

STUDIES REGARDING THE ACCESS OF ENTREPRENEURS TO RESEARCH INFRASTRUCTURES FUNDED BY EU

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Abstract: *At international level, the large research infrastructures have a crucial role in solving great economic and social challenges, becoming part of the economic cycle. Although they are complexes and mostly expensive entities, they are approached not only as strategic investments, but also as innovation vectors able to influence local economies and national and global competitiveness. Within the proposal for the next programming period (2021-2027) for Horizon Europe 7 Programme, the support granted to research infrastructures in pillar I "Open Science" has an estimated budget of 2.4 billion euros. At national level, the national roadmap for research infrastructures for the programming period 2021-2027 is under progress and the new financing instruments are being elaborated. In this context, the authors of the paper are analysing the possibility of entrepreneurs access to large research infrastructures and the way they are influenced by non-reimbursable European funds.*

Keywords: *Entrepreneur, Innovation, Research Infrastructure, Non-Reimbursable Funds, Start-Ups.*

INTRODUCTION

The research infrastructure is one of the defining elements that could guarantee the obtaining of innovative and competitive products in the European economic space. Facilitating and ensuring access to this infrastructure for the private economic environment, as well as the close collaboration between the staff of a research institute that has the research infrastructure and the staff of private companies, would lead unconditionally to the appearance of new products in the market. This synergy ensures the achievement of objectives related to sustainable development and the principles of the circular economy through the potential emergence of innovative products, whose production cost is lower, resource consumption is substantially reduced even by reusing raw materials, production time is also decreased, but their performance, durability and efficiency increase [1].

In the fourth trimester of the year 2009 over 9000 start-ups from the non-agricultural sector have been funded through governmental and European programs, the value of the non-reimbursable grants offered to them being over 290 million Euro [2]. At the same time, if we analyze the situation identified at the level of 2020 among farmers / SMEs that have accessed non-reimbursable financing through the National Rural Development Program between 2013

and 2021, we identify payments made to them to set up new activities or to expand its current activity of over 1.4 billion euros. Over 27,000 applications were submitted for these types of funding, while in 2018, only 30 applications were submitted for accessing and developing research projects. The value of the contracted research projects is approximately 8 million euros, in the context in which funding applications were submitted whose cumulative budget exceeds 11 million euros [4].

Although the private sector pays a major interest in the development of Research Infrastructures involving consistent investments in their construction and use, they are usually not open to public use. In this context, at European level, policies related to the creation of Research Infrastructures, in addition to addressing issues related to strategic focus on European infrastructure, encouraging pan-European cooperation, providing funding solutions, access for external user groups, legal framework, issues related to access policy, promotes their financing from public funds, from the level of state budgets, given their role in stimulating economic competitiveness and regional development. Thus, the use of structural funds in order to set up large Research Infrastructures becomes an important financing alternative, especially in their construction phase, while the contribution of these financial instruments to the subsequent operational costs of the CI is reduced, especially in the national context, where at the level of these instruments no operating costs were foreseen, or for the human resource, so necessary in ensuring the sustainability of the new CI, which means that over 90% of the subsequent operating costs are dependent on national budgets. Another important aspect for strengthening the role of Research Infrastructures lies in public policies related to improving access to and interaction with SMEs and other target groups, in the context of public funding for their creation and operation.

Before highlighting the principles of these EU policies, a brief analysis of the SHAREHOLDERS relationship is required (those who pay or invest financially in the construction and / or operation of the research infrastructure) and STAKEHOLDERS (those that ultimately provide the political basis and justification for shareholders to financially support the construction and operation of the CI) reported to the Life Cycle of Research Infrastructure. In the light of the above, we note the strategic importance of the bodies that manage the structural funds and the coordinating institutions that provide public funding from the state budget as the main SHAREHOLDERS of the construction and operationalization of large Research Infrastructures at the national level. Also, given the extremely large and diverse range of potential STAKEHOLDERS of Research Infrastructures, we note the importance of the quality of their management throughout the life cycle and the access policies both to the research results and to the facilities of these infrastructures. In this context it is important the relationship based on the transparent cooperation between SHAREHOLDERS - STAKEHOLDERS in a way that ensures the long-term sustainability of the CI and the efficient capitalization of the results obtained within the research processes. Taking as reference period the years 2015 - 2020, in figure 1 we find the graphic representation of the share of research projects in the total amounts allocated by PNDR to private sector beneficiaries for the establishment and / or expansion of agricultural activities.

It is noted that in the period 2015 - 2020, although over 1.4 billion euros were allocated to private beneficiaries for the establishment and / or expansion of agricultural activities only a

percentage of 0.56% was allocated for the creation of partnerships between beneficiaries and research in order to generate added value in this field.

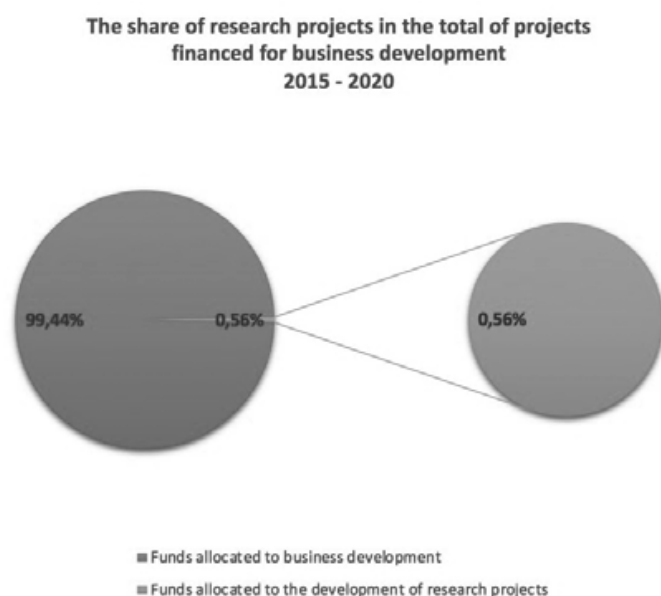


Figure 1. The share of research projects in the total of projects financed for business development

At national level, a list of priority research infrastructures for national support has been prepared, based on policy documents in the field (National RDI Strategy 2014-2020), on European and international commitments of Romania. At national level, a list of priority research infrastructures for national support has been prepared, based on policy documents in the field (National RDI Strategy 2014-2020). On European and international commitments of Romania (participation in pan-European research infrastructures included in the ESFRI Roadmap, etc.), on a prospective basis of needs and on a process to identify areas of specialization and future development with potential economic and regional impact, embodied in the national Roadmap for Research infrastructures in Romania for the period 2017-2025 [4]. Thereby, at national level, a total number of 60 research infrastructures was highlighted, in different stages of maturity, namely: emerging -20, active - 30 and benchmark - 10. Registration in the National Roadmap was a condition for the possibility of accessing non-reimbursable structural funds necessary for the development or establishment of these infrastructures.

Also, at national level, the EERIS platform [5] (Engage in the Romanian Research Infrastructures Registry) was developed by UEFISCDI, through a project financed by European funds being the first online platform in Romania, of the "open access" type, which brings together most of the public and private research infrastructures. Its purpose is to promote infrastructures at national and international level, in order to increase the visibility of the services provided and the existing research equipment and, implicitly, to facilitate the connection of potential users with research infrastructures in order to access and use research and technological services and equipment. Enrollment in this platform for accessing the national research subprograms within the National Plan for Research, Development and

Innovation (PNCDI III). has become a conditionality since 2016. For the period 2021-2027, the updating of the national Roadmap has been initiated, which gives the possibility to register and continue investments for the development of new research infrastructures that can contribute to the process of intelligent specialization and / or to the support of scientific excellence and can subsequently be integrated into major research programs centered around pan-European and international research infrastructures.

In this context, the case study is based on the proposal to register in the updated national Roadmap [6] a new national research infrastructure - RONAVEC - RO National Vegetal Genetic Resources Center [8]. Our analysis focuses on how the planning of the access policy, of the financing sources and of the types of users in the project phase in correlation with the established rules for accessing the non-reimbursable funds can influence the sustainability of the proposed infrastructure. Registration in the National Roadmap is a mandatory condition for accessing the structural funds through the POCIDIF 2021-2027 program necessary for the construction of RONAVEC.

METHODOLOGY

The research done and presented in this article, has as main objective the obtaining of a minimum calculation formula that can be integrated into future SME financing programs, so that SMEs can develop innovative solutions, services and products. , and its research infrastructure can survive economically without financial support from the state budget. In this sense, the research methodology is based on an empirical approach, through which the authors put in the same balance the non-reimbursable funding granted by the government, through various funding programs, and a research infrastructure proposed to be established: RONAVEC - RO. We analyzed the amount allocated through funding programs in 2015-2020, and noticed that there is no budget allocation in the budgets of SMEs funded for access to research infrastructure, to ensure the development of innovative solutions that have a higher degree of profitability with lower resource consumption.

Finally, regarding the use of Research Infrastructures, the access principles provided at the level of the European Charter for Access to Research Infrastructures must be taken into account, which brings important recommendations related to issues such as: access policy, recognition and co-authorship, legal compliance, access costs and fees, ethical conduct and integrity of research, non-discrimination, implementation, research data management and user instructions.

All the aspects revealed above are extremely important factors that must be taken into account from the design phase of a Research Infrastructure. Considering that a correct use of EU funding sources together with ensuring the access of a relevant volume of users, can ensure the sustainability of the CI and reduce its dependence on subsidies from the public budget, especially in the current international pandemic context, generated by COVID 2019, characterized at national level by budgetary restrictions and contraction of the economic environment.

EXPERIMENTAL

The purpose of RONAVEC is to ensure high-performance facilities and installations, tangible / intangible equipment and endowments based on advanced technology, highly qualified human resources, together with resources of knowledge and / or structured scientific information (relating to plant genetic resources), as well as the provision of related services to be used by the scientific community in the research activity regarding the exploration, inventory, collection, conservation and capitalization of phytogenetic resources. The purpose of RONAVEC is entirely subsumed in the object of activity of the coordinating institution (Plant Genetic Resources Bank - for Vegetable Growing, Floriculture, Aromatic and Medicinal Plants Buzau) and the research activities proposed at the level of the new infrastructure will essentially contribute to the fulfillment of its attributions. The proposed research infrastructure, in the project and construction phase, will be served by a number of 12 employees and in the operation phase will be served by a total number of 30 employees in order to support the complexity of research processes and the transfer of the results obtained to the academic and scientific community, the educational and economic environment in order to achieve a higher level of knowledge in the field of exploration, inventory, collection, conservation and capitalization of plant genetic resources.

After the operationalization, RONAVEC becomes a new Research Infrastructure which, from a structural and functional point of view, will have the following configuration: The main construction will consist of an A category building, in accordance with the international standards in the field, made structurally and functionally in order to ensure the necessary autonomy and resistance in conditions of natural disasters, consisting of 3 bodies: A Body - with administrative / extension function and transfer to farmers and representatives of the educational environment; B Body - with function of conservation and protection of phytogenetic resources - 5 cells with controlled atmosphere; C Body- with research function - 8 specific laboratories. Another proposed constructive element refers to the establishment of an area of 6000 sqm of experimental greenhouses, which will serve the research, protection and conservation activities in accordance with the international standards in the field. For the establishment and operationalization of RONAVEC, we present, structured, the indicative budget in Figure 2. Most of the costs of creating this type of infrastructure are allocated to the construction of all necessary elements for optimal operation, 41.97% of the budget of 25,321,550.31 EURO. Along with the construction costs, the costs necessary for the acquisition of technological machinery and equipment with and without assembly are added, which, together, consume 43.41% of the total budget.

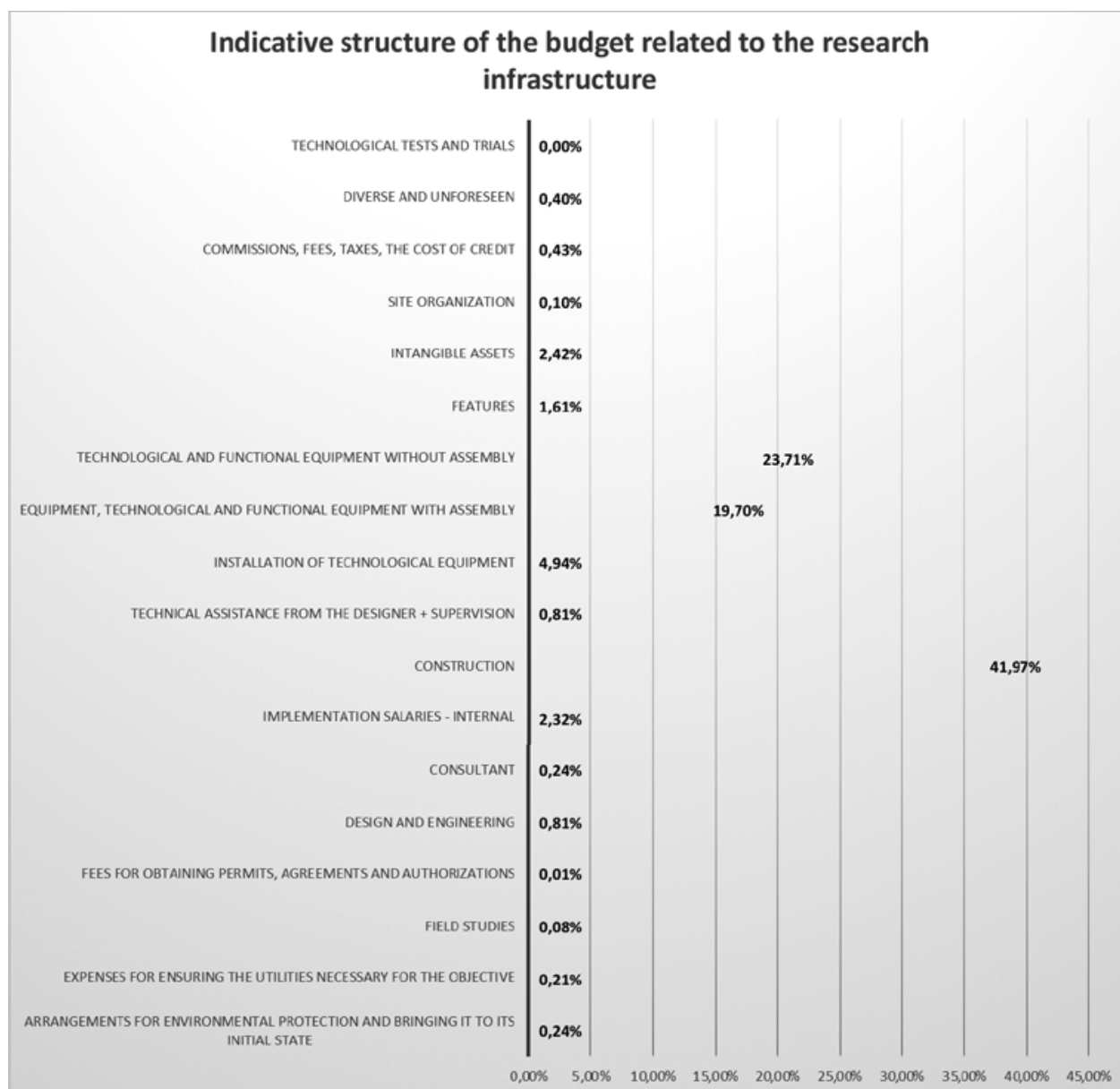


Figure 2. Indicative structure of the budget related to the research infrastructure "RONAVEC"

Table 1. Budget on project phases

Major actions	Euro Budget	Main Financing Sources	Deadlines
project / design phase	559.245,51	POCIDIF 2021-2017	18
construction phase	29.440.754,61	POCIDIF 2021-2020	24
operationalization phase	3.302.880,00	PUBLIC BUDGET-MADR	60

The main phases for the establishment of RONAVEC, the budget and the proposed funding sources are summarized in Table 1.

The access policy proposed at RONAVEC level regulates two main directions: access to digitized research data through the Data Research Management Plan and the IT resources proposed in compliance with the "FAIR" principles and the physical access to the research and conservation equipment at RONAVEC level. Also, the basic principle is to ensure open access to data and research results and / or to RONAVEC facilities for all users of public research institutions and academia, respecting the conditions of security and confidentiality. For private users, the access to the research data and its results and / or to the RONAVEC facilities will be made on the basis of minimum access tariffs, established according to the level of importance and complexity of the data and / or according to the use costs. Regarding the SME access at the RONAVEC level, 11 types of services will be developed for which, in a minimalist version, is estimated a number of approximately 1500 users per year.

The access policy together with the proposed form for the post-implementation RONAVEC operation is transposed in the synthetic income and expenditure structure, as indicated in Table 2. From the above resides the massive dependence, in the operation phase, on the revenues from the public budget, which in the current conditions, with the possibility of massive budgetary reductions in the public sector, puts at risk the very sustainability of the investment from structural funds.

Table 2. Average income for five years

	Total average income/year					
	Year IV	Year V	Year VI	Year VII	Year VIII	Total
Incomes from service	98.816,00	118.579,20	130.437,12	143.480,83	157.828,92	649.142,07
Incomes from subsidies	587.530,00	587.520,00	587.530,00	587.520,00	587.520,00	2.937.600,00
Total incomes	686.330,00	706.099,20	716.959,12	731.000,83	745.348,92	3.586.742,07
	Total expenditures Euro/year					
	Year IV	Year V	Year VI	Year VII	Year VIII	Total
Total expenses	660.576,00	660.576,00	660.576,00	660.576,00	660.576,00	3.302.880,00
Incomes/Expenses Balance	25.760,00	45.523,20	57.381,12	70.424,83	84.772,92	283.862,07

What interests us in this context is to analyze whether there is a viable formula by which, using in an integrated manner (a multi-fund approach) EU non-reimbursable funds, we can reduce the dependence of the RONAVEC on public subsidies by stimulating the access of SMEs in the field to its services and, also, increasing the revenues from the use of the proposed infrastructure. We are also interested in whether this formula is viable to support

the budgets of SMEs allocated to research given that a national and global economic contraction generated by the COVID-19 pandemic is known, thus stimulating competitiveness and economic growth through research.

In general, any research structure generates annual costs for operation in optimal conditions. In this article we aim to analyze the possibility of access of the entrepreneurial environment to research infrastructures, through a general analysis of the factors of optimal functioning of the research infrastructure. Unfortunately, most of the research infrastructures in Romania function and support their expenses only through the subsidies received annually from the government. In Figure 3 we find the minimum annual structure of operating expenses that "RONAVEC" has. This research infrastructure needs an annual budget of at least 660,576.00 EURO, in order to function in optimal conditions. Over 60% of the annual expenses are found in the cost of staff, the staff generating directly added value, through the intellectual inputs they bring in the field in which they interfere.

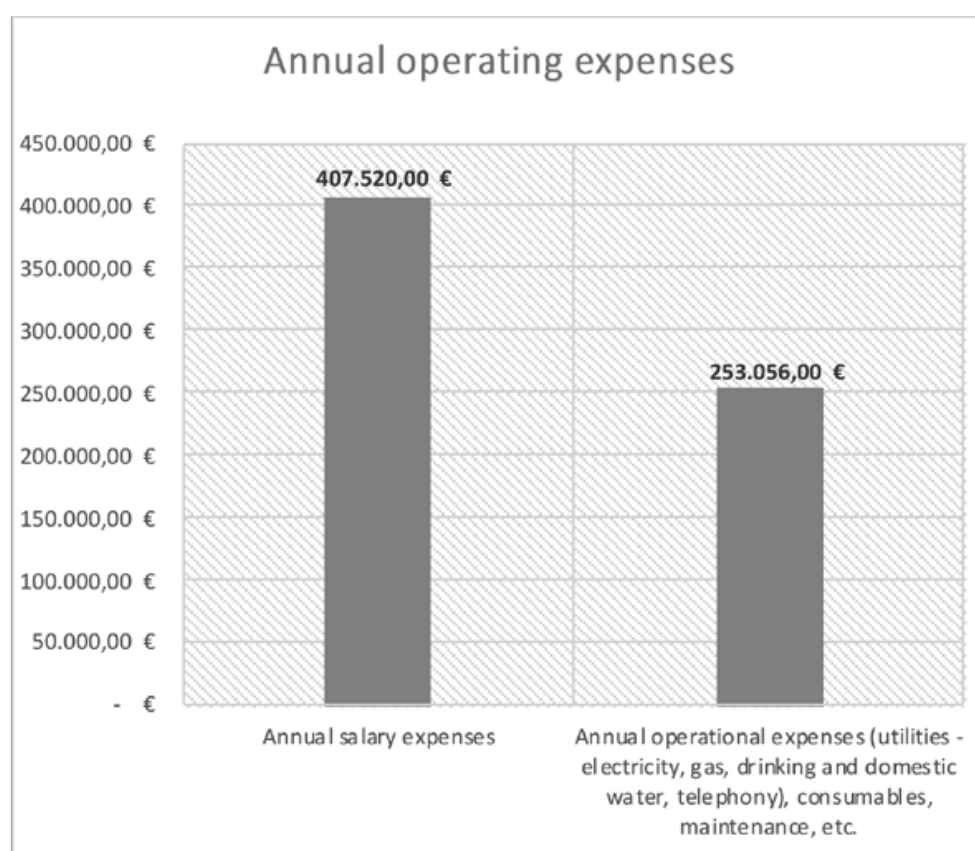


Figure 3. Annual operating expenses -"RONAVEC"

Starting from these expenses, it is easy to understand that a series of funding sources are needed to ensure the functioning and sustainability of a research infrastructure, which unfortunately, at the moment, is burdening the state budget. In the case of "RONAVEC", the Ministry of Agriculture and Rural Development (MADR) provides through annual subsidies the vast majority of infrastructure operating costs (Figure 4).

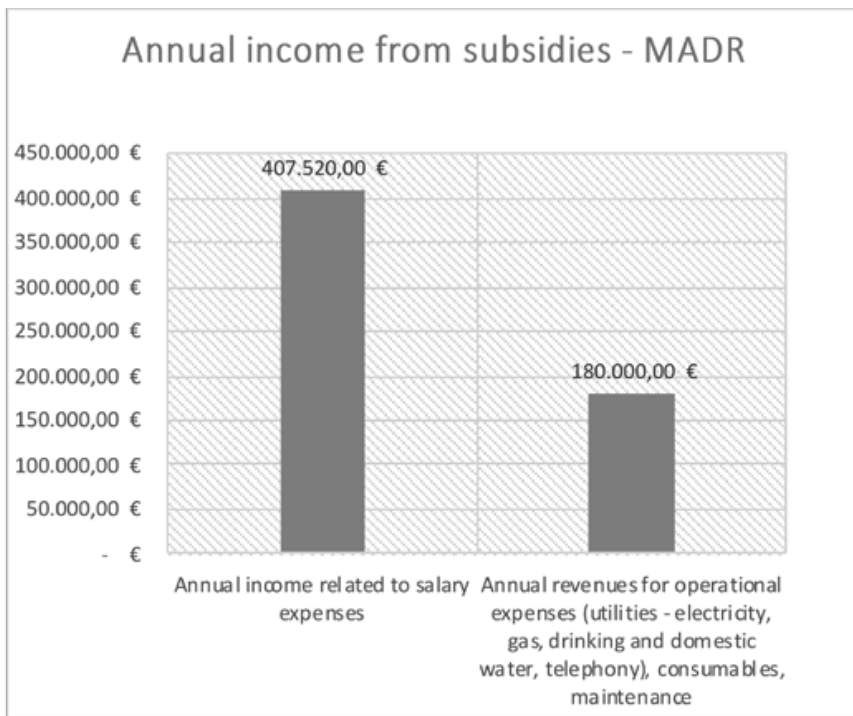


Figure 4. Annual income from subsidies - MADR

This approach namely the dependence on state subsidies is not efficient, burdening the state budget annually. In this sense, for "RONAVEC" a series of estimates were made regarding the possibility of attracting external financing sources by providing services and selling genetic materials to potential users of the infrastructure. We notice how after an annual increase of revenues of this type, the research infrastructure reaches in 5 years from its completion reaching cumulative revenues of approximately 660,000 EURO.

Putting together all the information and data presented above, it is important to generate a minimum calculation formula through which the necessary programmatic documents can be elaborated which should solve the development needs of SMEs and to support research infrastructures to generate innovation and added value by supporting the expenses by the business environment:

- ✓ The budget allocated for a programming period to finance a given sector.
- ✓ The number of potential beneficiaries of the Funds in order to achieve the objectives of the program.
- ✓ The running costs of the research infrastructure over the programming period.

RECOMMENDATION

The recommendation of this article focuses on solving problems related to management and innovation within the three factors that lead to the sustainable evolution of the business and economic environment of a country as well as the evolution of research and innovation on different specific levels: The political factor, the entrepreneurial factor and the scientific

factor. In this sense, we launch three proposals through which we can achieve synergy between the three factors.

The first proposal is related to obtaining a complex mathematical algorithm starting from the minimum calculation formula presented in this article. Based on such a function, the central public authorities will be able to elaborate the budgets related to the programming periods and the project calls, taking into account the need of: SNCDI, the existing or the established research infrastructures and the needs of the business environment in terms of research and innovation.

The second proposal is related to the way of evaluation and scoring of all projects (projects for which it is possible to intervene scientifically through a research infrastructure). It is important that projects which allocate a certain percentage of the budget for the development of services and / or products in partnership with a research infrastructure to receive additional points. This is important, first of all, because by financing such projects the research infrastructures will be able to carry out their research activity in optimal conditions and will participate with entrepreneurs in the evolution of technique and technology at national level. Secondly, the current pressure on the state budget would be reduced or even eliminated, no need for the state to intervene in subsidizing these research infrastructures.

The third proposal addresses the business environment and research infrastructures, in the sense that a centralized IT system must be set up through which entrepreneurs who have received funding from European funds can consult a database and conclude a partnership with a research infrastructure that will ensure them through scientific inputs the sustainable evolution of the company. At the same time, research infrastructures must address the business environment in order to develop value-generating partnerships, or even to monetize by selling or subscribing to entrepreneurs to benefit from specific services, innovative products, patents, manufacturing licenses, etc.

DISCUSSIONS AND CONCLUSION

Starting from the objective established in the previous chapter, we managed to obtain an important result, which could be extremely useful for future financing programs and which could generate positive effects both in the sustainable development of companies and in terms of impact on the state budget.

Taking the example of "RONAVEC", the research infrastructure for SMEs operating in the agricultural field and the National Rural Development Program (PNDR) in the period 2015 - 2020, we have defined the following elements that lead us to obtain the necessary calculation formula:

- ✓ The non-reimbursable financing granted to the beneficiaries in the period 2015 - 2020
- ✓ Number of beneficiaries financed in the period 2015 - 2020
- ✓ Operating costs of the research infrastructure in a period of 5 years
- The potential impact of the operating costs of a research infrastructure in the total payments made to the beneficiaries in the 2015 - 2020 period

- The average value of the financing received by each beneficiary in the 2015 - 2020 period.

$$ICOP = \frac{CIC}{FA} \% \quad (1)$$

Where:

- ICOP represents the Potential impact of the operating costs of a research infrastructure in the total payments made to the beneficiaries;
- CIC represents the operating costs of the research infrastructure;
- FA represents the non-reimbursable Financing granted to the beneficiaries;
- CAIC represents the average Budget allocated to the research infrastructure by each beneficiary;

In this case we have the following data:

- CIC = 2.937.000 EURO
- FA = 1.400.000.000 EURO

Thus, applying the formula we obtain the ICOP value = 0.21%

$$VM_B = \frac{FA}{BF} \quad (2)$$

Where:

- ✓ VM_B represents the average value of the financing received by each beneficiary;
- ✓ FA represents the non-reimbursable Financing granted to the beneficiaries
- ✓ BF represents the number of financed beneficiaries

We have the following data:

- $FA = 1.400.000.000 \text{ EURO}$
- $BF = 27.000$

Applying the formula we obtain $VM_B = 51.851,85 \text{ EURO}$

$$CAIC = VM_B \cdot ICOP \quad (3)$$

$$CAIC = VM_B \cdot \frac{CIC}{FA} \quad (4)$$

$$CAIC = \frac{FA}{BF} \cdot \frac{CIC}{FA} \quad (5)$$

We have the following data:

- $VM_B = 51.851,85 \text{ EURO}$
- $ICOP = 0,21\%$
- $CIC = 2.937.000 \text{ EURO}$
- $FA = 1.400.000.000 \text{ EURO}$

Applying the above formulas we obtain:

$$CAIC = \frac{CIC}{BF} = 108,78 \text{ EURO} \quad (6)$$

This result represents the total average and indicative cost that each SME should allocate at the level of Business Plans / Funding Applications in order to access the research infrastructure for a period of 5 years, so that the research infrastructure to ensure its costs necessary to operate in optimal conditions. In this way, the negative impact generated by the granting by the government of the subsidies necessary for the operation of a research infrastructure is eliminated. [3]

REFERENCES

- [1] Manea, C. ; A. S.; I. V., "Challenges of transitioning towards a circular economy, in the context of non-refundable european funds financed romanian start-ups", Review of Management and Economic Engineering, vol. 20, nr. No. 1(79), pp. 72-82, 2021, SSN (print): 1583-624X, ISSN (online): 2360-2155 - 72.
- [2] Manea, C; A. S., "The risks associated with start-ups in romania, in the context of their financing from european non-refundable fund", Review of Management and Economic Engineering, vol. 20, nr. Romanian Association of Managers and Economic Engineers from Romania, pp. 21-30, 2021 ISSN (print): 1583-624X, ISSN (online): 2360-2155.
- [3] Adrian I., AUGUSTIN S. ,Cezar Florin P., ,, STRATEGIC MANAGEMENT. THEORY AND APPLICATIONS". Editura Matrix Rom, București, ISBN 978-973-755-8268, București, 2012
- [4] F. I. R. (AFIR), „www.opendata.afir.info,” (AFIR), Agentia pentru Finantarea Investitiilor Rurale, 2021. [Interactiv]. Available: <http://opendata.afir.info>. [Accesat 13 August 2021].
- [5] (CRIC), „Report on research infrastructures in Romania - Roadmap 2017,” Bucuresti, 2017.
- [6] EERIS, „www.erris.gov.ro,” UEFISCDI, [Interactiv]. Available: www.erris.gov.ro. [Accesat 13 August 2021].
- [7] p. d. d. n. p. d. m. i. (...), „<https://www.research.gov.ro/ro/articol/5365/minister-comunicare-anunt-privind-depunerea-de-noi-propuneri-de-mari-infrastructuri-de-cercetare-in-vederea-actualizarii-foii-de-parcurs-nationale-pentru-infrastructuri-de-cercetare>,” 09 july 2021. [Interactiv]. Available: <https://www.research.gov.ro/ro/articol/5365/minister-comunicare-anunt-privind-depunerea-de-noi-propuneri-de-mari-infrastructuri-de-cercetare-in-vederea-actualizarii-foii-de-parcurs-nationale-pentru-infrastructuri-de-cercetare>. [Accesat 13 august 2021].
- [8] RONAVEC, „<http://www.gigafire.ro/agenda-stiintifica/>,” [Interactiv]. Available: <http://www.gigafire.ro/agenda-stiintifica/>. [Accesat 13 August 2021].