

Embrapa's SDGs Network: contributions to the 2030 Agenda

Fábio Homero Diniz, Research Analyst, Embrapa Dairy Cattle (corresponding author)

fabio.homero@embrapa.br

(+55) 32 3311-7552

Av. Eugênio do Nascimento, 610

Juiz de Fora, MG 36038-330

A. C. C. dos Santos, MSc Agronomy, Embrapa Grape and Wine

L. M. R. de Mello, MSc Rural Sociology, Embrapa Grape and Wine

V. S. Hammes, DSc Agricultural Engineer, Secretariat of Intelligence and Strategic Relations, Embrapa Headquarters

Sustainable development is a global concern, resulting in a commitment among 193 countries to achieve the 17 Sustainable Development Goals (SDGs) and their 169 targets, set out in the 2030 Agenda. The complexity, uncertainties, interactions and resilience of the social, biological, economic and political systems are challenges faced by countries to achieve the SDGs, requiring transformations in societies and economies and their interfaces with the planet (SDSN 2017). Surrounded by the contributions from many sectors, such as private and public sectors, and considering the synergies and trade-offs between the SDGs (Scheyvens, Banks, and Hughes 2016; Pradham *et al.* 2017), research, innovation and leadership is essential in helping society to transform into pathways of sustainable development. Due to its intrinsic characteristics of creation and dissemination of knowledge, research institutions can contribute to the implementation of the SDGs by providing knowledge, evidence base, solutions, technologies, know-how and best-practice examples to support implementation and by integrating issues of sustainability into their operations, research, and science-society interactions (ICSU 2017). As such, research institutes have a critical role in the achievement of the SDGs and will also greatly benefit from engaging with them. Besides, research institutes are able to contribute to pathways and innovations to support the implementation of the SDGs and to reach its targets from local to global level, considering social, economic and environmental dimensions (Nakamura *et al.* 2019).

From these reasons, research institutes, such as Brazilian Agricultural Research Corporation (Embrapa), have been encouraged to introduce the concept of sustainable development in their core operations, contributing to the achievement of the SDGs. Embrapa is a governmental technological innovation enterprise focused on generating knowledge and technology for Brazilian agricultural sector. Embrapa was founded on April 26, 1973, and it is under the aegis of the Ministry of Agriculture, Livestock and Food Supply (MAPA), embracing research institutes, experimental stations and existing projects of the National Agricultural Research Department (DNPEA), the former federal institution in charge of agricultural research activities (Avila and Souza 2002). The corporation operates as a network with institutions that are part of the National Agricultural Research System (SNPA), which is composed by state agricultural research organizations, universities, and national or state research institutes, in addition to other public and private organizations and with researchers from various parts of the world, directly or indirectly linked to agricultural research activities. As a research, development and innovation entity, Embrapa's agenda is entirely aimed at the generation of new knowledge, most of which translates into products, processes and services for the agricultural sector. Moreover, the corporation is ever more progressing towards

increasing the competitiveness and sustainability of agriculture with high-quality studies, actions, and information. Embrapa also generates information that contributes to the formulation and implementation of policies in areas that are relate to respond to the demands from Brazilian agriculture while anticipating and facing the challenges of the future (Embrapa, n.d.).

Currently, Embrapa has 9,545 employees in total, being 2,444 researchers (about 87% PhD), distributed in 46 research centers spread throughout the country (Embrapa, n.d.). The research centers are clustered according to products (dairy cattle, grape and wine, cassava and fruits, coffee, cotton, beef cattle, fisheries and aquaculture, goat and sheep, maize and sorghum, rice and beans, swine and poultry, soybean, vegetables and wheat); ecoregions (Western agriculture, Eastern Amazon, Western Amazon, Temperate agriculture, Semiarid agriculture, Roraima, Rondônia, Pantanal, Mid-North, cocais, coastal tablelands, Brazilian Cerrados (savannah), Southeast livestock, Southern livestock Amapá and Acre), and themes (agricultural informatics, agrosilvopastoral, agroenergy, agrobiolgy, environment, tropical agroindustry, territorial intelligence, instrumentation, genetic resources and biotechnology, forestry and food agroindustry) .

Since its foundation Embrapa has taken on the challenge to develop a genuinely Brazilian model of tropical agriculture and livestock to overcome the barriers that limited the production of food, fiber, and fuel in the country. The importance of agriculture to achieve the SDGs in Brazil is even greater, considering the extension of the areas occupied with crops, forests and pastures, the expressive contingent of agribusiness producers, workers and family farmers involved in agriculture and the relevance of the sector for economic development and welfare improvement of the population (Figure 1).

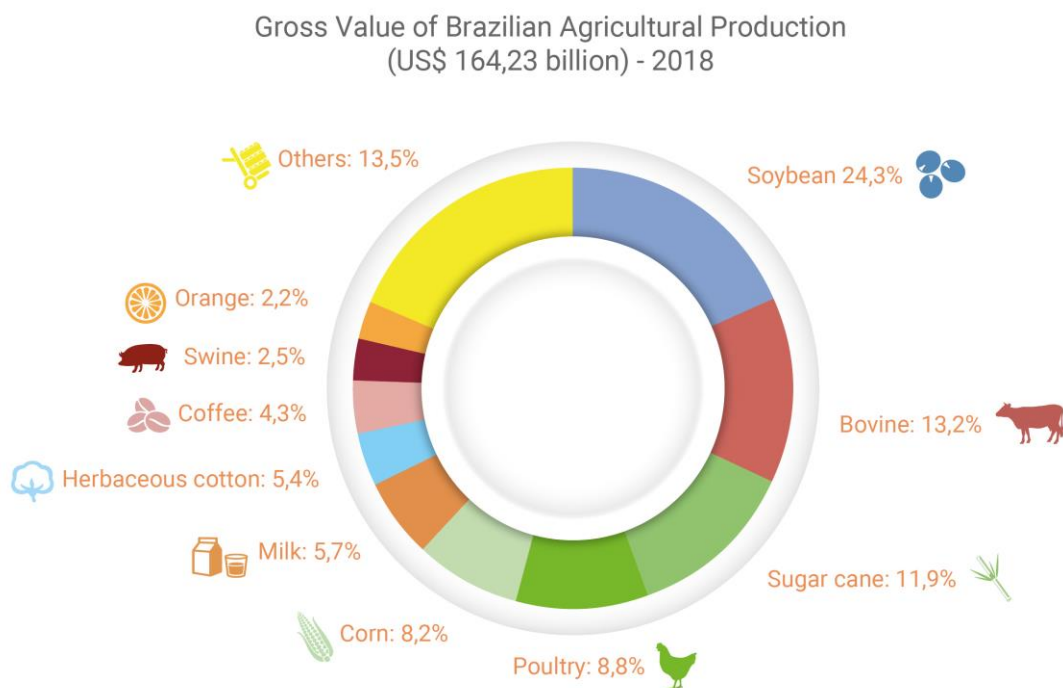


Figure 1: Gross Value of Brazilian Agricultural Production in 2018, according to the main products. Source: Embrapa 2018.

The contributions of research and development to the Brazilian agriculture are remarkable, being the country one of the most efficient in the planet. For instance, a wide area of formerly degraded *Cerrado* (savannah) lands has been incorporated into production systems; a region that now accounts for nearly 50% of national grain production. The country has quadrupled the beef and swine supply and increased the poultry supply (Embrapa, n.d.). These are some of the achievements that took the country from the condition of basic food importer in 70's to one of the world's largest food producers and exporters nowadays (Table 1).

Table 1. Brazilian world ranking of some products, according to production – 2018 (Source: FAO 2019)

Product	Production	World ranking
Soybean	120.8 million tonnes	1 st
Sugar	30.5 million tonnes	2 nd
Beef meat	9.9 thousand tonnes	2 nd
Corn	80.7 million tonnes	3 rd
Poultry meat	13.9 thousand tonnes	4 th
Milk	35.4 million tonnes	5 th
Pork	3.6 thousand tonnes	6 th

In turn, the most obvious linkages between agriculture and SDGs goals consider food production and nutrition, health and poverty, and among agriculture, natural resources, clean energy and climate change. Moreover, the links and contributions of agriculture to the reach of other SDGs are also undeniable. In this way, reflecting and acting in the development of the 2030 Agenda is an obligation and an opportunity for Embrapa (Hammes *et al.* 2018).

Considering the specificities and complexities of Brazilian society and the commitment of the country to reach the SDGs, the Presidency of the Republic established the governance of them by setting up the National Commission for the Sustainable Development Goals (NCSDG) in 2016, whose structure is presented in Figure 2.

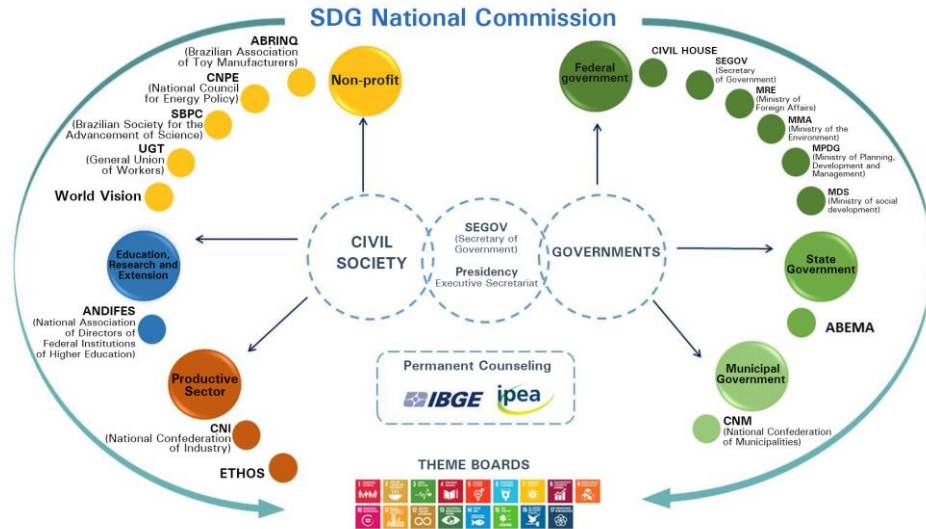


Figure 2. The structure of the National Commission for the SDGs. Source: (Hammes *et al.* 2018).

Previously to the official launch of the NCSDG, the Secretariat of Government (SEGOV) and the Ministry of Planning, Development and Management (MP) proposed that all ministries validate a proposal for alignment with the 17 goals, 169 targets and 241 UN indicators and the 54 programs, 303 goals, 1,132 targets and 3,094 initiatives of the 2016-2019 Pluriannual Plan (PPA) of the federal government.

In light of the agricultural vocation of Brazilian society, the MAPA created the Commission on Sustainable Development of Agribusiness (CSDA) (BRAZIL, 2016), which is composed of working groups (WGs) – one of them is SDG – with representatives from MAPA agencies, such as Embrapa and National Supply Company (CONAB).

In order to institutionalize Embrapa efforts towards the 2030 Agenda, the Executive Board has appointed out an internal working group for the SDG (WG-SDG/Embrapa). The steps – from the MDGs design to the consolidation of CNOSD, with the involvement of Embrapa, the fulfillment of the demands of the Court of Audit of the Union (TCU) and the MAPA performance – are represented by means of a timeline, in Figure 3.

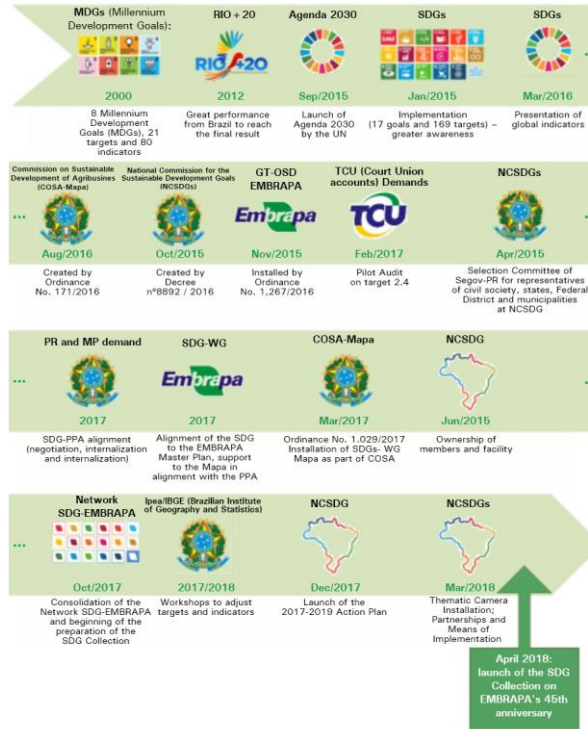


Figure 3. Timeline of the actions of Embrapa in the context of the Sustainable Development Goals (SDG). Source: (Hammes *et al.* 2018)

Embrapa has used some strategies in the structuring of its contributions to reach the SDGs and its targets, through agricultural innovation. The corporation has aligned the actions/themes of research, development and technology transfer related to the institutional planning of the VI Embrapa Master Plan (VI EMP) (Embrapa 2015) and the PPA 2016-2019. The analyzes, carried out in 2017, made it possible to observe that, by generating knowledge and technological assets for the sustainability of Brazilian agriculture, Embrapa contributes directly and indirectly to all 17 SDG. The five impact axes (Figure 4) of the VI EMP have clear alignment with all SDG. The impact axes refer to the main transformations that Embrapa expects to leverage in agriculture and Brazilian society within the period of 2014-2034.

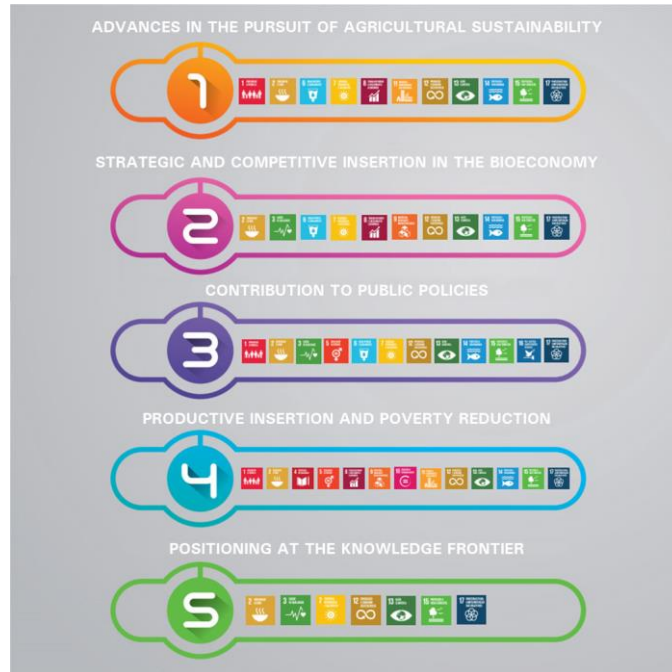


Figure 4. Alignment between the Impact Axes of the VI Embrapa Master Plan and the SDGs. Source: Embrapa 2017.

Considering that the MAPA has many programs within its scope, the WG-SDG/Embrapa aligned the SDGs targets based on the Program of Research and Innovations for Agriculture and the Program of Climate Change, in which the corporation has responsibilities and activities. The selection of the relevant targets within each SDG, was done by cross-referencing the SDGs targets and the goals and initiatives of those Programs, considering the potential of agricultural research contributions to the SDG by 2030. The crossing results were categorized into three priority levels according to the direct or indirect performance of Embrapa, as follows:

- Perspective of direct acting of Embrapa without dependence of other institution.
- Perspective of Embrapa performance depending on interaction with the MAPA and/or other actors in the agricultural sector.
- Indirect action of the corporation depends on interaction with other institution/actors outside the agricultural sector.

The results (Figure 5) shows that there is great interface in terms of alignment, since actions and potential contributions of Embrapa cover all 17 SDGs and 76 of the 169 targets (45% of the targets of the 2030 Agenda).

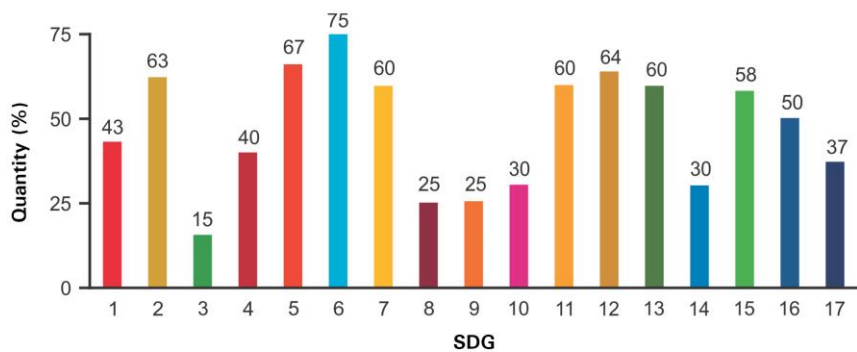


Figure 5. Relative amount of targets of each SDG with contribution from Embrapa's initiatives.

After that, accomplished in a 20-hour workshop, which was attended by 24 researchers and analysts, in a first round, 670 contributions from Embrapa were identified to reach the 76 selected targets of all SDGs. The contributions were clustered in the six categories of results as indicated below:

- Qualification and training – Support for the training of undergraduate and graduate students; training and technological updating of multiplier agents from the public extension service or private sector.
- Support to the formulation and/or implementation of policies – Identification and prioritization of opportunities and demands related to policies.
- Advancement of knowledge – For the development of research solutions that can be applied in agricultural production; impact studies; socioeconomic studies; prospective studies.
- Technological Solutions – Development of cultivars; strains/races/types; farming or agricultural inputs; innovation assets; technical-scientific methodologies in R&D, TT or communication; business technology; new technical processes; agroindustrial practices/processes; agricultural practices/processes; improved processes, methodologies or technical studies; agroindustrial products; pre-technological products; prototypes of machinery, equipment and implements; information or analysis systems; software for external customers.
- Maintenance of biodiversity – Enrichment and/or conservation of biological collections and germplasm banks; inventories and characterization of genetic and biocultural diversity.
- Institutional development – Internal training in strategic areas; corporative image; incremental improvements or technical-administrative processes; corporate or specific software; new organizational and/or managerial processes; improved processes, methodologies or organizational and/or managerial studies.

Most of the contributions were categorized as a technological solution or support to policies, as shown in Figure 6.

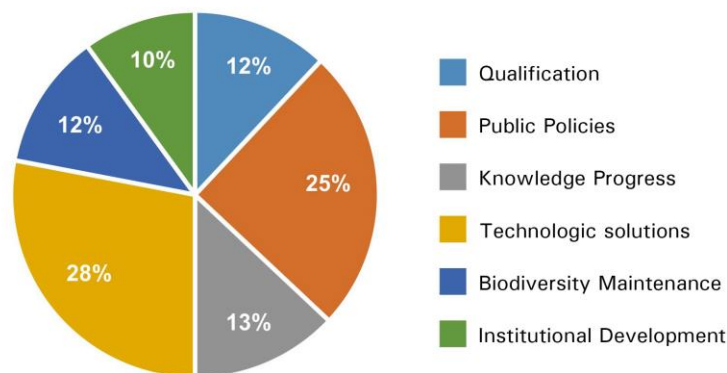


Figure 6. Percentage distribution of contributions from Embrapa to the SDG collected in the workshop, by category of result. Source: Hammes *et al.* 2018

Some contributions from Embrapa and partners are already available in the SDG Partnership Platform from UN as shown in table 2.

Table2. Contributions from Embrapa and partners in the UN SDGs Partnership Platform. Source: SDG 2019.

Embrapa's Research Center	Selected practice	SDGs
Food Agroindustry	Good practices for food loss and waste reduction	1, 2 and 12
	Food biofortification, providing health to Brazilian meals	1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 15 and 17
Goats and Sheep	Center of intelligence and market for goats and sheep in Brazil	1, 2, 5, 8, 11 and 17
	Participative assessment of local maize varieties used by farmers to cope with Brazilian semiarid	1, 2, 8, 9 and 13
Cocais	Good practices of interaction with female workers of Babassu coconut breaking activities from the state of Maranhão, Brazil	2, 5, 8, 9, 10, 12 and 15
Forestry	Agroforestry systems for the conservation of Brazil southern Atlantic Forest	2 and 15
	Roads with Araucarias	15
Southern Livestock	"Balde Cheio" Programme - Full Bucket a farmer-oriented programme of intensifying dairy farming systems in Brazil	1, 2 and 8
Wheat	Improvement of food quality and income generation with wheat products	1, 2, 5 and 8
	Improving crop-livestock integration systems with dual-purpose wheat for smallholder farmers	2
	Realizing no-till system in the subtropical regions of Brazil	2 and 15
	Biological control of wheat aphids with parasitoids	2
Secretariat of Intelligence and Strategic Affairs (SIRE)	SDG Collection - Good practice of co-creation and dissemination of institutional contributions to the fulfillment of 17 SDG and agricultural research and innovation for Peace, People, Planet, Prosperity and Partnerships	all 17
	SDG Network	all 17
With Partners	CGIAR Challenge Program: biofortified crops for improved human nutrition	
	CGIAR Challenge Program: 'Water and Food'	
	CGIAR Partnership Challenge Program: 'Unlocking genetic diversity in crops for the resource-poor'	
	Globally important ingenious agricultural heritage systems (GISHS)	

According to the broad scope of the 2030 Agenda captured by the 5 P's, (People, Prosperity, Planet, Partnership and Peace) and to provide a systemic view, those contributions were classified as proposed by Wollaert (2016). In this classification, 60% of the 76 selected by the WG-SDG/Embrapa, are related to the dimensions Planet (34%) and People (26%) and encompass 10 of the SDGs. The remaining 40%, in which Embrapa provides contributions, relate to Partnership, Prosperity and Peace, encompass 7 SDGs (Figure 7).

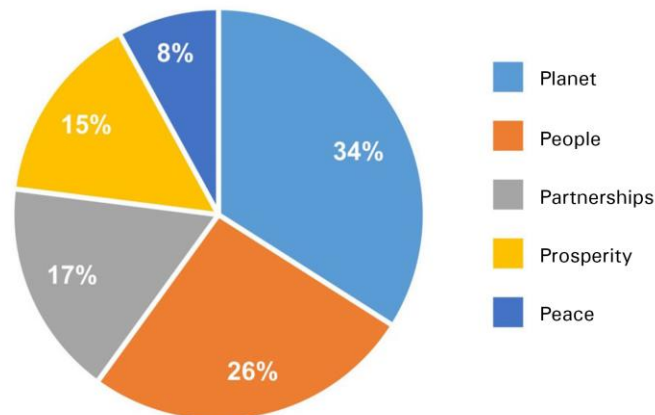


Figure 7. Distribution of Embrapa's contributions to the 5 P's, considering the 76 targets selected by the WG-SDG/Embrapa. Source: Hammes *et al.* 2018

Successively, to internalize the 2030 Agenda within the corporation, it was created a collaborative network, materialized by a virtual community the so-called SDG-Network/Embrapa. Currently, the network has 637 participants, spread out in all research centers. Structuring the SDG-Network/Embrapa allowed the corporation to introduce and deepen the debate about the SDGs, its targets and the 2030 Agenda. In addition, the SDG-Network/Embrapa elaborated prototypes of e-books and published a collection with 18 e-books, within four months. Considering the 17 SDGs and the 76 targets earlier selected, the e-books addressed samples of the contributions of Embrapa to each one, from 670 contributions previously mentioned. Another e-book, depicted, step by step, the approach and the method applied to organize and to internalize the SDGs at corporation level, showing the background and the strategies adopted by the corporation to provide to Brazilian society an overview of the contributions of Embrapa to the 2030 Agenda within the scope of the commitments of the country.

The developed process of the establishment of the SDG-Network/Embrapa was based on PGMacro method, the so-called 'Macroeducação', which is a participatory planning and cooperative management method that helps the establishment of a co-governance building by the collective, focusing on people and outcomes, developed by Embrapa. The method is based on the perception that complexity is easier noted from different points of view (panoramic and collective vision) and uses several visual artifacts (constructed images, such as drawings, maps, models) as a way of composing circuit relationships between people and their ideas in a creative and interpretive process, creating 'materiality' for joint analysis (Hammes; Arzabe, 2015). It presupposes working in a collaborative and systemic way, that is, with the entire internal community. It is a work methodology conducted by a moderator, based on planned actions, in which three

assumptions are considered:

- Multilevel training of teams with the future perspective of everyone's involvement acting in the result generation process.
- Creation of space for all in the working environment.
- Participatory planning for the generation of results aligned to the SDGs purposes.

From the alignment of the 17 SDG and the selection of the 76 targets, previously selected by the WG-SDG/Embrapa, the SDG-Network/Embrapa was motivated to answer the question "How does Embrapa contribute to the achievement of the selected targets?" Considering the complexity of the mission of the corporation, this response should be given by researchers and analysts from all the research centers. In the next step, the team of researchers and analysts made a quick survey based on a time cut of the last 10 years, limited to records in the internal systems of easy access to identify the contributions resulting from Embrapa's interaction with its collaborators. The aim was to identify technologies, products, processes and contributions to public policies with potential impact in the 2030 Agenda context.

Considering that the PGMacro consists in planning and implementing the achievement of a result legitimized by a collectivity, in a collaborative way, the management of this process has fulfilled the following steps:

- Ideation of the proposal to create the SDG-Network/ Embrapa based on three pillars: people, work environment and result.
- Responsibility in the multilevel team formation process (coordination, technical editors and authors).
- Reconstruction and expansion of the systemic view on the contributions of the corporation to SDG compliance (elaboration of editorial design by the SDG-Network/ Embrapa and respective selected targets).
- Adequacy in the development of active searches, guided by search system managers, to gather and group possible solutions to problems related to the selected targets, for which the corporation developed solutions with its partnerships.
- Habituation for the effective incorporation of this new way of perceiving the solutions compiled by the teams in the debate, in the organization and summary writing on context, the problems and different ways of contributing, and the future challenges of Embrapa to meet the 2030 Agenda, considering the five P's: People, Planet, Partnerships, Peace and Prosperity (elaboration of the collection of e-books).

The elaboration of that collection of e-books was the first stage of internalization of SDGs in Embrapa. The SDG-Network/Embrapa intends to expand its activities to all the teams of researchers and analysts, resulting in an institutional strengthening, and then gradually involve all its partnerships in a perspective of the three pillars of sustainability: economic, social and environmental. The process was established in agreement with the following PGMacro indicators:

- Efficiency in involving the target audience.
- Efficiency of the process in the creation of adequate work environment and rapid response (response time).

- Effectiveness in producing the expected results.

Figure 8 shows a synthesis of the process of establishing governance, organization, and outcome/target production of the SDG-Network/Embrapa.

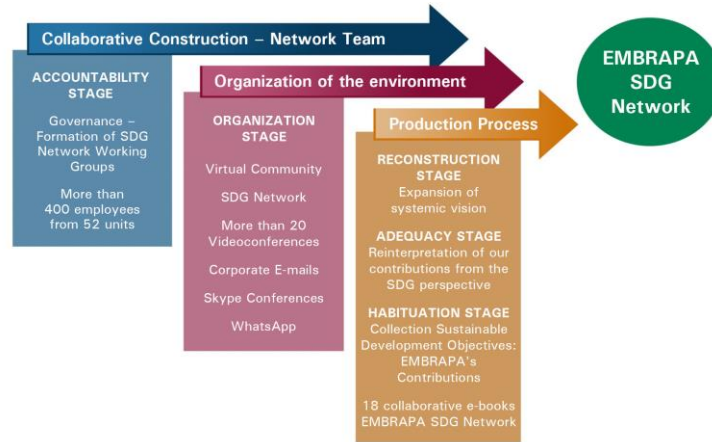


Figure 8. Diagram of the methodology adopted in the process of establishing the governance, organization and production of outcome/targets of the SDG-Network/Embrapa. Source: Hammes *et al.* 2018.

The SDG-Network/Embrapa is a strategy to promote the engagement of the internal community in a productive debate on the solutions already available, those that are underway and the future actions that will contribute to reaching the SDGs. The platform is also a repository of documents and records of actions, providing subsidies for institutional strategic planning. In the endogenous process of internalization of the 2030 Agenda, it is necessary, at first, to sensitize managers, from the highest level of direction to the supervision of the Embrapa research centers, through the researchers/analysts who lead the research actions and transfer of technologies in order to ensure the proper support of actions and individuals particularly inserted in the network.

Acknowledgment

I would like to thank the German Development Institute that provides the grants to my participation in the ICDS 2019. I am also grateful to the editors of e-book 18 for their support in elaborating this paper. I also thank Embrapa Dairy Cattle for supporting my participation in the conference.

References

Avila, Antonio Flavio Dias, and Geraldo da Sila e Souza. 2011. "The importance of impact assessment studies for the Brazilian agricultural research system."

<https://www.alice.cnptia.embrapa.br/bitstream/doc/1069186/1/Theimportanceofimpact.pdf>. Accessed July 19, 2019.

Embrapa. 2017. Objetivos de desenvolvimento sustentável. Brasília: Embrapa. Ações e campanhas. <https://www.embrapa.br/objetivos-de-desenvolvimento-sustentavel-ods/?link=banner-home>. Accessed 19 May 2019.

Embrapa. n.d. “Research and Development.” Accessed July 18, 2019. <https://www.embrapa.br/en/pesquisa-e-desenvolvimento>.

FAO. Food Outlook: Biannual Report on Global Food Markets. 2019. Rome: FAO. <http://www.fao.org/3/CA4526EN/CA4526EN.pdf>

Hammes, Valeria Sucena, Arzabe, Cristina. Inteligência coletiva para o alcance da sustentabilidade: Macroeducação, um método com ênfase na colaboração. Anais do XI Congresso Nacional de Excelência em Gestão, Rio de Janeiro, p. 1-14. 2015.

Hammes, Valeria Sucena, Daniela Biaggioni Lopes, André Carlos Cau dos Santos, Joanne Régis Costa, and Yeda Maria Malheiros de Oliveira. 2018. *Agricultural research and innovation on the 2030 agenda for sustainable development: contributions of Embrapa and partners*. Brasília: Embrapa. ePub. <https://www.embrapa.br/objetivos-de-desenvolvimento-sustentavel-ods>.

ICSU. International Council for Science. 2017. “A Guide to “SDG” Interactions: From Science to Implementation”. Paris, France: *International Council for Science (ICSU)*.

Nakamura, Masafumi, Pendlebury, David, Schnell, Joshua, & Szomszor, Martin. 2019. Navigating the structure of research on Sustainable Development Goals. Retrieved from Institute for Scientific Information. https://clarivate.com/wp-content/uploads/dlm_uploads/2019/03/Navigating-the-Structure-of-Research-on-Sustainable-Development-Goals.pdf. Accessed 18 July, 2019.

Pradhan, Prajal, Luís Costa Costa, Diego Rybski, Wolfgang Lucht, and Jürgen P. Kropp. 2017. “A Systematic Study of Sustainable Development Goal (SDG) Interactions”. *Earth's Future* 5: 1169-1179. doi:[10.1002/2017EF000632](https://doi.org/10.1002/2017EF000632).

Saath, Kleverton Clovis de Oliveira, and Arlei Luiz Fachinello. 2018. “Crescimento da demanda mundial de alimentos e restrições do fator terra no Brasil.” *Revista de Economia e Sociologia Rural*, 56(2), 195-212. <https://dx.doi.org/10.1590/1234-56781806-94790560201>.

Scheyvens, Regina, Banks, Glenn., and Hughes, Emma. 2016. The Private Sector and the SDGs: The Need to Move Beyond ‘Business as Usual’. *Sust. Dev.*, 24: 371– 382. doi: [10.1002/sd.1623](https://doi.org/10.1002/sd.1623).

SDSN Australia/Pacific. 2017. Getting Started with the SDGs in Universities. A Guide for Universities, Higher Education Institutions, and the Academic Sector. *Australia, New Zealand and Pacific Edition*. Melbourne: Sustainable Development Solutions Network

– Australia/Pacific.

Turner, G. M. 2008. "A comparison of The Limits to Growth with 30 years of reality." *Global Environmental Change-Human and Policy Dimensions* 18 (3): 397-411. <https://doi.org/10.1016/j.gloenvcha.2008.05.001>.

Wollaert, Peter. 2016. The sustainable development goals: a global vision for local action. Antwerpen: Cifal; Unitar. <https://do.vlaanderen.be/sites/default/files/atoms/files/CIFAL%20Flanders%20Introduction%20SDGs%20Wij-de%20Wereld%2C%20Gent%2008%2006%202016.pdf>. Accessed: July 22, 2019.