



Case study on the Digital Extension Centre, Chile

Contribution to the OECD TIP Digital and Open Innovation project

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Executive summary

The Center of Technological extension in intelligent industries: Digitalization and Automation of the Agribusiness sector” (hereafter, the ‘Digital Extension Centre’), which started in 2018, aims to help addressing the needs in terms of technological updating, digitalization and automation of the productive processes of small and medium-sized agribusiness and fruit companies of the Maule Region. The main goal is to ensure the correct absorption of technological solutions by these companies, in order to increase their productivity and competitiveness.

The extension services are delivered by the extension agents supported by the universities. If this is not possible and technically the service should be executed by one of the participating academics, the customer will be offered the service in packaged form to avoid losses of time and profitability. The main areas of action are technical assistance to deploy new technologies, education and training. Their services seek to deliver 3 key value factors for companies: smart, digitalization, automation.

The activities of the Centre are targeted at SMEs in the fruit and agribusiness sectors. The technologies of focus include the following: software and information systems; sensor technologies- IoT- Geolocation; networks and connectivity; storage and information management and data analytics.

The Digital Extension Center is led by the University of Talca, through the Faculty of Engineering, in collaboration with the Faculty of Agricultural Sciences, Center of Pomáceas and Center for Research and Transfer in Irrigation and Agroclimatology. Implementation is strengthened through the collaboration with the Technological University of Chile (Inacap), Sede Talca - a Co-executor that seeks to be a linking agent between the needs of technological updating in matters of digitalization and automation of the productive processes of small and medium-sized agribusiness and fruit companies in the Maule Region.

1. The process of creation

1.1. What are the main factors and background conditions that motivated the creation of the Digital Extension Centre? What stakeholders were involved in its creation?

The innovation policy of the Innovation Division of the Ministry of Economy establishes as a central purpose to increase the growth rate of the country's productivity through innovation. Standing out as a priority action of public policy is to get a relevant number of national companies reach the technological frontier, acquire the best productive practices and count on human capital with high capacity for absorbing new technologies. For this, it is necessary to act, first, on the offer side, to support technological diffusion and technological awareness raising, and second, on the demand side, in order to improve the use of technology and stimulate innovation in companies. In the first case, institutions capable of identifying the best practices and technologies available in Chile and in the world should be strengthened, existing gaps in companies in the country should be assessed, and then technologies should be adapted to their needs and disseminated as appropriate. On the demand side, it is necessary to stimulate the interest of the companies, through associative efforts and through specialized consultancies.

In situations of low competitiveness, the intervention of the State is justified when the companies do not find in the market the resources to solve their problems, even though they make their best efforts. When analysing the situation in Chile, some of the main competitiveness challenges for firms include:

- **Little information for SMEs to innovate:** The Eighth Innovation Survey indicates that 30.10% of Chilean SMEs consider that more information on technology is needed to innovate.
- The greatest **existing gaps** between the **absorption capacities** of companies of 25% of "advanced" versus those of 25% of "laggards", is given by the training of personnel, by the incorporation of management systems and quality standards (ISO or others), or for external consultancies or the use of software (InnovaChile study: "Evaluation of the capacity to absorb knowledge of Chilean companies", Pulso SA consultant, 2009).
- **Limited supply of productive technological services for business development:** according to the Eighth Innovation Survey, only 6.8% of the companies that perform innovative activities carried out cooperation actions. Of these, 31.3% did with private consultants, laboratories or institutes of R&D and 52%, considered that the importance of using this cooperation mechanism was very high to carry out the innovative activity.
- **Low reliability and dispersion of information sources consulted by SMEs** to learn about new technologies and available knowledge: 85% of national SMEs discretionally use the Internet as an information channel to learn about new trends, knowledge and technologies in the market, being that in 55% of the cases, it is considered as the most important information channel.

It is in this context that the Chilean government decided to promote the creation of **Technological Extension Centers**, aimed to provide small and medium-sized companies with an adequate and effective offer of specialized technological services, technical assistance for an adequate technological absorption, services for the improvement of their

receiving capacity of technologies and strengthening of their capacity to innovate. The definition of technological extension considers "all the mechanisms designed to stimulate companies to acquire or improve the use of technology and stimulate innovation, be it product, process or organization". The program was created by the Ministry of Economy and designed by CORFO.

In general terms, the Technological Extension Centres ("*Centros de Extensionismo Tecnológico*", or CET) have as main functions: (1) the realization of diagnoses of obstacles and problems that face the companies; (2) the identification, based on their experience, of possible solutions considering technological alternatives, know-how and other forms of knowledge available, generated through the implementation of technology surveillance activities; and (3) the implementation of the solutions proposed in the companies.

The scope of the program has been oriented to potential economic sectors of the economy within the framework of CORFO's strategic program "Transforma".

The program started in 2015 and it has financed 13 Centers. Each centre gets 300 million Chilean pesos per year, for 3 years in total. One of them is the "**Center of Technological extension in intelligent industries: Digitalization and Automation of the Agribusiness sector**" (hereafter, the 'Digital Extension Centre'), which started in 2018.

The Center will be a linking agent between the needs of technological updating in matters of digitalization and automation of the agro-industrial companies of the Maule Region, as a potential economic sector and it is highly representative of the region. To fulfil this objective, solutions based on digital technologies such as Big Data, Cloud Computing, Security, Storage, Sensor Networks, Mobility and Robotics will be developed and transferred. These are becoming increasingly crucial to enable the improvement of productive factors in the industry, such as competitiveness, the added value of products and services, operational excellence and exports.

1.2. Did the creation of the Centre involve co-ordination with other policy areas? What mechanisms facilitated such co-ordination?

The Digital Extension Centre (or "Center of Technological extension in intelligent industries: Digitalization and Automation of the Agribusiness sector"), which was established in 2018, is part of the Technological Extension Centers programme, initiated in 2015.

The Technological Extension Centers program is aligned with all policies aimed at providing support (in the broad sense) to small and medium-sized companies. The most relevant are:

- "Transforma" Strategic Programs (Corfo)
- Business Development Centers (Sercotec)
- Small Business Management (BancoEstado)

More details are provided in section 3.4.

2. Main features of the Digital Extension Centre

2.1. What is the mandate and the specific objectives of the Centre?

The main objective of the **13 Technological Extension Centers** is to provide SMEs with an adequate and effective offer of specialized technological services, technical assistance for adequate technological absorption, services for improving their capacity to receive technologies and strengthening their capacity to innovate.

In particular, the **Digital Extension Centre** aims to help addressing the needs in terms of technological updating, digitalization and automation of the productive processes of small and medium-sized agribusiness and fruit companies of the Maule Region. The main goal is to ensure the correct absorption of technological solutions by these companies, in order to increase their productivity and competitiveness.

Specific objectives:

- Increase productivity and competitiveness
- Promote investments in technological improvements
- Contribute to the technological update
- Promote professionalization in critical areas

The Digital Extension Center is led by (and located in) the University of Talca, through the Faculty of Engineering, in collaboration with the Faculty of Agricultural Sciences, Center of Pomáceas and Center for Research and Transfer in Irrigation and Agroclimatology. Implementation is strengthened through the collaboration with the Technological University of Chile (Inacap), Sede Talca - a Co-executor¹ that seeks to be a linking agent between the needs of technological updating in matters of digitalization and automation of the productive processes of small and medium-sized agribusiness and fruit companies in the Maule Region. The objective is to ensure the correct absorption of technological solutions in order to increase their productivity and competitiveness.

2.2. What are the Centre's main areas of action?

The services are currently being defined. These will be delivered in the first instance by the agents of the extension centre supported by the universities. If this is not possible and technically the service should be executed by one of the participating academics, the customer will be offered standardised services to avoid losses of time and profitability.

The functions of the extension agents are the following:

- Application of technical diagnostics to companies.
- Identify the improvement needs of the processes within their field of action, mainly and indirectly the capabilities of the team.

¹ the co-executor is one who complements the capabilities of the University of Talca in the guidelines of the Extension Center.

- Prepare proposals for technical assistance services according to the CORFO guidelines and adjusted to the processes in the Extension Center, according to the requirements of the companies.
- Organized and systematic follow-up of the work plan that assesses the achievement of the proposed objectives and the technical adoption of the companies, with general indicators and indicators for the case, and registration of the relevant information with the media for the Extension Center.
- Represent the Extension Center in the activities in the field and the dissemination corresponding to the protocol of the work, ensuring the correct execution before the Management and Management of the CET.

The main areas of action are education and training and technical assistance to deploy new digital technologies. Their services seek to deliver 3 key value factors for companies: smart, digitalization, automation.

2.3. Do the activities of the Centre focus on specific sectors or technologies? If so, which ones? Are there mechanisms in place to ensure interdisciplinary approaches to research and innovation?

The activities are targeted at SMEs in the fruit and agribusiness sectors. The technologies of focus include the following:

Software and information systems: It corresponds in general to the diagnosis, adaptation and implementation of computer solutions to different problems and situations of interest for SMEs in the fruit and agroindustrial sectors, through specific applications of software or information systems that integrate and require greater complexity. The following services are available to beneficiaries:

- Software applications adapted to specific problems.
- Information systems that integrate solutions for managing variables.
- Replacement of proprietary technologies, through the adaptation of solutions in free software alternatives.
- Mobile applications and integrated information systems, usable in smartphones, tablets and others.

Sensor technologies- IoT- Geolocation: Corresponds to the diagnosis of needs, adaptation and implementation of solutions associated with sensorization of variables of interest for the various productive sectors of interest of this CET. These variables need to be measured online using technologies of the IoT type, which allow generating, storing and transferring the information collected in real time. This topic includes the use of sensors in the field, aerial robotics through the use of drones, and geographic positioning systems. This allows generating key information for the digitization process of the fruit and agroindustrial sector, considering the different stages of the productive chain of the fruit and agribusiness sector, from the orchard to the consumer, which is linked to gaps and traceability needs. The following services are available to beneficiaries:

- Adaptation and implementation of IoT solutions for the digitization of variables of interest.
- Adaptation and implementation of sensors with specific application and energy autonomy.

- Solutions based on aerial robotics to record, monitor, and control variables of productive interest.
- Geographical positioning solutions.
- Traceability of fruit processes.
- Technical-economic evaluation of technological investment alternatives in areas of digitalization and automation.

Networks and connectivity: It corresponds to the identification and delivery of solutions to technological gaps linked to securing and delivering enabling infrastructure in terms of digital connectivity of the different stages of the productive chain of the agro-industrial sector. Including sensors, equipment and other existing systems. This area is linked to the predecessors since it provides connectivity support to feed information systems to support the fruit and agroindustrial sector. The following services are available to beneficiaries:

- Specific diagnosis of the connectivity situation in the productive sector.
- Wireless connectivity in orchards and hard-to-reach production sites. Including protocols, equipment and usability.
- Integration and connectivity of existing digital systems.

Storage and information management: This aspect is related to the needs and gaps identified in the sectors of interest, regarding storage capacity, access and information management. Particularly in the Maule Region there are important shortcomings regarding the availability of enabling infrastructure for hosting services, access and processing of information online or in the cloud. The following services are available to beneficiaries:

- Information storage with security features, information integrity.
- Online management of information, including physical support as in the cloud.
- Web services that deliver information online to users and interested parties.

Data analytics: It corresponds to the delivery of solutions for the analysis of the information generated in the different productive stages associated with the prioritized sectors. This service area has special interest because it provides information with high value for companies, which provide answers to problems and factors of great impact in the fruit sector as the main focus. For example, by providing predictions regarding crop yields, production quality indicators, the presence of pests and diseases, alerts about climatic events, among other factors. These services are linked to the use of statistical models, based on artificial intelligence techniques and the development of intelligent systems in general, that use the information generated, and stored on parameters and production variables (historical business data) to respond to the needs of the company. The following services are available to beneficiaries:

- Predictive systems for crop yield.
- Early warning systems for pests and pathogens that affect productivity
- Early warning systems of climatic phenomena that affect productivity
- Solutions based on artificial intelligence techniques for agribusiness. With focus on inference of parameters and variables of interest in production.

2.4. What is the annual budget allocated to the Centre? What are the sources of funding?

The public budget is 300 million Chilean pesos per year, for three years in total. In addition, a total of 15 million Chilean pesos for the three years are fund by the University of Talca, and 230 million Chilean pesos on valued contribution. INACAP fund 12 million Chilean pesos on valued contribution (Operational and Human resources) in total for the three years.

The sustainability model of the Center includes 3 sources of private financing. However, for the first 3 years of operation, the financing is mainly public, with a percentage of financing from private sources charged to companies for the services received and memberships, which happens gradually and quite slowly during this period. Generally, the companies cover around 30% of the actual cost of the service provided, while the differential is subsidized by the program.

After the first three years, funding is expected to come from 3 (mainly private) sources: payment for services, leverage resources from public/private projects, and memberships. More details are provided below:

1. Payment for services

Regarding the pricing policy, values established by CORFO are considered by type of service. The subsidy percentages will be reduced, as much as possible, from year 2, this is desirable but not mandatory, depending on the case to case, however the centre must look for sustainability for the beginning of year 4, assuming that the basal funding it is finished and it can only continue to function based on the resources generated, and in this period it must already have its own legal personality. The value of each service will ultimately depend on the number of hours that this requires.

2. Leverage resources of public/private funds:

It is also considered the application to public and / or private funds for both national and international projects, in which the SMEs are the beneficiaries. These may include application to CORFO funds (business innovation, Voucher, prototype, packaging, technology contracts, among others), SERCOTEC, FIA (tenders for example), CONICYT (regional action, science company linkage, among others), FND for implementation, Regional Government Funds, among others. The Digital Centre is considered in the execution of specific activities within the projects or as a co-executor, associate, institution providing knowledge or beneficiary depending on the case.

3. Membership

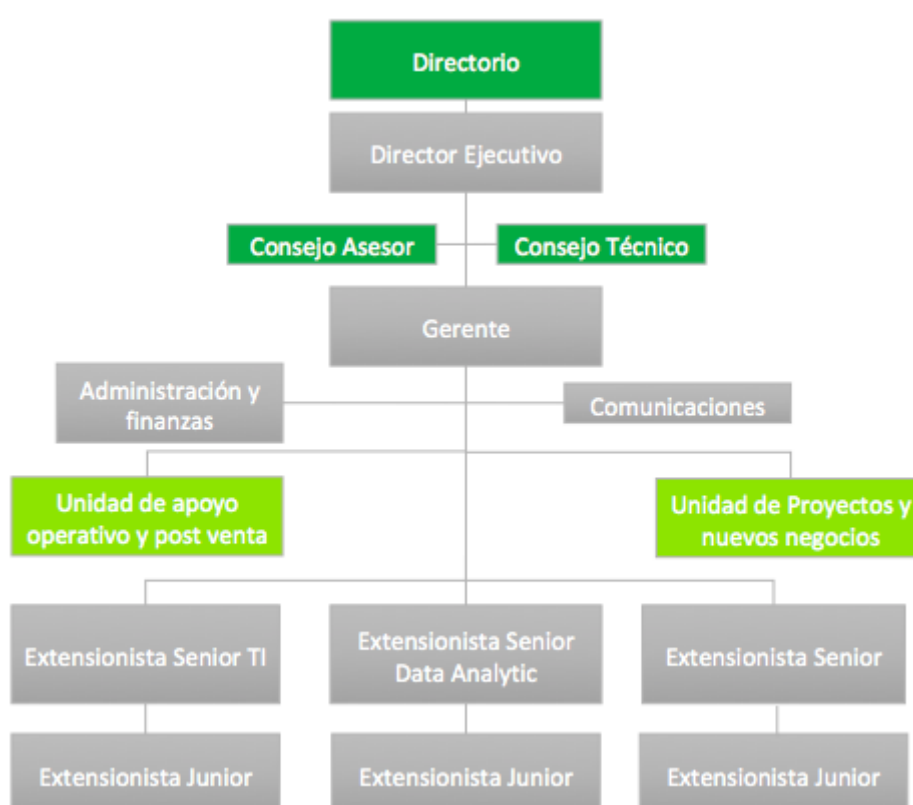
It is intended to have income also by the concept of "membership" of individual SMEs. The price range will be validated in the initial market study.

3. The Digital Extension Centre in practice

3.1. What type of organisational structure does it have? What are the mechanisms in place to ensure that the activities of the Centre are in line with its general objectives/mandate?

The structure of the organization is hierarchical: it has a Board of Directors, a Technical Board and an Advisory Board, as detailed in the figure below:

Figure 1 Structure of the Digital Extension Centre



Within the functions of the **Board of Directors** (“Directorio”) is the strategic definition of the Center and ensure that the activities developed are aligned with its objectives. Its conformation allows obtaining a vision of the main representatives of the sector belonging to the academic, business and public world.

The Board of Directors is composed by: the Executive Director of ThinkAgro, a representative of the Digital Transform Committee (CORFO), a fruit sector entrepreneur, an agroindustrial sector entrepreneur and two technology providers. The board of Directors will hold ordinary and extraordinary sessions. The ordinary will be held, at least, every two months.

The second instance of governance corresponds to the Technical Council and Advisory Council.

The **Technical Council** (“Consejo Técnico”) participates in decisions of a technical and operational nature. Its main function is to validate the offer of technical assistance services of the center and define the technical content addressed in the activities developed by the center. It is composed of academics of both institutions (UTalca and Inacap), who meet every 4 months. The **Advisory Board** (“Consejo Asesor”) is composed of representative groups of local companies and they participate in the validation of the supply of services according to the demand.

Finally, the internal conformation of the team is led by the **General Manager** (“Gerente”), who acts according to guidelines established in the strategic planning. Its functions are managing and leading activities related to obtaining resources and their effective and efficient use for the achievement of the Center's objectives. The activities of the Manager are developed within a context of objectives and policies, concurrent activities of planning and control as well as the direct relationship with the Center's clients.

There are also the extension units and the operative and after sales support unit. These two units are related in the execution and evaluation of the diagnoses and interventions. The extension agents are directly related to the manager in the yield of productivity according to indicators of the center and also propose new clients. They also relate to the unit of projects and new businesses in the proposal of new partners and potential services to offer, all according to their practical experience in the field.

3.2. In what ways does the Centre differ from others (if any) that do not have a digital focus?

There are no other Technology Extension Centers or other initiatives for SME companies in the fruit and agribusiness sector with a focus on digitalization in the territory. The main differentiation of this center is in the productive technological areas it deals with, which are related to smart agriculture technologies, such as software and information systems, sensorization, storage and information management and data analytics, which have direct effects in the management of agricultural variables that have an impact on the competitiveness and productivity of SMEs.

3.3. What challenges have been faced during the process of design and/or implementation of the Centre (if any) and how are these being (or planning to be) addressed?

The challenges that have been identified in the first 3 months of operation of the Centre have to do with:

- Aspects of connectivity associated with low levels of internet coverage and poor quality of service in rural areas, making it difficult to use software or other technologies that depend on the Internet. This also makes it difficult to transmit large amounts of data.
- Low capacity of absorption of new technologies by workers.
- Low development of human capital for ICT management.
- Lack of awareness of the potential economic benefits of the implementation of new technologies.

- Prioritize the services associated with "digitalization" and understand that this is a means to achieve an ultimate goal (increase in productivity). For the Center, it has been complex to prioritize where to start or what dose of services to deliver. On the one hand, they can sensorise an entire production and spend many hours, but they must also look for services that have an impact on more "measurable" indicators.

A study of specific demands in the sectors and territory that the Center is addressing is currently being prepared, with the purpose of defining a range of services and strategic guidelines that allow them to address and minimize these gaps.

3.4. Are other policy initiatives (also in other policy areas) in line with the objectives of the Centre? In what ways do they reinforce each other?

The Technological Extension Centers program is aligned with all policies aimed at providing support (in the broad sense) to small and medium-sized companies. The most relevant are:

- "Transforma" Strategic Programs (Corfo)
- Business Development Centers (Sercotec)
- Small Business Management (BancoEstado)

CORFO's Strategic Programs are a set of initiatives that seek to enhance the diversification and sophistication of the economy, identifying technological and market opportunities, with global reach, under an intelligent specialization approach. The mechanisms of linkage and reinforcement with the 'Transforma' Strategic Programs are generated through the active participation of representatives of the programs in the governance of the centers, which provide a sectoral institutional vision in the strategic definitions of the centers.

On the other hand, there is an intense complementary collaborative work between the Technological Extension Centers (CET) and the Business Development Centers (CDN) of), which provide free advice to smaller companies addressing issues of business management, finance, business models, and marketing. As a result of this link, to date there has been a bidirectional flow of more than 100 derivative companies.

Finally, since August of 2017, there is a cooperation agreement with Banco Estado (Small Business Management) which grants preferential financial and non-financial benefits to companies that are served and derived by the Centers. Within these benefits are: discount in the interest rate of 15% of the blackboard for investment credits and working capital; access to specialized training conducted through the Bank and access to the communities of Banco Estado (Grows Women and Entrepreneurs in Network).

4. International dimension

4.1. In what ways did experiences from other countries inform the development of the Centre?

The design and implementation of the Technological Extension Centers program has been carried out taking into account experiences and methodologies of technological extension internationally validated, which have been adopted and adapted locally, with the support of international entities experts in the field (UC Davis, Georgia Tech, Frounhofer, Eurecat, TecNALIA, among others).

The ThinkAgro CET has not yet defined the expert entity (s) with which it will be linked. To date, they are in contact with Georgia Tech and UC Davis.