.E. Udovychenko note that there are problems on the way of clustering, to overcome which it is necessary to intensify activities to develop a unified state cluster policy. Therewith, the latter should cover: the development of support programs for small businesses, technology parks, and special economic zones; the development of investment and venture funds, and investment programs; promotion of projects designed to increase the competitiveness of cluster members; development of legislative initiatives for clustering the national economy; establishment of an institutional environment to stimulate cluster developments, etc. [8].

The necessity of establishing and improving the mechanisms of financial support for the development of clusters at the state level and providing them with the necessary methodological, information, consulting, and educational support is noted by V.S. Dubovyk in his work [9].

According to the results of the analysis of the functioning of clusters in nine economic regions of Ukraine, the researcher S.V. Busniuk identifies the peculiarities of their establishment and activity, specifying that the sources of financial capital development of the cluster are the own funds of

participating enterprises, funds of international organisations and programmes, sponsorship of business structures, charitable contributions of legal entities and individuals, grants and subsidies from the state and local budgets [10].

Scientists O.R. Kvasovskyi and E.T. Karapetian, having summarised the relevant definitions of a wide range of researchers, identified the structure of the financial mechanism, which is understood as a specific component of the economic mechanism, a set of interrelated components: financial methods, financial instruments, financial levers, regulatory and legal and information support. They further note that, given the increased importance of sources of financing for the activities of any cluster development at the stage of its establishment, if necessary, various financial institutions can be involved in the association: investment funds, microcredit institutions, venture capital and leasing companies, commercial banks, etc.

Despite the urgency of the problem, a unified approach to possible mechanisms of financial incentives for clusters at the regional and interregional levels has not yet been developed. The purpose of the study – summarise the mechanisms of support for cluster developments abroad. To expose modern aspects of the national institutional environment to stimulate the genesis of scientific and innovative agro clusters and identify the main possible areas of financial support for their development.

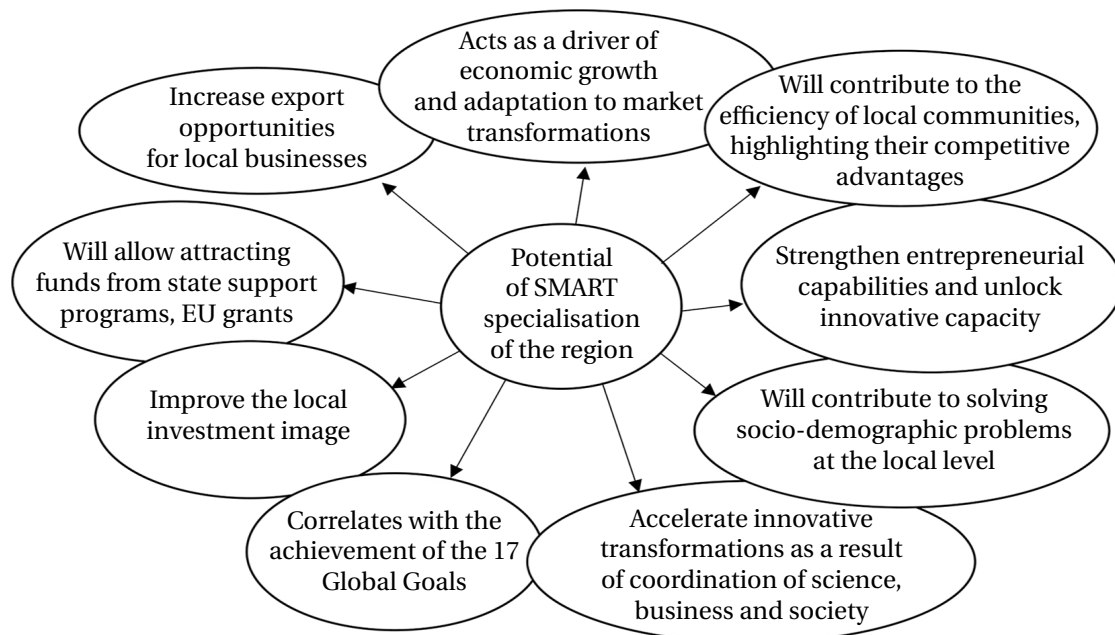
#### ► Results and Discussion

As the study of literature demonstrates, in many countries cluster developments are strongly supported by the state. Thus, the published report of the European Observatory for Clusters and Industrial Change on cluster support in 29 European countries demonstrates an in-depth analysis of 30 national and 55 regional programs, specifically designed policies and strategies to support clusters, which are widely used both in Europe and around the world. Therewith, even though the specific development and implementation of cluster policy depend on the context and validity of national/regional policies in different territories, the analysed approaches share some progressive similarities, in particular, support for the participation of small and

medium-sized enterprises in clusters, international cooperation of such enterprises in the same sector, intersectoral (inter-sectoral) cooperation, access to other markets, entrepreneurship development activities; financing of meetings and networking; establishment of new cluster infrastructure; promotion of eco-efficiency and a new culture of cooperation and management; business development [11].

In addition, the EU is gaining weight in the policy of regional innovation development, which is called the Smart Specialisation Strategy, and

should contribute to the economic growth of the regions through the full disclosure of their potential. Smart specialisation is a partnership between representatives of business, government, scientific and technical institutions, and public organisations, in which the authorities encourage and stimulate entrepreneurs, scientists, and developers to cooperate to implement the main areas of specialisation of the region. Therewith, cluster developments are the main “blocks” in the development of such specialisation (Fig. 1).



**Figure 1.** Priority opportunities for smart specialisation of the region

**Source:** Developed based on [3]

Currently, in European countries, the presence of a specific smart specialisation is considered a condition for obtaining funding from the European Union’s structural funds. The International Organisation for Economic Cooperation and Development (OECD) is conducting a relevant audit of “smart” specialisation. Throughout the EU, the authorities encourage the development of national and regional research and innovation strategies for smart specialisation (Research and Innovation Strategies for Smart Specialisation, RIS3) to ensure the proper use of EU structural funds and to increase synergies between different alliance policies: national and regional, and public and private investment [12].

Notably, the European cluster support system is based on the development and implementation

of programs at the European, regional and national levels, the main tasks of which are defined as:

- establishment of an institutional environment – higher, favourable for the development of clusters, based on strengthening the cooperation of stakeholders and increasing their competitiveness;
- modernisation of production and successful implementation of smart specialisation at the regional level;
- further development of innovative (research) developments, including their technological support.

There are several programs in the European Union to stimulate cluster development. Noteworthy are the projects designed for the economic development of the regions. This is Interreg Europe - a project to improve regional policies in four main

areas: innovative development, support for small and medium-sized enterprises (SMEs), green economy, and energy efficiency; SMARTY – a project to develop a unified knowledge base on best practices in regional development approaches; InnoHEI – a project to improve research infrastructure and establish sustainable cooperation between science and business; INNO Industry – a project to improve innovation development policies through the involvement of clusters in smart industry projects, the establishment of regional hubs on the development of the region's innovation ecosystem in a particular industry through regional clusters [13]. In European countries, three main sources can be identified for the financial support of the establishment and functioning of cluster structures:

1. State budget (France, Sweden, Portugal, Norway).
2. Regional budgets (Germany, Great Britain, Lithuania, Poland).
3. EU Structural Funds (Germany, Great Britain, Lithuania, Poland) [3].

In Ukraine, innovative cluster structures could efficiently contribute to the regional socio-economic development of territorial communities in particular. To this end, local authorities should ensure at the initial stage the integration into regional development strategies of tasks designed to establish and develop clusters, develop and constantly update the list of innovative business entities and key technological solutions in key industries, especially in selected areas of smart specialisation of regions and communities. For example, to significantly strengthen communication links between the authorities, business and scientific institutions, and higher education institutions of the region (joint presentations, consultations, specialised innovation days, training, workshops, etc.), to improve and develop cluster infrastructure, including using the infrastructure capabilities of innovative technology parks being established in Ukraine.

However, it is necessary to actively stimulate the processes of clustering development, which is possible both through the direct financial support of cluster initiatives and through indirect mechanisms. Indirect stimulation can be performed within the framework of national, sectoral, and regional strategies, in particular, strategies of smart

specialisation of regions and territorial communities; strategies to support small and medium-sized businesses (SMEs); support for technological transformations and significant modernisation of existing industries; organisation of competitions for the development of competencies, training, information campaigns, financing of relevant fundamental research and development; facilitating access to export markets and increasing participation in global value chains (internationalisation of cluster initiatives) [13].

The “Cluster Support Program in Ukraine: Development Principles and Key Features” proposed by German and Ukrainian experts at the end of 2015 provides for a model of sustainable financing for regional associations, which could include:

1. Basic budget funding (e.g., from state/international institutions/organisations).
2. Income received (e.g., membership fees, income from services such as participation in trade fairs).
3. Third-party funding (e.g., private sector investment project financing, international or government research programmes).

However, the program notes that the initial funding should be provided by the public sector/international organisations. Further, a model of downward financing is proposed, which motivates the cluster to generate income and find alternative sources of funding. Thus, if at the preparation stage 100% of the eligible costs are covered by the public sector/international organisations, their share can be reduced during the following stages [14].

Notably, even in the absence of sufficient legislative regulation, clusters in Ukraine objectively exist, and some of them are financed. Thus, in 2018, within the framework of the implementation of the Agreement on Financing of the Sectoral Policy Support Programme [15], the following funds were allocated: “Regional Innovation HUB” (RInnoHUB) – UAH 1.95 million; for the establishment of an aviation cluster as a “growth point” of the economy of the Kirovohrad region – UAH 9 million; for the development of rural entrepreneurship and infrastructure of the agro-tourism cluster “HorboHory” – UAH 18.37 million [3].

Currently, three projects, which can be identified as cluster start-up programs, are being funded from the EU budget through sectoral support,

amounting to approximately \$ 16.2 million. The total amount of funding for the 70 projects in Ukraine is USD 1.5 billion, which is 5% of the total funding for 70 projects in Ukraine. Therewith, co-financing from local budgets and other sources accounts for only about 1% [3, 16].

Stimulating the design of cluster developments is possible with the funds allocated from the state budget for the development of regions. Thus, the State Regional

Development Strategy for 2021-2027 (SRDS) provides for the targeted allocation of funds for the implementation of regional development programs that correspond to the priorities and objectives defined in it and regional development strategies, the annual amount of which, according to the legislation, will be at least 1% of the general fund revenues in the state budget [14].

The Action Plan for 2021-2023 for the implementation of the State Regional Development Strategy provides for the area "Support for interregional cooperation and exchange programs between the regions of Ukraine", one of the tasks of which is to establish conditions for stimulating regions and territorial communities to cooperate and implement joint interregional projects. In addition (which is important for the development of interregional scientific centres of NAAS as cluster structures), some operational purposes of the mentioned plan, to promote the introduction of innovations and the growth of the technological level of the regional economy, support innovative enterprises and startups, provide for the development and implementation of an efficient mechanism for supporting startup companies, innovation clusters that unite legal entities-residents and individual entrepreneurs engaged in innovative activities, technology transfer centres. To this end, first of all, it is necessary to conduct an inventory of the existing research and innovation infrastructure in higher education and research institutions to assess the possibilities of their participation in the development of regions based on smart specialisation, participation in the development of efficient interaction between the educational and scientific environment and business [17].

According to the SFDRR, and for the implementation of regional development strategies until 2027, separate measures of immediate support for cluster development are envisaged at the regional

level. In particular, using such support tools as the establishment of technology transfer centres, databases of domestic developments of the profile area, educational environment for the population of the region, business incubators for start-up companies; training and retraining of personnel to ensure the activities of clusters by specialists; search for investors; consulting support, etc. Therewith, the focus of regional strategies is mainly the establishment at the level of the best European standards within the framework of smart – specialisation and strategic vision of the relevant conditions, basic facilities, and infrastructure elements to ensure an investment attractive and environmentally – the correct image of the territory through the introduction of a cluster model of development and effective use of the innovative potential of the region [12].

Along with the instruments of external support, it is important to establish a financial mechanism in the cluster structures, based on the principle of ensuring the effective interaction of all its elements (methods, tools, and levers) that influence the process of reproduction of scientific and innovative and production and economic activities of the cluster association. The structure of the financial mechanism of cluster development includes such financial methods as financial forecasting and planning, financing, investment, lending and self-lending, pricing, taxation, incentives and responsibility, financial control, etc.

Under the current conditions, the priority financial methods that should be used in the process of establishment and further functioning of clusters, including scientific and innovative ones, include, in addition to investment, financing, lending (with which there are some difficulties), and, importantly, self-credit and self-financing.

Within the cluster association, self-financing means that covering the costs of both transformational and transactional (very relevant for science and innovation clusters) should be performed at the expense of own funds of development funds established by deductions from the profits of participating entities or the total profit of the cluster establishment. Therewith, self-lending provides an opportunity for cluster members to avoid raising funds on the credit market and mobilise internal loan sources for this purpose. Notably, the potential for practical

implementation of the self-lending method at the level of cluster structure is much more significant than at the level of a separate independent entity, as cluster members can establish their credit union [5].

If considering the interregional scientific centres of NAAS as scientific and innovative cluster structures that unite homogeneous regional clusters, their establishment will depend primarily on the mobilisation of internal resource capabilities of a particular territory and the possible attraction of funds from the above state sources. Thus, the current aggregate potential of scientific, natural, labour, institutional and financial resources can stimulate the development of favourable conditions for the implementation of the plan, and in the future the established integrated system of local authorities,

science, education, and agricultural business will develop independently, using generally accepted methods of financial management.

To some extent, financial support for the activities of the newly established, based on the mentioned centres, scientific and innovative agricultural clusters can be provided in the estimates of using the funds of the special fund of the National Academy of Agrarian Sciences of Ukraine. The availability of such potential opportunities is evidenced by the reported financial performance of NAAS (Table 1). Although for this purpose it is necessary to initiate and introduce appropriate amendments and additions to the budget legislation and to revise the internal regulations on the procedure for the development and use of the particular fund.

**Table 1.** Financial performance of NAAS, UAH million

Indicator	Approved with amendments		In fact	
	2016-2020	including 2020	2016-2020	including 2020
Total amount of funding	5014.6	1298.0	5527.4	1255.8
1. General fund, UAH million	1988.1	517.9	1986.2	517.5
including for scientific and research activities	1892.6	495.5	1894.3	495.2
2. Specific fund, UAH million	3026.4	780.1	3541.1	738.2
including proceeds from operating activities	989.0	210.9	964.6	206.0
3. The share of the special fund of scientific institutions in the total amount of funding, %.	60.3	60.1	65.9	60.8
4. Received own funds of scientific institutions per 1 UAH of the general fund, UAH	1.52	1.51	1.78	1.60

**Source:** Developed based on [18, 19, 20]

### ► Conclusions

World experience demonstrates that financing of cluster initiatives and further activities of associations can be performed both through direct budget support of clusters and indirect mechanisms. Indirect incentives are available within the framework of national, sectoral, and regional strategies, in particular strategies for the smart specialisation of

regions and territorial communities, strategies for supporting small and medium-sized businesses as the main element of entrepreneurial initiative, and the main driver of cluster establishment. The regional development strategies developed in Ukraine mostly only declare the current trends of social and economic growth, including the establishment of clusters, but do not provide financial support.

Therewith, it is necessary to establish the productive activity of clusters, including scientific and innovative ones:

1) financial capital for the launch of cluster initiatives (cluster management), which is based on a partnership with the participation of the public and private sectors and provides start-up assistance for the development of associations on the principle of co-financing and a progressive basis;

2) financial capital for cluster development (funds for joint cluster projects) provided for individual projects only based on a competitive basis and considering specific results and thematically combined with projects of other clusters in the region. The decisive share, in this case, maybe the EU structural funds under the condition of a balanced relaxation of competitive requirements for financial support.

The RDDS can become a guideline for the preparation of regional development projects that will include the development of cluster models based on interregional scientific centres of NAAS, the establishment of regional cluster initiatives/clusters, cluster research on the ground, cluster infrastructure development, etc. Budgetary support for cluster development projects under programmes of regional development, implemented at the expense of funds received from the European Union within the framework of improving the regional policy of Ukraine can be performed under the condition of simplifying the procedure for obtaining funds to increase the number of incentives.

Innovative agro-clusters established based on the Interregional Scientific Centers of NAAS, using at the initial stage state incentives, in the future have potential opportunities for self-financing and self-crediting of their activities.

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## Потенційні напрями фінансового стимулювання розвитку науково-інноваційних кластерів

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► **Анотація.** На сьогоднішній день кластерні об'єднання є однією з найефективніших форм організації інноваційних процесів в регіоні, за якої на ринку конкурують вже не окремі підприємства, а цілі комплекси, які скорочують свої витрати завдяки кооперації діяльності. Такі об'єднання сприяють підвищенню продуктивності праці, прискорюють темпи впровадження інновацій на виробництві, сприяють підвищенню конкурентоспроможності різних галузей економіки, не вимагають значних коштів і складаються з різних ініціатив, спрямованих на стимулювання учасників для співпраці. Створення кластера дозволяє сформувати специфічний економічний простір, метою якого є розширення сфери вільної торгівлі, збільшення обсягів експорт продукції кластера, вільного переміщення капіталу та людських ресурсів. Мета статті – узагальнити механізми підтримки кластерних утворень за кордоном. Розкрити сучасні аспекти національного інституційного середовища стимулювання генезису науково-інноваційних агрокластерів та визначити основні можливі напрями фінансової підтримки їх розвитку. Використано загальнонаукові та специфічні методи емпіричного дослідження: порівняльно-історичний та монографічний, які дозволили оцінити в динаміці розвиток державної підтримки процесів кластеризації в Європейському Союзі та в Україні, а також з'ясувати джерела їх фінансового стимулювання; системний підхід – сприяв дослідженню механізмів взаємодії кластера як системи з оточуючим суспільним середовищем, сприймати кластерне утворення динамічною цілісністю, що постійно розвивається; аналіз і синтез надали можливість розкрити потенційні фінансові методи підтримки кластерів та інтегрувати підходи до формування механізму стимулювання кластерних об'єднань; використано пізнавальні операції порівняння й опису; абстрактно-логічний метод застосовано для теоретичних узагальнень та формування висновків. Проаналізовано реалізацію сучасних кластерних політик у країнах Європейського Союзу. Встановлено, що, незважаючи на конкретність розробки та реалізації кластерних програм і їх залежність від контексту та обґрунтованості відносно національної/регіональної політики на різних територіях, в аналізованих підходах вирізняється їх певна прогресивна схожість. Наведено пріоритетні можливості смарт-спеціалізації регіону, в розбудові якої кластерні утворення виступають основними «блоками». Висвітлено кращі європейські проекти, пов'язані із соціально-економічним піднесенням регіонів, які стимулюють розвиток кластеризації. Розкрито складові сталого фінансування регіональних кластерних утворень в Україні, що насамперед передбачає стартову державну підтримку. Оцінено можливість стимулювати процес кластеризації коштами, що направлятимуться з державного бюджету на розвиток регіонів, а також на фінансування Програми підтримки секторальної політики. Підтверджено можливості самофінансування та самокредитування науково-інноваційних агрокластерів, що будуть утворені на основі міжрегіональних наукових центрів НААН. Розвинуто концептуальні засади формування джерел фінансового забезпечення становлення і розвитку науково-інноваційних кластерних моделей, утворених на базі міжрегіональних наукових центрів НААН. На основі успішного європейського досвіду вдосконалено теоретико-методичні підходи до побудови фінансових механізмів кластеризації в Україні. Запропоновано напрями фінансового стимулювання процесів кластеризації в межах загальнонаціональних, галузевих та регіональних стратегій, зокрема стратегій смарт-спеціалізації регіонів і територіальних громад, стратегії підтримки малого і середнього бізнесу, як основного елемента підприємницької ініціативи та базового драйвера створення кластерів

► **Ключові слова:** державна підтримка, кластеризація, регіональний розвиток, фінансовий механізм, стимулювання, міжрегіональний науковий центр, смарт-спеціалізація