Culture of impact in agricultural research organisations: What for and how?

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ABSTRACT

Research organisations experience increasing demands to analyse on the multidimensional societal impacts of their activities. This leads to more reflections about the integration of organisational strategies devoted to research evaluation and impact monitoring, in order to answer societal and funder's demands, improve research practices, and make research and innovations more transformative to society. Establishing a "culture of impact" within an organisation is driven by multiple factors and translates into a variety of changes at different organisational levels. We aim to understand what motivates agricultural research organisations to develop a culture of impact, and the consequences of this culture on research, management, and collaboration practices. For this, we analyse organisational trajectories of three research organisations: the French Agricultural Research Centre for International Development (Cirad), the Brazilian Agricultural Research Corporation (Embrapa), and the Colombian Agricultural Research Corporation (AGROSAVIA). Through a cross-analysis of these cases along the reasons to integrate impact evaluation in strategic agendas, the materialisation of a culture of impact in practice, and what it entails in terms of cognitive and practical changes within their respective staff and management structures, we highlight drivers and patterns of development of a culture of impact, and circumstances that seem to either favour or hinder its emergence. This study is unique for examining various types of changes that a culture of impact can generate among individuals, in particular. It offers valuable material to enable re-interrogate and orient a research organisation's culture of impact's path in accordance with organisational values, priorities, and opportunities.

1. Introduction

Research organisations experience ever increasing demands to analyse and communicate about the societal impacts of their research activities (Joly et al., 2016; Temple et al., 2018; Reed et al., 2021; Weißhuhn et al., 2018; Bozeman and Youtie, 2017; Avila et al., 2015; Maru et al., 2018a, 2018b). This leads to more and more reflections about the integration, in research organisations, of strategies devoted to impact monitoring and research evaluation (Reed et al., 2022). Such strategies aim to answer societal and funder's demands, improve

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research practices (Watts et al., 2008), advance impact evaluations[1] (Douthwaite and Hoffecker, 2017), and make research and innovations more transformative to society (Schot and Steinmueller, 2018). For some research organisations, this trend resulted in the establishment of a "culture of impact" (Leeuwis et al., 2018; Hainzelin et al., 2017) whereby there is a general recognition within the organisation that research should also be designed and practiced according to the types of impact it aims to generate. A culture of impact (also sometimes referred to as "evaluative culture"[2]) encourages the research community at large to better understand and reflect upon their role in contributing to long-term societal change, equip and support researchers to fruitfully carry out this reflection, and infuse this learning process across the various levels of an organisation (Blundo-Canto et al., 2019). Such a culture is instrumental for supporting organisational learning in impact evaluation (Cooper, 2014; Rodrigues et al., 2010) and can be used as a mechanism to re-think innovation systems and their link to policies, and implement transformative changes in institutional settings (Weber and Rohracher, 2012; Kok et al., 2019).

Building an organisational culture is driven by a multiplicity of factors (e.g., organisation's history, routines, values, modes of governance, organisation's capacity to provide a common frame), which contribute to determine its nature, vision, and how it operates (Blundo-Canto et al., 2019). Klerkx et al. (2017) study how researchers engage in co-innovation and argue that the institutional context, including individual and organisational dimensions such as historical practices, highly influences the way new organisational norms, routines or shared expectations are set, governing actors' behaviour. Thus, the context conditions the type of responses to an organisational culture's ambition. In the agricultural field in particular, a number of studies have questioned management models in agricultural research organisations at the light of contextual factors. Schmid et al. (2016) and Maru et al. (2018a) contribute to the reflection on "new models" of agricultural research that can facilitate innovation and address complex problems of agricultural development by analysing its impact pathways. Others have studied how the association between the type of research (e.g., level of application) and its degree of perceived "responsibility" to generate impact on society influence the funding environment (Calvert, 2006). Other authors have studied the suitability of the CGIAR organisational models (including funding mechanisms) to its development mandate (Leeuwis et al., 2018). Conti et al. (2024) recently examined future organisational scenarios or prototypes of how agricultural research organisations might adapt to address complex systemic challenges. Finally, Rijswijk et al. (2019) use the concept of 'organisational identity'[3] to describe the responses to newly introduced practices (along digital agriculture) among agricultural research organisations by examining organisational nature and context as well as capabilities, existing practices, partnerships, and values.

The literature on agricultural research organisation models that integrate a culture of impact shows that it can take various operational forms. "Culture of impact" can be referred to as "impact plan", "impact strategy", or "impact ambition", involving different types of configurations for implementing and "infusing" organisational practices associated with such a culture (see Reed et al. (2022) for an overview of various configurations across a set of organisations). Among studies focusing on organisational issues pertaining to culture of impact, a few have investigated models that integrate monitoring and evaluation of research activities (Stone-Jovicich et al., 2019; Blundo-Canto et al., 2019), foster interactions and relationships with new social actors, and encourage the use of research products (e.g., Bin et al., 2013). Joly et al. (2016) analysed the research impact assessment systems established in five agricultural research organisations and their objectives. Turner et al. (2022) discussed the tension triggering impact evaluation practices (summative versus formative purposes[4]), and how the need for building evaluative capacity emerged in four agricultural research organisations and what it translated into. Preskill and Boyle (2008) investigated what "evaluative capacity building" (ECB) means in practice among fifteen organisations, focusing on participants' motivations for engaging in ECB, learning strategies, and perceived outcomes. Finally, Mayne and Johnson (2015) and Maru et al. (2018b) investigated the understanding and use of Theory of Change concept in the agricultural and development field.[5]

Yet, and despite the recent rise of debates over culture of impact in agricultural research, in-depth understanding of what drives, internally and externally, agricultural research organisations to develop a culture of impact, as well as of the changes that a culture of impact in agricultural research organisations translates into for the individuals and for the organisation more generally, remain scarce. Addressing this issue is important for understanding, in a comprehensive manner, "what it takes" and "what it means" to introduce a culture of impact in research organisations, and thus for reflecting on suitable organisational strategies. Our study contributes to fill this gap by carrying out a cross-analysis of three organisations that explicitly promote this ambition. Thus, we conduct a comprehensive cross-case reflection on organisational drivers, structuring, and practices targeted to reinforcing the evaluation of societal impacts associated with agricultural research and associated learnings, and on how these in turn influence its strategies, values, and trajectories. Our study aims to address the following research questions: Which are the main motivations for an agricultural research organisation to build a culture of impact? How does a culture of impact roll out? Which changes does it entail? We take stock of three experiences and examine i) the organisational trajectories for developing a culture of impact, including the reasons to its emergence, and the internal and external factors that hindered or facilitated its development; ii) how the culture of impact materialises in terms of discourses, visions, strategies, methods, tools, spaces of exchanges, resources, and support; and iii) the various cognitive and behavioural changes this culture generates among the staff, e.g. in terms mainly of perceptions, knowledge, capacities, interactions, and practices.

2. State-of-the art – conceptualizing the notion of "culture of impact"

A comprehensive analysis of the concept of "culture of impact" calls for investigating different strands of the literature. Indeed, we first need

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[1] Agricultural innovation systems are increasingly recognised as complex systems in which interventions are not fully predictable and do not generate linear impacts. Douthwaite and Hoffecker (2017) prone for distancing from standard logic models (like the "convention conventional model the "adoption impact pathway") that tend to ignore the complexity dynamics and miss important alternate impact pathways, and for investing on and exploring more dynamic, flexible, systemic and "complexity-aware" approaches to monitoring and evaluation approaches and tools.

[2] An evaluative culture is usually embedded into a culture of impact in the sense that it seeks out information on organisational performance in order to feed a learning process, for better managing and delivering its programmes and services (Mayne, 2008).

[3] Organisational identity refers to "what is central, enduring, and distinctive about an organisation's character" and includes tangible and intangible attributes (Rijswijk et al., 2019).

[4] Reed et al. (2021) define these notions as follows: an evaluation designs with summative focus is oriented towards "achieving, evidencing and claiming impacts and being accountable"; a more formative focus is rather about "ongoing monitoring, learning, adaptation and taking epistemic responsibility for the generation of impact".

[5] Maru et al. (2018b) use the notion of "mainstreaming" practices, in the sense of "embedding a new concept, principles or an approach into a routine practice of individuals and organisations of relevant domains, while recognising that there is no guarantee that the new approach will be institutionalised as originally intended".

to understand how and under which form a "new" organisational culture emerges and sustains itself. Second, culture of impact pertains, in part, to practicing impact evaluation and applying impact evaluation approaches and methods on a variety of objects, with the purpose, among others, to learn and integrate lessons learned into research practices, for improving how research contribute to societal impact in targeted areas. For this reason, organisational learning and its underlying mechanisms are key to the development of such a culture. Third, the introduction of a culture and new associated manners of thinking on research and interventions implies changes of various natures across different levels of the organisation: hence a focus on literature concerning how change occurs in an organisation.

An organisational culture is influential to development trajectory of an organisation and its practices (Alsabbagh and Khalil, 2017). It is defined by shared assumptions, values, beliefs, experiences, knowledge, and traditions that shape the organisation's identity and mission (Blundo-Canto et al., 2019; Schein, 1990). It builds and evolves over time, and is usually associated with structural and strategic reconfigurations, redesign of systems and procedures, as well as changes in operations and job profiles (Mintzberg and Westley, 1992). For investigating change in an organisational culture, Muscalu (2014) suggests to explore on beliefs, attitudes, and behaviour, in order to assess the degree of fitness of uptake of a new culture, and the deepness of changes associated with it. Furthermore, an organisational culture shapes people's behaviour through learning (Blundo-Canto et al., 2019; Akhtar et al., 2011), and is also the result of that learning (Seyedyousefi et al., 2016). A variety of cultures often co-exist within an organisation (Akhavan et al., 2014), among which Seyedyousefi et al. (2016) identify a learning culture as one that promotes the development of others.

Organisational learning is of growing interest to researchers and practitioners (Jyothibabu et al., 2012; Templeton et al., 2002). It is defined as the ability of an organisation to process knowledge (i.e., create, acquire, transfer, and integrate knowledge in an objective of improvement, or adaptation to a context and new opportunities (Jerez-Gómez et al., 2005)), and refers to the process by which the staff acquires capabilities, learn, and innovate (Chiva & Alegre 2007; Cayla, 2007). These processes tend to be gradual, cumulative, and systemic, involving contributions of both individual and collective learning experiences to achieve organisational goals (Rebelo and Gomes, 2007), as well as moves of knowledge between different levels of action, from the individual to the group level, and to the organisational level and back again (Alsabbagh and Khalil, 2017; Liao and Wu, 2010). Along this line, the concept of organisational learning capability relates to organisational and managerial characteristics that facilitate the organisational learning process (Chiva and Alegre, 2007) and help shape a culture within an organisation (Abdi and Senin, 2015). Various criteria are identified to assess such capabilities: knowledge management (Akhavan et al., 2014; Omotayo, 2015), management commitment, systems perspective, openness and experimentation (Jerez-Gómez et al., 2005), risk-taking, interaction with the environment, dialogue, and participatory decision making (Alegre and Chiva, 2008).

Importantly, the development of any organisational culture involves a set of changes at individual and organisational levels for the culture to "permeate" and "infuse" an organisation. With the latter term transpires the idea that the realisation of changes requires both a formal implementation plan with specific structures or units in charge, and a diffusionist approach made of lesser coordinated avenues and intermediaries. These changes involve implementing specific "spreading" strategies across the organisation, adapting the organisation's visions, adopting or adapting rules and actions that foster specific reflections, and supporting learning processes to develop values and attitudes and orient research practices and interactions. Yet, fostering learning and change is not an easy process (e.g., it implies fluidity of knowledge between different levels of action: individual, group, and organisation (Alsabbagh and Khalil, 2017; Liao and Wu, 2010)). Turner et al. (2023) illustrate this difficulty by examining how a new multi-actor innovation logic

integrates with the different institutional logics that co-exist within an agricultural research institute. They found that organisations and their members need specific time for learning and reflecting on the values and practices associated with the newly introduced logic. Furthermore, McKay et al. (2013) and Choi and Ruona (2011) argue that individual readiness to change is key to enable organisational change, and that the readiness level tends to be positively influenced by an environment that promotes a learning culture.

Establishing a culture of impact in a research organisation, in particular, goes along with the development of a posture at organisational and individual levels that questions the impacts to which research contributes, their articulation, and their evaluation (Blundo-Canto et al., 2019). It may also involve a shift in the way impact evaluation is being thought through, i.e., switching from an objective of impact accountability and a summative purpose to a learning and formative purpose, stimulated by the engagement of more diversified stakeholder groups along research design, monitoring, and evaluation (Spaapen, 2015; Joly and Matt, 2022; Matt et al., 2017). For instance, Saari and Kallio (2010) discuss the value of "developmental impact evaluation" that combines frameworks of organisational learning and impact evaluation, facilitating continuous strategic thinking in research processes, through both learning within innovation networks and promoting impact-oriented reflections. Blundo-Canto et al. (2019) formulate broad principles in regards to what a culture of impact in an agricultural research organisation would translate into: (i) transdisciplinary dialogue on the multiple roles and functions played by researchers; (ii) adaptability to different needs, lexicon and functions to foster appropriation; (iii) support by high-level management and fitting in a broader strategical frame; (iv) capacity reinforcement of staff in understanding and characterising the impacts of research; (v) resources dedicated to develop and sustain the culture of impact; and (vi) adequate internal and external communication towards promoting this culture. The necessary changes associated with the uptake of a culture of impact are very much fostered by organisational learning, implying a degree of awareness and criticism on own research practices (Watts et al., 2007), the capacity of the organisation to generate, analyse, transfer, and integrate knowledge on research processes and their impacts (Jerez-Gómez et al., 2005), and a capacity to modify behaviour and actions following reflection on this new knowledge (Zhou et al., 2015; Chiva et al., 2007), in order to improve practices and performances, and to adapt to new opportunities.

The review of the above literature emphasises that organisational change towards the integration of a culture of impact in agricultural research organisation is enabled by a supportive environment (Wolf et al., 2015; Blundo-Canto et al., 2019; Joly et al., 2016), including the development of suitable strategies, visions, skills, and tools, which can foster changes in organisational and individual practices. The uptake of such a culture is therefore very much revealed by individual and organisational level "pushes". This justifies our research questions and focus on capturing i) historical path of development of a culture of impact, ii) organisational level attributes, strategies and actions supporting its development, and iii) individual level of changes that result from this culture.

3. Material and method

3.1. Study cases

We analyse three agricultural research organisations that have embarked on a similar ambition with regard to the establishment of a culture of impact. They are the French Agricultural Research Centre for International Development (Cirad), the Brazilian Agricultural Research Corporation (Embrapa), and the Colombian Agricultural Research Corporation (AGROSAVIA) - see Appendix 1 for maps with their organisational reaches. Table 1 below presents their main attributes. These organisations operate in the Global South; they slightly vary in their mandate and reach of action: Cirad has a broad mandate to support

Table 1
Descriptive information of the organisations.

	Cirad	Embrapa	AGROSAVIA
Attached to	Ministry of Higher Education, Research & Innovation, & Ministry of Europe & Foreign Affairs	Ministry of Agriculture and Livestock	Ministry of Agriculture and Rural Development
Date of creation	1984	1973	1993
Mission	Works in partnerships for the sustainable development of tropical and Mediterranean regions	Works to assure the sustainability of agriculture through solutions in research, development and innovation for the benefit of Brazilian society	Transform sustainably the Colombian agricultural sector with the power of knowledge to improve the lives of producers and consumers
Research units (Appendix 1)	Headquarter in France, 14 regional offices in Global South	43 decentralised research units and 24 central units, in Brazil; 4 international scoping laboratories (Labex)	1 central headquarter, 13 regional research centres, 8 local units, 2 experimental farms, in Colombia
Number Researchers	1140	2190	778
Number staff	1650	7790	1865
Approximate budget	215 million USD (2022): 65 % public funds, 35 % own resources (contract-based)	716 million USD (2022), from federal government	80 million USD (2022): 92 % public funds, 8 % own resources

Note: Situation of the three organisations in 2022. Inspiration for designing this table: Bin et al. (2013).

international development through agricultural research; Embrapa has a national mandate mainly focused on agricultural technology and R&D (it also has scoping offices, known as Labex in various continents); AGROSAVIA has a national mandate focusing on applied agricultural research and technical services. This diversity provides contrasting cases in terms of trajectories, characteristics, and external contexts, which may have influenced the construction and rolling out of the culture of impact, while common features likely emerge. The choice of these cases is further justified by the fact that they share an intentionally implemented process to institutionalising impact evaluation and reflexive approaches on research impact, which is not formalised up to this level in other agricultural research organisations.[6] Moreover, each of these organisations is in demand for a reflective (cross)-learning process on this organisational priority,[7] allowing conducive conditions for analysing the effects of a culture of impact. Next, we succinctly describe the three cases and their respective organisational activities centring impact evaluation approaches.

Cirad works in partnerships (public and private partners) to build

knowledge, alternatives, and interfaces supporting innovation and agricultural development in tropical and Mediterranean regions. In 2010, in line with a "research-for-development" mandate, Cirad initiated a process of institutionalising reflexivity on the contribution of research to societal impacts (Hainzelin et al., 2017, 2016). It translated into the development of approaches for supporting and facilitating these reflections. An *ex post* evaluation method (ImpresS *ex post*) was developed (Barret et al., 2017) based on reflexive and participatory retrospective analyses of innovation paths, collectively rebuilding impact pathways and investigating the cumulated "impacts" of sets of agricultural research interventions over long timeframes, thus enabling collective reflection on the contribution of research to impacts (Faure et al., 2018; Faure et al., 2020; Blundo-Canto et al., 2020a). Then, an adaptive *ex ante* (prospective) approach ("ImpresS *ex ante*") (Blundo-Canto et al., 2020b) was designed, engaging collective thinking among actors involved in a future research intervention (research and non-research actors) on the changes and impacts that it would generate and the plausible pathways by which to achieve them.[8] These tools have been institutionalised through Cirad's organisational strategy ("Strategic Vision", Cirad, 2017) and planning documents like the "Strategic science and partnership objectives" (Cirad, 2018b) where one of Cirad's ambitions is stated to be the development of the culture of impact in the organisation.

Embrapa works on developing solutions to enhance the country's production of food, fibres, and energy, through research, development and innovation to ensure the sustainability of agriculture for the benefit of Brazilian society. In the last 25 years, Embrapa developed and systematised structures and methodologies to account for comprehensive impact assessments of the technologies designed through its research programmes (Avila et al., 2015; Rodrigues et al., 2010; Vedovoto et al., 2022).[9] This ambition is exercised in two ways: i) the organisation-wide application of an *ex post* Reference Methodology, composed of "Economic Surplus" (Avila et al., 2008) and "Ambitec-Agro" (Rodrigues et al., 2003, 2010) methods that, in a multidimensional approach, considers economic, social, environmental, and institutional development impacts of agricultural technology adoption; and ii) the use of these studies and results of impact assessments for the annual release of its "Social Balance Report" (26th edition this year, Embrapa, 2023) as well as for managerial documents (organisational performance evaluation, Embrapa's Strategic Master Plan), accountability reports, and scientific and collaboration purposes (publications, conference papers, projects/research, partnerships). Embrapa directives also encourage research teams to carry out *ex ante* impact assessments, based on the same methods to determine 'expected impacts' from technology development research and transfer. This *ex ante* process not being formalised yet, the present study will not focus on this. In the development of a culture centred on impact, in its latest Strategic Master Plan, Embrapa established a set of goals to guide strategic, tactical, and operational research actions towards a vision of impact-based results (Embrapa, 2020).

AGROSAVIA works on producing knowledge and technologies that are used and adapted to sustainably transform the Colombian

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[6] Joly et al. (2016) report on the extent to which impact evaluation results are used by agricultural research institutes, indirectly indicating a growing interest in culture of impact among those organisations: the US Department of Agriculture (USDA), the French National Institute for Agricultural Research and Environment (INRAe), the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia, Embrapa, the Consultative Group on International Agricultural Research (CGIAR). This effort exists in New Zealand's Agresearch and France's INRAe but their mandates are not in the Global South.

[7] Regular discussions between AGROSAVIA, Cirad, and Embrapa on this subject started in 2018 in the frame of a one-week workshop organised by Embrapa and the International Centre for Tropical Agriculture (CIAT) from CGIAR, which aimed to present the evaluation approaches of the respective institutions (Embrapa, 2018a, 2018b).

[8] Support to the conception and implementation of Monitoring and Evaluation participatory and actor centred approaches in Cirad's interventions has been ongoing. Since it was very new in 2022, it is not part of the study.

[9] Embrapa has put into place a systematic and wide routine for reporting out in thousands of farms and technology adopting units, on hundreds of technological innovations, contributing to a large database available to public consultation via its impact platform webpage (https://www.embrapa.br/balanco-social). Results feed directly into establishment and monitoring of quantitative strategic goals, with baselines monitored and checked as to their fulfilment. Hence, strategic planning with specific, measurable, traceable, and time-bound targets became a milestone at the institution, possible via the consolidation of the impact assessment process.

agricultural sector by increasing sustainable management of natural resources and improve Colombian populations' livelihoods. AGRO-SAVIA has long been developing economic and environmental impact assessments of part of its projects, technologies. Since 2016, it has embarked on the institutionalisation of a comprehensive impact analysis strategy that includes components: i) "Social Balance" (AGROSAVIA, 2022) inspired by the methodology developed by Embrapa, which assesses the economic and socio-environmental impacts of a sample of technologies and other actions of the Corporation, and which the results then feed annual reporting; ii) *ex ante* impact analysis in the formulation phase of R&D and transfer projects, to estimate the adoption and potential impacts of the technologies generated and disseminated among targeted populations, which recently (2022) evolved towards identifying contextual problems and opportunities for projects' implementation and for designing more plausible anticipated impact pathways along the use of developed technologies; iii) the recent development of other *ex post* impact assessment methods; and iv) the development of a culture of impact in the organisation, as part of a corporate strategic planning called "cultural transformation" with horizon 2030, having generation and evaluation of impacts as central elements.

3.2. Methodology

- **Analytical dimensions and data collection**

As per our research questions, we focused on three main analytical dimensions: i) the historical path of development of a culture of impact and its *modus operandi*, looking at the evolution of the organisation and the historical emergence of strategies and tools to develop a culture of impact; ii) the organisational level attributes, strategies, actions, and motivations that constitute the supportive environment to the culture of impact, including drivers, constraints, and opportunities to its development; and iii) the cognitive and practical individual changes experienced by staff, as well as their perceived organisational change following the development of such a culture. To explore these dimensions, we relied on a combination of different methods, which were adapted across the organisations to fit their respective contexts. Table 2 describes the data collection process and samples of participating populations.

First, we reviewed the scientific and grey literature pertaining to the organisations, including reports, publications, and strategic and operational documents. This aimed to specify how the notion of "culture of impact" is defined and communicated within each organisation, how it is being "practiced" within the organisation according to their explicit operational strategy, as well as reconstitute the respective historical trajectories of development of a culture of impact. Second, using interviews and structured and open-questions surveys, we reached to agents who actively contributed to the historical path and reflection premises of the culture of impact (Table 3), in order to capture key drivers to the establishment to such a culture and potential obstacles, constraints, and opportunities to its development. In Embrapa, the survey was sent out to 103 managers linked to Embrapa Headquarters and 43 Decentralised Units spread throughout the country. The 18 respondents included managers across different research centres and top management at the organisation's Headquarters, who were, for most of them, involved with impact assessments, specifically in the preparation of impact reports, coordination of impact assessment teams, and selection of technologies to be evaluated in the decentralised units. In Cirad, respondents were selected as per their involvement in the trajectory of building the culture of impact, and their management responsibilities in the organisation. Out of the 23 persons invited for 1-hour interview, 13 accepted the invitation. In AGROSAVIA, the interviews were carried out with researchers who had a focus on impact issues, directors whose role is closely related to impact generation in the Corporation due to their capacity to make decisions. Out of 39 persons requested, 31 accepted the invitation.

Table 2
Data collection – overview.

Activity	Target population	Number of responses		
		Cirad	Embrapa	AGROSAVIA
Literature review	Relevant literature pertaining to the organisations, providing information on the trajectory and *modus operandi* of culture of impact	NA	NA	NA
Interview or survey	**Key informants, key players of the historical process of development.** This includes researchers and managers: Table 3	13	18	31
Engaged-population survey	**Participants or contributors to impact-related activities**			
	- In CIRAD: contributors and participants to the development and application of *ex post* and *ex ante* evaluation approaches. They include researchers and support staff. Target population was selected based on records of participants to these activities	65		
	- In EMBRAPA:		16	
	o Appointed agents involved in annual impact assessment of technology innovations. They include researchers and analysts associated with four Research Units. Target population was selected based on focal points' recommendations			
	o Agents in departments that conduct the "Social Balance Report", including researchers who have technologies adopted and referred to in this process		123	
	- In AGROSAVIA: contributors and participants to the development and application of *ex post* and *ex ante* evaluation approaches. They include researchers and support staff			294

Note: "NA": not applicable.

Third, we conducted a survey (hereafter referred to as "engaged-population survey") among the staff of each organisation who have been closely participating or contributing to the activities directly pertaining to the culture of impact (e.g., methodological development, support to project development, technological or project evaluation, strategic planning). Thus, we aimed to capture the effects of these activities, which can broadly be differentiated into *ex ante* and *ex post*-related activities, on individual changes. We asked survey participants whether they experienced changes in multiple domains as a result of their involvement in impact evaluation-related activities and the nature of change they have experienced. Those included cognitive changes (i.e., in terms of perception, knowledge, attitude, capacity) and behavioural changes (i.e., practice, interaction), and cover multiple areas, from the conception of research ideas to the building of projects, their monitoring, evaluation, and research interactions (Table 4 for an overview). The survey also included questions on opportunities that supported

Table 3

Key informants of the historical trajectory of culture of impact – participants' profiles.

Profile	Number of participants		
	Cirad	Embrapa	AGROSAVIA
Researcher involved in methodological development of impact evaluation organisational approaches, support materials	0	0	6
Former or retired researcher/staff involved in methodological development of impact evaluation organisational approaches, support materials	1	0	3
Current manager of the organisation (research unit, department, section)	10	18	21
Former or retired manager of the organisation (research unit, department, section)	2	0	1

Table 4

Grid of changes surveyed at individual level, as a result of an organisational culture of impact.

Main change	Type of change	Description
Cognitive change experienced	Knowledge	About notions related to impact and impact evaluation About the types of impacts to which research can contribute About the innovation (process) under study About the principles, specificities and conditions of application of impact evaluation methods
	Capacity	To interact with actors potentially impacted by the research To use impact reflection methods independently
	Perception	Of the role/mission of your organisation Of your own role within your organisation and your team Of the role of research in contributing to societal impacts
Practical changes experienced	Interaction	With partners in the South and actors in the field Interactions with staff from other professions and/or disciplines in the organisation
	Behaviour	In formulating/constructing research questions In choosing themes and issues and research questions in the retrospective evaluation In planning future interventions
Observed/perceived organisational change		Changes in the organisation at the operational or managerial level: e.g., changes in vision, communication, knowledge management

these changes. Note that in Embrapa, another survey was conducted, which aimed to capture postures and practices that align with a culture of impact, beyond those who interacted directly with *ex post* impact evaluation activities. The survey was conducted among staff ($n = 123$) involved with social balance reporting; it brings complementary findings.

The above steps were possible through building an inter-institutes group composed of researchers and support staff (authors of the paper) who were highly involved in the building of a culture of impact in their organisations. We thus undertook a mutual learning process translating into regular interactions between 2021 and 2023 for building and implementing the analytical framework, the methodology and analysing the results, including a 3-days workshop in Bogotá-Colombia in April 2023. This process was particularly useful to create a foundation to share experiences, aspirations, and be able to interrogate and adjust culture of impact's path in accordance with contexts and priorities.

4. Results

4.1. Trajectories of development of a culture of impact in each organisation

We trace and compare the trajectories of development of the culture of impact in the three organisations, highlighting major phases, task forces, key events, and supporting tools and approaches (see Appendix 2 for a graphical representation of organisations' trajectories, and details). Table 5 captures the key comparative elements to the trajectories. We find that Cirad, AGROSAVIA, and Embrapa have followed relatively similar paths for building a culture of impact. They all share methodological development reflections, organisation of trainings and facilitation events, internal and external moments of exchanges, design of supporting tools to equip researchers for carrying out evaluations, setting up of specific human and financial resources, and an organisational structure that evolved step-by-step towards creating conducive conditions for a culture of impact to realize. Yet, a few points deserve attention, as follows.

First, the three organisations show similar reasons for developing a culture of impact, which is primarily to demonstrate impacts of research (i.e., accountability purpose): this contextual incentivizing factor to prove usefulness of research investments was strongly experienced by the organisations. This factor was then completed by an (internal) learning aspiration in the aim of contributing to strategic planning of the organisation, and which expresses differently across the cases. For Cirad, the learning process is oriented towards improving research practices, better reflecting on the plausible and multiple impacts of interventions, and (ultimately) contributing to inform strategic organisational decisions. In contrast, the learning process in Embrapa is more oriented towards gathering information for, on the one hand, enabling adjustment and adaptive management of proposed technologies in order to maximize adoption rates and technological performance, and on the other hand informing the directions of organisational investment in terms of choice of technologies to be developed. This finding very much echoes the contrasts along main purposes for promoting evaluation: it is rather a formative purpose in Cirad with a focus on learning to produce new knowledge on how research contributes, as part of long-term innovation processes, to societal impacts, while it is mainly used as a metric for organisational performance and assessment of economic outcomes in Embrapa (with effect on funding level allocated to research branches), with a focus on innovation transfer and adoption. In AGROSAVIA, the purpose is a combination of both in the sense that it is proposed as a guide to the corporative agenda that seeks both to improve research practices and metric to measure societal impact.

Methodological development and tools' accessibility is another major component, common to the three trajectories. Cirad, Embrapa, and AGROSAVIA trajectories are all marked by strong investments in *ex post* evaluation methodological developments, which then fed *ex ante* methodological reflections, serving the design and planning of interventions. Methodological choices, however, vary. With regard to *ex post* method, Cirad developed its own methodology in order to suit to the nature of the agricultural objects studied (often involving long-term innovation process, complex agricultural systems, multitude interactions between research and other stakeholders), its desire to focus on disentangling the contribution of its research activities to impact among other contributions, and its willingness to account for multiple voices in the application of evaluation approaches, therefore relying on multi-stakeholders participatory processes and actor-centred methods. For building this method, Cirad largely exchanged with various experts from international agricultural research institutes and relied on internal research work; this is a major step of its culture of impact's trajectory. AGROSAVIA and Embrapa on the other hand chose existing methodologies suitable to quantitatively measure the gain of adoption, i.e., the net economic benefits of their projects or technologies (through the 'economic surplus' method in particular), with a stronger reliance on the

Table 5

Key elements across trajectories of development and modus operandi of a culture of impact in the three organisations.

	Cirad	Embrapa	AGROSAVIA
Trajectories of development			
Contextual "pushing" factor	*Ex post:* alignment with research organisations questioning impact of research, societal/funders pressure	*Ex post:* desire to demonstrate return on investment of public research; communicate about societal impacts and organisational performance; orient decision-making on technology development and transfer processes	*Ex post*: change in direction of the organisation with a stronger focus on economic and social impacts and accountability on how resources are invested
Triggering element	*Ex ante + MEL:* Build project and research interventions differently (participatory and actor cantered). 2015: A dedicated organisational project to develop systematic *ex post* evaluation. Then, an institutional decision (2017) to build on *ex post* learnings to develop *ex ante* (with dedicated budget)	*Ex ante*: maximize technology adequacy and adoption rates to favour agricultural economic returns. 1997: An organisational decision based on the first Strategic Planning, to implement *ex post* impact assessments on agricultural research	*Ex ante (corporate model)*: funders' demands. *Ex ante (participatory model)*: governmental demand for more inclusive research. 2016: a dedicated macro-project and team to establish corporate impact assessment strategy (*ex ante, ex post,* culture): partnership with Embrapa. 2021: *ex ante* (participatory model): partnership with Cirad
Purpose	*Ex post*: learning on research contribution to societal impacts, improving research practices. *Ex ante and M&E*: improving plausibility/groundness and change-oriented management of research for development projects	*Ex post:* demonstrating and communicating about social return to public investment; accountability. *Ex ante*: improvement of research project focus, prediction of technology adoption rates	*Ex post*: accountability, learning to improve research and transfer practices, institutionalise impact evaluation. *Ex ante*: prioritising institutional research agenda and better directing/orienting projects
Evolution of purpose	*Ex post and ex ante*: same purpose + strengthening culture of impact	*Ex post:* establishing goals in organisational strategic planning to guide strategic & operational research actions towards impact-based results; strengthening culture of impact. *Ex ante*: improving plausibility - groundness of research projects (participatory model)	*Ex post:* accountability and learning to improve research and transfer practices, strengthening culture of impact. *Ex ante*: improving plausibility - groundness of research projects (participatory model)
Institutionalisation	2018–2028 strategic plan	2021–2030 strategic plan	2019–2030 corporate

Table 5 (*continued*)

	Cirad	Embrapa	AGROSAVIA
	includes impact as one of the four organisational "ambitions" Institutionalised *ex post* and *ex ante* evaluation approaches An Impact team (ImpresS) A dedicated funding mechanism	includes impact as a "strategic goal" Institutionalised *ex post* evaluation approach An "impact team" A dedicated funding mechanism	strategic plan includes impact as a key "higher purpose" Institutionalised *ex post* evaluation (Social Balance); *ex ante* approach being institutionalised An "impact team", a dedicated funding mechanism
Modus operandi			
Impact teams	ImpresS team: 3 researchers, 4 impact mission agents, 1 department director (coordinator) Project development agents: trained by ImpresS teams for strategic planning of intervention using ImpresS *ex ante*	Impact assessment team located at SMAE for coordinating the system nationwide (1 supervisor, 2 researchers, 4 analysts), in SPAT (Social Balance teams) in decentralised units: 150 staff, researchers and analysts for carrying out field evaluations	Impact-Base Team: 4 researchers, 1 director of planning and institutional cooperation (coordinator) Social balance team (*ex post*): 94 staff in research centres, local units, Communications Office Culture team: 4 staff of planning, Human Management
Organisational positioning	Research unit + impact and science marketing direction (project development team), direction research & strategy	Superintendence of strategy and decentralised units	Research Centres, Planning and Institutional Cooperation Directorate
Key functions of impact-dedicated team	Interventions/project/strategies planning and M&E building, with project development officers, accompanying Evaluative capacity building, Fostering reflexive learning on impact within the institution Impact and outcome evaluation Methodological development Scientific publication, Communication	Evaluative capacity building; methodological support Fostering reflexive learning on impact within the institution Impact evaluation Methodological development Scientific publication External communication Monitoring organisational goals on impact	Project/strategies planning and accompanying Evaluative capacity building Fostering reflexive learning on impact within the institution (researchers, managers, support staff) Impact evaluation Methodological development

Table 5 (*continued*)

	Cirad	Embrapa	AGROSAVIA
Formalisation	For *ex ante* and *ex post*: Dedicated yearly budget (functioning, evaluations funding); Institutional annual meeting presentations. Representation in the direction research and strategy	For *ex post* (social balance): Dedicated yearly budget; Institutional annual meeting presentations and board of directors' presentations for *ex post*. Representation in the superintendence of strategy Performance evaluation of the decentralised units	External communication. For *ex post* (social balance): Dedicated yearly budget; Presentation at annual general meeting of active members. Coordination in Planning and Institutional Cooperation Directorate
Developed evaluation approaches	*Ex post*: ImpresS *ex post* participatory impact pathway evaluation method applied on long-term innovation processes (projects' cluster of 15–30 yrs) *Ex ante*: ImpresS *ex ante* approach on interventions, projects, programmes, value chains, partnership networks (for strategic planning)	*Ex post*: "Reference Methodology": economic surplus, Ambitec-Agro for socio-environmental and organisational development dimensions: *Ex post* impact assessments on adopted technologies (~160 yearly), in participative field studies with selected users (Social Balance report). *Ex ante*: Project-oriented assessments for determining 'expected impacts' from technologies	*Ex post* (Social Balance): economic surplus and Ambitec-Agro (ref. Embrapa) applied on selected technologies. *Ex ante* (corporate model): quantitative adoption estimation method applied to the technologies being developed *Ex ante* (participatory model): "Weaving Impact" method applied in the participatory formulation of projects
Tools	Monitoring, Evaluation & Learning (MEL) and outcome evaluation: offer in development. Guidelines *ex post* method Guidelines *ex ante* approach Trainings. Videos. Dedicated page on organisational website Dedicated website Dedicated knowledge management system. Inter-organisational community of practice on change-oriented approaches	Organisational Performance Assessment process. Guidelines *ex post*. Trainings. Dedicated page on organisational website. Dedicated website	Guidelines *ex post* (economic surplus and Ambitec-Agro methods, selection of technologies, definition of adoption criteria); Guidelines social balance. Guidelines *ex ante*. Trainings. Videos Dedicated page on organisational website
Implementation modalities	*Ex post*: voluntary-based, on responses to an organisational call and selected by a committee made of impact team and direction. *Ex ante* and MEL support: voluntary application by research teams, tailored to each intervention	*Ex post*: annually mandatory with selection of technologies by each decentralised unit's social balance team, with financial support from management branch. *Ex ante* implemented occasionally, depending on interest from project, when there is an interaction with economists	*Ex post*: annually mandatory for a sample of technologies selected by the corporative community. *Ex ante* corporate model: mandatory for all projects. *Ex ante* Participatory model: voluntary applications
Spaces of exchange	Inter-organisational community of practice Annual internal presentations. Young recruit's introduction	Inter-decentralised units community of practice. Annual presentations *ex post*	Annual training and workshop of lessons and learnings of the Social Balance teams. Directorial committee of analysis of Social Balance Annual presentations
Appropriation dynamics	Adaptations of *ex post* Spontaneous requests for *ex ante* support. Autonomous application of *ex post* and *ex ante*	Adaptation of *ex post* methods. Autonomous application of *ex post* method	Spontaneous requests for *ex ante* support. Autonomous application of *ex ante* (corporate model) Autonomous application of *ex post*
Key documents	*Ex post* impact case study reports (standardised) *Ex post* outcome evaluation reports (ad hoc) *Ex ante* reports (ad hoc) **Feeds into:** Strategic science and partnership objectives; Science and society note; Cirad annual activity report	Social Balance yearly report (standardised) **Feeds into:** Strategic Master Plan, Business Plan, Organisational Performance Evaluation	Social Balance yearly report (standardised) *Ex ante* reports (ad hoc) **Feeds into:** Strategic frameworks of innovation networks

Note: In 2021 – time of the data collection for this survey, the MEL and outcome evaluations were not in place yet in Cirad; same for *ex ante* Participatory model at AGROSAVIA.

attribution principle.[10] They then widened the scope using the 'Ambitec-Agro method' to also capture the economic, social, environmental, and organisational development impact dimensions of the technology transfer and adoption. Inter-institutes dialogue also took place during these trajectories. In fact, AGROSAVIA's *ex post* evaluation and annual reporting methods ('social balance') are directly inspired by Embrapa's experience. With regard to *ex ante* methodological development, principles also vary. For Cirad, the objective is an encouragement towards staff carrying reflective processes for better planning of interventions and the impacts they target. In AGROSAVIA and Embrapa, the sake of *ex ante* tends to be oriented towards improving project focus, and predictions of adoption rates and associated economic returns of the developed technologies. Yet, AGROSAVIA has recently evolved its approach towards higher level of contextualisation analysis prior to introduction of technologies in a specific territory (AGROSAVIA, 2023), and consideration of participatory processes for increasing plausibility of impact pathways. Last on this methodological pillar of the trajectories, we find that all organisations made considerable investments in developing procedures, accessible methodological guidelines, platforms, trainings, for encouraging organisational staff to question and undertake these approaches.

In sum, the three trajectories are marked by a methodological path (in the aim of stimulating ideas and improving evaluation approaches), an organisational path (i.e., translating into different levels of recognition and promotion of the culture), and a scientific path, that feeds methodological development, accountability of the contribution of research to societal impacts, and learning processes. The realisation of these paths is possible through significant and continuous dedicated human and financial resources, specific organisational tools and dedicated teams to support its development, and a level of systematisation in the application of the evaluation approaches (in terms of procedures (call) or choice of technologies/cases).

4.2. Modus operandi – the creation of a supporting environment to a culture of impact

We detail the current vision and operational system of the culture of impact in each organisation, highlighting the engines of the organisations that contribute to the development and uptake of such a culture. Appendix 3 presents the respective organisations' *modus operandi* (i.e., chosen way of proceeding) for promoting a culture of impact, and Table 5 underlines key comparative elements on the same. Looking at how each organisation expresses or defines "its" culture of impact provides preliminary insights into the chosen modalities of deployment. Culture of impact in Cirad is described as a desire "*at both the individual and collective levels to better understand the complex mechanisms at work within innovation processes that generate impacts. It is based on rigorous tools and on the desire to better interact and work with the actors involved in innovation processes. It takes the form of capitalizing on collective experiences (ex post), continuously improving research practices, and taking impact pathways into account ex ante in the programming of actions undertaken by Cirad*" (Cirad, 2018a - website). At Embrapa, the "culture of impact" can be defined as the promotion of an organisational mind-set and practice that seeks to measure, communicate, and maximize the positive impact of research, development, and innovation activities for the sustainability of Brazilian agriculture and society as a whole. In AGROSAVIA, it is defined as a corporate aspiration for which the staff, from their different roles, orient their individual and collective actions to generate well-being for producers and consumers and towards the sustainable

management of agroecosystems. Those formulations (often not framed as institutional statements) bring out contrasting attributes. Cirad for instance highlights the idea of fostering understanding mechanisms to the generation of impacts and working with actors involved in innovation processes; while from Embrapa's discourse emerge ideas of assessment, measure, and communication towards social accountability. AGROSAVIA on the other hand makes larger references to a global learning process in the institution, which shall foster the culture of impact.

Important as part of the *modus operandi* is the institutionalisation and formalisation of this culture, with the concept being embedded into key strategic documents: in the Strategical Scientific and Partnership Objectives (OSSP) and strategic vision for Cirad (Cirad, 2017, 2018b); in the institutional Strategic Master Plan for Embrapa by including operational impact assessment activities linked to short and long-term goals (Embrapa, 2020), and in corporate strategic plan for AGROSAVIA. All organisations have also invested in setting up an "impact team" with specific expertise and skills, and recognised at organisational level as main engine for deploying a culture of impact. We find that the composition of these teams varies but is commonly composed of researchers (often from an economic background), support staff, and directive representatives. This proximity to the direction level is important for facilitating communication and feeding into strategic choices. Another common aspect is that these teams share various missions including research, methodological development, support and accompaniment of staff in the application of evaluation methods, monitoring of these applications, and accompaniment of research teams in strategic planning and monitoring via customizing and adapting ImpresS *ex ante* approach to the specific intervention (for Cirad specifically).

We find that all organisations count on "brokering" or "bringing" people between the "impact team" and research units, to optimize diffusion of practices and reflections among research teams and partners, and thus enable a "multiplier effect" of the culture of impact. In Cirad, these bridging people are the "project development officers" (20 in total) who are being trained primarily to use ImpresS *ex ante* and M&E tools in their day-to-day activities, in order to enhance their routine and autonomous use in research teams support activities. In Embrapa, this diffusion process occurs in particular through the allocation of financial and human resources to the 43 Decentralised Units for both training of the evaluation teams (present in each Unit) involved in impact assessments (SPAT), and carrying out annual impact assessments of technologies, through liaising with the responsible researchers and investigating "technology-adopting" stakeholders. In AGROSAVIA, the "Base team" is linked up with 13 Social Balance Teams (in each research centre) that are continuously trained by the former, and jointly develop analyses. Moreover, the three organisations aim at passing on this culture of impact to their partners. In Cirad, this is part of the mandate of the ImpresS team. In Embrapa and AGROSAVIA, the impact teams are often called upon by organisational partners - research institutes, NGOs, Universities - for their impact assessment expertise. Last, accessibility to support materials, methodological guidelines, technical and organisational publications, and promotion of workshops and courses related to impact assessment is key to promote learning and capacity strengthening, and a priority in these organisations.

Yet, we find that the way culture of impact is implemented follows diverse modalities and assumptions. In Cirad for instance, all *ex post*, M&E, and *ex ante* approaches are internal processes carried out voluntarily by research teams and their partners, with methodological support from the ImpresS team and the project development team. This voluntariness principle has been chosen in the idea that, at the difference with imposing staff involvement into these activities, it would facilitate appropriation of impact-related and participatory concepts and methods, as well as autonomous reflexive capacity on the contribution of research to impacts. We observe that Embrapa and AGROSAVIA in contrast, opted for more systematic and mandatory procedures,

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[10] Evaluation applications in Embrapa follow a proposed "reference methodology" based on econometrics and multi-criteria approaches. Investigation with specific objectives and deeper analyses (e.g., with experimental or quasi-experimental design, counterfactuals) usually involve research specialists, whether in economics, sociology, or ecology for instance.

formalising dedicated research teams to coordinate and promote impact evaluation activities, including organisational recognition and compensations for the quality of their work.

A difference also exists along standardisation of procedures in link with the application of evaluations, and capitalisation of results. In Cirad, the conduct of evaluation used to follow an "opportunity/demand-based principle" along which ImpresS *ex post* evaluation or ImpresS *ex ante* accompaniments would be carried out on demand and in a flexible manner. Recently (2022), a funding mechanism has been put into place to incentivise for application to *ex post* evaluations every year (still on a voluntary basis). There is not yet clear mechanism in Cirad enabling systematic capitalisation of lessons from *ex post* or *ex ante* accompaniments to the top level. In Embrapa, however, standardised and systematic procedures are in place around *ex post* assessments and social balance: every year, the 'Technology Prospection and Evaluation Sector' (SPAT) teams in each decentralised unit submit technology impact reports to the central 'Strategy Monitoring and Evaluation Supervision' (SMAE) team, for compilation of the annual institutional research highlights, the annual bibliometric review, the file of awards and distinctions received, the accounting balance-sheet, and all information for the Social Balance Report. The latter provides strategic information on research and technology impacts to support the sustainability of the national agricultural sector. In AGROSAVIA, the Social Balance teams participate in the development of the strategy, and maintain a permanent relationship with the other Directorates in order to share information and discuss results. The Corporation allocates an annual budget to develop the impact strategy, sometimes complemented with external funding.

4.3. Insights into drivers, obstacles, and opportunities to the development of a culture of impact

The above findings were derived from documentary analyses and discussions with representatives of the impact teams of the organisations engaged in this study. We now report on the results from in-depth interviews with key organisational informants who consist, for the majority, of high-level managers having long-term experience in the organisations, and thus also a sharp and comprehensive view of their functioning. While part of the results confirms findings highlighted in Table 5, others are interesting insights into the drivers, obstacles, and opportunities to the development of a culture of impact (see Table 6). First and along the reasons for launching a culture of impact, beside commonly shared motivations around demonstrating usefulness of activities and generating learning to feed into agenda priorities, we note an ethical positioning in line with the R4D mandate of the institution calling for a responsibility to think and practice research along the socio-economic impacts it (aims to) generate (Cirad), and thus a need to change paradigm and move from a "culture of promises" to a "culture of impact" (Hainzelin et al., 2016). Another interesting reason, also experienced by Cirad, was a strong willingness to stand out from other organisations in terms of impact approaches, and develop comprehensive and complexity-aware approaches. A desire for transparency towards society (public) on what research does and how it performs was also reported (Embrapa). It was also noted that the development of such a culture was very much enabled by a synergy of human resources willing to substantially push the reflection on this at that particular moment. With regard to common difficulties for introducing a culture of impact, part of key informants reported a relative resistance by staff to different approaches and new questionings, a fear of additional workload, and a fear of losing creativity of research and freedom in knowledge production.

Reported drivers to the development of this culture and the adhesion of staff to it are of two kinds. On the one hand, they are about internal conducive conditions, including i) supportive direction, ii) perception of an opportunity for the culture of impact to explore new questions and new paths in ones' profession, conducting inter-disciplinary works, and

fostering mutual learning across fields and types of actors, iii) internal recognition of socio-economic works, and iv) presence of a motivated, leading, and devoted teams able to play the role of intermediaries between disciplines and actors. For the case of Cirad, low level of formalisation, and tailored support for each specific intervention accompaniment request are two additional drivers. On the other hand, external drivers also matter. For instance, in Embrapa is reported the importance of external recognition, organisation's image and relationship with society through a comprehensible dialogue, hence the importance of a culture of impact. Then, in terms of constraints to its deployment, nature of research disciplines appears as potential brakes, together with insufficient resources (in terms of operational capacity to meet demands on evaluations), and lack of strategic vision by some leaders. Embrapa specifically also reports on lack of uniform tools to facilitate data collection with accurate and precise bases, and lack of capitalisation on learning to enable continuous improvement in practices, processes, and scientific productions. The latter is considered as a risk to culture of impact. This may suggest that fatigue among staff may arise if no organisational capitalisation process is in place to take count of learnings of evaluations and thus of individual and collective work investments.

A majority of informants report that this culture is generally accepted but there is a feeling that it did not yet lead to profound transformations on research practices, nor full appropriation at all organisational levels (the next section provides details on the infusion of this culture on research practices). Organisations coincide in their views along with the need for continuous investments, convinced leaders, and recruitment of staff trained or open to training on the topic (i.e., having "change-oriented" mind-sets). Other reported opportunities for fostering development of a culture of impact included creating more occasions for inter-disciplinary exchanges/works, relying on "champion" researchers to infuse the culture of impact in their unit, increasing communication on impact themes and research results, working with different communities and types of agriculture, and generating spaces for dialogue on the topic.

4.4. Changes generated in the organisations by engaging into the culture of impact

4.4.1. Sample description and overview of analyses

In Table 7, we present the main characteristics of the "engaged-population" sample, and Table 8 presents how the analysis was conducted on the sample.

4.4.2. Changes in perception vis-à-vis a culture of impact

We analysed the general perception and changes in the perceptions of the "engaged-population" in regard to the culture of impact in the organisation (Table 9 below). We find that the majority of participants do believe in an alignment between the role of the organisation and its ambition to establish a culture of impact; this perception not varying significantly across positions (research management, research support, researcher). Along this, participants, regardless of the organisation, describe the ambition of a culture of impact with the following statements: "*justified*", "*essential*", "*relevant*", "*necessary*", "*crucial*", "*expected*", and "*strategic*", highlighting the relevance of this culture. In AGROSAVIA, participants report specific benefits of having a culture of impact as "*improving corporate visibility*", "*being an instrument of accountability*", encouraging "*performance in activities, commitment, identity, and incentivising teams to achieve objectives*", or achieving "*greater social recognition in contributing to the development of the country's agricultural sector*". In Cirad, respondents explain that this culture "*enables the organisation's values to be put into practice*", including e.g., commitment to development and beneficiaries, co-construction of interventions with different actors, sharing of knowledge and skills, and trans-disciplinarity. Notably, something that could be referred to as a "turning point" is the fact that the deployment of the culture of impact has switched from a perceived constraint to an interest by staff. Yet, a set of

Table 6
Why a culture of impact and under which conditions?

		Cirad semi-directed interviews, *n* = 13	**Embrapa** closed-questions survey, *n* = 18	**AGROSAVIA** structured interview, *n* = 31
Construction phase	**Reasons-motivations** for building a culture of impact	- Being better at demonstrating usefulness of Cirad's activities - Responding to societal demand on demonstrating public investments into research - Desire to shift from scientific excellence to research in partnerships' relevance and usefulness - Shifting from a culture of promises to a culture of impact - Moving away from the dichotomy research vs. development; bringing research closer to societal needs - Fostering an organisational reflexive capacity, to inform research strategic programming - Fostering organisational learning and improving research practices - Ethical positioning of Cirad - Willingness to stand out from other organisations in terms of impact approaches, and develop comprehensive and complexity-aware approaches - Building upon the strategic planning 2008–2011 stating request to produce a methodological reflection on the impact of its activities - A synergy of conducive (human-related) factors that enabled the launch of such culture	- Transparency of information for society and control bodies - Accountability to society justifying the investments in agricultural RD&I - Establishing clear metrics to perform holistic assessment of research results and impacts - Monitoring and communicating about the impact of agricultural technologies - Demonstrating the importance of technological solutions developed through research - Directing and prioritising future actions and research on topics of greater relevance - Strengthening organisational image and importance	- Accountability to government and society being a publicly funded institute that must fulfil its societal mandate - Excelling into delivering positive impacts to farmers, society, and the environment. - Demonstrating to society the benefits resulting from investing in research, development, and innovation - Fostering long-term interest of key researchers in reflexive learning on the impact of the organisation - Desire for an organisational appropriation of the impact reflection.
	Difficulties, constraints to the emergence of a culture of impact	- Perception of "instrumentalisation" of researchers by the direction to carry out evaluations - Fear of additional workload, anxiety vis-à-vis the level of effort demanded by new approaches - Fear of losing freedom in knowledge production, creativity of research - Resistance to open up to new questioning, uncertainties etc. - Perception of no added value, and that research practices are already (implicitly) impact-driven - Fear that this might lead to questioning of research postures, epistemics	- Scarcity of human and financial resources - Methodological and training difficulties: need to adapt the method to different types of technologies and maintain a continuous training schedule - Resistance to changes of mind-set, especially for those who have worked for many years at Embrapa - Logistical difficulties and lack of financial resources in surveying impact data in field studies	- Dependency on public sector funding, government policies, which can prevent the organisation from directing its own agenda - Resistance of researchers and administrative staff to conduct work related to economic and social impact
Development & "infusion" phase	**Drivers of the culture of impact** (facilitators to its appropriation; conducive conditions)	- Perception of an opportunity to foster inter-disciplinary works, mutual learning across fields and types of actors, and about the position of own research - No hierarchical request, low level of formalisation; a voluntary approach (change in research practices and critical thinking not imposed) - A team of motivated, leading, and devoted people with communication skills - Brokering people able to play the role of intermediaries between disciplines and actors' profiles - To be able to justify research actions and provides arguments to focus on some topics - A way to valorise researcher's work in impact analysis (via scientific publications) - Internal communication through website, oral presentations to staff - A supportive direction, willing to provide human and financial resources - Link of the ImpresS team with high-level management, visibility - An institutionalised team of agents (DIMS/project development team,	- Internal competence to carry out impact assessments (well trained and up-to-date teams) - Awareness of teams on the internalised innovation process - Organisation's image and relationship with society through a comprehensible dialogue (annual Social Balance Report) - Influence of impact assessments on the organisational performance evaluation process - Communication and interaction with managers and teams about the importance of impact studies - An institutionalised and standardised methodological basis	- Strategic presence of the Corporation at the regional level through the Research Centres - Enables to showcase the results of actions in the field to partners and society more broadly (through the annual Social Balance report - impact analysis strategy) - Financial security because of the public status and projects/alliances with the private sector - Increased awareness among researchers, who are more open and alert to the impact that their projects can generate

Table 6 (*continued*)

		Cirad semi-directed interviews, *n* = 13	**Embrapa** closed-questions survey, *n* = 18	**AGROSAVIA** structured interview, *n* = 31
Perceptions		ImpresS) able to accompany project or research development and infusing questioning on impact generation and corresponding mechanisms - A diversity of agents in their profile and background being "touched" by the culture - "Word of mouth" among agents to share experiences and raise interest of others - Capacity to adapt to the demand of researchers, tailored support for each specific intervention and request, flexibility in the type of accompaniment proposed		
	Hindering factors to its appropriation	- Type of discipline makes adhesion to these approaches and concepts more or less easy: agents already working on "finalised research", participatory action research and transdisciplinarity (e.g., on production systems) tend to consider that they already carry out such reflections, resulting sometimes in resistance; versus agents working on "more distant" objects (e.g., fundamental research like genomic characterisation, biological processes) - Level of exposure to other disciplines and approaches. Some disciplines already working with similar questioning and tools may be reluctant to new "similar" approaches	- Insufficient financial resources, which restricts the set of technologies to be assessed - Lack of strategic vision by some leaders - Lack of uniform tools for all Decentralised Units to facilitate data collection with accurate and precise bases - Lack of capitalisation on learning to enable continuous improvement in practices, processes, and scientific productions - Lack of adequacy between operational capacity (number and trained people) and volume of demands with regard to evaluation work	- Complexity of internal processes, hindering establishment of continuous interactions with farmers communities - Lack of articulation between research department and department in charge of bringing technological offers to producers - Very few researchers in economic, social and human disciplines - Lack of transdisciplinary work in the development of research and innovation proposals - Centralised decision-making process, giving little power to directors of the research centres in their regions
	Perception towards culture of impact	- Majority find it essential given development mandate of Cirad - Consistency of the concepts with what is going on in the organisation - This culture generally accepted, included at management levels, but did not yet lead to a transformation on research practices - Staff took the culture of impact up with different levels of engagement, depending on their interest. Little resistance, natural to go along this way - Staff has a desire to learn about and test evaluation approaches - Enables increased awareness on strategic orientation and roles to play for developing agricultural innovations and contributing to long term innovation processes with multiples stakeholders - Enables researcher to formulate stronger and more informed messages to decision makers - Contributes to foster dialogue among disciplines and professions; offers opportunities to work together, and spaces of dialogue	- For most managers, the dissemination of a culture of impact is of fundamental importance for organisational survival, and must be advocated and recognised by all employees and leaders in the organisation - Development of a culture of impact has evolved as expected	- Elements in the corporation that denote an emergence of a culture of impact. Yet, a need to generate actions that allow it to be fully appropriated at individual and organisational levels.
	Opportunities, suggestions to further development of culture of impact	- Integrating modules on "research impact" in doctorate programmes - Integrating selection criteria in the recruitment processes (for "change-oriented" researchers) - Focusing on a larger spectrum of agents categories in the organisation beside researchers, such as technicians, who have a role to play for making change and impact happen - Expanding criteria for the evaluation and promotion of researchers (to include a specific effort to contribute to fostering change and impact as a criteria) - Offering more opportunities for inter-disciplinary exchanges/works to researchers, as part of increasing mind-openness	- Methodological level: Improving evaluation methodologies, streamlining processes to allow assessment of more technologies, updating tools based on worldwide benchmarking organisations - Institutional/strategic level: continuous training of teams, reinforcing culture of impact in management, continuous investment in impact assessment, promoting interaction and partnerships with academic and non-academic communities, improving interaction between impact assessment and strategic/planning processes, recruiting staff with expertise in related areas	- Generating incentives, especially for researchers, supporting to focus their projects on impact - -Policies of the current (2022) government focusing on territories and small and medium-sised producers are in accordance with the corporate transformative superior purpose. - Increasing work with producers and generating participatory work methodologies - Working with different communities (indigenous, Afrocolombian -black communities, smallholders) and types of agriculture - Establishing a structure (group) transversal to the entire corporation

Table 6 (*continued*)

	Cirad semi-directed interviews, *n* = 13	**Embrapa** closed-questions survey, *n* = 18	**AGROSAVIA** structured interview, *n* = 31
	- Cultivating an opening to what is happening outside, work of other organisations - Widening the Impact team to further meet with coming demands from staff - Presence of "champion" researchers that contribute to infuse culture of impact in their unit - Targeting institutes partners to adhere to culture of impact	- Communication level: extending dissemination about impact theme and research results - Impact assessment coordination team: further integrating support and technical teams, together with productive sector; better defining a coordinating team at the national level, able to carry out field surveys and provide adequate resources - Strengthening culture of impact at all levels of organisation: units, directorate, heads, superintendence, management, supervision	that is in charge of championing and implementing the culture of impact throughout the corporation. - Generating spaces for internal dialogue, at all levels of organisation

Note: Related findings across the organisations are presented along a same row.

Table 7
Descriptive statistics of "engaged-population".

Descriptive variables		Cirad (*n* = 65)	Embrapa (*n* = 16)	Embrapa (n = 123)	AGROSAVIA (*n* = 294)
Gender (female)		42.3 %	25 %	80 %	41,5 %
Age	20–35 years old	12.7 %			29,3 %
	36–50 years old	46 %	63 %	34 %	48,6 %
	51–65 years old	41.3 %	31 %	48 %	20,4 %
	Over 65 years old	0	6 %	18 %	1.7 %
Position	Researcher	69 %	44 %	52 %	74,1 %
	Research support (project development)	15 %	0		1,0 %
	Direction	1,5 %	0		5,8 %
	Research management (analyst)	0	56 %	46 %	0
	Administrative support	0	0	2 %	19 %
	Others (PhD students, engineer)	15 %	0		0
Number of years in organisation	1–10 years	31 %	37 %	4 %	61,9 %
	11–20 years	37 %	50 %	50 %	20,4 %
	Over 21 years	28 %	13 %	46 %	17,7 %
Engagement Intensity (EI) score[a]		2.5 (1.2) (scale: 1 to 5)	3.1 (1.7) (scale: 1 to 6)	Not applicable	3.08 (2.07) (scale: 1 to 7)

Note: The higher the EI score, the higher his/her engagement has been. See Appendix 4 for an overview of the nature of such engagement and Appendix 5 for details on the calculation of EI. In Cirad, researchers include Cirad's researchers and partners' researchers.
[a] The EI score corresponds to the reported level of engagement of participants into "impact-evaluation activities".

Table 8
Sampling and data analysis.

	Cirad	Embrapa	AGROSAVIA	Type of analyses
1. All participants of "engaged-population"	65	16 and 123	294	General perception, role of research, institution, opportunities
2. Participants who took part to *ex ante* activities exclusively	50	NA	202	Type of change experienced Comparison across EI: low EI, high EI
3. Participants who took part to *ex post* activities exclusively	8	16	26	Type of change experienced

Note: For a matter of better comparability of the results, we studied the changes experienced by the targeted population (outside general perceptions) by looking on the one hand at staff who was exposed to *ex ante* evaluation related activities, and on the other hand at staff exposed specifically to *ex post* evaluation related activities.

the population mentioned insufficient resources and concrete actions in link with this culture. Next, a majority reported that this culture has influenced the way they perceive the role of research in society. In Cirad, for instance, participants report a "*more optimistic vision of the role of research*" or "*a better understanding of the various roles research can play and the synergies with other stakeholders*". In AGROSAVIA, this finding is

Table 9
Proportion of respondents that report a change in perception as a result of culture of impact.

	Perception of an alignment between culture of impact and role of organisation	Change in one's perception of one's role within organisation and team	Change in one's perception of the role of research in contributing to societal impacts	Changes observed in the organisation (management, process) as a result of the organisational impact ambition
Cirad (*n* = 65)	86 %	25 %	52 %	52 %
Embrapa (n = 16)	94 %	38 % (*n* = 8)	75 % (*n* = 8)	56 %
AGROSAVIA (n = 294)	83 %	52 %	58 %	30 %

illustrated by statements like "*research is essential for the improvement of society*" or "*research must be aimed at closing gaps, generating impacts, and satisfying the needs of a community, a sector*". In contrast, we find limited change in the perception of the roles within teams and organisation. This might be explained by a potential selection bias, in the sense that these participants have been engaging (voluntarily or not) into impact-evaluation activities, and are likely well aware of their role as part of the organisation. Last, about half of the participants observed

organisational change, e.g., with regard to development and planning of interventions, that would result, in part, from the impact-related actions carried out in the organisation. In Cirad, observed organisational changes seem to translate into stronger communication about impact, change in the way research interventions are conceived, and implementation of a common lexicon around impact evaluation. Some respondents reported their views in how they thought a culture of impact relates to: in AGROSAVIA, terms like "*change*", "*transformation*", "*appropriation*", "*orientation*", "*prioritisation*", "*values*", "*identity*", or "*belonging*" were used.

4.4.3. Cognitive and practical individual changes resulting from a culture of impact

We present the type of changes that the "engaged-population" has experienced as a result of the exposure with either *ex ante* or *ex post* evaluation activities (see Table 10). In terms of cognitive changes associated with *ex ante* activities, we find that a large majority of participants reported feeling more acquainted with impact notions and how to evaluate it. This change of knowledge includes, in particular, gain of impact-related suitable vocabulary, increased knowledge along impact evaluation methods and approaches, and impact pathways, as per Cirad's responses. In AGROSAVIA, participants indicated a better understanding of the productive systems and a strengthening of their knowledge along evaluation methodologies. With regard to exposure to *ex post* evaluation activities specifically, AGROSAVIA's respondents reported a gain of knowledge and a strengthening of *ex post* methodologies (Ambitec-Agro). Changes seem less pronounced with regard to capacity to interact with impacted actors, or to implement reflections and methods in an independent way. A bit less than half of the participants in Cirad mentioned that involvement into *ex ante* impact-evaluation activities has helped them increase their levels of interaction with other professions and disciplines of the organisation, and hence their level of understanding for those. Among those who experienced a change, some

reported to now see differently the role and place of impacted actors: they are increasingly considered by the respondents as centred actors in the interventions and not "only" as beneficiaries. One respondent from Cirad stated specifically that the use of *ex ante* approaches has enabled to "*strengthen the transition of farmers from beneficiaries to actors, and to acquire the reflex of 'actor-centred' questioning: with whom? for whom? by whom? who should do what differently?*" Moreover, 69 % of respondents at AGROSAVIA describe a similar change: through these new interactions, they report a more active level of interdisciplinary participation, leading to i) a better understanding of the production system, which generates more comprehensive results: e.g., "*today the focus of the projects has changed: we are called to formulate more comprehensive proposals, where several disciplines participate, making it necessary to make connections or alliances among researchers from different disciplines*", "*collaborative interaction has improved the approach to proposals and their projected impact*"; and ii) a co-responsibility in the formulation, development, and achievement of proposed goals: e.g., "*interaction with other research teams generates a better construction and adoption of the technology*", "*improved communication between areas and knowledge enables the formulation of most realistic schedule*".

With regard to changes in interactions resulting from engaging with *ex post* activities, several respondents from AGROSAVIA explain that evaluation has allowed them to understand the importance of working with other areas and domains of the corporation. People expressed "*the Centre's Social Balance team is multidisciplinary, besides we evaluate different Technology Offer thus complementing knowledge and information.*", "*the evaluations are interdisciplinary works, so we are in constant interaction with people from other disciplines and professions and we are constantly learning.*" This also includes changes in external interactions, which have, according to some respondents, reinforced their conviction of the importance of interacting with producers in order to better identify their perceptions, needs, and strengthen adoption of developed technologies. This is reflected in quotes like "*it is always necessary to*

Table 10
Proportion of "engaged-population" that reports cognitive and/or practical changes.

	Change in knowledge about impact and impact evaluation	Change in knowledge about the types of impacts to which research can contribute	Change in knowledge of principles, specificities, conditions of application of the method	Change in capacity to interact with the actors potentially impacted by the research	Change in capacity to use impact assessment methods, approaches independently	Change in interactions with other professions and/or disciplines at the institution	Change in the way of formulating & constructing research questions	Change in the way of planning future interventions	Change in the way to manage/coordinate interventions and their steering
Exposure to *ex post* activities									
Cirad (n = 8)	75 %	50 %	62.5 %	37.5 %	50 %	87.5 %	37.5 %	62.5 %	
Embrapa (n = 16)	78 % (n = 8)	75 % (*n* = 8)	63 % (*n* = 8)	63 % (*n* = 8)	38 % (*n* = 8)	63 % (*n* = 8)	25 % (*n* = 8)	38 % (*n* = 8)	
AGROSAVIA (*n* = 26)	81 %	88 %	58 %	65 %		73 %		69 %	
Exposure to *ex ante* activities									
Cirad (*n* = 50)	84 %		74 %	48 %	32 %	44 %	54 %	30 %	24 %
AGROSAVIA (*n* = 202)	63 %		59 %			69 %	55 %	60 %	
Differentiation by level of EI (for *ex ante*)									
Cirad EI Low (*n* = 33)	82 %		67 %	52 %	21 %	36 %	58 %	36 %	30 %
Cirad EI High (*n* = 17)	**88 %**		**88 %**	41 %	**53 %**	**59 %**	49 %	18 %	12 %
AGROSAVIA EI Low (*n* = 127)	51 %		49 %			61 %	49 %	53 %	
AGROSAVIA EI High (*n* = 75)	**83 %**		**76 %**			**81 %**	**65 %**	**72 %**	

Note: Cells containing no data means that the survey did not integrate a comparative question (reminder: data collection tools were customized to each organisation).

know the perception directly of the producers to identify opportunities for improvement or additional actions to maximize results" or "*the potentially affected actors provide insights into future reception of technological offer*".

More than half of participants who engaged in *ex ante* activities, in both Cirad and AGROSAVIA reported a change in the way of formulating and constructing research questions, illustrated in the following ways: "*better planning based on concrete objectives and available resources*", "*construct research questions that are consistent with the stakeholders' visions*", "*more relevant research questions in terms of their importance in the territory and focus on generating impact*", "*forces the formulator to think prospectively and in terms of impact*", "*the producer and the consumer are the essence of the Corporation, and the research questions should revolve around them*", or "*higher concerns about impact explains change in the ways of formulating research questions aimed at adoption and subsequent impact*". The level of reported change in planning and management of research interventions is lower though. Yet, those who report a change, mention "*co-construction of impact pathways that enable a higher level of efficiency in the way of piloting interventions*" (Cirad), or '*construction of more robust research proposals and greater success in external calls for project financing*' (AGROSAVIA).

Considering the results from the survey on staff involved with the Social Balance at Embrapa ($n = 123$), we find that half of the participants report that they very frequently collaborate with researchers from areas other than their own, and reflect with colleagues on how research and projects are conceived: 75 % answered that they often partake in reflection groups. Regarding the sharing of experiences and field knowledge, more than 80 % of people report to do it very often. Moreover, the majority of this sample reported carrying out discussions, and proposition of methods, tools, and approaches to analyse the impacts of research (e.g., on the use of reference methodology, on the results of the Social Balance report). Last, more than half of the participants reported to often build and share impact-related skills, and knowledge with others. Yet, 11 % claim never doing so.

4.4.4. Factors of changes and opportunities

Among the population that engaged with *ex ante* activities, we analysed the effect of the level of engagement (EI score) on the experienced level of change (Table 10). We find that levels of changes along knowledge, capacity, and some research practices tend to be, in proportion, higher among the sample of population that more intensively/frequently engaged with evaluation-activities. This finding is reassuring in the sense that it confirms the idea that for a culture of impact to impregnate a population, time and continuity of support is needed, together with level of recurrence of the activities.

Our methodological design was also an opportunity to gather thoughts on potential difficulties and suggestions from participants for strengthening these changes and further promote this culture. As part of difficulties, some respondents from Cirad mentioned that it is not easy to enter and get familiar with the proposed evaluation approaches, which appear complex. Others mention the amount of time necessary for engaging into these participatory processes, which is not always easy to accommodate with all parties involved. For AGROSAVIA some people consider that more training and support is needed to encourage impact-oriented focus: "*we continue to do very basic and not applied research*", "*expert staff in adoption and expected impacts of Technological Offers are scarce and do not allow all projects to be covered*", "*there is a lack of training to include in the formulation of the projects how we can measure the impact of the possible technological offers that are generated*". Other difficulties lie in the interest of some researchers and the level of allocated resources, as example: "*greater resources and infrastructure are required for impact research*". By contrast, other answers suggest the importance to have interdisciplinary teams and strengthening expert staff on impact issues: "*projects should always be formulated by interdisciplinary teams*". On the side of Cirad, as transpires also from the interviews, we note the "*importance of leaving this ambition as a dynamic work that is intellectually open and productive* » (oral comm.), and the idea of "*enlarging object of*

studies (e.g., in evaluation) in order to enlarge the spectrum of agents and profiles feeling concerned by the culture of impact, and therefore being able to position themselves, within their field, in relation to other activities, and in terms of contribution to societal impacts» (oral comm.).

5. Discussion

The studied organisations have followed their own path in building a culture of impact. Embrapa developed and implemented multidimensional impact assessment methodologies since the last twenty-five years while Cirad started its journey fourteen years ago, with the design of specific participatory approaches for evaluating, planning, and reflecting with its partners on the impact of research activities. AGROSAVIA advanced, in the last seven years, in the institutionalisation of a global impact assessment strategy including systematic assessments and *ex ante* reflections. While the emergence of this culture is driven, in the three cases, by a desire to demonstrate usefulness of research and foster an organisational learning process (as shown by White et al. (2018)), these two factors unfolded differently in the cases and over time. Cirad chose to focus on a reflexive learning process to equip research teams to reflect, with partners and other actors, on the contribution of research activities to societal impacts, and the role and position of research. For Embrapa and AGROSAVIA, a strong driver to this culture is 'Social Balance' reporting in order to comprehensively communicate on socio-economic benefits of the technologies and innovations developed through agricultural research. In relation to what Turner et al. (2022) propose, these two organisations seek primarily for 'accountability', to show both funders and society, and their supervising authorities, the contribution of science to society, while Cirad is rather guided by 'analysis', in an intention to understand effects of research and improve practices. Notably, these trajectories are anchored into different methodological choices, which are influenced by the organisational context, including its operational scope and configuration, and intervention modalities and philosophies. This very much echoes the findings of Klerkx et al. (2017) and Rijswijk et al. (2019) who highlighted how the institutional and economic/financial context may shape the culture and influence the deployment of new practices. For instance, given the diversity of settings within which Cirad operates, designing flexible, customized, and participatory reflexive approaches is important. The diversity of operating contexts being more geographically limited for AGROSAVIA and Embrapa, more standardised approaches may be suitable. Another contrasting element along the methodological approaches lies in the level of complexity that is aimed at being captured. Embrapa and AGROSAVIA tend to have a technological impact and adoption-oriented focus, in order to inform research development and transfer processes, whereas Cirad considers innovation process more widely, exploring its multiple dimensions and the changes its appropriation generates. This may again be influenced by their institutional settings: Cirad is organised in departments and units composed of various disciplines and addressing various types of innovations, while Embrapa and AGROSAVIA are organised along agricultural products and technology types, or regional development priorities, potentially leading to more focused inter-disciplinary exchanges and systemic designs.

We acknowledge several limitations to our study. First, our samples are heterogeneous across the organisations, which limits the extent to which they can be compared. Yet, this heterogeneity contributes to make this study unique, by depicting varying professional populations working on impact evaluation-related activities, in research organisations. Second, the sample may not be comprehensive in depicting culture of impact's trajectories and the veracity of effects on research practices. There are likely other cases that could add to the picture and would deserve considerations. Third, the "engaged-population" is supposedly familiar with impact-related principles and aware of their own role in the organisation, a potential selection bias. Thus, they may have implicitly implemented changes in their practices without reporting

them, leading to a possible "under-estimation" of the level of changes associated with a culture of impact. Fourth and similar to the limitations of Rijswijk et al. (2019), our study is not longitudinal, hence the difficulty to measure change in practices or in organisational identities. We relied on perceived changes of people in regard to their own experience or observations. Last, as also reflected by Rijswijk et al. (2019), it is sometimes difficult to disentangle the culture of impact and its associated changes, as the culture "is as much a consequence of change as it is a cause of other changes". Further research could focus on monitoring the nature and degree of changes in research practices over time, as a result of this culture.

One important finding lies in the "infusion process" of the culture of impact across different layers of the organisation, pointing at the importance of looking at various organisational levels to understand how people may uptake and be willing to engage into "new" approaches (Klerkx et al., 2017). First and commonly to our cases, a central engine to this infusion is needed, which translates into dedication and specific staff to support and accompany others in performing impact evaluation related activities (reflections and applications), and keep up-to-date with literature development, in interaction with various levels of the organisation, including multiple levels of management. Indeed, supporting such organisational change implies specific expertise, including evaluation impact skills, communication skills, and ability to support others. This echoes the idea of "research impact practitioners" by Bayley and Phipps (2019) for fostering an "impact literacy" that can be gradually spread at individual and organisational levels, or the idea of "organisational legitimacy" around such a culture that imply new values to infuse through various levels of the organisation as well as broader institutional environments (Turner et al., 2023). "New professionalisms" to support this literacy have been long called for in agricultural research (Pretty and Chambers, 1993), also as a shift from accountability to learning of all stakeholders involved through evaluation (Douthwaite et al., 2017). Our findings show that the 'impact teams' of the studied organisations have a pivotal role in supporting the development of such "impact literacy", and consist of unique entities in their composition (both research and support staff) and in their ability (or mission) to convey transversal organisational considerations and facilitate inter-disciplinary and inter-profession dialogues. Second, we find that the infusion process unfolds in different manners, suggesting different links between the organisational and the individual level strategies. Indeed, the evaluation applications vary from a strong level of formalisation - whereby technology impact assessments are integrated into the organisational performance assessment process, implying "mandatory" involvement of staff into evaluation activities -, to a weaker level along the belief that a deep and durable level of appropriation of evaluation principles is associated with a freedom of engaging, or not, with proposed approaches in the organisation (i.e., voluntariness principle). This difference seems to influence the degree and modalities of organisational capitalisation (i.e., the use of results from the evaluations into strategic planning and agenda priorities). A level of systematisation and standardisation in evaluation processes may be favorable to capitalisation of results for informing organisational strategic decisions (in line with Duffield and Whitty, 2016), by enabling to cover a wide and diverse range of objects considered for evaluations, and therefore produce a comprehensive organisational vision, at the difference of when the application of impact evaluation depends on what staff brings up as suggestion. Yet, a downside of standardised approaches may be the little room for flexibility and individual contributions to suit specific technologies or innovation processes. Clearly, the difficulty lies in finding the right balance between on the one hand strategic organisational-level drivers that promote systematisation and standardisation of impact evaluation approaches, and on the other hand suiting individual-level potential interests, specific innovations' trajectories, and enabling tailored approaches, and thus facilitating internal learning processes. In fact, the "impact agenda" calls for both summative and formative functions of evaluation (Turner et al., 2022); this combination being,

moreover, conducive to the building of collective memories in the organisation (Ferré et al., 2022). Third and in regards to "what it takes" to build a culture of impact, our findings highlight the need for continuous investment and efforts by the various levels of the organisation. One could suggest that such effort may be higher in settings where evaluation activities are voluntary: as staff turns over, the level of efforts needs to be maintained to convince new recruits. Where activities are mandatory and follow routine procedures, the level of investment decreases as staff becomes acquainted with those.

No work had focused on examining the cognitive and practical changes that a culture of impact in agricultural research organisations translates within the staff exposed to evaluation-related activities. We find nuancing results. Cirad, Embrapa, and AGROSAVIA highlight significant gains in knowledge along evaluation principles, notions, and methods. With regard to capacities, those seem to be particularly enhanced when individuals participate to several experiences along *ex ante* or *ex post* evaluation approaches. Changes of actual practices are, in general, more incremental, with a smaller sample reporting changes on the way they interact with others, the way they design research questions, or plan interventions. Our findings clearly highlight that there is a learning process in place that generates first levels of changes at individual levels, yet demanding time (cf. Turner et al., 2023). Preskill and Boyle (2008) suggest that the organisation's leadership, structures, and communication channels may influence the effectiveness of evaluation capacity building efforts. Interestingly, an indicator of the percolation of the culture of impact is the fact that what was initially perceived as an "extra layer" or an effort is generally being looked at as a new norm and a criterion embedded into the organisational landscape, and project-related practice. Furthermore, reported multi-faceted benefits of establishing a culture of impact consists of a unique opportunity to strengthen the community of researchers and practitioners, enlarge and reinforce partnerships, and to better argue why and what an organisation does. Thus, individual changes aligning with such a culture contribute to reinforce the organisations' identity.

6. Conclusion and perspectives

Our study depicts the diverse shapes a "culture of impact" may take and the various manners it can be conceived, shaped, and implemented in agricultural research organisations. We considered three organisations having an ambition for establishing a culture of impact (Cirad, AGROSAVIA, Embrapa), and analysed the characteristics and trends relative to how they build and "practice" such a culture. We compared their respective historical trajectories in developing a culture of impact, their *modus operandi*, drivers, and the types of individual changes exposure to such a culture foster. Thus, we identified contextual circumstances and organisational elements that seem to favour or hinder the emergence of a culture of impact, as well as research practices that can promote its internalisation and consolidation.

This work enables to understand the multiple facets and implications of establishing a culture of impact in research organisations. We show that there is a variety of approaches that can fit different objects of evaluation, agents, and interests. Eventually, the uptake of the culture of impact is largely dependent on the way impact is perceived, evaluated, and discussed, and therefore on what the organisation and agents value. Embracing such a culture requires a level of openness to influence individual and collective practices, and a mutually shared and collective understanding of what this means and what it entails. This calls for consistency between organisational strategy, communication, visions, and planning, which then translate operationally through organisational mechanisms. Our study offers clues on opportunities to stimulate such a culture (e.g., identifying "champions", recruiting staff having "change-oriented" mind-sets, focusing on soft skills). Yet, and just like for any culture, it remains a slow and long-term endeavour and the adhesion process is not straight forward. Particular attention is required on the integration of this culture with other organisational cultures, like the

"project" culture, which refers to tendency of research being organised around project modalities implying short-term cycles, compliance with funders' requirements, and delivery of specific products. A culture of impact may fit with a project culture in the sense that it implies reflecting on specific impact contributions and the way that needs to be put into place in order to achieve it (through the so-called Theory of Change). In fact, for the case of Cirad that very much functions around the project modality, impact-related reflections are fostered by the need to responds to calls, attract funds, and design projects. Project's dynamics may also act as a constraining frame for building a culture of impact as the latter requires thinking beyond the project's goals and as part of a variety of research objects (e.g., partnerships, value chains). This tension between project culture and organisational culture deserves further exploration. Furthermore, as shown by Blundo-Canto et al. (2019) and White et al. (2018), learning is a key component of a culture of impact for encouraging continuous reflections on research practices and research positioning, enabling sharing of experiences and ideas at different organisational levels, feeding the organisational learning process at strategical level, but also fostering experimentations and interactions, and thus improving research practices contributing to societal impacts. This learning process is facilitated by accessibility to adequate tools, spaces, support staff, and a level of "decentralisation" through the role of intermediaries or "champions" that some staff may (consciously or not) endorse. Importantly, as transpiring here, culture of impact is an ever-evolving process: it is shaped by both people composing the culture and by the external context, therefore requiring permanent update along new opportunities and interests. Openness and adaptability of *modus operandi* are therefore key to adapt to future trajectories of the culture. This also calls for "pause and reflect" times allowing occasional assessment of evaluation capabilities in the organisation, perceptions towards this culture, possible resistances, and expectations, like this study does.

Building upon Blundo-Canto et al. (2019) and this analysis, we finally contribute to refine the definition of the "culture of impact" concept, as follows: an organisational aspiration to design, plan, and conduct research through the eyes of the types of impact it aims to contribute to, involving a conducive organisational environment (with tools, approaches, and communication spaces at various levels of the organisation, facilitating moments of reflections in the research process), and translating into the staff and partners feeling both consciously aligned within the research system and key to directing research activities in a way that contribute to the generation of socio-economic impacts. As part of this definition, we suggest that a culture of impact may contain different (sub)cultures with various dynamics covering different strands or organisational objectives, and allowing different paces. The co-existence of sub-cultures allows to match with and reach out to a larger scope of profiles, capacities, and interests, adjusting to their own practices and context of action (Blundo-Canto et al., 2019).

The development of a culture of impact aligns with recent agenda in agricultural research organisations that call for systemic innovation, and rethinking of organisations' function and responsibilities for enabling a shift towards more sustainable trajectories of development and addressing wicked and complex issues (Conti et al., 2024), considering a context of ecological and societal emergency too. This study is particularly useful for scientists and managers in research organisations who aim to integrate the evaluation on societal impacts within their practices and develop strategies to critically reflect on the contribution of research to societal impacts. Practical guidance on building a culture of impact could be stated as follows: i) exploring context-specific issues and path-dependencies in order to prepare for challenges and opportunities to the development of such a culture, ii) encouraging continuous inter- and intra-organisational dialogues and design of "standard routine procedures" for facilitating staff engagement and structuring a learning process; iii) engaging with the community at large, including researchers, technicians, engineers, supporting staff, who all have a role within innovation processes. Thus, adhesion of this diversity of profiles and professions to this culture, in their own way, is key to foster effective changes of postures, and may be facilitated by offering a diversity of evaluation approaches able to suit various needs and evaluative capacities; and iv) ensuring a set of structural and variable elements, including dynamic human resources to propel it over time, as well as a combination of both voluntary and systematic/mandatory elements (cf. bottom-up and top-down dynamics as formulated by White et al., 2018).

CRediT authorship contribution statement

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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Data availability

Data will be made available on request.

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