Scientific and technological research article

How to cite: Sánchez Suárez, Y., Acosta Mesa, S. F., & Quintana Cala, J. F. (2026). Characterization of the Young Researchers Network of Cuban Ministry of Higher Education. *Estrategia y Gestión Universitaria*, 14, e9126. https://doi.org/10.5281/zenodo.19324348

Received: 10/03/2026
Accepted: 30/03/2026
Published: 06/04/2026

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Conflict of interest: the authors declare that they have no conflict of interest, which may have influenced the results obtained or the proposed interpretations.

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Characterization of the Young Researchers Network of Cuban Ministry of Higher Education

Caracterización de la Red de Jóvenes Investigadores del Ministerio de Educación Superior de Cuba

Caracterização da Rede de Jovens Pesquisadores do Ministério do Ensino Superior de Cuba

Abstract

Introduction: the development of research capacities requires collaborative approaches that articulate interdisciplinary learning and community building; in this context, youth scientific networks emerge as an opportunity. **Objective:** to characterize the Network of Young Researchers of the Ministry of Higher Education. **Method:** a mixed-methods study was conducted using a design based on a case study. the analysis period covered January to December 2025. Methods and supporting tools included the general process map, the Delphi method, and expert selection techniques. **Results:** nine experts were selected and, through brainstorming sessions, the network's main activities and processes were identified. A process map was constructed and validated by 100% of the experts. The network's composition was described as comprising 135 members. Participation was recorded in projects across seven knowledge areas. The western region was the principal producer of research articles and events, while the eastern region stood out in international events. **Conclusion:** the network was characterized through the definition of its processes and composition, as well as by the scientific output, project participation, and awards of its members.

Keywords: higher education, researcher training, young researchers, science policy, academic networks, network of young researchers

Resumen

Introducción: el desarrollo de capacidades investigativas requiere enfoques colaborativos que articulen el aprendizaje interdisciplinario y la construcción comunitaria, en este contexto, las redes científicas juveniles se perfilan como una oportunidad.

Objetivo: caracterizar la Red de Jóvenes Investigadores del Ministerio de Educación Superior. **Método:** se desarrolló una investigación con enfoque mixto, mediante un diseño basado en el estudio de caso. El período de análisis fue de enero a diciembre de 2025. Entre los métodos y herramientas de apoyo se encuentran el mapa general de procesos, método Delphi, y técnicas de selección de expertos. **Resultados:** se seleccionaron nueve expertos y en tormentas de ideas se identificaron las principales actividades y procesos de la Red. Se construyó el mapa de procesos y se validó por el 100 % de los expertos. Se describió la composición de la red con 135 miembros. Se registró participación en proyectos de siete áreas del conocimiento. La región occidental fue la productora de artículos de investigación y eventos, mientras que la región oriental destacó en eventos internacionales. **Conclusión:** se caracterizó la red a partir de la definición de sus procesos, su composición, así como la producción científica, participación en proyectos y premios de sus miembros.

Palabras clave: educación superior, formación de investigadores, jóvenes investigadores, políticas científicas, redes académicas, red de jóvenes investigadores

Resumo

Introdução: o desenvolvimento de capacidades investigativas requer abordagens colaborativas que articulem o aprendizado interdisciplinar e a construção comunitária; nesse contexto, redes científicas juvenis se apresentam como uma oportunidade. **Objetivo:** caracterizar a Rede de Jovens Pesquisadores do Ministério da Educação Superior. **Método:** desenvolveu-se uma pesquisa com abordagem mista, mediante um desenho baseado no estudo de caso. O período de análise foi de janeiro a dezembro de 2025. Entre os métodos e instrumentos de apoio estiveram o mapa geral de processos, o método Delphi e técnicas de seleção de especialistas. **Resultados:** foram selecionados nove especialistas e, em sessões de brainstorming, identificaram-se as principais atividades e processos da Rede. Construiu-se o mapa de processos, validado por 100% dos especialistas. Descreveu-se a composição da rede com 135 membros. Registrou-se participação em projetos de sete áreas do conhecimento. A região ocidental foi a principal produtora de artigos de pesquisa e eventos, enquanto a região oriental destacou-se em eventos internacionais. **Conclusão:** a rede foi caracterizada a partir da definição de seus processos e de sua composição, bem como pela produção científica, participação em projetos e prêmios de seus membros.

Palavras-chave: educação superior, formação de pesquisadores, jovens pesquisadores, políticas científicas, redes acadêmicas, rede de jovens pesquisadores

Introduction

The transformation of science, technology, and innovation (STI) systems places early-career researchers at the center of sustaining national scientific capabilities (Alvarado-Peña et al., 2025). As key nodes within innovation ecosystems, universities need institutional arrangements that integrate training, collaborative practices, and social commitment, particularly in contexts in which development depends on the alignment between scientific knowledge and public policy (Čajka et al., 2023; Germain-Alamartine et al., 2021).

Within such settings, research extends beyond isolated, disciplinary efforts to become embedded in structured cooperation dynamics. These dynamics are shaped by institutional platforms and financing mechanisms (Sakaguchi, 2024). Importantly, these spaces do not emerge spontaneously; rather, they require formal instruments that enable mentoring, intergenerational interaction, and sustainable academic trajectories (Cugmas et al., 2024). From a transdisciplinary standpoint, advancing knowledge toward sustainable development requires frameworks that integrate academic and non-academic stakeholders (Jacobi et al., 2022). Accordingly, networks become collective learning environments in which practices, identities, and social commitments are redefined (Nimmo et al., 2023), and the participation of multiple actors strengthens the legitimacy and societal impact of knowledge (Oakden et al., 2021).

Academic networks represent a critical strategy for research development, as they prioritize the training of young researchers and communities of practice that extend beyond institutional boundaries, thereby facilitating collaboration and knowledge exchange at the international level (Fouladi et al., 2025). In particular, rural agroecological training initiatives illustrate that such networks can operate as autonomous spaces for knowledge production and collective leadership, while also promoting innovation emerging from within communities themselves (Chavez-Miguel et al., 2022; Weisz Kohn et al., 2022).

The democratization of knowledge and the recognition of diverse forms of expertise can counter vertical, top-down models and enable participatory processes (Rubiano et al., 2025). This is especially relevant in the youth domain, because early scientific leadership requires environments that acknowledge the transformative capacity of new generations (Calvo-Salvador et al., 2025).

Within STI policy contexts, the literature highlights structural challenges related to financing, governance, and talent retention, underscoring the need to treat youth as a strategic actor (Huete-Pérez et al., 2024). The transition toward knowledge-based economies calls for frameworks that integrate advanced training, scientific administration, and international openness (Blohm, 2023). Institutionalizing structures that support the professional development of young researchers is therefore a core element of national innovation strategies.

In Cuba, this policy approach offers a distinctive reference for Latin America, where scientific policy has been shaped by the revolutionary leadership's commitment to promote education, science, and health as foundational pillars for national development. From early university reforms, efforts were directed toward building scientific capacities to respond to economic and social needs, thereby

surpassing the constraints typically imposed by underdevelopment in strategic areas (Santana, 2023). This model reflects persistence in the construction of a scientific system with social relevance.

The interplay between the educational system and sociocultural values helps create an environment in which scientific training is anchored in social commitment and the defense of national sovereignty (Rodríguez López & Ortiz Blanco, 2024). Experiences in sectors such as agriculture further indicate that territorial systems require flexibility to reconcile institutionalization with social orientation through participatory methodologies (Benítez et al., 2023).

Against this backdrop, youth scientific networks unfold within institutional frameworks that condition their consolidation. Although scholarship on youth in Cuba has influenced the design of social policies (Zabala Argüelles et al., 2023), some studies point to a gap between political intentions to involve young people in strategic matters and their actual capacity to exercise transformative leadership (Gioacchino, 2019). Developing research capabilities requires collaborative approaches that integrate interdisciplinary learning and community-based knowledge construction (Van Der Plank et al., 2024), thereby supporting youth empowerment through the coproduction of knowledge (Jacobi et al., 2022).

Nevertheless, limited systematization persists regarding how these structures operate in the Cuban context. It is imperative to consolidate effective spaces in which young people can contribute fully to the formulation and implementation of science policy, engaging in dialogue with sociocultural specificities to ensure coherence between innovation and the social development project (Villalonga Arencibia et al., 2023).

In addition, the reviewed literature indicates that existing scientific production tends to focus on isolated case studies. Clear typologies have not been established because patterns of membership, interaction, leadership, and sustainability remain insufficiently characterized. This epistemic gap hinders an accurate understanding of their real impact within social networks. Moreover, there is no evidence reported regarding process-based organization of functioning, as opposed to compartmentalized activity in isolated functions.

Along these lines, the present study aims to characterize the Young Researchers Network “Dr. C. José Luis García Cuevas” of the Ministry of Higher Education during its first year of operation. The research focuses on its organizational structure, knowledge-management mechanisms, collaboration dynamics, and alignment with national STI policies, as well as its contribution to strengthening early research pathways through mentoring and academic cooperation.

Methods and materials

A mixed-methods study was conducted, using a qualitative–quantitative (QUAL–QUAN) approach. The research adopted a case-study design centered on the Young Researchers Network “Dr. C. José Luis García Cuevas” of the Ministry of Higher

Education (MES) of the Republic of Cuba, which was approved by Ministerial Resolution No. 73 of 18 June 2025. The analysis period ran from January through December 2025, corresponding to the Network's first year of operation.

The study began with a general characterization of the Network and the mapping of its processes. This was complemented by an analysis of the main results obtained during its first year (2025).

Instruments and supporting tools

An online working session was held via videoconference with 90 Network members, representing 66.67% of the total membership. The session included representation from all Higher Education Institutions (HEIs) affiliated with the MES. Through a brainstorming exercise, participants identified all activities carried out by Network members, enabling the identification of the principal processes. Medina León et al. (2019) propose that each process should be assigned a name that is both simple and sufficiently representative of the concepts and activities it encompasses. To support process identification, the Network's functions were analyzed, namely:

- Undertake research aimed at improving the Higher Education System based on scientific and technological advances across different fields of knowledge.
- Contribute to the development of scientific solutions to meet the country's and territory's economic and social needs, based on the priorities established by the MES.
- Promote science and innovation within the training process of students and university youth more broadly.
- Maintain active communication regarding science and innovation results achieved by its members, not only through scientific publications but also through the use of social and/or academic networks.
- Establish linkages with other networks, youth organizations, and youth involved in institutions that provide training.
- Establish ties with municipal university centers (CUM) and territorial stakeholders, in order to contribute to priority areas defined in local development strategies.

To represent the relationship among processes in accordance with the Network's mission (articulating university youth with relevant outcomes in science, technology, and innovation activities to enhance such activities within the MES) the process map technique was selected. This tool allows for the visualization of all processes and their categorization as strategic, support, or core (key) processes occurring at each level of the Network: national coordination, regional coordination, and institutional levels.

For the validation of the process map, the Delphi method was employed (Cañizares Cedeño & Suárez Mena, 2022) in two rounds, based on the judgments of nine experts from the HEIs and the MES. To verify the experts' suitability for this investigation, the procedure proposed by Sánchez Suárez et al. (2023) was followed,

which emphasizes the calculation of the expertise index (IE). An expert is considered competent when their IE exceeds 0.70.

The expertise coefficient (IE) is calculated using Equation 1, an indicator that depends on the level of knowledge (K) held by members of the working team (Equation 2), in terms of:

- Theoretical or experimental knowledge (weight: 0.30),
- Practical knowledge (weight: 0.50),
- Reviewed national bibliography (weight: 0.05),
- Reviewed international bibliography (weight: 0.05),
- Knowledge of the problem area (weight: 0.05),
- Intuition (weight: 0.05).

$$IE_j = \sum_{j=1}^{m} W_j \times K_j \qquad j=1, 2, \ldots, n \qquad \text{(Equation 1)}$$

$$K = \frac{1}{2}(K_c + K_a) \qquad \text{(Equation 2)}$$

Where:

- Wj: weight of the criterion (these criteria and weights may be modified and recalculated).
- Kc: knowledge coefficient.
- Ka: argumentation coefficient.
- n: number of experts to be included in the working team.

Variables

Six (6) variables were selected for the study to characterize the Network: membership by region and by field of knowledge, scientific publications, projects by field of knowledge, participation in events, and awards obtained by region.

Table 1 presents the relationship among the study variables, indicators, and scales used to characterize the Network.

Table 1

Relationship between variables, indicators, and scale

Variable	Indicator	Scale
Membership by region	Percentage of members by region (x) = number of members in the region / total number of members. **Regions**: western, central, and eastern.	x ≥ 70%: High concentration (Unacceptable) 50% ≤ x ≤ 69%: Moderate concentration (Acceptable) 15% ≤ x ≤ 49%: Balanced distribution (Optimal)
Membership by field of knowledge	Percentage of members by field (y) = number of members in the field / total number of members. **Fields**: technical sciences, social sciences and humanities, education, business, agricultural and forestry sciences, computer science, and sports sciences.	y ≥ 50% or y ≤ 5%: Total imbalance (Risk) 30% ≤ y ≤ 49%: Controlled imbalance (Monitoring required) y within ±5% of the institutional strategic plan: Functional distribution (Optimal)
Scientific publications	Percentage of publications by region (z) = number of publications by region / total publications. Percentage of publications by group (Z1) = number of publications by group / total publications. Proportion of group publications within a region (Z2) = number of publications by group / number of publications in the region. **Groups recognized by the MES**: I, II, III, IV.	Z1 ≥ 50% in Group IV or Z1 ≤ 20% in Groups I and II: Low performance (Deficient) 21% ≤ Z1 ≤ 40% in Groups I and II: Moderate performance (Acceptable) Z1 ≥ 50% in Groups I and II: High performance indicating quality and consolidation (Optimal)
Projects by field of knowledge	Number of projects by field of knowledge. T: based on the average deviation of institutional projects.	T ≤ 50%: Low activity (Deficient) 51% ≤ T ≤ 100%: Moderate activity (Acceptable) T exceeds the institutional average: High activity (Optimal)
Participation in events	Participation ratio = participants by region / total number of events. Percentage of international participation (P) = participants in international events / total events. **Event type**: international, national, other.	P ≤ 10%: Low visibility (Deficient) 11% ≤ P ≤ 30%: Moderate visibility (Acceptable) P ≥ 31%: High visibility (Optimal)

Awards obtained by region	Nominal count of awards received by members in each region.	0 awards during the evaluation period: Low (Deficient) 1–2 awards: Moderate (Acceptable) More than 3 awards: High (Optimal)

Source: authors' own elaboration.

Statistical processing

Statistical processing was performed using RStudio v.2023.09.01, from which descriptive analyses of the variables were obtained.

Data analysis

A document review was conducted of the Network's reports, minutes, and quarterly records for each region (West, Central, and East). All information was processed by a researcher responsible for homogenizing the data. For data analysis, descriptive statistical techniques were used.

Results and discussion

Nine experts were selected (three members of the MES, four members of the Network, and two specialist researchers in process management from the University of Matanzas) (Table 2). All experts met the required competencies (values ranged from 0.84 to 0.96).

Table 2

Experts selected for the study

Experts	Ka	Kc	K	Competence level
1. Expert 1 (E1)	0.85	0.83	0.84	Competent
2. Expert 2 (E2)	0.90	0.90	0.90	Competent
3. Expert 3 (E3)	0.98	0.80	0.89	Competent
4. Expert 4 (E4)	0.95	0.90	0.92	Competent
5. Expert 5 (E5)	0.84	0.88	0.86	Competent
6. Expert 6 (E6)	0.86	0.90	0.88	Competent

7.	Expert 7 (E7)	0.95	0.80	0.87	Competent
8.	Expert 8 (E8)	0.90	0.90	0.90	Competent
9.	Expert 9 (E9)	0.84	0.88	0.86	Competent

Source: authors' own elaboration.

Characterization of the Young Researchers Network "Dr. C. José Luis García Cuevas" of the MES

The characterization was developed based on the definition of its processes, its composition, and the scientific output, project participation, and awards of its members.

Through brainstorming sessions and records of the Network's main activities, eight processes were identified: strategic (digitization/informatization, communication, and internationalization), key (student-research work, postgraduate training, and science and technology management), support (membership management and extension and local development). When the Delphi method was applied in the first round (Table 3) to validate the process map, a concordance coefficient of 55.56% was obtained, because five experts disagreed with the proposed processes.

Table 3

First Delphi round

Criterion	E1	E2	E3	E4	E5	E6	E7	E8	E9	Negative votes	Concordance
Validation	1	0	1	1	0	1	1	0	0	5	55.56 %

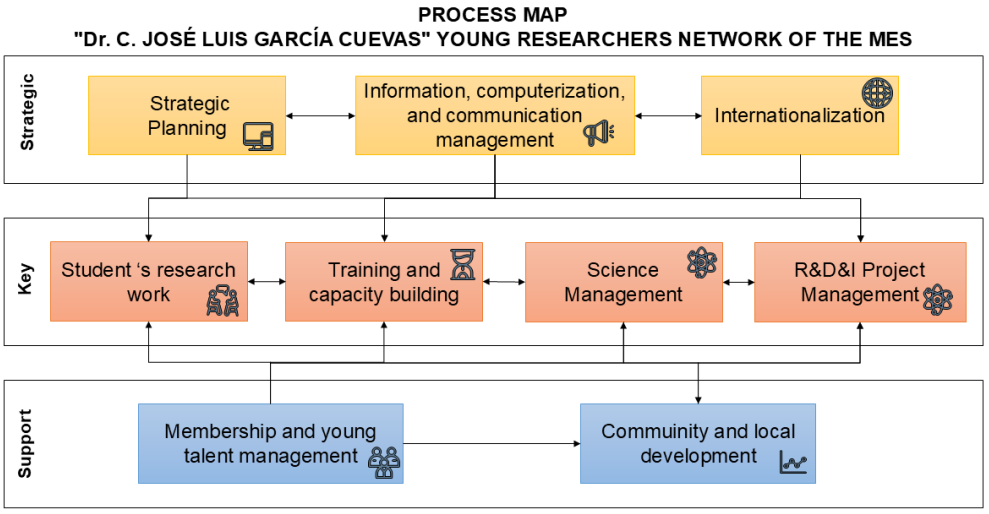
Source: authors' own elaboration.

Note. E denotes the expert.

The new proposals included strategic planning, information management, digitization/informatization and communication, training and professional development, science management, R&D&I project management, and membership and young talent management. The proposed processes were discussed and a second Delphi round was conducted; this yielded a concordance coefficient of 100%. The processes were then categorized, and the process map was developed (Figure 1).

Figure 1

Process map of the Young Researchers Network of the MES

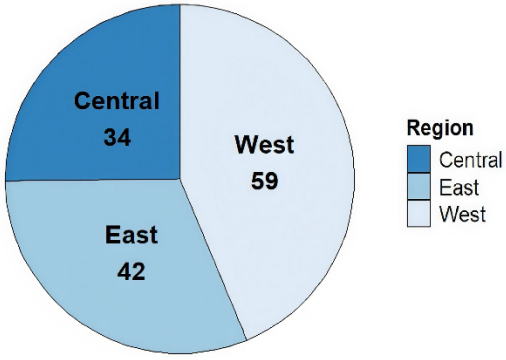


Source: authors' own elaboration.

The distribution of members across regions shows a significant territorial concentration in the western part of the country (Figure 2), where 59 members are grouped, representing the largest share of the total analyzed sample. The eastern region comprises 42 members, indicating substantial participation, albeit lower than that of the west. Finally, the central region includes 34 members, making it the least represented within the studied set.

Figure 2

Distribution of Network members across the country



Source: authors' own elaboration.

Regarding high-level training, 16 Network members (11.8% of the total) are pursuing doctoral studies, with projects linked to agroindustry, education sciences, social sciences, agroecology, sociocultural management, and health.

Based on this territorial configuration, Table 4 synthesizes the research

projects developed across knowledge areas. The results demonstrate thematic diversity, interdisciplinary scope, and territorial presence of initiatives across different regions of the country. This makes it possible to observe, in a structured manner, how academic capabilities are translated into specific research proposals that align with current scientific and social priorities.

Table 4

Research projects by field of knowledge

Field of Knowledge	Project	Institution / Region
Technical Sciences	Value chain modeling	UM – West
	Logistics and supply chains	UC – Central
	Renewable energy and energy efficiency	UO – East
	Sustainable tourism and hotel benchmarking	West
Social Sciences and Humanities	Sociocultural management for development	Granma – East
	Sociolinguistics and cultural heritage	Las Tunas – East
	Universal design for learning	Varona – West
Pedagogical Sciences	Teaching innovation and ABP	UNISS – Central
	Educational inclusion and speech therapy/logopedics	East
Natural and Exact Sciences	Marine biodiversity and climate conservation	UO – East
	Classification of ferralic soils	INCA – West
	Applied molecular biology	Guantánamo – East
Sports Culture Sciences	Inclusive physical education	UM – West
	Physical culture and health	East
	Sport psychopedagogy	East
Agricultural Sciences	Sugar agroindustry	UNAH, UM – West
	Agroforestry systems and crops	Guantánamo – East

	Beekeeping and natural medicine	Granma – East
Informatics and Computing Sciences	Cybersecurity in enterprises	West
	AI applied to education	Central
	Educational informatics and support software	East

Source: authors' own elaboration.

Note. Where: UM (University of Matanzas), UC (University of Camagüey), Varona (University of Pedagogical Sciences "Enrique José Varona"), UNISS (University of Sancti Spíritus "José Martí Pérez"), UO (University of Oriente), INCA (National Institute of Animal Science), UNAH (Havana University of Agricultural Sciences).

A total of 26 national projects were reported, distributed evenly between the western and central regions, with 13 projects each. This figure is complemented by territorial initiatives in the eastern region, which focus on strategic lines such as local development, the environment, health, and sociocultural management, thereby expanding the Network's research portfolio.

In a complementary analysis, Table 5 examines the composition of the Network from both a disciplinary and territorial perspective by presenting the distribution of members across fields of knowledge within each region of the country. This organization facilitated the identification of the scientific areas with the highest presence, as well as the levels of concentration and balance among the western, central, and eastern regions. Overall, this presentation provides a more precise depiction of the academic structure underpinning the Network's research activities.

Table 5

Members by field of knowledge

Field of Knowledge	West	Central	East	Total
Technical Sciences	Industrial engineering, energy processes, logistics (≈25)	Engineering, logistics, applied AI (≈12)	Geological engineering, energy, architecture (≈15)	≈52
Social Sciences and Humanities	Sociocultural studies, history, law, tourism (≈14)	Social sciences, law, territorial management (≈14)	Sociolinguistics, psychology, social work (≈15)	≈43
Pedagogical Sciences	Didactics, educational	Applied pedagogy,	Inclusive education, speech	≈30

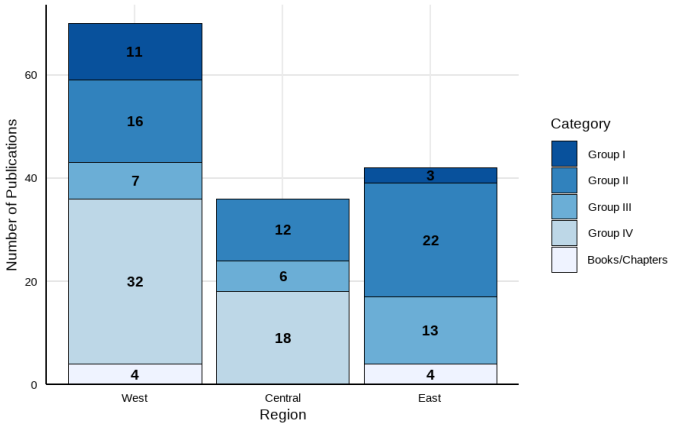
	innovation, school geography (≈10)	teacher training (≈8)	therapy/logopedics, pedagogy-psychology (≈12)	
Natural and Exact Sciences	Applied mathematics, agroindustrial chemistry (≈5)	Physics, applied biology (≈4)	Biology, biodiversity, climate conservation (≈6)	≈15
Physical Culture Sciences	Inclusive physical education, sport (≈5)	Physical culture projects in UCLV (≈3)	Physical culture, adapted sport, sport psychopedagogy (≈8)	≈16
Agricultural Sciences	Agronomy, plant health, agroecology (≈20)	Territorial agricultural projects (≈8)	Agroforestry, beekeeping, crops (≈12)	≈40
Informatics and Computing Sciences	Cybersecurity, UCI, applied ICT (≈5)	Applied AI, digital platforms (≈3)	Educational informatics, applied software (≈4)	≈12

Source: authors' own elaboration.

Regarding the volume of scientific publications, the western region leads overall production within the Network, with 70 publications in total. The largest concentration is in journals from Group IV (32 articles), accounting for 45% of the total. Publications in Groups I and II follow with 11 and 16 articles, respectively, indicating a meaningful presence in higher-impact outlets. In addition, the west includes four publications as books or book chapters, reflecting sustained contributions to scientific output, as shown in Figure 3.

Figure 3

Number of publications distributed by region



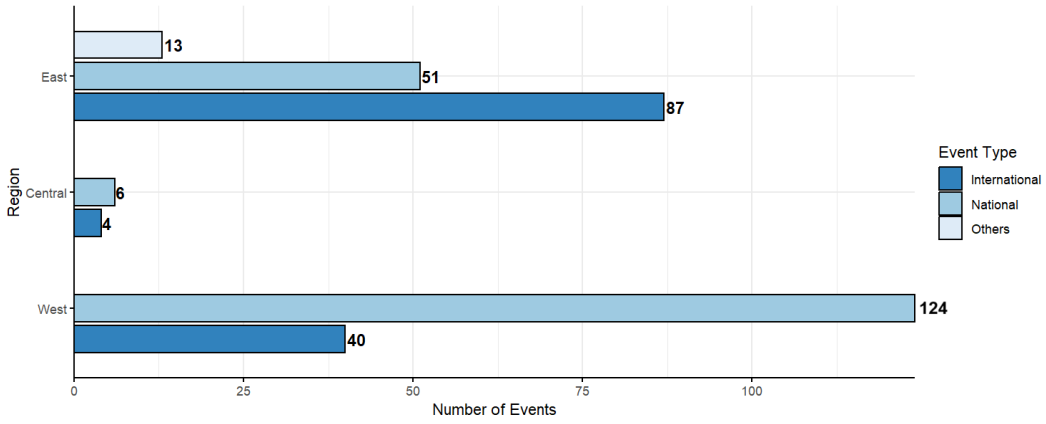
Source: authors' own elaboration.

The central region records 36 publications, including 12 articles in Group II journals, 6 in Group III, and 18 in Group IV, with no publications in Group I or in books. This distribution suggests a moderate publication volume with representation in medium- and lower-impact groups, albeit without participation in the highest-visibility group. By contrast, the eastern region totals 42 publications: three in Group I, 22 in Group II, 13 in Group III, and four in book chapters. Overall, the eastern region exhibits a slightly higher volume than the central region and a broader distribution across higher-impact groups.

Participation in scientific events follows a differentiated pattern. The western region accounts for 164 events, with a predominance of national events (124) and a substantial presence in international events (40). This distribution indicates strong activity within the country, accompanied by meaningful international engagement, and demonstrates absolute leadership in event volume, particularly in national meetings (Figure4).

Figure 4

Participation in scientific events



Source: authors' own elaboration.

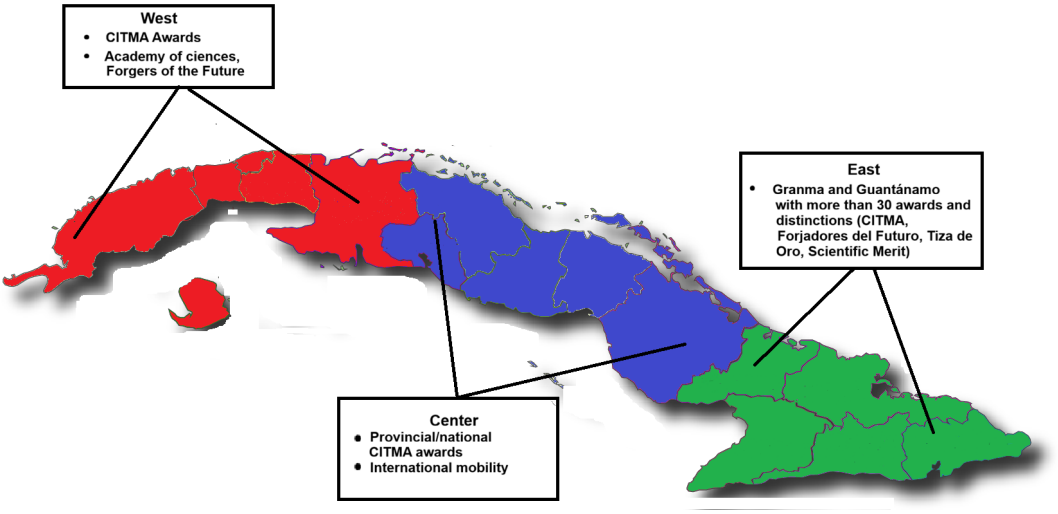
In contrast, the eastern region participates in 151 events, 87 of which are international. It also shows notable participation in national events (51) and other categories (13). Overall, this region demonstrates a profile that is more oriented toward international projection and greater diversity in event types. Meanwhile, the central region recorded only 10 events (four international and six national), reflecting a comparatively low level of participation concentrated in events of limited scope both nationally and internationally. This suggests a more modest involvement in the Network's scientific activities.

Recognition of scientific activities has generated various awards and distinctions distributed across the Cuban territory (Figure 5). In the western area, notable recognitions include those from CITMA, the Academy of Sciences, and

Shapers of the Future. The central region highlights CITMA awards at both provincial and national levels, as well as international mobility. In the eastern region, the provinces of Granma and Guantánamo stand out, each accumulating more than 30 recognitions, including the Golden Chalk and Scientific Merit.

Figure 5

Awards obtained by region



Source: authors' own elaboration.

The composition of the working team, nine experts with high expertise indices, supports the validity of the process. However, it also places the study toward the lower end of the size range typically recommended for broad topics. Methodological guides often suggest between 15 and 30 experts for general subject areas, along with clearly defined inclusion criteria and diversity of perspectives (Nasa et al., 2021; Hohmann et al., 2025).

In this context, the initial disagreement observed (55.56% concordance) should not be interpreted as a weakness. Rather, it likely reflects that the first process map did not capture the full range of Network activities. This also indicates that experts had sufficient information about the Network's functioning and diversity to question the proposed structure, an outcome consistent with expectations in well-designed Delphi studies (Hasson et al., 2025).

The transition from a first round with low concordance to a second round reaching total agreement (100%) aligns with the expected behavior of the technique. Iterative rounds and controlled feedback reduce the dispersion of opinions and facilitate convergence toward a shared judgment (Dietrich et al., 2024). Nevertheless, the literature cautions that very high consensus should be interpreted carefully, since it may reflect implicit pressure toward conformity or an item set with limited controversy, rather than a genuine intellectual debate (Schifano & Niederberger, 2025).

In the specific case under analysis, the reframing of processes into clearer categories that better reflect typical functions of research and development networks, namely information management, R&D&I project management, and young talent management, suggests that the increase in consensus reflects an improved conceptual coherence of the model rather than a simple accommodation of expert opinions. In line with Spranger et al. (2022), this can be regarded as good practice in Delphi-based iteration.

With respect to regional analysis, the west consistently shows a higher number of members, publications, and events. This pattern is widely documented in regional science and technology research, which highlights the concentration of capabilities, infrastructure, and human capital in a limited number of nodes, contrasted with peripheral regions characterized by lower scientific density (Pinedo López et al., 2025). Consistent with this perspective, Chankseliani et al. (2021), using bibliometric evidence, report that regions with larger research communities and stronger institutional connectivity tend to lead in both output and impact, whereas regions with weaker internal capacity rely more heavily on external networks and selective collaborations.

The differentiated profile between the western and eastern regions is likewise analytically meaningful. Whereas the west concentrates output volume and maintains a stronger presence in higher-impact journals, the east displays an intensive international projection through events and relatively high productivity relative to its size. Studies examining regional scientific production indicate that regions with more limited internal capacity can partially offset these constraints through strategic embeddedness in international networks. However, the extent of the benefit depends on the local capacity to absorb and translate relational capital into sustained knowledge production (Chankseliani, 2022).

Disciplinary structure and implications

The strong representation of areas such as Technical Sciences, Agricultural Sciences, and Social Sciences and Humanities, together with territorially distributed interdisciplinary projects, aligns with science policy recommendations aimed at concentrating resources in strategic fields while simultaneously fostering thematic diversity to address complex sustainable development challenges (Pinedo López et al., 2025; Bueno et al., 2025). The existence of a core group of members in doctoral training working on topics related to agroindustry, health, education, and sociocultural management indicates an emerging base of advanced early-career scientific potential.

Overall, the findings suggest that young researchers' networks can construct consensual process models when the Delphi method is applied in a methodologically appropriate manner. At the same time, the results unfold within an environment shaped by territorial differences in capacity, consistent with patterns described in the international literature on regional scientific production. This provides an opportunity to use the process map and the generated evidence strategically to support territorial balance initiatives, strengthen capacities in the central region, and enable more equitable utilization of national and international collaboration dynamics.

Characteristics of the Young Researchers Network "Dr. C. José Luis García Cuevas" of the MES

- Integrates youth up to 35 years of age from multiple disciplines and HEIs: students and faculty from all higher education institutions and from the Higher Education Entities for Science, Technology, and Innovation (ECTI) affiliated with the MES participate in its activities.
- Has a national scope with regional structure: regional meetings are conducted to strengthen participation and enable collaboration among members.
- Promotes articulation, debate, and collective creation: the Network functions as a forum for exchanging experiences and building alliances among young researchers from different affiliated HEIs and ECTI.
- Serves as a platform to make young science visible: it provides visibility for the scientific contributions of its members to both the broader community and society at large.
- Pursues social transformation through knowledge: its mission extends beyond the academic sphere and seeks to place science at the center of Cuba's sustainable development by applying research to address concrete societal problems.

Conclusions

The study characterized the young researchers' network of the Ministry of Higher Education by identifying its processes and constructing, through participatory engagement, the map depicting interrelations among these processes. This step is essential for capturing the organizational complexity of a scientific network from its inception. The technical validation was carried out using the Delphi method, achieving 100% consensus in the second round. This tool demonstrated collective recognition of strategic functions linked to R&D&I project management and the development of young talent, thereby reinforcing the legitimacy of the proposed approach.

Five principal characteristics of the Network were defined. In addition, the territorial analysis revealed a pronounced tendency in scientific production: while the western region concentrates the largest volume of publications and projects, the eastern region stands out for its participation in international events. This suggests that global visibility does not depend exclusively on the size of the core membership. Instead, it likely reflects external collaboration strategies that could be strengthened through regionally differentiated support policies.

Finally, the distribution of 135 members across seven fields of knowledge, together with the presence of 16 members in doctoral training in strategic areas such as agroindustry, health, and sociocultural management, indicates that the Network has succeeded in concentrating diverse capabilities toward early formation. Nonetheless, a persistent challenge remains: increasing the number of members

producing high-impact outputs that extend beyond publications in MES-designated Groups III and IV.

References

Alvarado-Peña, L. J., Vega Osuna, L. A., Hernández Medina, S. M., Vega Esparza, R. M., Jimeno Espadas, R., & Reyes Bazúa, X. (2025). Estado dos sistemas de ciência, tecnologia e inovação: desafios e oportunidades para instituições educacionais na América Latina e no Caribe. *Revista Angolana De Ciencias*, *7*(1), e070109. https://doi.org/10.54580/R0701.09

Benítez Fernández, B., Nelson, E., Crespo Morales, A., Ortiz Pérez, R., Acosta Roca, R., & Cárdenas Travieso, R. M. (2023). Transforming food systems: a gendered perspective on local agricultural innovation in Cuba. *Frontiers in Sociology*, *8*, 1256379. https://doi.org/10.3389/fsoc.2023.1256379

Blohm, S. (2023). Research Management and Administration in Saudi Arabia: Transitioning from an oil to a knowledge-based economy. In S. Kerridge, S. Poli & M. Yang-Yoshihara (Eds.), *The Emerald Handbook of Research Management and Administration Around the World* (pp. 779–787). https://doi.org/10.1108/978-1-80382-701-820231077

Bueno, C., Macharete, R., Rodrigues, C. A., Kamia, F., Moreira, J., Freitas, C. R., Nascimento, M., & Gadelha, C. (2025). Global Knowledge Asymmetries in Health: A Data-Driven Analysis of the Sustainable Development Goals (SDGs). *Sustainability, 17*(14), 6449. https://doi.org/10.3390/su17146449

Čajka, P., Čajková, A., & Krpálek, P. (2023). The role of universities as the institutional drivers of innovation at the regional level. *Terra Economicus*, *21*(1), 94–107. https://doi.org/10.18522/2073-6606-2023-21-1-94-107

Calvo-Salvador, A., DePalma-Úngaro, R., Rodríguez-Hoyos, C., & Hevia-Artime, I. (2025). Ciudadanía global y juventud. Una investigación inspirada en la ciencia ciudadana. *RELATEC Revista Latinoamericana De Tecnología Educativa*, *24*(2), 27–38. https://doi.org/10.17398/1695-288x.24.2.27

Cañizares Cedeño, E. L., & Suárez Mena, K. E. (2022). El método Delphi cualitativo y su rigor científico: una revisión argumentativa. *Sociedad & Tecnología*, *5*(3), 530-540. https://institutojubones.edu.ec/ojs/index.php/societec/article/download/261/544

Chankseliani, M. (2022). Who funds the production of globally visible research in the Global South? *Scientometrics*, *128*(1), 783–801. https://doi.org/10.1007/s11192-022-04583-4

Chankseliani, M., Lovakov, A., & Pislyakov, V. (2021). A big picture: bibliometric study of academic publications from post-Soviet countries. *Scientometrics*, *126*(10), 8701-8730. https://doi.org/10.1007/s11192-021-04124-5

Chavez-Miguel, G., Acevedo-Osorio, Á., Castaño-Arcila, G., Löhr, K., Sieber, S., &

Bonatti, M. (2022). Farmer-led education on the Colombian Andes: Escuelas Campesinas de Agroecología as a social learning approach for post-conflict reconstruction. *Agroecology and Sustainable Food Systems*, *46*(8), 1249–1276. https://doi.org/10.1080/21683565.2022.2092577

Cugmas, M., Mali, F., & Kronegger, L. (2024). Longitudinal patterns of scientific collaboration in doctoral studies. *Scientometrics*, *129*(2), 1055–1077. https://doi.org/10.1007/s11192-023-04900-5

Dietrich, T. J., Mascarenhas, V. V., Cerezal, L., Afonso, P. D., & Sudoł-Szopińska, I. (2024). Overview for developing Delphi-based interdisciplinary consensus statements on imaging: Pros and cons. *Journal of Ultrasonography*, *24*, Artículo 15. https://doi.org/10.15557/JoU.2024.0015

Fouladi, N., Frazer, K., Gordon, P., Hashmi, M., Ajayi, D., Kroll, T., & Exworthy, M. (2025). Developing an intercollegial international health research exchange training and education network. *European Journal of Public Health*, *35*(4). https://doi.org/10.1093/eurpub/ckaf161.860

Germain-Alamartine, E., Ahoba-Sam, R., Evers, G., Moghadam-Saman, S., Fonseca, L., Nieth, L., Salomaa, M., Atta-Owusu, K., Guerrero, D. F., Alpaydin, U. a. R., Manrique, S., Kopelyan, S., Çınar, R., Nguyen, H., Drejer, I., Fitjar, R. D., Moldekleiv, K. W., & Charles, D. (2021). The role of universities in innovation and regional development. In *UiS Scholarly Publishing Services eBooks*. https://doi.org/10.31265/usps.77

Gioacchino, G. (2019). You defend what you feel: 'Presencing' nature as 'experiential knowing.' *Action Research*, *17*(1), 108–129. https://doi.org/10.1177/1476750319829208

Hasson, F., Keeney, S., & McKenna, H. (2025). Revisiting the Delphi technique - Research thinking and practice: A discussion paper. *International Journal of Nursing Studies*, *168*, 105119. https://doi.org/10.1016/j.ijnurstu.2025.105119

Hohmann, E., Beaufils, P., Beiderbeck, D., Chahla, J., Geeslin, A., Hasan, S., Humphry-Murto, S., Hurley, E., LaPrade, R., Martetschläger, F., Matache, B., Moatshe, G., Monllau, J., Murray, I., Niederberger, M., Rüetschi, U., Shang, Z., Weber, S., Wong, I., & Perry, N. P. J. (2025). Guidelines for Designing and Conducting Delphi Consensus Studies: An Expert Consensus Delphi Study. *Arthroscopy: the journal of arthroscopic & related surgery*, *41*(10), 4208-4224.e10. https://doi.org/10.1016/j.arthro.2025.03.038

Huete-Pérez, J. A., Hernández-Mondragón, A. C., Massey, D. S., García, L. M. C., Amadei, B., De León Sautú, N., Acosta, M. L., Asensio, O., Boright, J., Cosgrove, S., Hernández, E. H., López-Selva, M., Manfredi, J. L., Mondragón, F., Natera, J. M., Joao, O. C. P., Santos, A. R., & Rocha, H. O. (2024). Catalyzing sustainable development: insights from the international workshop on STI policies and innovation systems in Central America. *Frontiers in Research Metrics and Analytics*, *9*, 1511393. https://doi.org/10.3389/frma.2024.1511393

Jacobi, J., Llanque, A., Mukhovi, S., Birachi, E., Von Groote, P., Eschen, R., Hilber-

Schöb, I., Kiba, D., Frossard, E., & Robledo-Abad, C. (2022). Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research. *Environmental Science & Policy*, *129*, 107–115. https://doi.org/10.1016/j.envsci.2021.12.017

Medina León, A., Nogueira Rivera, D., Hernández-Nariño, A., & Comas Rodríguez, R. (2019). Procedimiento para la gestión por procesos: métodos y herramientas de apoyo. *Ingeniare. Revista chilena de ingeniería*, *27*(2), 328-342. https://www.scielo.cl/pdf/ingeniare/v27n2/0718-3305-ingeniare-27-02-00328.pdf

Nasa, P., Jain, R., & Juneja, D. (2021). Delphi methodology in healthcare research: How to decide its appropriateness. *World Journal of Methodology, 11*(4), 116-129. https://doi.org/10.5662/wjm.v11.i4.116

Nimmo, E. R., Nelson, E., Gómez-Tovar, L., García, M. M., Spring, A., Lacerda, A. E. B., De Carvalho, A. I., & Blay-Palmer, A. (2023). Building an Agroecology knowledge network for agrobiodiversity conservation. *Conservation*, *3*(4), 491–508. https://doi.org/10.3390/conservation3040032

Oakden, L., Bridge, G., Armstrong, B., Reynolds, C., Wang, C., Panzone, L., Rivera, X. S., Kause, A., Ffoulkes, C., Krawczyk, C., Miller, G., & Serjeant, S. (2021). The importance of citizen scientists in the move towards sustainable diets and a sustainable food system. *Frontiers in Sustainable Food Systems*, *5*. https://doi.org/10.3389/fsufs.2021.596594

Pinedo-López, J., Baena-Navarro, R., Carriazo-Regino, Y., Torres-Hoyos, F., & Nieves-Garces, D. (2025). Science, technology, and innovation policy and regional scientific production in Colombia: a methodological framework to address asymmetries in developing countries. *Journal of Innovation and Entrepreneurship, 14*(1), 89. https://doi.org/10.1186/s13731-025-00562-0

Rodríguez López, M. D. C., & Ortiz Blanco, A. M. (2024). Nexo ciencia, tecnología, cultura y sociedad. *Revista Opinião Filosófica*, *15*(1), 1–13. https://doi.org/10.36592/opiniaofilosofica.v15n1.1163

Rubiano, M. F. G., Medrano, J. C. M., Ocampo, C. P. R., Sosa, I. S., & Medel, R. R. (2025). Pasando del qué hacer al con quién hacerlo: el caso de la apropiación social del conocimiento y tecnologías en el Alto Putumayo, Colombia. *Naturaleza Y Sociedad Desafíos Medioambientales*, *12*, 42–64. https://doi.org/10.53010/nys12.02

Sakaguchi, M. (2024). Overview of a Platform for International Collaborative Research: Schemes of Japan (MEXT and JSPS) and South Africa (DHET and NRF). In *UJ Press eBooks* (pp. 177–203). https://doi.org/10.36615/9781776489350-09

Sánchez Suárez, Y., Marqués León, M., Hernández Nariño, A., & Suárez Pérez, M. M. (2023). Metodología para el diagnóstico de la gestión de trayectorias de pacientes en hospitales. *Región Científica*, *2*(2), 23. https://doi.org/10.58763/rc2023115

Santana, M. A. (2023). Impact of public policy on higher education in Cuba. *Region - Educational Research and Reviews*, *5*(2), 34. https://doi.org/10.32629/rerr.v5i2.1224

Schifano, J., & Niederberger, M. (2025). How Delphi studies in the health sciences find consensus: a scoping review. *Systematic Reviews, 14*(1), 14. https://doi.org/10.1186/s13643-024-02738-3

Spranger, J., Homberg, A., Sonnberger, M., & Niederberger, M. (2022). Reporting guidelines for Delphi techniques in health sciences: A methodological review. *Zeitschrift fur Evidenz, Fortbildung und Qualitat im Gesundheitswesen, 172*, 1-11. https://doi.org/10.1016/j.zefq.2022.04.025

Van Der Plank, S., Addo, K. A., Anderson, R., Boruff, B., Bruce, E., Chambers, K., Duncan, J., Davies, K., Escoffery, D., Fidai, Y., Fletcher, D., Hickey, S., Jayson-Quashigah, P., Maxam, A., Pauli, N., Schlenker, M., Sowah, W. N. A., & Dash, J. (2024). The 'More Than Maps' framework for building research capacity among young people in coastal climate change adaptation. *Area*, *56*(2). https://doi.org/10.1111/area.12919

Villalonga Arencibia, Y. S., Tarifa Lozano, L., De Lourdes Artola Pimentel, M., Palmira, E. a. G., González, Y. A., & De La Cruz, L. F. (2023). Diagnosis on social impact measurement in the Matanzas science and technology park. *Revista Boletín Redipe*, *12*(5), 105–113. https://doi.org/10.36260/rbr.v12i5.1968

Weisz Kohn, C. B., Tommasino Comesaña, N., & Rieiro Castiñeira, A. (2022). Entramados afectivos en movimiento: redes de Economía Social y Solidaria en Uruguay. *Psicología Conocimiento Y Sociedad*, *12*(2). https://doi.org/10.26864/pcs.v12.n2.5

Zabala Argüelles, M. del C., Peñate Leiva, A. I., Díaz Pérez, D., & Núñez Morales, I. (2023). Desigualdades sociales en la sociedad cubana actual. Desafíos para la educación. *Estudios del Desarrollo Social: Cuba y América Latina, 11*(3). http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2308-01322023000300017

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Declaration of author responsibility

Yasniel Sánchez Suárez: 1: Conceptualization, Data curation, Formal analysis, Research, Methodology, Resources, Software, Supervision, Validation/Verification, Visualization, Writing/original draft and Writing, review and editing.
Sandro Felipe Acosta Mesa 2: Data curation, Formal analysis, Research, Resources, Software, Supervision, Validation/Verification, Visualization, Original drafting, and Writing, reviewing and editing.
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Special Acknowledgments:

We would like to thank the members of the network, the directors of the MES (especially the General Directorate of Research and Postgraduate Studies), and the national coordination for the support received for carrying out the research in question.

Financing:

Own resources