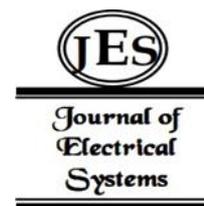


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# Perception of Agricultural and Agro-Industrial Companies about the Management of Research, Technological Development and Innovation of the Agro-Industrial Technological Innovation Center Ica - Peru



**Abstract:** - The Centers for Productive Innovation and Technology Transfer (CITE) promote innovation and drive the use of new technologies among producers, companies, associations and cooperatives in each productive chain (i.e., agro-industrial, leather and footwear, fishing and aquaculture, wood and forestry, and so on). The objective of this article is to analyze the level of perception of the management of research, development and innovation (R&D&i) of the CITEagroindustrial Ica in agricultural and agro-industrial companies in Peru. The study is based on a quantitative approach, the data were collected from 304 responses from surveyed agricultural and agroindustrial companies that received some technological service at CITEagroindustrial Ica. The results show the level of R&D&i management of the CITEagroindustrial that allows identifying opportunities for improvement to energize the agro-industrial value chains of export products in Peru, which is relevant for developing countries. Likewise, it can be replicated in other CITEs.

**Keywords:** Perception, Management, Research, Technological development, Innovation, CITEagroindustrial Ica.

## I. INTRODUCTION

The Ica region is characterized by having agribusiness as one of its main economic activities, which in recent years has allowed it to be among the most competitive regions in the country, ranking 5th out of 25 regions in 2020 [1]. However, micro, small and medium-sized companies represent large parts of the companies that also boost production and generate income, so many of them need to strengthen their innovation and productivity capabilities, among others.

The Technological Innovation Centers (CITE) in the country promote and encourage the capacity for innovation in companies as agents of the country's economic development [2]. The CITEagroindustrial is aimed at developing solutions that add value to companies in the agri-food sector in the Ica region of Peru, through research, technological development and innovation. However, it has strengths and limitations with respect to management capabilities [3]. If it is taken into account that each year more companies are expected to improve their capabilities to be more competitive, especially those that have been affected by the COVID-19 pandemic, it is necessary to know the perception of those agricultural companies regarding the R&D&i management of the CITEagroindustrial [4]. Therefore, it is necessary that said information comes from those companies that have taken services from the Technology Center, in order to develop improvements in management capabilities if necessary or strengthen their potential that leads to boosting the development of the region in the agro-industrial sector.

Faced with the context of promoting economic reactivation in the agro-industrial sector, the problem is described around the way in which the CITEagroindustrial, through its management capabilities in research, technological development and innovation, can contribute to the improvement of agricultural companies. Since the CITEs have infrastructure, equipment, demonstration plots and technological services, which, if used optimally, could support many small and medium-sized companies.

A study of the Technological gap in agro-export companies in the Lambayeque region through the CITE Design was carried out in [5]. For this purpose, a diagnosis of 66 companies was carried out and an Agro-industrial CITE was proposed with a focus on value-added products in the international market. On the other hand, [6] analyzes the functions of a Technology Transfer Office (OTT) for the promotion of innovation in regional development in Mexico. An instrument was applied to 131 OTTs with the objective of measuring their impacts considering regional specialization, economic sectors, and regional agglomeration indicators.

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[7] analyzes the specific factors of the Knowledge Management Enablers (KME) dimensions that can affect innovation capabilities in an R&D organization. Likewise, it seeks to correlate personal, organizational and technological capacity with innovation. Also, in order to stimulate creative thinking, strengthen the integration of processes, strengthen business culture and increase innovation in the company, the internalization of innovation as a shared value is proposed in [8].

This study allows us to know in an exploratory way the attitudes of micro, small and medium-sized agricultural and agro-industrial companies in Peru, regarding the CITEagroindustrial service in R&D&I management, thus being a first step to know the opinion and assessment collected from companies, which will allow them to identify opportunities for improvement to be increasingly efficient in the management of research, technological development and innovation, and can be replicated by the different innovation and technology transfer centers which have energized the value chains. Agro-industrial export products in Peru, thus being relevant for other developing countries.

The general document is organized as follows: Section I corresponds to the introduction where the main idea of the perception of an R&D&I Center is presented. The services that CITE provides to companies are indicated in section II. Section III formulates the methodology used for the problem. Section IV indicates the results obtained. Finally, the conclusion of the work carried out is indicated.

## II. R & D & I SERVICES TO COMPANIES

CITEagroindustrial focuses its services on agricultural and agro-industrial companies in the Ica region. However, it is necessary to effectively organize its activities and use of material, technological and human resources to increase the effectiveness of the impact of the CITE-Company interaction. [9]-[11].

Currently, CITEagroindustrial provides the following services related to R&D&i:

### A. *Laboratory tests*

Instrumental physical and chemical tests are carried out for the wine and agro-industrial sector. Also, it participates in standardization and research activities.

### B. *Production*

It addresses training services, packaging, development of new products, has infrastructure and equipment in areas of harvest, fermentation, distillation, rest and microvinifications and microdistillations.

### C. *Research*

Research projects related to the topics of climate change, agriculture and pest management are mainly developed; the research responds to business problems.

### D. *Agricultural Production*

Provides support to small and medium-sized producers in the proper agronomic and phytosanitary management of the vine, whether it is intended for the production of table grapes, raisins, pisco and wine production.

### E. *Training and technical assistance*

Training is provided on production, innovation, processes, laboratory analysis, regulations, among others.

### F. *Quality*

Programs are provided around quality, safety and production. CITEagroindustrial has quality management and assurance systems that ensure that our products are manufactured under strict hygiene and quality standards, free of physical, chemical and biological contaminants.

## III. METHODOLOGY

The research is of the qualitative-quantitative type; since the identification and analysis of the R&D&i services provided by CITEagroindustrial Ica is carried out, and the level of perception of the R&D&i management of CITEagroindustrial is identified and analyzed through a survey instrument. Ica in agricultural and agroindustrial companies in the Ica Region.

A virtual survey is used based on a questionnaire of closed questions based on a Likert social scale adapted to capture the perception of the participating company in relation to the R&D&i management of the CITEagroindustrial. This survey has been previously validated by a group of experts with experience in public management with emphasis on R&D&I capabilities [12]-[14].

The sample is identified, through a non-probabilistic selection, made up of companies from this population. According to the information obtained in the questionnaire used to develop the surveys, we worked with a sample of 304 survey respondents from agricultural and agro-industrial companies in the Ica region, for which the segmentation criteria of the study were identified to characterize the participation of the companies, as well as for better analysis. Among these criteria, we worked with type of company due to its size and type of company due to capital investment, as specified in Table I.

**Table I.** Study Segmentation Criteria.

Classification	N	Percentage (%)
Type of company by size		
Microempresa	191	63
Small company	67	22
Medium company	46	15
Type of company by investment of its capital		
Public	33	11
Private	271	89

#### IV. RESULTS

The perception of CITEagroindustrial Ica's R&D&I management by agricultural and agroindustrial companies represents relevant information for this public institution that provides technological services, especially with a view to working on continuous improvement that increases competitiveness in companies.

##### A. Knowledge of CITEagroindustrial Ica

As in Fig. 1, to know what the opinion is regarding the level of management in R&D&i, the knowledge that the companies had about the CITEagroindustrial was considered as a starting point, from which it was obtained that in the case of the statement about whether the CITEagroindustrial is a public institution and belongs to the Ministry of Production, it is highlighted that 71% responded that they totally agree, while 26% responded that they agree with said statement, which reflects that around 97% claim to know the type of institution. and its affiliation, which confirms the services and opportunities that can be provided to companies from the State.

Regarding knowledge about whether they knew that CITEagroindustrial provides technological services, 57% mentioned that they totally agreed and 41% mentioned that they agreed, which shows that there is a clear knowledge of the technological services that it provides, which which has allowed them to expand their client portfolio beyond the Ica Region, reflecting that there is adequate dissemination of the technological services they offer.

For the stated case: The CITEagroindustrial provides technical assistance and training that strengthens the productive chains, 57% of the companies responded that they totally agree and 41% responded that they agree, in this way it is stated that around 98% give an opinion. positive assessment since they claim to know that CITEagroindustrial provides this type of service with a focus on improving the technological capabilities of micro, small and medium-sized companies in the Ica Region.

Likewise, another knowledge statement analyzed was whether the CITEagroindustrial Ica promotes the optimization of processes that promote industrial competitiveness in Peru. Regarding this particular question, it was reported that 34% stated that they totally agreed, while 57% responded that they agreed. agree, which shows that there are still opportunities for improvement to position this institution based on the results obtained from providing services, additionally mentioning that as mentioned in the segmentation criteria of the research, 64% of those surveyed were represented by micro and small businesses, which also shows that a greater push is still required in their institutions to talk about industrial competitiveness, which occurs when the work carried out is on a larger scale.

Finally, the statement for this section on whether the CITEagroindustrial has management systems based on international standards, it was obtained that 47% of the companies indicated that they totally agree, meanwhile 42% responded that they agree, in this way it is confirmed that around 89% of agricultural and agroindustrial companies know that CITEagroindustrial Ica is aligned with management systems that meet international standards, which provides guarantees to their clients.

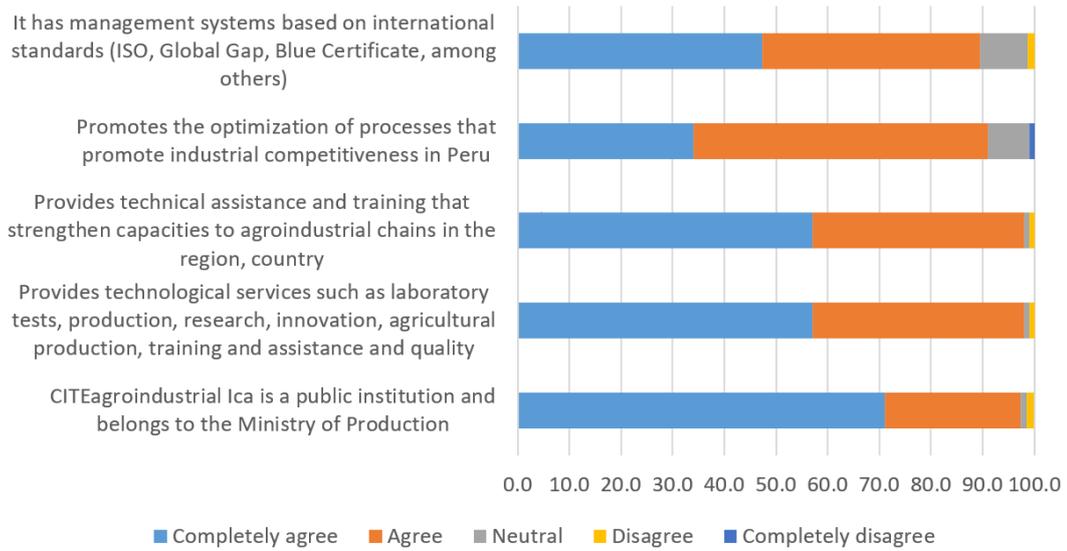


Figure 1. Knowledge perception.

*B. Perception of R&D&I management efficiency of CITEagroindustrial Ica*

As in Fig. 2, to measure the perception of management efficiency, statements were considered that lead to an assessment of the opinion they have when using technological services, of which it is highlighted that companies recognize that 33% agree completely and 57% agree when it is mentioned whether the CITEagroindustrial has trained personnel to carry out management activities; Another aspect that demonstrates the commitment to carry out research in this institution are the responses obtained when it was mentioned whether they considered that the CITEagroindustrial Ica has trained personnel to carry out research since 42% stated that they totally agreed and another 50% also responded. agree, which shows that around 92% gave a positive evaluation to this statement.

In the case of the other responses related to the installed capacity to provide services, 34% mentioned that they totally agreed and 51% reported that they agreed, which confirms that CITEagroindustrial has the capabilities at the level of infrastructure and equipment. to meet the needs of the region in agroindustrial matters.

Regarding compliance with service delivery times and whether the administrative processes are customer-friendly, 34% and 28% stated that they totally agreed, respectively, while 51% and 59% indicated that they agreed, respectively.

— Completely agree — Agree — Neutral — Disagree — Completely disagree

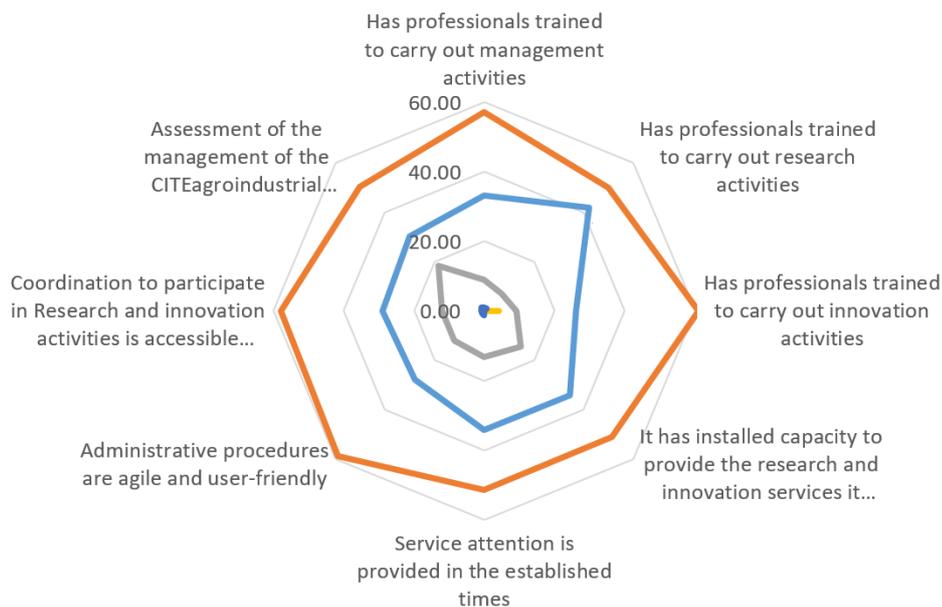


Figure 2. R&D&I management efficiency.

C. Perception of quality of the technological services of CITEagroindustrial Ica

Additionally, as in Fig. 3, in addition to management perception, it was also considered relevant to know the perception at the level of the quality of services they provide related to R&D&i.

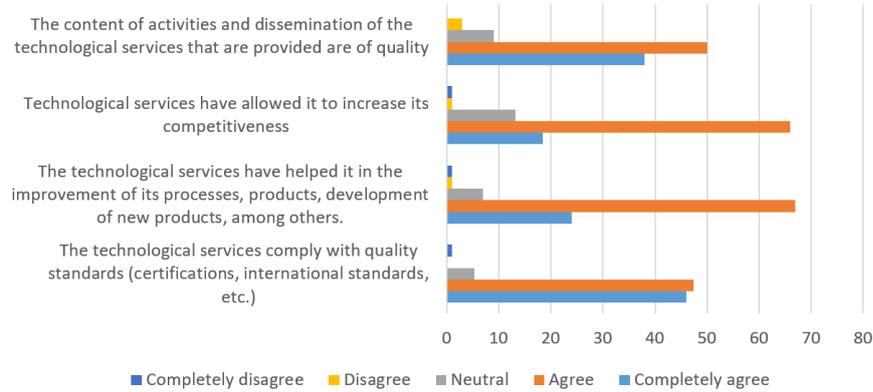


Figure 3. Quality of technological services.

Within this section, the statements that are highlighted are related to the perception of whether technological services meet quality standards, from which it was obtained that 46% of the companies reported being in complete agreement and 47% stated that they agreed about said statement which confirms that the clients who use these services give a passing assessment to CITEagroindustrial for providing its services with international standards, that is, aspects of calibration, audits, accreditation of its laboratories among others.

Likewise, regarding whether technological services have helped in the improvement of processes and if it has allowed them to increase their competitiveness, the results obtained were: 24% and 18% of the companies reported being in total agreement respectively, and 67% and 66% respectively. , stated that he agreed with these statements.

Another statement that should be mentioned is the assessment they gave regarding whether it is considered that post-service follow-up is necessary to ensure the quality of the service provided. According to this, 62% for the scale totally agreed and 38% stated that they agreed. agree, which shows the need to incorporate this post-service monitoring which will increase not only the perception in R&D&I management but also the improvement of competitiveness in companies.

Finally, the statement was made regarding the perception of good coordination and dissemination of technological services where it was identified that on perception issues, 38% of companies indicated they totally agreed and 50% reported agreeing, in this way Compliance with the dissemination of the information resources provided by the CITEagroindustrial is evident.

D. Global analysis of the perception of the R&D&I management of the CITEagroindustrial Ica by agricultural and agroindustrial companies

This section presents, as Fig. 4 shown, the results of the surveys analyzed graphically by color intensity (heatmap - heat points), with a significant rating of “totally agree” were questions 7 (Do you have personnel trained to carry out research activities ) and 9 (It has installed capacity to provide the services it offers related to R&D&I), which is an indication that users highlight both the capabilities of the professionals who carry out research management, as well as the installed capacity. presented by CITEagroindustrial Ica (infrastructure, equipment).

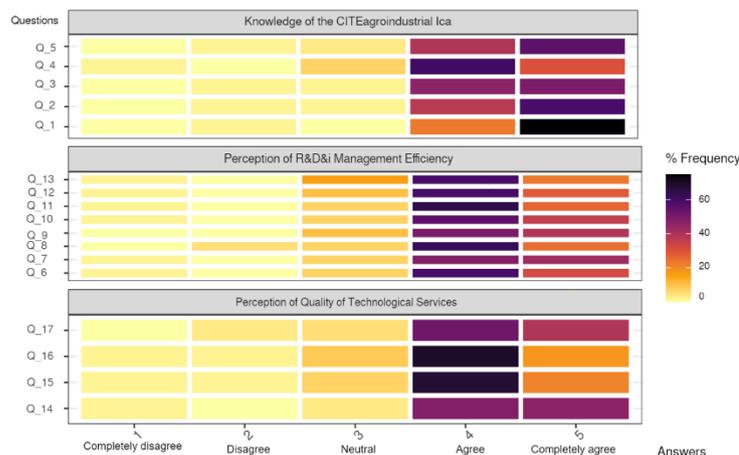


Figure 4. Perception of CITEagroindustrial Ica by agricultural and agroindustrial companies.

Finally, regarding the perception related to the quality of the technological services provided, it was identified that the answers to questions 15 (Technological services have helped you improve your processes, products, development of new products, among others) and 16 (Technological services have allowed them to increase their competitiveness) obtained the highest percentage with the rating “agree”, which provides support for the quality service they offer, which is reflected in the rating assigned by the respondents.

## V. CONCLUSION

The analysis of the knowledge that companies have of the institution is relatively complete. That is, around 97% of companies stated that they agreed and totally agreed on issues regarding the agency to which CITEagroindustrial Ica belongs, the services they offer, capabilities they provide, the benefit they provide in the agroindustry and the management systems that said state entity has, which infers that users know and are clear about this knowledge about the CITEagroindustrial Ica.

It was found that the level of perception of R&D&I management efficiency was mostly in agreement and totally in agreement, since between these two responses the lowest percentage amounted to 87% of responses, which indicates that companies consider that there is efficiency in the management of services they offer, highlighting that they recognize that they have trained personnel whether for management, research activities, innovation; as well as the infrastructure they have to provide services and compliance with the deadlines for requesting their administrative processes.

At the level of quality perception, it was evident that the user companies consider that quality services are provided, since their responses also stood out as agree and totally agree, with the sum of these evaluations being greater than 84%, however, through The surveys also identified that companies consider it necessary to implement an additional service such as post-sales monitoring, which will allow us to know the improvement in the competitiveness of the company based on the services provided, whether at the level of training or in their processes.

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