

STRATEGIC BUSINESS PLAN (SBP)

Clause 2.1.2 of the ISO/IEC Directives, Part 1



ISO/TC 347 Data-driven agrifood systems

What is the main market trend? How fast is the sector evolving?

Bringing AI, autonomy and data-driven decisions to the farm and factory, while enabling the smallest farmers to benefit from digital tech. It's evolving quickly.



Message from the Chair

"Our global agrifood systems will be severely tested over the next few years. Join us to enable scalable data-driven solutions that can be used worldwide."

R.A. Ferreyra, Chair, ISO/TC 347



Why are standards important? What benefits can standards bring?
Standards enable building scalable systems, avoid "reinventing the wheel" and have a strong role in global trade.



About ISO/TC 347

- [Secretariat](#) →
- [Scope](#) →
- [Participating members](#) →
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Who participates in standards development in this topic? How are different global regions involved?

Technologists, service providers, academics and regulators in agrifood systems. TC 347 actively engages stakeholders worldwide.



High-profile standards

- The full TC 347 work programme coming soon.



What actions will the committee take in the next 3 years? What are the committee's strategic priorities?
See the ISO/TC 347 strategy map



About ISO

- [ISO 2030 Strategy](#) →
- [ISO/IEC Directives, Part 1](#) →

How can you get involved?

Reach out to the **ISO member** in your country to learn more about participating in ISO/TC 347, or contact info@isotc347.org



ISO's role in supporting the SDGs

ISO/TC 347 standards support the following SDGs



Introduction

The evolution of formal strategic planning in ISO Technical Committees is a key measure in supporting the ISO 2030 Strategy vision of making lives easier, safer and better. This document is designed to aid committees and their stakeholders in:

- Identifying benefits and vision of standardization within the committee's field of activity
- Linking benefits to higher strategic imperatives (ISO 2030 Strategy, SDGs, London Declaration Action Plan)
- Prioritizing among projects and allocating resources
- Providing transparency and communicating through a format adapted to three key audiences (general public, TMB and other TCs, and internal TC stakeholders)
- Supporting data-driven continuous improvement, including user perspectives where available
- Maintaining strategic flexibility for different market cadences

International standards embody the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in ISO Technical committees, representative of all interested parties, supported by a WTO TBT-compliant public enquiry phase.

International standards are developed through a member-driven market-centric process, where any participating member ("P- member", as opposed to observing or "O-members") may submit a proposal for new work.

This document represents an important filter through which new work items should be considered by P-members of a committee and shall be referenced in new work item proposals submitted to the committee per clause 2.3.4 of the ISO/IEC Directives, Part 1.

Meeting global needs

To realize our vision, we must develop consensus-based standards that are relevant and respond to current and future challenges. We must focus on getting the right standards to market at the right time, and with the right content and in the right format.¹



Business environment and future trends

As the world's human population grows in the context of over-used arable land and fresh water, increasing crop productivity is imperative for well-being and food security. This productivity increase must be balanced with sustainability and regulatory compliance, and take place despite climate change, market volatility, and political instability. The use of modern information technologies in agriculture (Smart Farming) has been presented as a component of a solution to the challenge of increasing agricultural productivity at scale in an economically, ecologically and socially sustainable way, increasing resource use efficiency, rather than just resource use.

This potential has been severely limited by data interoperability concerns. Standardizing the data being exchanged across agrifood system value chains will increase interoperability and the benefits of sustainable agriculture will be available to agrifood producers worldwide. This will only happen if the standardization effort is inclusive and considers smallholders and their technology providers as communities that must be served by the new standards along with the more traditional equipment and crop input manufacturers, large corporate farms, etc.

New approaches appear often in data-driven agrifood systems; the landscape evolves constantly. The integration of Internet of Things (IoT) devices and new sensor technology across the whole agrifood sector enables the collection and evaluation of real-time data. Analysing large datasets, and coupling them with models, enables predictions (e.g., of yield), optimization of resource allocation, and improved decision-making. The ongoing inclusion of machine learning and artificial intelligence (AI) will lead to further progress – enabling more sustainable farming and food production, reducing environmental impact and enhancing resilience to climate change.

In the context of data-driven agrifood systems, a wide range of stakeholders with their respective concerns and perceptions must be considered. Interests of producers and their supply chain partners directly involved in implementing data-driven solutions into agrifood systems practice must be combined with the Government and Regulatory Bodies responsible for setting policies and regulations regarding the use of data in agrifood systems, the interest of research

organisations and investors developing new ideas and technologies as well as consumers demanding more transparency.

Governmental, hybrid governance and private initiatives are already setting up standards focusing on food safety, sustainability and fair labour conditions (e.g., GlobalGAP, GFSI, MSC) as well as facilitating data sharing among different platforms and systems (e.g., OADA, DAPI). While it is our intent to interoperate with existing solutions as much as possible, and many of these solutions are internally consistent and interoperable within a limited scope within the whole agrifood system, as a whole these initiatives lack common, standardized semantics that can enable the preservation of the meaning of data, as well as seamless communication and better transparency. ISO/TC 347 will create a reference architecture with clear and coherent semantics according to the FAIR data principles, enabling a better compliance with upcoming legislative regulations (e.g., EUDR).

1. Agriculture, food and trade

Agriculture, the production of crops and livestock, fisheries and forestry, enables human life. Due to a rising world-population, an increasing claim to dual use of agricultural resources and, most significant, climate change, today's agriculture is under increasing pressure. Worldwide, more than 1,2 billionⁱⁱ people are employed in agrifood systems, 857 million people work in primary agricultural production, while 375 million people work in the off-farm segmentsⁱⁱⁱ creating a market value of over 13 300,00 billion U.S. dollars in 2023. The amount of food produced annually totals over 2 600,00 billion kilograms^{iv} produced on at least 570 million farms worldwide^v.

The volume of agricultural commodities traded worldwide has been increasing in recent years in all world regions^{vi}. Despite the disruption caused by COVID-19, the market was able to recover, and the trend continued^{vii}. This ongoing development faces challenges: Climate change is already having an impact on trade in agricultural goods. Also, promotion of responsible business conduct and due diligence in global value chains will lead to changing markets^{viii}. The use of smart farming technologies is being discussed as part of the solution to realizing more environmentally friendly farming methods and fairer working conditions. And the market development confirms this: from 2021 to 2023, the market for smart farming goods recorded an increase of over 20%^{ix,x}.

2. Developments in food tech and retailing

The food processing and retail sectors are seeing a wave of new developments driven by technological advancements and shifting consumer preferences. A growing focus on sustainability and health-conscious options is leading to innovations from consumer-packaged goods (CPG) companies such as plant-based meat alternatives, clean-label products, and sustainable packaging solutions. Advancing regulation (e.g., EUDR) also creates a greater need for detailed traceability and production process documentation. Shifting consumer preferences also influence the retail sector, leading to increased online grocery shopping, enabled by continuous digitization^{xi}.

3. Development of data-driven technology

Current market forecasts estimate further growing markets. From 2021 to 2026 the smart farming market value worldwide is expected to double, from 12.75 billion U.S. dollars to approximately 26 billion U.S. dollars^{xii,xiii}. Regarding the respective technologies, particularly significant developments can be expected in the field of artificial intelligence, from 1,7 billion U.S. dollar market value in 2023 to 4,7 billion U.S. dollar market value by 2028. Also, the development of autonomous robotics in the agricultural sector is of particular relevance, since the global market value is expected to more than double from 7 billion U.S. dollars in 2023 to nearly 16 billion U.S. dollars in 2028^{xiv}. Considering the respective sectors, the most significant growth is expected in the precision agriculture market, especially in smart spraying, smart harvesting and smart crop monitoring technologies. Here, next to the aforementioned automation and robotics, variable-rate technology, guidance technology as well as sensing and imagery will be most important.

The next most quickly growing agricultural sector is the livestock monitoring and management sector. According to Grand View Research^{xv}, the global livestock monitoring market was valued at approximately USD 4,01 billion in 2023 and is projected to grow at a Compound Annual Growth Rate (CAGR) of 11,56% from 2024 to 2030. Similarly, MarketsandMarkets^{xvi} reports that the market size was valued at USD 1,6 billion in 2022 and is expected to reach USD 3,7 billion by 2030, growing at a CAGR of 11,0% during the forecast period.

This significant growth is driven by factors such as technological advancements, increased focus on real-time monitoring and early disease detection, and the rising adoption of Internet of Things (IoT) and Artificial Intelligence (AI) technologies in livestock management. The demand for

efficient livestock monitoring solutions is further propelled by the need to enhance productivity, ensure animal welfare, and meet the growing global demand for meat and dairy products.

4. Funding in the agrifood sector

Investment in the agrifood sector has increased significantly, with global investments reaching staggering figures. Global agricultural investment (including, among other things, agribusinesses, food processing, distribution, and retailing) reached approximately \$225 billion in 2020, marking a notable increase from previous years^{xvii}. Upstream investment increased up to 15,8 billion U.S. dollar surpassing the downstream investment of 14,3 billion U.S. dollar in the first time. Investment in innovative food startups reached up to 2,3 billion U.S. dollar in 2020, largely driven by alternative protein startups. From 2020 on, investing in agrifood tech became an established category^{xviii}. The level of investment can provide an outlook for future developments in the ag-tech sector. An increase in investments in agricultural technology (except between 2021 and 2022) was recorded worldwide, from 12,2 billion U.S. dollar in 2017 to 29,6 billion U.S. dollar in 2022^{xix}. A thematic shift in investments can be observed, away from alternative proteins (maximum in 2020) and vertical farming towards artificial intelligence and precision agriculture^{xx} underlining the relevance of greater standardization of agrisemantics in support of data-driven business models.

5. Regulatory Environment

The general or end-consumer, who in many countries is now more removed from farming than ever (FAO Reference), has a growing interest in where their food, fiber, and fuel come from and how it was produced. Much of this interest is driven by climate change concerns as well as other geo-political shifts highlighting the need for increased supply chain visibility. These requirements manifest as regulatory requirements for producers in many countries. In others, the requirements may be voluntary but represent barriers to market access if they are not met. More robust data standards are required to not only capture relevant information about production practices and activities within the supply chain to meet the demands. Regulatory bodies also need well-reasoned, industry supported standards to inform regulations.

ISO/TC 347 addresses data interoperability in agrifood systems at scale, both by providing a holistic, systems-oriented view and reference architecture for the domain, and by developing (and coordinating) standards to fill standardization gaps. The proposed actions will complement and strengthen existing ISO activities and are in line with ISO STRATEGY 2030, ISO's commitment to achieve the climate agenda by 2050 (London declaration) and the UN SDGs.

The work of ISO/TC 347 is expected to deliver a range of benefits for different users:

- **Industry and commerce – large industry**

Large companies in the agrifood sector (input manufacturers, equipment companies, etc.) will likely benefit from standardization that enables interoperability across different countries. Food and beverage companies, under consumer pressure to show evidence of sustainably grown produce, create incentives for data sharing. Doing this at scale requires farm-to-fork interoperability. This means the information from each actor in the supply chain must be findable, accessible, interoperable and reusable for all parties requiring it as part of their interaction with that actor.

- **Industry and commerce – Micro, small and medium-sized enterprises**

Small and medium enterprises in particular benefit from data standardization, as they may not have the financial resources or market share to compete with large market actors with proprietary data formats and solutions.

- **Government**

Pursuing interoperability is a political option for action, but it is also a state duty to guarantee user rights. Competition law and initiatives such as the EU's Digital Markets Act presuppose freedom of choice for users, which is meaningless if they cannot move data among competing systems. For the rights to freedom of choice and data portability to be effectively implemented, states must expand their design mandate and, loosely based on the guiding principle that "code is law", increasingly integrate interoperability standards and technical protocols into their legislation.



Benefits of standards and vision for standardization in the field of activity

- **Consumers**

A major benefit of data-driven farming and food systems for consumers is a more transparent and traceable method of food production allowing consumers to decide whether food meets their ethical and environmental requirements.

- **Labour**

Repetitive and physically demanding work can be reduced through automation using data leading to improved social conditions. This creates opportunities for higher-skilled jobs in technology and maintenance and enhancing food security through increased efficiency and productivity. Additionally, greater standardization of risk management and market access data can provide smallholders with more value-add opportunities.

- **Academic and research bodies**

Universities and their funders often expend considerable resources to fund very promising research that is ultimately not impactful because the resulting tools (e.g., decision-support aids) cannot scale or interoperate with existing industry platforms. Moreover, the companies responsible for these platforms do not have clear incentives to invest in integrating with market-unproven tools. Using standardization to make the tools interoperable and easy to integrate which could dramatically lower barriers to adoption.

- **Standards application businesses**

Enabling data interoperability through standards is a key to making processes more observable and controllable, thus creating more opportunity for standards application businesses in the agrifood sector.

- **Non-governmental organizations**

Having standardized mechanisms for technology providers, advisors, non-governmental organizations (NGOs), extension services, etc. to integrate their tools and data collection mechanisms with a learning framework will help make data more usable.

- **Certification bodies**

Standardized data formats and coherent agrisemantics offer a strong foundation for certification bodies by ensuring consistency, interoperability, and transparency in agricultural data, facilitating streamlined processes, reliable assessments, and informed decision-making across the certification process.



Reflections on current publications and their market impacts

ISO/TC 347 has no current publications.



Sustainability and climate change

SUSTAINABILITY

The standards developed by ISO/TC 347 are expected to directly respond to several UN SDGs targets including:

1.4

By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance.

Enabling smallholders to gain access to microfinance and the opportunity to make the most profitable and sustainable use of opportunities afforded them by the agrifood industry is an important objective of TC 347. See strategic objective 3.17.

2.3

By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.

The standards planned by TC 347 are meant to enable better data interoperability in the agrifood industry. An expected positive outcome from this is that it will become easier for technologists in the Global South to develop tools to provide agronomic advice, risk management, and other valuable agricultural tools that can increase the productivity, profitability and sustainability of agrifood systems, including the ones involving vulnerable smallholder farmers and ranchers.

2.4

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

The standards planned by TC 347 are meant to enable better data interoperability in the agrifood industry. An expected positive outcome from this is that it will become easier to capture, represent, and unambiguously communicate measurements, decisions and activities regarding agroecosystem health and productivity.

2.5

By 2030, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed.

The standards planned by TC 347 are meant to enable better data interoperability in the agrifood industry. This includes enabling better recordkeeping and management of germplasm.

3.9

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

The standards planned by TC 347, with their emphasis on accurate and unambiguous crop input identification, can contribute to soil monitoring and health, and also to minimize worker exposure to dangerous agrochemicals, by enabling machine-actionable, digital product labels that can be leveraged to warn workers of the need to use specific personal protective equipment, warn them of unexpired restricted entry and pre-harvest intervals, etc. See strategic objectives 2.2, 3.4, 3.7, 3.8, 3.9 for more detail.

4.4

By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

The young professionals program managed initially by AG 1 (Communications) is aimed at this target, and at addressing that agriculture and food careers are not perceived as aspirational. The initial direct impact of the program will not be significant, but through it we seek to increase the number of data-driven agrifood system professionals, as well as a capacity-building model that can be replicated and scaled. See strategic objective 2.3 for more detail.

6.3

By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Multiple opportunities here: enabling spot application / targeted spraying of agricultural chemicals, better testing and management of field runoff and tailwater quality, increased ability to keep chemical applications label-compliant.

This target is enabled by interoperability of observations and measurements (in this case, of pollutants in the water), and by better tracking of the field operations such as application of crop inputs, both core themes of TC 347.

6.4

By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Multiple opportunities to enable scientific irrigation scheduling, and better water use efficiency in agricultural and food manufacturing processes.

This target is enabled by interoperability of observations and measurements (in this case, of water content, pumped water, water levels, and evapotranspiration model inputs and outputs), and by better tracking of the field operations such as application of irrigation water and crop harvest, all core themes of the SAG-SF.

7.3

By 2030, double the global rate of improvement in energy efficiency

TC 347 standards can enable

- estimating carbon intensity of agricultural and food production at scale (See strategic objectives 3.2 and 3.19) and
- optimizing the timing (e.g. to off-peak) and execution of energy-intensive operations (e.g. pumping, see strategic objectives 3.2 and 3.4).

7.b

By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support

TC 347 standards can enable planning, coordination, and optimization of biofuels production and on-farm electrical production (agrivoltaics). See strategic objectives 3.4, 4.3, 4.10.

8.3

Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services

Small and medium-sized food producers are very vulnerable to bad weather years and have little access to credit and risk management opportunities. This leads them to be very cautious in their investment in crop inputs, to minimize the downside of a bad year, while unfortunately severely limiting the upside of a good year. TC 347 standards can enable reinsurers and other service providers to offer low-cost risk management services by leveraging readily available data (e.g., satellite images, georeferenced phone photos). This will enable farmers to make optimized investments in crop inputs, limiting the downside of bad years, yet benefiting from the upside of good years. See strategic objectives 3.17 and 4.4.

8.4

Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead.

This target is enabled by interoperability of observations and measurements (in this case, of nutrient levels, water content, crop and livestock conditions, etc.), and by better tracking of the

field operations such as application of irrigation water, crop nutrition and crop protection products, as well as crop harvest, all core themes of TC 347.

9.1

Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

TC 347 seeks to enable agrifood systems data interoperability through semantic infrastructure (i.e., semantic registries). Also, and as part of its outreach to the Global South, TC 347 has repeatedly been exposed to the need for a mechanism to enable diffusion of valuable innovations (e.g., appropriate mechanization designs for planters, agrifood-system-specific open-source software libraries). These designs do not typically lend themselves to standardization, but a standard for a platform to make them more visible and widely available is a contribution that TC 347 will endeavor to make. See strategic objective 4.11.

9.3

Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets

Many of the capabilities considered by the SAG-SF, and the recommendations resulting from them, targeted smallholders, their advisors and the manufacturers and distributors of inputs and tooling, directly or indirectly. In the case of this particular target, enabling access to new technology, financial services and microfinance (and the data privacy policies and terms and conditions that underlie them) is among TC 347's strategic objectives.

9.4

By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Food loss and waste consume a large fraction (30-40%) of the world's food production. The causes range from improperly calibrated machinery to suboptimal harvest planning, to late-season losses from fungal disease damage. TC 347 seeks to collaborate with TC 34/SC 20 (Food loss and waste) in data aspects related to reducing food loss and waste. (Strategic objective 4.8) There is also opportunity to enable greater efficiencies in crop and animal products processing by enabling interoperable observations and measurements, standardizing asset health reporting and enabling process formalization through data product specifications. (See strategic objective 3.6)

11.4

Strengthen efforts to protect and safeguard the world's cultural and natural heritage

Greater data interoperability emerging from TC 347 standards enables tracking and incentivizing responsible agricultural production (e.g., not on recently-deforested land) and thus help preserve the world's natural heritage and support compliance with regulations such as the EU Deforestation Regulation (EUDR). Standards for observations and measurements applied to agricultural systems will also make it easier to generate and use valuable information about biodiversity in managed ecosystems. See objectives 3.10 and 4.9.

11.5

By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

One of the increasingly urgent problems in agrifood systems is economic losses and erosion emerging from increasingly frequent high-intensity precipitation. Planned TC 347 standards will enable data-driven decision-making regarding land allocation and preparation for cover crops and other conservation and regenerative practices, as well as enabling data products that provide producers with risk management options. See strategic objectives 3.1, 3.4, 3.17, 4.3, 4.4 and 4.9

11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

TC 347's scope includes controlled environment agriculture (e.g., greenhouses and vertical farms), as well as urban farming and the reclamation of urban plots for agricultural use. These activities have the potential to reduce the environmental footprint of cities by producing some of the cities' food needs (typically vegetables) locally. See strategic objective 3.3.

11.b

By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

TC 347 has begun discussions with ISO/TC 207 on jointly developing implementation guidelines and other deliverables to help communities with climate adaptation of urban and rural agricultural systems. See strategic objective 3.1.

12.2

By 2030, achieve the sustainable management and efficient use of natural resources.

ISO/TC 347 standards will enable accurate records of agricultural and food production, as well as digital twins / accurate representations of the processes occurring therein, will translate into more accurate crop input purchases and applications, since there can be more accurate estimates of areas to treat, amounts of chemicals and fertilizers needed, etc. In this way the release of excess products into the environment is minimized. Likewise, by enabling smart spraying, adaptive soil-infiltration-limited irrigation, and so forth, the likelihood of products going off-target through wind drift, runoff, etc. is minimized.

12.3

By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.

One of the strategic objectives of TC 347 is to enable reducing global food loss and waste through data, both through collaboration with TC 34/SC 20 on the ISO 20008 standard and through work with equipment manufacturers and other producers and consumers of production data. See strategic objectives 3.6, 4.7 and 4.8.

12.4

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

Enabling accurate records of agricultural and food production, observations and measurements (such as the precise location of patches of observed weeds) as well as digital twins / accurate representations of the processes occurring therein, enable making more accurate crop input purchases and applications, since there can be more accurate estimates of areas to treat, amounts of chemicals and fertilizers needed, etc. In this way the release of excess products into the environment is minimized. Likewise, by enabling smart spraying, adaptive hydraulic-conductivity-limited chemigation, and so forth, the likelihood of products going off-target through wind drift, runoff, etc. is minimized.

12.8

By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

The saying "you can't manage what you can't measure" applies here. TC 347's emphasis on enabling principled decision-making involves a range of activities such as enabling unambiguous communication of observations and measurements, making agrifood systems data findable,

accessible, interoperable and reusable (FAIR), and effectively communicating results and opportunities to stakeholders. See strategic objectives 2.6, 2.7, 3.10, 3.15, 3.16, 3.27, 4.3 and 4.6.

13.1

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

These standards seek to enable data-driven decision-making based on observations and measurements; through unambiguous identification of resources such as products, places and people; and through the accurate representation of planned and actual operations in the field. In a context of changing rainfall patterns, rising temperatures, and other forms of change that require making changes to crop and food production practices, a) making unambiguous plans, and b) aligning them with the quantitative reality observed, are important enablers of adaptation.

13.2

Integrate climate change measures into national policies, strategies and planning

This target is enabled by establishing a data model that unambiguously expresses the quantitative elements and goals usable within national policies, strategies and planning.

14.1

By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

The standards planned by TC 347 can support this target by enabling traceable, interoperable data on agricultural inputs and practices (e.g., fertilizer, pesticide, and plastic use). With standardized data flows, it becomes easier to monitor and reduce nutrient runoff and agrochemical pollution entering rivers and coastal waters, thereby helping control eutrophication and plastics leakage into the ocean.

14.7

By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

Through standardized agrifood and fisheries data systems, the standards planned by TC 347 can help Small Island developing States and least developed countries build trustworthy value chains, improve market access, and attract investment. Data standards enhance traceability of fish and aquaculture products, support certification for sustainability, and improve resource management—leading to higher value capture while ensuring long-term sustainability of marine resources. See strategic objective 3.26.

15.3

By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

TC 347's planned standards can enable interoperable soil and land-use data systems, making it easier to track soil health, detect degradation, and measure restoration progress. Standardized data from farms, satellites, and monitoring programs can feed into consistent national and global reporting, helping countries demonstrate progress toward land degradation neutrality. See strategic objectives 3.4, 3.10, 3.18, 3.23 and 4.9.

15.4

By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

By enabling scalable, harmonized data collection and sharing on biodiversity, farming practices, and ecosystem services in fragile mountain areas, the standards planned by TC 347 can improve monitoring of pressures such as overgrazing, deforestation, or unsustainable crop expansion. Better data comparability across regions supports more effective conservation strategies and sustainable resource use in mountain ecosystems. See strategic objectives 3.4, 3.10, and 4.9.

15.5

Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

Standards for agrifood biodiversity data, land-use classification, and ecosystem monitoring can help identify trends in habitat conversion or species decline linked to agricultural practices. With consistent, high-quality data enabled by the standards planned by TC 347, policymakers, businesses, and conservation groups can take coordinated action to reduce harmful impacts, promote biodiversity-friendly farming, and monitor progress against biodiversity loss. See strategic objectives 3.4, 3.10, and 4.9.

CLIMATE CHANGE

The forthcoming publications of Technical Committee 347 are designed to support the London Declaration by focusing on two key objectives: involving those most vulnerable to climate change and integrating climate science into all standardization activities. Although no publications have been released yet, their anticipated impact will lead to:

- **Facilitating Involvement of Vulnerable Populations:**

TC 347 aims to create standards that ensure the participation and protection of communities most affected by climate change. This will help build resilient systems that can better withstand climate-related challenges.

- **Integrating Climate Science:**

By incorporating climate science into standardization activities, the TC will enhance the quality and utility of climate-related data. Accurate and standardized data is essential for understanding climate patterns and developing effective strategies.

Generally, the planned publications will lead to two main outcomes:

- **Enhanced Application of Data-Driven Solutions in Agriculture:**

Improved data standards will allow for more efficient and sustainable agricultural practices, optimizing resource use and increasing productivity.

- **Improved Environmental Monitoring and Climate Action:**

High-quality data will facilitate better environmental assessments and more effective climate action plans. Farmers will benefit from better decision-making tools based on real-time environmental data.

These standards will also aid countries in the Global South in adapting to changing climate conditions, promoting sustainable development, and safeguarding livelihoods.

Additionally, TC 347 is pursuing cooperation with TC 207 (Environmental management). For example, to support the climate adaptation that is the object of ISO 14091; better quality data enables better decisions, which in turn enables better outcomes.

All voices heard

We need to ensure that we attract and retain the best experts and enable everyone to participate. We must listen to all voices, both in the development of standards and when making decisions as an organization.



Stakeholder mixture and engagement

TC 347 is a young committee that is dealing head-on with the challenge of developing a good staffing mix. The TC's experts are a mixture of agronomists, data scientists, farm management information system experts, original equipment manufacturers, input manufacturers, regulators, and more.

We are actively engaged in increasing representation from the Global South (e.g., through direct outreach with national standards bodies, interaction with DEVCO, projects with regional standards bodies, and by developing liaison relationships). We are also investing much attention on a young professionals program (with participants from six continents) looking to ensure that the next generation of agricultural system professionals takes seats at the table.



Developing country perspectives

Smallholders in developing countries have a lot to gain from involvement in the field of data-driven agrifood systems; the business capabilities enabled by this approach to food production can mitigate the impact of climate change on their food security and income.

Data-driven agrifood systems are very likely to reduce the barriers of interoperability and make agronomic and market advice more accessible and affordable to the smallholder, which in turn can lead to higher productivity, food security and income for the smallholder, as well as reducing the food insecurity for the surrounding population.

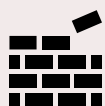
Data-driven services afford multiple opportunities to smallholders:

- Access to financial services, such as banking, money transfer, credit, and microloans;
- Access to risk management instruments such as crop insurance;
- Access to market data, such as product requirements, pricing/selling, buyer location;
- Land and crop allocation optimization in planning, field operations and going-to-market;
- Weather forecasts and alerts;
- Asking questions and receiving expert advice.

Moreover, by creating participation opportunities beyond the standardization work done in ISO/TC 347, barriers to get in touch with standardization have been significantly lowered.

ISO Standards used everywhere

To encourage the widespread use of ISO standards and attract experts to the development process, we must clearly demonstrate the benefits of using ISO standards.



Coordination and cohesion

ISO/TC 347 ensures coordination and cohesion across its work programme through a systems-oriented governance approach that aligns projects, working groups, and liaison activities around a shared vision of data-driven agrifood systems.

Internally, the committee promotes cohesion by establishing common conceptual foundations—including shared terminology, a reference architecture (Initially mediated through IWA 47), and an emergent set of data quality principles, naming conventions, use cases and requirement drafting guidelines—that are being applied consistently across standards, technical reports, and implementation guidance. Working Groups and Ad hoc Groups are encouraged to explicitly position their deliverables within this shared framework, ensuring that individual outputs contribute to an integrated and interoperable standards portfolio rather than stand-alone solutions. Advisory groups in Communications (AG 1), Stakeholder engagement (AG 2), Responsible Innovation (AG 3) and Regional matters (AG 4) provide horizontal support for the other subgroups.

Strategic coordination is further supported through regular cross-group communication, portfolio reviews led by the Chair and Secretariat at the plenaries, and the use of roadmap and gap-analysis activities to manage dependencies, avoid duplication, and identify opportunities for reuse

or harmonization across projects. Additionally, the idea of creating a chair’s advisory group was presented to the committee convenors in 2025 (who initially deemed it unnecessary given the existing level of coordination), but this idea will be revisited annually.

Externally, ISO/TC 347 actively coordinates its work with related ISO technical committees, joint technical committees, and recognized liaison organizations whose scopes intersect with agrifood systems, digitalization, sustainability, and responsible innovation. These liaison relationships are used to clarify boundaries of responsibility, align conceptual models, and ensure compatibility with foundational standards in areas such as data management, geospatial information, artificial intelligence, environmental management, and quality infrastructure.

The committee also places emphasis on cohesion between standardization and implementation communities. Through engagement with industry, public-sector stakeholders, research organizations, and capacity-building initiatives—including programs aimed at early-career professionals—ISO/TC 347 seeks to ensure that its standards form a coherent, accessible, and practically usable body of work that evolves in step with real-world agrifood systems.

Together, these coordination mechanisms enable ISO/TC 347 to function as a unified, forward-looking technical committee, delivering standards that are mutually reinforcing, internationally aligned, and fit for purpose across diverse agrifood contexts.

Additionally, ISO/TC 347 is crucial for a successful coordination of existing projects in further ISO/TCs related to agriculture in the Smart Farming Coordination Committee (SFCC):

1. In the absence of an agrifood-data-specific TC, there would not be a domain-centric source for ongoing direction for the Smart Farming Coordination Committee (SFCC) proposed by the ISO Strategic Advisory Group on Smart Farming (SAG-SF) in Recommendation 3.1.4 of its final report.
2. The standards landscape in smart farming across the world is fragmented, incomplete, and susceptible to poorly coordinated efforts. The SAG-SF recommended the creation of a multi-organization landscaping and coordination group (See Recommendation 3.1.5 of its final report), but ISO will need technical domain input to fully participate in that effort. The proposed TC would be able to provide much of that, i.e., the aspects related to agrifood systems data.
3. There will be an increasing number of data-related standards in the future; fitting them into the current ISO structure would be inadequate, as it will tend to place the standards in existing TCs / SCs that lack a high concentration of agricultural data expertise.

ISO/TC 347 recognizes that the adoption and effective use of standards for data-driven agrifood systems occurs primarily at the national and regional levels, through national standards bodies, regulatory frameworks, industry initiatives, and voluntary market mechanisms. National contexts differ widely with respect to agricultural systems, digital infrastructure, regulatory environments, institutional capacity, and levels of technological maturity.

In response to this diversity, ISO/TC 347 seeks to develop standards that emphasize principle-based frameworks, modular structures, and clearly defined concepts, enabling national bodies to adopt them identically or with limited national adaptation while preserving international interoperability. Where appropriate, the committee complements normative requirements with informative guidance, examples, and reference models to support interpretation and implementation in different national contexts.

ISO/TC 347 anticipates that its deliverables will be adopted through multiple pathways, including direct national adoption as standards, incorporation by reference into public policy or regulatory guidance, use within voluntary certification or sustainability programs, and application by industry and research organizations as a common foundation for interoperable data practices.

The committee is attentive to potential adoption barriers, including variation in data governance regimes, resource constraints among technologists who work with smallholder and emerging-market stakeholders, and differences in digital readiness across agrifood systems. To mitigate these challenges, ISO/TC 347 engages with national experts, liaison organizations, and capacity-building initiatives to ensure that national perspectives inform both the design and evolution of its standards.



National adoption perspectives

Through this approach, ISO/TC 347 seeks to maximize national relevance and uptake of its standards while maintaining global coherence, enabling countries at different stages of digital and agricultural development to participate in—and benefit from—a shared international framework for data-driven agrifood systems.

To strengthen adoption, ISO/TC 347 has integrated market testing and implementation feedback into its strategic objectives. Working closely with national standards bodies will be the key to success.

Strategic objective 2.4, *Detect opportunities and market signals*, describes the early strategy on this topic. TC 347 has to date created three groups to cover different aspects of connecting with the market:

- A communications advisory group (AG 1)
- A stakeholder engagement advisory group (AG 2)
- A regional matters advisory group (AG 4)

Based on initial results obtained from these groups, TC 347 will periodically consider establishing an additional commercial liaison advisory group (CLAG) to provide a structured interface with agtech providers, agrifood industry actors, certification schemes, and other implementation stakeholders who can validate deliverables through pilots and real-world usage. Its mandate and activities would include:

- Enabling pilots: identify and facilitate early pilot projects, testbeds, or plugfests using TC 347 standards and draft outputs, to surface interoperability issues early.
- Market testing: support structured “market sounding” for draft deliverables (e.g., implementation questionnaires, developer workshops, and integration exercises), feeding actionable findings back to project teams.
- Adoption pathways: articulate adoption models (e.g., reference implementations, profiles, conformance test suites where feasible) that lower barriers for SMEs and emerging-market innovators.
- IPR considerations: clarify, in coordination with ISO rules and national member bodies, how intellectual property and licensing considerations affect participation, implementation, and the sustainability of any externally managed registries or maintenance agencies.
- Feedback loop: maintain a clear mechanism for capturing, prioritizing, and tracking implementation feedback as an input to committee decisions and document maintenance planning.

The CLAG would coordinate closely with AG 1, AG 2 and AG 4 to ensure that commercial relevance is balanced with inclusivity, public-interest objectives, and global applicability.



Conformity assessment

Maintaining effective implementation interoperability requires an ongoing conformance testing and validation effort. Examples:

- AEF's system for ISO 11783, which involves a third-party conformance-testing stage followed by Plugfests involving integration partners
- ISO TR 28380 Health informatics - IHE global standards adoption

The work of several of TC 347's subgroups will likely translate into standards projects requiring conformity assessment. TC 347 will seek guidance from CASCO and will establish good working relationships with the third-party conformance testing community, to learn how to optimize our standards for effective and efficient conformance testing. The first mission of TC 347's AG 5 (Learning & growth) is to prepare materials to help our experts understand the structure and function of requirements work, to learn how to identify them in their work, and to master how to write and format them properly for maximum clarity and SMART (i.e., machine-actionable) compatibility.

Another aspect of this matter comes to us from SAG-SF Recommendation 3.1.10, which points out that a challenge we will face with our standards is to enable a conformance testing system inexpensive enough so that even small players can participate in data-driven agrifood systems technology development and implementation; the third-party conformance testing that is common with ISO 9001 certification of medium to large industrial companies may not be practical for small software companies in the agrifood industry.

ISO's Conformance Assessment Committee (ISO/CASCO) makes allowances for first- and second-party attestations of conformance. Other standards groups (e.g. the Object Management Group, OMG) have successfully set up similar conformance assessment systems for software-related standards. We seek to adapt a community-based system to our agrifood system standards, as we also make allowances for, and support, third-party conformance testing.

ISO TC 347 Strategic objectives

Overview

Farming and food producers in general have always looked for more efficient ways to grow food and raise livestock, but their task is becoming increasingly difficult. Producers and other agrifood stakeholders like processors or food manufacturers pursue often-competing objectives such as profitability, sustainability, and the freedom to operate, under an ever more challenging set of constraints such as climate change, regulatory pressure, changes in consumer preferences, increasing cost of inputs, commodity price volatility and an increasingly complex geopolitical situation. The future availability of critical resources like fertilizers and irrigation water is uncertain, weather-related stresses are increasingly extreme and unpredictable and market signals are ambiguous at best.

Given the critical role of data and its exchange in this context, agrifood systems today:

- are increasingly data-driven
- increasingly need to base decisions on sound scientific principles and generally accepted good agricultural practices
- involve multiple stakeholders in the value chain (i.e., producers, their advisors, equipment manufacturers, post-harvest sector, customers and regulators, to name a few)
- must adapt to a volatile, uncertain, complex and ambiguous world (e.g., the prices of both crop inputs and harvested commodities are volatile, yields and the availability of resources like irrigation water are uncertain and market signals are ambiguous at best).

ISO/TC 347's strategic objectives are organized to enable this vision, and to do so in the context of the set of 49 recommendations provided by the ISO Strategic Advisory Group for Smart Farming (SAG-SF)^{xxi}. We arranged them in the form of a strategy map, influenced by the Balanced Scorecard method of strategic performance management. As in the Balanced Scorecard method, the strategy map includes four different perspectives or layers, in our case Learning & growth, Internal processes, Deliverables, and End-users. Each layer is dependent on the ones beneath it.

The strategy map

Figure 1 below shows the TC 347 strategy map, including dependencies shown as arrows connecting objectives with others they enable. A key at the bottom explains the meaning of colors, priority marks, etc.

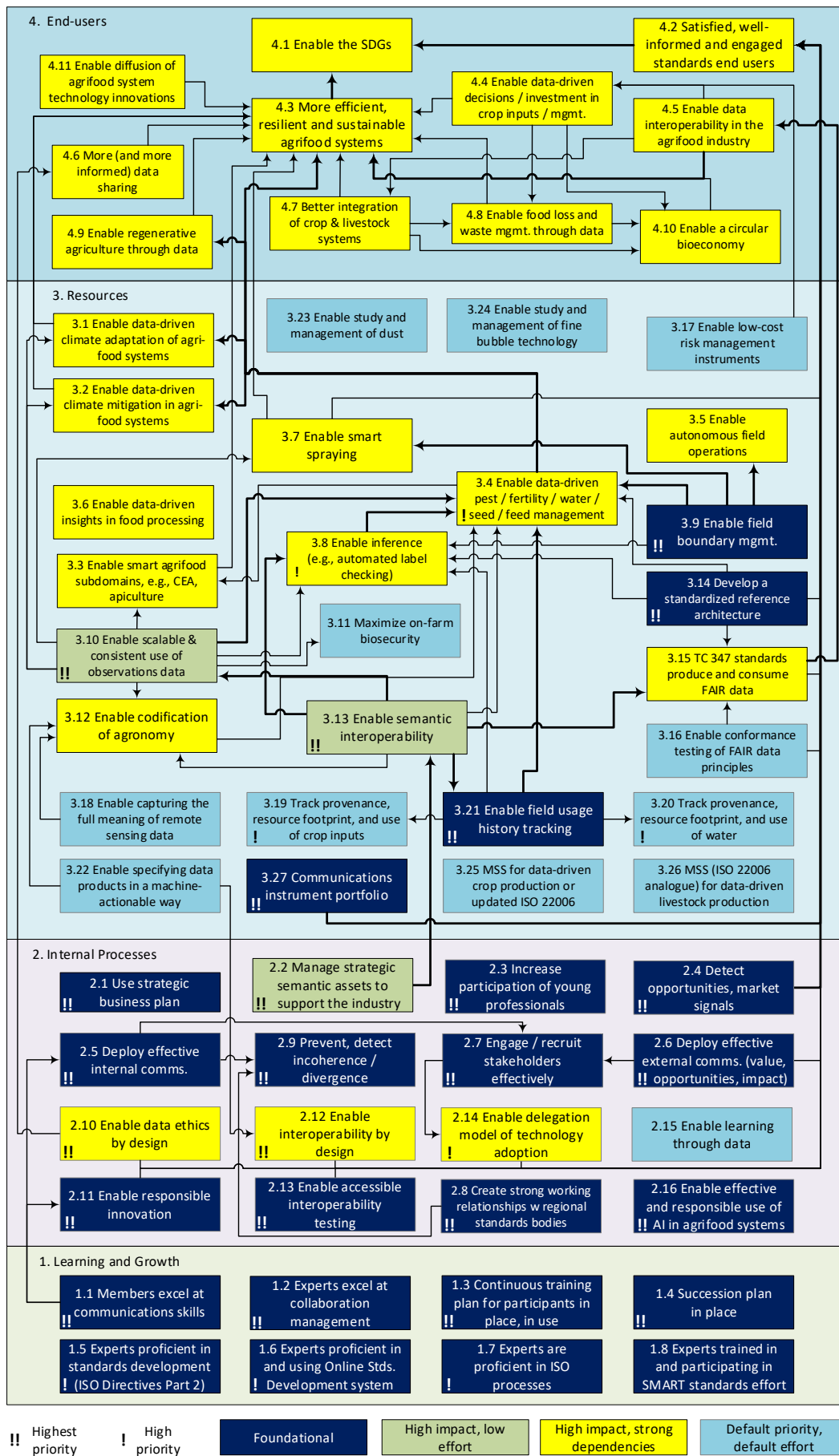


Figure 1: ISO/TC 347 strategy map



The strategic objectives

Learning and growth

| # | Objective (and supported ISO priorities) | Responsible SC or WG | Rationale | Proposed actions | Priority |
|-----|--|---|---|---|-----------|
| 1.1 | Members excel at communications skills (Strengthen ISO members through capacity building) | AG 1 (Comms) and AG 5 (Learning and Growth) | Clear, consistent, and audience-aware communication is essential for the uptake, relevance, and global impact of standards in data-driven agrifood systems. Effective communication empowers members to articulate complex technical concepts in accessible ways, build trust across diverse stakeholder groups (including farmers, researchers, governments, and private-sector innovators), and foster inclusive collaboration across regions and disciplines. By investing in communication capacity, the committee strengthens both its internal coordination and its external influence—accelerating adoption, enabling feedback loops, and ensuring that its work remains responsive to the evolving needs of agrifood systems worldwide. | <ol style="list-style-type: none"> 1) Establish a Communications advisory group (AG 1). 2) Establish a Learning & Growth advisory group (AG 5). 3) Launch a communications skills training series. Leverage short, focused webinars and/or other microlearning instruments on topics such as writing for non-technical audiences, visual storytelling, cross-cultural communication, and social media engagement, tailored to the context of agrifood standards and stakeholder outreach. 4) Develop a Shared communications toolkit, i.e. create a practical, evolving toolkit that includes message templates, visuals, infographics, talking points, presentation slide decks, and media guidelines to help members consistently and effectively communicate the committee's work to various audiences. 5) Establish a peer support and feedback circle, i.e., form a small, rotating peer review group where members can informally test and refine communication materials—such as webinar pitches, LinkedIn posts, or stakeholder presentations—with structured feedback and mentoring, fostering both skill-building and community. 6) Engage youth. Provide participants in TC 347's Young professionals program (See objective 2.3) and other youth members of TC 347 with training and the opportunity to practice communications skills. This will also enable inserting young professionals with contemporary communication skills to contribute to the mainstream of TC 347. | VERY HIGH |
| 1.2 | Experts excel at collaboration management | AG 1 (Comms) and AG 5 | Enabling ISO/TC 347 member experts to excel at collaboration management is essential for fostering inclusive, | <ol style="list-style-type: none"> 1) Develop mechanisms for periodically assessing TC 347 members' comfort level and expertise in collaboration management. (Linked to action 1 in objective 1.3.) | VERY HIGH |

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| | (Strengthen ISO members through capacity building) | (Learning and Growth) | efficient, and innovation-driven standardization in complex, data-rich agrifood systems. As the committee spans diverse geographies, disciplines, and stakeholder groups—from smallholder farmers to AI developers—collaboration must be actively cultivated, not assumed. Strong collaboration management ensures that expertise is integrated across working groups, that timelines and deliverables are harmonized, and that trust is built among members with varying expectations and communication styles. By empowering its experts with the skills and tools to lead and navigate collaborative processes, the committee strengthens its ability to deliver coherent, interoperable, and globally relevant standards. | <ol style="list-style-type: none"> 2) Offer facilitation and collaborative Leadership Workshops: host practical sessions on virtual facilitation, consensus-building, cross-cultural coordination, and managing multi-stakeholder groups in standards development. Leverage existing training materials (e.g. from ISO and the NSBs) whenever possible. 3) Create a collaboration playbook: document and share best practices for managing ad hoc, advisory and working groups, drafting deliverables collaboratively, resolving tensions, and maintaining momentum across time zones and institutions. 4) Establish a cross-subgroup liaison program: Pair volunteers across different subgroups (ad hoc, advisory, project, working, etc.) to act as liaisons, improving information flow and encouraging collaborative alignment across the committee. This activity is strongly linked also to objective 2.9 (Prevent, detect, remediate divergence). 5) Pilot collaboration tools and templates: Introduce shared digital tools (e.g., kanban boards, shared calendars, co-editing templates) and workflows to streamline task tracking, comments, and version control. 6) Recognize and showcase exemplary collaborators: celebrate members who model inclusive, effective collaboration—through spotlights in newsletters or end-of-year recognitions—to reinforce a collaborative culture. An early example of this is AG 1’s <i>Agrifood Who are You</i> program on LinkedIn. | |
| 1.3 | Continuous training plan for participants in place, in use (Strengthen ISO members through capacity building) | AG 1 (Comms) and AG 5 (Learning and Growth) | TC 347 must ensure that its members remain equipped with the evolving technical, procedural, and soft skills necessary to lead standardization in a rapidly transforming agrifood data landscape. As technologies, stakeholder needs, and ISO processes evolve, ongoing capacity-building helps maintain high-quality contributions, fosters inclusivity, and accelerates onboarding of new experts, ultimately sustaining the committee’s effectiveness and global relevance. | <ol style="list-style-type: none"> 1) Conduct a training needs assessment: Survey members to identify priority skill gaps and topics (e.g., data governance, AI ethics, ISO standards development directives, stakeholder engagement). 2) Develop a modular learning pathway: Assemble a set of short, reusable learning modules—combining live sessions, recordings, and reference materials—targeted at different experience levels and roles. Leverage existing training materials (from ISO and the NSBs) whenever possible. 3) Integrate training into annual workplan: Schedule at least two committee-wide training events per year and embed short learning segments into regular plenary or working group meetings. | VERY HIGH |

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| | | | | <ul style="list-style-type: none"> 4) Establish a mentorship and onboarding program: Pair new or less experienced members with seasoned mentors and provide them with curated training resources to accelerate engagement. 5) Leverage partnerships for capacity building: Collaborate with ISO/CS, regional and national standards bodies, and external institutions (e.g., FAO, academic programs) to co-deliver specialized training content. | |
| 1.4 | <p>Succession plan in place</p> <p>(Strengthen ISO members through capacity building)</p> | <p>AG 1 (Comms) and AG 5 (Learning and Growth). Include Chair's advisory group (CAG) when/if one is created.</p> | <p>A clear succession plan for leadership roles in ISO/TC 347 ensures continuity, resilience, and long-term effectiveness across the committee and its subgroups. As projects evolve and member availability changes, proactive planning helps avoid leadership gaps, reduces burnout, and builds a diverse pipeline of capable, confident leaders. It also promotes institutional memory, smoother transitions, and broader participation—especially from underrepresented regions or sectors.</p> | <ul style="list-style-type: none"> 1) Map current and emerging leadership needs: Identify key roles, expected transitions, and areas where future leadership capacity is needed across the committee and subgroups. 2) Encourage deputy or co-convenor roles: Promote shared leadership structures where possible to prepare successors and distribute workload effectively. Note: AG 1, AG 2, AG 3, AG 4, AHG 6, AHG 7 and AHG 8 all have a co-convenorship leadership structure. 3) Launch a leadership development track: Offer training and mentorship opportunities specifically for members interested in taking on leadership roles in the future. 4) Create a transparent nomination and transition process: Document and communicate clear processes for identifying, nominating, and onboarding new leaders at all levels. 5) Actively engage young professionals and liaison organization representatives: Prioritize inclusion of emerging experts and diverse voices in leadership pipelines to reflect the committee's global and cross-sectoral scope. | VERY HIGH |
| 1.5 | <p>Experts are proficient in standards development (ISO/IEC Directives Part 2)</p> <p>(Strengthen ISO members through capacity building)</p> | <p>AG 1 (Comms) and AG 5 (Learning and Growth)</p> | <p>Enabling its experts to be proficient in standards development, as outlined in ISO/IEC Directives Part 2, is essential for ISO/TC 347 to produce clear, high-quality, and consensus-based deliverables. A strong understanding of drafting rules, structure, terminology, and process helps ensure consistency, avoids delays, and improves alignment with other ISO and IEC standards. It also empowers more members to contribute</p> | <ul style="list-style-type: none"> 1) Develop mechanisms for periodically assessing TC 347 members' comfort level and expertise in standards development. (Linked to action 1 in objective 1.3.) 2) Assess any training needs exist for TC 347 that are specific to data-driven-agrifood-systems, and require ad hoc treatment, as opposed to being addressable through existing ISO and NSB training materials. 3) Develop ad hoc instruments to cover any training needs that are specific to data-driven-agrifood-systems and are not addressable through existing training materials. 4) Host a training workshop on ISO/IEC directives Part 2: Offer a live or recorded session walking members through key rules for drafting standards, with examples relevant to agrifood data systems. | HIGH |

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| | | | effectively and take on drafting or convening roles with confidence. | <ol style="list-style-type: none"> 5) Create or find a quick-reference guide for drafters: Develop a concise, easy-to-use checklist or cheat sheet summarizing the most relevant sections of the Directives for TC 347 work. 6) Launch a draft review “buddy system”: Pair experienced drafters with newer contributors to review and improve draft content together, reinforcing learning through practice. 7) Incorporate standards drafting tips into meeting agendas: Dedicate 5–10 minutes in working group or plenary meetings to highlight common drafting pitfalls or useful clauses. 8) Request targeted support from ISO/CS: Invite ISO Central Secretariat to provide specialized guidance or feedback sessions on draft development and editorial best practices. NOTE: This has been standard procedure for all TC 347 plenaries to date. | |
| 1.6 | Experts proficient in and using Online Standards Development (Strengthen ISO members through capacity building) | AG 1 (Comms) and AG 5 (Learning and Growth) | Proficiency in ISO’s Online Standards Development (OSD) platform, the use of which has been mandated since January 1, 2025, is essential for ISO/TC 347 to work efficiently and collaboratively across time zones and stakeholder groups. As more drafting, commenting, and editing activities move online, members who are confident using OSD can participate more actively, reduce bottlenecks, and ensure smoother coordination of documents. Building this proficiency supports transparency, inclusivity, and timely progress of technical work. | <ol style="list-style-type: none"> 1) Provide members with live OSD training sessions: Direct members to existing ISO OSD training opportunities (preferably live) that can provide walkthroughs to demonstrate key features of the platform such as commenting, editing, version control, and assigning tasks. 2) Create a step-by-step “cheat sheet”: Develop a visual guide tailored to TC 347 users with screenshots, tips, and examples relevant to its standards work. 3) Identify and support OSD champions: Designate a few experienced members as informal support contacts who can answer questions and assist others as they learn the platform. 4) Incorporate OSD practice into meetings: Use brief exercises or live document reviews during subgroup meetings to build familiarity with the platform in real time. 5) Gather user feedback and share with ISO/CS: Regularly collect input on challenges and suggestions for improving the OSD experience and share feedback with ISO Central Secretariat for potential enhancements. | HIGH |
| 1.7 | Experts are proficient on ISO processes (ISO/IEC Directives Part 1) (Strengthen ISO members through capacity building) | AG 1 (Comms) and AG 5 (Learning and Growth) | Proficiency in the processes outlined in ISO/IEC Directives Part 1 is vital for ISO/TC 347 to navigate the full standards development lifecycle effectively and in line with ISO rules. Understanding procedures such as project approval stages, voting | <ol style="list-style-type: none"> 1) Develop mechanisms for periodically assessing TC 347 members’ comfort level and expertise in ISO processes. (Linked to action 1 in objective 1.3.) 2) Host a process-focused orientation session: provide an overview of ISO/IEC Directives Part 1, with practical examples drawn from ongoing or recent TC 347 projects. Convert this into a microlearning module for future use. | HIGH |

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| | | | timelines, liaison coordination, and document submission requirements enables members to plan, manage, and contribute more effectively to deliverables. This reduces delays, strengthens compliance, and ensures that the committee operates smoothly within the global ISO system. | <ol style="list-style-type: none"> 3) Implement a visual process roadmap: Create a clear, simplified flowchart showing key steps, timelines, and decision points for new work items and standards development. Use or adapt existing ISO materials if possible. 4) Prepare a roles and responsibilities guide: outline the tasks of convenors, project leaders, editors, and national bodies to clarify who is responsible at each stage. Use or adapt existing ISO materials if possible. 5) Include process highlights in meetings: Dedicate a short segment of each plenary or subgroup meeting to explaining a relevant part of the process. 6) Encourage use of ISO/CS support materials: Share links and quick references to ISO Central Secretariat tools, videos, and templates that reinforce procedural understanding. | |
| 1.8 | Experts trained in and participating in SMART standards effort <i>(Innovate to meet user needs)</i> | AG 1 (Comms) and AG 5 (Learning and Growth) | Proficiency in the ISO SMART standards initiative is important for ISO/TC 347 because it supports the development of machine-readable, digitally actionable standards that align with the needs of data-driven agrifood systems. As digital tools increasingly depend on structured and interoperable content, SMART standards improve usability, automation, and integration with software systems. Enabling members to understand and apply SMART principles ensures that TC 347 deliverables remain forward-looking, accessible, and ready for digital implementation. | <ol style="list-style-type: none"> 1) Organize an introductory webinar on SMART standards: Invite ISO/CS or relevant experts to explain the purpose, components, and benefits of the SMART initiative with examples from other committees. Use existing ISO materials to the extent possible. 2) Distribute a SMART readiness checklist: Provide a simple checklist to help working groups assess whether their draft documents are structured in ways that support SMART transformation. Use existing ISO materials to the extent possible. 3) Pilot SMART structuring in one deliverable: Select a draft or existing standard to serve as a test case for applying SMART formatting and markup, with technical support as needed. 4) Develop a guide for TC 347 contexts: Summarize how SMART principles can be applied specifically to agrifood data standards, including terminology, field structures, and workflows. 5) Identify SMART liaisons or focal points: Designate one or more members to monitor developments in the SMART initiative and share updates or resources with the rest of the committee. | MEDIUM |

Internal processes

| # | Objective (and supported ISO priorities) | Responsible SC or WG | Rationale | Proposed actions | Priority |
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| 2.1 | Use strategic business plan (Innovate to meet user needs, Deliver ISO standards when the market needs them) | AHG 1 with assistance from AG 1, CAG when created | Using our strategic business plan as an important part of our operating model provides a shared vision, clear priorities, and a roadmap for coordinated action. The plan helps align technical work with real-world needs, supports consistent communication, and ensures that limited resources are focused on high-impact outcomes. Regular use of the plan also strengthens accountability, stakeholder engagement, and continuity across leadership and working groups. | <ol style="list-style-type: none"> 1) Develop strategic business plan adopting the new business plan template. 2) Present the strategic plan at key meetings: highlight key points of the business plan during plenary and subgroup sessions to reinforce alignment and shared direction. 3) Link projects to plan objectives: map ongoing and proposed work items to the strategic objectives in the plan to guide prioritization and justification. 4) Include strategic plan reminders in agendas: Add a recurring agenda item for subgroups to reflect on how their activities support the strategic plan. 5) Create a one-page summary for broad use: develop a simplified version of the plan for easy reference in outreach, onboarding, and communications. 6) Develop and implement a process for periodic assessment of progress on the TC's strategic objectives and a visualization tool (e.g., dashboard) to visualize it. 7) Review and update the plan periodically: Establish a lightweight process to revisit the plan each year and make adjustments based on progress, feedback, and emerging needs. | VERY HIGH |
| 2.2 | Manage strategic semantic assets to support the industry (Innovate to meet user needs) | AHG 2, AHG 6, proposed Agrisemantics WG, new AG on strategic assets, Chair / CM. | The data-driven approach pursued by TC 347 involves creating standards that will involve semantic resources such as controlled vocabularies and data dictionaries. These are often handled through registries managed by maintenance agencies. | <ol style="list-style-type: none"> 1) Create an Agrisemantics working group, as recommended by SAG-SF recommendation 3.2.1, associated with the first of the "low-hanging fruit" semantic standards recommended by the SAG-SF and currently the object of the work of AHG 2, Crop definitions (Recommendation 3.4.3). 2) Put in place a mechanism to evaluate at the AHG / PWI level whether a proposed standard requires a data type registry or other mechanism for managing strategic assets, and whether that should be managed internally, | VERY HIGH |

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| | | | | <p>or externally through a management agency or registration authority. (Chair & Agrisemantics WG)</p> <ol style="list-style-type: none"> 3) Establish a relationship with one or more maintenance agencies (and registration authorities as needed) to manage the externally facing semantic resources (e.g., controlled vocabularies) required by the semantic standards developed by TC 347, using a registry as recommended by the SAG-SF (Recommendation 3.4.2). 4) Once the Agrisemantics working group exists, continue developing the “low-hanging fruit” semantic standards presented in SAG-SF recommendations 3.4.4-3.4.9, in an order determined by needs and stakeholder interest, either directly within the Agrisemantics working group (e.g. using a PWI mechanism) or beginning with ad hoc groups, depending on the initial level of consensus and the chair’s and committee manager’s assessment 5) Create and actively manage a strategic assets advisory group (SA AG) for internally facing resources (Use cases, business capability model, terms and definitions). | |
| 2.3 | <p>Increase participation of young professionals in standardization processes</p> <p>(Advance inclusivity and diversity in the ISO system, Demonstrate the benefits of standards)</p> | <p>AG 1 (Comms), AG 5 (Learning and growth), proposed AG on young professionals when critical mass is reached.</p> | <p>Increasing the participation of young professionals in standardization is essential for TC 347 to remain innovative, inclusive, and sustainable. Young experts bring fresh perspectives, digital fluency, and long-term engagement potential that can strengthen the relevance and continuity of standards work. Their involvement also builds leadership pipelines, enhances diversity, and ensures that the committee reflects the evolving nature of agrifood systems and technology adoption.</p> <p>TC 347 has identified youth engagement as an important two-facet problem:</p> <ol style="list-style-type: none"> 1) On one hand, as the world continues to change quickly and agrifood systems become increasingly vulnerable, we will need many of the world’s brightest minds engaged in problems related to agrifood systems. It is | <ol style="list-style-type: none"> 1) Establish a Communications advisory group (Now AG 1) and create a young professionals engagement program within it. 2) Engage young-professional-facing liaison organizations and national standards bodies in engaging young professionals. 3) When a critical mass of participation in the program is reached, spin off the young professionals program into a young professionals advisory group. 4) Promote targeted outreach and recruitment: Partner with universities, research programs, and professional networks to identify and invite emerging talent to participate. 5) Highlight youth contributions in communications: Feature young professionals in newsletters, webinars, and social media to recognize their input and encourage others to join. 6) Offer training tailored to newcomers: Develop accessible materials and learning sessions (e.g., microlearning instruments) that introduce the basics of ISO | <p>VERY HIGH</p> |

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| | | | <p>incumbent upon the current generation of data-driven agrifood system professionals to train this next generation.</p> <p>2) On the other, agriculture and food production have a branding problem, in that young professionals worldwide typically do not see agrifood system jobs as aspirational career choices.</p> | <p>standardization and the specific focus of TC 347 to young professionals.</p> | |
| 2.4 | <p>Detect opportunities and market signals</p> <p>(Capture future opportunities for international standardization, Deliver ISO standards when the market needs them)</p> | AG 1, AG 2, AG 4 | <p>TC 347 is addressing a large data interoperability gap in agrifood systems, but as a young committee its network of stakeholders who provide input on national, regional and/or sectorial needs is limited. Building TC 347's relevance will require a sustained, well-organized effort to develop and exercise mechanisms for collecting agrifood systems' pain points and opportunities where standardization can bring value.</p> | <ol style="list-style-type: none"> 1) Establish a communications advisory group (Now AG 1), and ensure its mandate and processes involve using surveys and other data collection mechanisms to obtain stakeholder input in its communications operations. 2) Establish a stakeholder engagement advisory group (Now AG 2) and ensure its mandate includes identifying and engaging relevant professional communities and collecting agrifood systems' pain points and opportunities where standardization can bring value. 3) Establish a regional concerns advisory group (Now AG 4), which can engage regional standards bodies and other regional stakeholders to provide input regarding agrifood systems' pain points and opportunities where standardization can bring value 4) Participate actively in the creation and operation of ISO's Smart Farming Coordination Committee, seeking to obtain input from other sectors. SAG-SF Recommendation 3.1.4) 5) Participate actively in the creation and operation of a Joint Smart Farming Landscaping Group involving committees from organizations such as IEC, ITU, and IEEE. (SAG-SF Recommendation 3.1.5). | VERY HIGH |
| 2.5 | <p>Deploy effective internal communications (capabilities, dependencies, etc).</p> <p>(Demonstrate the benefits of standards)</p> | AG 1 | <p>TC 347 operates under the assumption that, as challenging and difficult as its technical mission might be, it is at most 10% of the total work that the committee must undertake, the remaining 90% being (internal and external) communications and stakeholder engagement.</p> | <ol style="list-style-type: none"> 1) Establish a Communications Advisory Group (AG 1), and ensure its mandate and processes involve identifying and addressing inward-looking communications pain points and opportunities (e.g., national mirror committees unable to communicate the profile of desired experts to their constituencies. | VERY HIGH |

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| 2.6 | <p>Deploy effective external communications (value, opportunities, impact, etc).</p> <p>(Demonstrate the benefits of standards)</p> | AG 1 | <p>TC 347 operates under the assumption that, as challenging and difficult as its technical mission might be, it represents at most 10% of the total work that the committee must undertake, the remaining 90% being (internal and external) communications and stakeholder engagement.</p> | <p>1) Establish a Communications Advisory Group (AG 1), and ensure its mandate and processes involve identifying and addressing outward-looking communications pain points and opportunities (e.g., raising awareness about smart farming, data-driven decision-making in agrifood systems, potential upcoming work opportunities in the committee, etc.) AG 1 shall use webinars, a website and printed materials as tools, as well as establish a social media presence (e.g., through a LinkedIn page and a YouTube channel) to communicate interesting information about TC 347.</p> | VERY HIGH |
| 2.7 | <p>Engage/recruit stakeholders effectively</p> <p>(Advance inclusivity and diversity in the ISO system, Demonstrate the benefits of standards)</p> | AG 2, TC 347 Chair & CM | <p>TC 347 is addressing a large data interoperability gap in agrifood systems. This has been a friction-producing issue in the agrifood industry for over a decade. Solving it globally is very difficult and will require the participation of a broad sample of stakeholders. Moreover, the community of practitioners and other potential participants is fragmented, given the many professionals who operate in this space. Identifying and engaging expert participants will be an ongoing challenge.</p> | <p>1) Establish a stakeholder engagement advisory Group (AG 2) and ensure that its mandate and processes involve identifying and addressing relevant stakeholders that represent the scope of TC 347.</p> <p>2) Execute a standing agenda item at ISO/TC 347 plenary meetings in which TC members (and/or guests) share their experiences, challenges and best practices for engaging stakeholders (especially smallholders) in their national mirror committees and standardization work.</p> <p>3) Identify needs and target populations and priorities for development of the following resources, with the purpose of communicating the value and increasing visibility of the work of ISO/TC 347 and related ISO groups to the international community of agrifood systems information technologies professionals, agrifood decision-makers, and the public at large; as well as maximizing the ability of stakeholders to be aware of and use ISO (and related) standards:</p> <ul style="list-style-type: none"> • Digital learning solutions and content (e.g. eLearning, webinars) • Distance coaching and mentoring • Publications, guidance documents and training materials • Seminars, training sessions and workshops (regional and national) <p>4) Work together with ISO/TC 347's other advisory groups to implement solutions to the identified needs.</p> | VERY HIGH |

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| | | | | 5) Develop a standard (preferably starting from an existing source ontology such as the CGIAR SEOnt), initiated in an appropriate AHG/WG, for a controlled vocabulary and data model of a hierarchical, geopolitical-context-dependent, mappable reference data system to represent actors and their roles in agrifood operations, consistent with SAG-SF Recommendation 3.4.18. | |
| 2.8 | <p>Create strong working relationships with regional standards bodies</p> <p>(Deliver ISO standards when the market needs them,</p> <p>Capture future opportunities for international standardization)</p> | AG 4, Chair, CM | <p>Given the strong relationship ISO has with CEN and the mechanisms for collaboration established in the Vienna protocol, the emergence of multiple forms of European legislation that de facto have global impact (e.g., GDPR, EUDR), and also strong activity by other regional organizations such as ARSO in Africa and COPANT in Latin America, establishing a strong working relationship with regional standards bodies will help prevent duplication of efforts, and development of incoherent, non-interoperable, competing standards. Regional bodies often have deep connections to local agrifood systems, regulatory frameworks, and implementation partners. Maintaining strong bonds will also help with stakeholder engagement and serve to better identify needs that TC 347 can address.</p> | <ol style="list-style-type: none"> 1) Create an advisory group on regional matters (AG 4) to identify and advise ISO/TC 347 on emergent regional issues that could benefit from data standardization, and to identify and advise ISO/TC 347 on ways to gainfully engage with regional standards organizations that may be involved with the aforementioned issues 2) In the short term, have the AG serve as a mirror committee for TC 347 participation in the CEN/SAG, assisting the TC 347 representative (The TC 347 Chair) in interpreting and reacting to emerging topics in the CEN/SAG, as well as proactively proposing ideas that could advance the CEN/SAG work in ways that maximize coherence and collaboration potential with TC 347. Engage in similar projects in the future as requested by the Chair & Committee manager. 3) Map key regional standards bodies and contacts: identify and catalogue relevant regional organizations, technical committees, and focal points working in data or agrifood systems. 4) Initiate outreach and relationship-building: send introductory communications and explore interest in dialogue or collaboration on topics of mutual relevance. 5) Host regional listening sessions: Organize informal consultations to gather insights on regional priorities, challenges, and expectations for standardization. 6) Facilitate liaison or observer roles: Encourage participation of regional bodies in TC 347 work or nominate TC members to follow regional efforts. 7) Report regional needs and contributions to plenary: develop a standing agenda item for the advisory group to share regional developments and strategic insights with the full committee. | VERY HIGH |

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| 2.9 | Prevent and detect incoherence / divergence among standards developed by TC 347 (Innovate to meet users' needs) | To be determined | Preventing incoherence or divergence among the standards developed by ISO/TC 347 is essential to ensure clarity, interoperability, and long-term usability across the data-driven agrifood systems landscape. As the committee advances multiple work items, a shared conceptual foundation is critical for avoiding overlaps, contradictions, or fragmented approaches. The reference architecture being outlined by ISO/IWA 47 that will be completed by ISO/TC 347 provides a unifying framework to align terminology, data flows, roles, and system functions across deliverables. Using this architecture, as well as unifying architectural insights emerging from various subgroups as a common guide supports consistency, integration, and easier implementation for stakeholders. | <ol style="list-style-type: none"> 1) Require alignment checks against the reference architecture: ask each working group to map its draft content against the shared architecture and identify areas of overlap or misalignment. 2) Establish a consistency review mechanism: form a cross-cutting editorial or review group to examine proposed deliverables for coherence across structure, terms, and scope. 3) Develop shared terminology and data models: promote the use of common glossaries, code lists, and data structures that reflect the reference architecture and are reused across standards. 4) Incorporate architecture-based orientation for drafters: provide training or quick guides to help contributors understand and apply the architecture in the early stages of drafting. 5) Update the reference architecture as new insights emerge: Maintain the architecture as a living resource that evolves with input from working groups and external stakeholders to remain useful and relevant. | VERY HIGH |
| 2.10 | Enable data ethics by design (Innovate to meet users' needs) | AG 3 | Data-driven agrifood systems increasingly shape decisions that affect livelihoods, food security, environmental sustainability, and public trust. By embedding ethical considerations such as transparency, accountability, fairness, inclusivity, data quality, and respect for local contexts directly into standards, TC 347 can help ensure that digital technologies and data infrastructures support responsible innovation rather than exacerbate power imbalances, exclusion, or unintended harm. Ethics by design provides a proactive and systematic way to align technical interoperability with societal values, regulatory expectations, and stakeholder trust, while reducing downstream risks and increasing the adoption and legitimacy of standards. This approach positions TC 347 not only as a technical authority, but also as | <ol style="list-style-type: none"> 1) Initially assign this set of activities to advisory group on responsible innovation (AG 3). 2) Use AG 3 to establish cross-WG ethics coordination to identify shared ethical principles, risks, and expectations across TC 347 work items and to ensure consistent treatment of ethics-related issues. 3) Develop a lightweight “data ethics by design” guidance note for use by working groups, outlining core principles, common ethical risk areas in agrifood data systems, and prompts to consider during system definition, requirements drafting, and validation. 4) Map upcoming TC 347 standards and drafts to ethical considerations, such as transparency, accountability, data quality, inclusiveness, and impacts on smallholders and marginalized actors, in order to identify gaps and opportunities for improvement. 5) Integrate ethics checkpoints into standard development workflows, for example by adding ethics-related | VERY HIGH |

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| | | | <p>a steward of trustworthy and human-centred data practices that enable sustainable, resilient, and globally relevant agrifood systems.</p> <p>This objective is aligned with the SAG-SF Recommendation 3.4.14.</p> | <p>questions to project planning templates, committee drafts, and internal reviews.</p> <p>6) Engage external stakeholders and liaison organizations, including practitioners, regulators, youth representatives, and ethics-focused organizations, to gather real-world perspectives on ethical risks and expectations in data-driven agrifood systems.</p> <p>7) Pilot ethics-by-design approaches in one or two active projects, documenting lessons learned and refining guidance before broader rollout across the committee.</p> | |
| 2.11 | <p>Enable responsible innovation (Innovate to meet users' needs, Advance inclusivity and diversity in the ISO system)</p> | AG 3 | <p>Data-driven agrifood systems directly affect ecosystems, communities and markets, requiring foresight to balance technological opportunities with ethical, social and environmental considerations. By embedding responsible innovation into its processes, ISO/TC 347 can ensure that standards anticipate risks, enhance trust, serve a wide range of stakeholders (including smallholders) and align with long-term sustainability goals.</p> | <p>1) Create adv. group on responsible innovation (AG 3)</p> <p>2) Develop short (1 or 2 page) guidelines for responsible innovation for TC 347</p> <p>3) Create case studies on how standards for data-driven agriculture positively or negatively affect innovation with specific attention to less structured companies, for example:</p> <ul style="list-style-type: none"> • entrepreneurs, • startup companies, • family businesses, • informal sector businesses <p>4) Train project leaders on how to follow the TC 347 guidelines on responsible innovation to anticipate the consequences of proposed agriculture data standards at all scales: on on-farm, across farming landscapes, throughout the food chain, effects on rural communities and the general public.</p> | VERY HIGH |
| 2.12 | <p>Enable interoperability by design (Innovate to meet users' needs)</p> | New AHG, continuing action by chair, CM, CAG. | <p>From SAG-SF Recommendation 3.1.9:</p> <p><i>Traditional liaisons among committees or joint working groups and directives on the drafting of ISO standards may not be sufficient to ensure interoperability among standards.</i></p> <p>As a result of SAG-SF Recommendation 3.1.4, ISO created a Smart Farming Coordination Committee. One of the standing topics in that group is how to enable</p> | <p>1) Develop and maintain a living document representing TC 347's understanding of what data interoperability entails in the data-driven agrifood systems domain. This document should enable other ISO committees to assess and address the interoperability of their standards with other related ISO standards, during the development of new standards and in the review and revision of existing standards.</p> <p>2) Make this document available to other SFCC committees, and enable them to contribute in the context of the SFCC.</p> | VERY HIGH |

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| | | | standards to be “smart-farming-friendly”, for example by formalizing the data payloads of analytical standards such as the ones developed by TC 34 and TC 93. It will require continuing commitment from TC 347 to make this happen. | <ol style="list-style-type: none"> 3) Engage with other TCs in defining families of similar standards and develop approaches for making those standards “smart-farming-friendly” through a set of tests and corresponding additions to the standards’ text. 4) Engage in joint work with other committees to assist in the implementation of the above process. | |
| 2.13 | Enable accessible interoperability testing <i>(Innovate to meet users' needs)</i> | To be determined | <p>Based on SAG-SF Recommendation 3.1.10.</p> <p>Maintaining effective implementation interoperability requires an ongoing conformance validation effort. Examples:</p> <ul style="list-style-type: none"> • AEF’s system for ISO 11783, which involves a third-party conformance-testing stage followed by Plugfests involving integration partners • ISO TR 28380 Health informatics - IHE global standards adoption <p>The challenge is to keep a validation system inexpensive enough so that even small players can participate; the third-party conformance testing that is common with ISO 9001 certification of medium to large industrial companies may not be practical for small software companies in the agrifood industry.</p> <p>ISO’s Conformance Assessment Committee (ISO/CASCO) makes allowances for first- and second-party attestations of conformance. Other standards groups (e.g. the Object Management Group, OMG) have successfully set up similar conformance assessment systems for software-related standards. We seek to adapt the system to our agrifood system standards, as we also make allowances for, and support, third-party conformance testing.</p> | <ol style="list-style-type: none"> 1) Put in place a user community interested in testing our standards. 2) Enable that user community to develop test suites by providing infrastructure, capacity-building and processes. 3) Specify mechanisms for first and second-party conformity assessment of data-driven agrifood systems standards (while also enabling third-party conformity assessment) 4) Manage the process, making efforts to minimize costs to participants (both testers and certification applicants). 5) Establish good working relationships with the third-party conformance testing community, so as to learn how to optimize our standards for effective and efficient conformance testing. | VERY HIGH |

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| 2.14 | <p>Enable delegation model of technology adoption</p> <p>(Innovate to meet users' needs, Demonstrate the benefits of standards)</p> | AG 2 | <p>From SAG-SF Recommendation 3.2.6:</p> <p>Whereas producers, including smallholder farmers, delegate the remedying of complex problems to sophisticated specialists such as electricians, diesel mechanics, agronomists and veterinarians, there is a lack of similar specialists in agricultural technology in general, and <i>data management</i> in particular, to whom producers can delegate responsibility to achieve the producers' desired outcomes. This impacts the ability of many, typically smaller producers to derive the full value of data-driven opportunities.</p> <p>The SAG-SF recommended enabling standards to support the <i>delegation model</i> as an alternative approach to the competency transfer model that assumes the producer must learn how to do everything.</p> <ul style="list-style-type: none"> • The competency transfer model moves expertise to people with the need or problem, through teaching, mentoring, advice and coaching, whereas the delegation model moves the need or problem to the people with the expertise thought outcome delegation. • The delegation model addresses exponential complexity in agricultural technology broadly, and in data-driven approaches especially, while also recognising the challenges of global-scale adoption of these data-driven approaches especially in the world's half billion smallholder farms. <p>Note: TC 347 does not specifically advocate for the delegation model but recognizes it may be an important tool to scale data-driven agrifood systems management adoption, and that its enablement must be</p> | <ol style="list-style-type: none"> 1) Develop a document, to be updated as needed, that can provide guidance to TC 347's standards development teams on how to accommodate the delegation approach within their work. (e.g., in data models, by enabling attribute-based data access controls or other mechanisms for managing access to specific categories of information). The essential contents of the proposed document then will address <ul style="list-style-type: none"> • the underlying principles of the delegation model as applied to data-driven systems, • the practical application of the principles to TC 347, and • the opportunities and challenges envisaged in broad scale adoption of the delegation model. 2) Put in place support mechanisms for TC 347 stakeholders to pilot the delegation model. | HIGH |
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| | | | done by design, and not <i>ex post</i> the development of TC 347 standards. | | |
| 2.15 | Enable learning through data (Innovate to meet users' needs) | New AHG, with input from AG on strategic data assets. | <p>From SAG-SF Recommendation 3.4.30:</p> <p>The purpose of TC 347 is fundamentally to enable using data to make better management decisions in agrifood systems. While standardization of agricultural technology is an important aspect of this, it is also important to enable stakeholders to use data to test ideas and to learn from the data. This can take several forms, including:</p> <ul style="list-style-type: none"> • Testing emerging digital technologies and learning about their fitness for use in solving specific problems in the context of the user, and • Testing and learning from on-farm or on-premise (e.g., for a processing plant) agronomic and management experiments. <p>- Having standardized mechanisms for technology providers, advisors, non-governmental organizations, extension services, etc. to integrate the tools and data collection mechanisms supported by them with a learning framework would be very advantageous for helping make data more usable.</p> | <p>1) Create a standard for unambiguously representing, in a machine-actionable way,</p> <ul style="list-style-type: none"> • dataset metadata, including data quality metrics, • on-farm and on-premise (for processors and manufacturers) experiments, • the variables used in those experiments, with reference to their data type definitions online (via a maintenance agency), • the hypotheses being tested, and • the results and learnings therefrom. | LOW (For this initial plan) |
| 2.16 | Enable effective and responsible use of AI in agrifood systems (Innovate to meet users' needs, Demonstrate the benefits of standards) | AHG 5 and AG 3 initially, more as needed | <p>Artificial intelligence is rapidly becoming embedded in decisions about planting, crop input use, irrigation, animal health, logistics, and compliance, where errors can harm producers, consumers, and ecosystems. The Seoul Statement, made jointly by ISO, IEC, and ITU-T, reinforces that international standards are a key mechanism for advancing AI that is safe, trustworthy, inclusive, and beneficial to society, and TC</p> | <p>1) Establish a liaison into ISO/IEC/JTC 1/SC 42, Artificial intelligence. Monitor SC 42's output continuously for applicability to the agrifood systems domain, and provide input to SC 42 regarding agrifood systems use cases and needs.</p> <p>2) Define a small set of testable requirements for AI-enabled agrifood decision support outputs, such as traceable sources, confidence indicators, and documented boundaries of applicability, so conformity assessment becomes feasible.</p> | VERY HIGH |

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| | | | <p>347 is committed to accompanying that vision.</p> <p>Additionally, AI hallucinations can cause real-world harm in agrifood systems, such as unsafe agronomic recommendations, incorrect regulatory guidance, or misleading traceability and sustainability claims. TC 347 standards can help reduce these risks by specifying requirements for data quality and provenance, model documentation and validation, domain constraints and human oversight, and interoperable reporting of uncertainty and fitness for use.</p> | <ol style="list-style-type: none"> 3) Produce a short “AI in agrifood systems” workplan that identifies priority use cases, risk categories, and gaps that standards can address, aligned with the Seoul Statement commitments. 4) Publish a compact guidance note for TC 347 projects that lists minimum expectations for responsible AI, including data provenance, evaluation practices, and transparency artifacts needed to mitigate hallucination-related risks. 5) Run one pilot within an active TC 347 deliverable to apply the guidance and requirements end to end, then capture lessons learned for committee-wide reuse. 6) Coordinate liaisons and joint workshops with relevant ISO and IEC AI groups to harmonize terminology, risk controls, and documentation approaches across standards development. | |
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Resources

| # | Objective (and supported ISO priorities) | Responsible SC or WG | Rationale | Proposed actions | Priority |
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| 3.1 | <p>Enable data-driven climate adaptation of agrifood systems</p> <p>(Advance environmental sustainability through ISO standards, Innovate to meet users' needs)</p> | To be determined | <p>Many countries and organizations worldwide are allocating increasing resources to enabling their communities to adapt to climate change.</p> <p>Agricultural production is no exception to the need to adapt to climate change, but the complexity of the systems involved often result in slow or inadequate adaptation in the context of increasing temperatures, unpredictable rainfall, etc.</p> <p>This is impossible to do at scale without standardizing the data used to characterize environments, represent observed environmental conditions, represent crop</p> | <ol style="list-style-type: none"> 1) Establish 2-way liaisons with ISO/TC 207 2) Work jointly with ISO/TC 207 to produce implementation documents that can enable implementation of TC 207 climate-adaptation-related standards (e.g., ISO 14091) in agrifood systems leveraging the principled, data-driven approach being pursued by TC 347. 3) An example to explore: A data model, exchange format and standardized application programming interfaces (API) to manage community registries of heat/cold/drought tolerant crop varieties. 4) Enable TC 207 to use the observations & measurements model and semantic infrastructure used by TC 347 (and TC 23 SC 19 for its 7673 standards) to unambiguously express sustainability indicators and other metrics needed for its work. | MEDIUM (Initially) |

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| | | | <p>inputs, the field operations in which the inputs are applied at specific rates, etc.</p> <p>The ISO/TC 207 (Environmental Management) committee has developed 73 published standards and are developing 22 new standards to address environmental and climate impact aspects of UN SDG 13. However, their application to agricultural production systems has been limited. In addition, data needed to characterize agricultural production systems in regional contexts is very limited, very diverse, and in some cases, only available behind paywalls.</p> | Note: These steps were derived from meetings and consensus between the chairs of TC 207 and TC 347. | |
| 3.2 | <p>Enable data-driven climate mitigation of agrifood systems</p> <p>(Advance environmental sustainability through ISO standards, Innovate to meet users' needs)</p> | To be determined | <p>Optimizing agrifood systems to minimize their environmental impact in unique environmental contexts requires standardization of inputs, processes and outputs to make efficient use of resources while minimizing adverse impacts beyond managed system boundaries. For example, inefficient management of nitrogen inputs results in the release of potent greenhouse gas emissions of nitrous oxides, as well as damage to freshwater systems by eutrophication. Impacts will have varying degrees of severity that will be influenced by the type of hotspot driver, as well as the vulnerability of the broader environmental context, e.g., whether a constraining threshold is exceeded to trigger a non-linear response.</p> <p>This is impossible to do at scale without standardization of the data used to represent the crop inputs themselves and their composition, the field operations in which the inputs are applied at specific rates, etc.</p> <p>The ISO/TC 207 (Environmental Management) committee has developed 73</p> | <ol style="list-style-type: none"> 1) Establish 2-way liaisons with ISO/TC 134 (ISO/TC 134 (Fertilizers, soil conditioners and beneficial substances) and other relevant crop nutrition organizations. 2) Work jointly with the abovementioned organizations and TC 207 to ensure that TC 347's standards (e.g., the land usage history standards that will merge from AHG 8's work) enable climate mitigation work. 3) Enable the abovementioned organizations to use the observations & measurements model and semantic infrastructure used by TC 347 (and TC 23 SC 19 for its 7673 standards) to unambiguously express sustainability indicators and other metrics needed for its work. | MEDIUM |

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| | | | published standards and are developing 22 new standards to address environmental and climate impact aspects of UN SDG 13. However, their application to agricultural production systems has been limited . In addition, data needed to characterize agricultural production systems in regional contexts is very limited, very diverse, and in some cases, only available behind paywalls. | | |
| 3.3 | Enable smart agrifood subdomains, e.g., CEA, apiculture, irrigation (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | To be determined | There are multiple subdomains within agrifood systems (e.g., controlled environment agriculture, irrigation, apiculture) that increasingly require data-driven decision-making support, data exchange, and other capabilities that fall within the scope of TC 347. Multiple recommendations from the SAG-SF (3.2.4, 3.4.21, 3.4.28) seek to enable data-driven, interoperable approaches in those subdomains. | <ol style="list-style-type: none"> 1) Accommodate ad hoc groups (e.g., for greenhouse / controlled environment agriculture, smart apiculture, smart irrigation) to study how to represent the subdomains in question within our reference architecture, find gaps, resolve those gaps through additional standards, and create the corresponding NWIPs. 2) Accommodate an ad hoc group for urban farming. Note that SAG-SF recommendation 3.2.4 encompassed both controlled environment agriculture (e.g., greenhouses) and urban farming (e.g. enabling the repurposing of urban plots for agricultural use following natural disasters). These two matters are both important but should be treated separately. Liaise with TC 190 (Soil quality) as needed. 3) Ensure all the abovementioned groups interact regularly with other TC 347 groups to identify patterns that can be used across multiple domains. | MEDIUM |
| 3.4 | Enable data-driven pest / fertility / water /seed / feed management (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | To be determined | <p>Much of the short-term promise of a data-driven approach to agrifood systems is in the optimization of production inputs such as crop protection / pest management products, crop nutrition / fertility management products, and so forth. This strategic objective exists in a central position within the SBP, in two roles:</p> <ul style="list-style-type: none"> • As a synthesis of high-priority precursors such as observations & measurements management, semantic interoperability, | <ol style="list-style-type: none"> 1) Identify a small number of priority, end-to-end management use cases (from the existing AHGs and from IWA 47) such as variable-rate fertilization, integrated pest management decisions or feed optimization, and explicitly map which AHGs/WGs contribute inputs to each use case. 2) Coordinate AHG/WG outputs around a shared reference scenario, ensuring that AHG 2 reference data, AHG 10 evolving field boundaries (and other master data), and AHG 8 land use histories align to support consistent spatial and temporal context for management decisions. | HIGH (In this first version of the SBP) |

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| | | | <p>field boundary management and a reference architecture, and</p> <ul style="list-style-type: none"> As a fundamental enabler of higher-level, more aspirational objectives. | <ol style="list-style-type: none"> Align integrated pest and livestock perspectives, by jointly reviewing AHG 4 and AHG 6 outputs to identify common patterns for activity tracking, treatment records, and decision-support needs across crops and animals. Specify minimum metadata and workflow requirements for actionable recommendations, drawing on AHG 7 to ensure that analytics supporting input optimization are traceable, interpretable, and fit for operational decision making. Develop a lightweight integration profile or checklist, describing how reference data, observations, boundaries, activities, and analytics outputs must work together to support data-driven input management in practice. Pilot the integrated approach in one selected domain, such as pest, irrigation or fertility management, and document lessons learned to inform broader application across TC 347 deliverables. <p>Together, these tasks emphasize coordination, reuse, and practical integration dealing with resource allocation and timing when growing a crop or raising cattle, allowing TC 347 to demonstrate early value while laying a foundation for more advanced and aspirational objectives.</p> | |
| 3.5 | <p>Enable autonomous field operations</p> <p>(Innovate to meet users' needs, Capture future opportunities for international standardization)</p> | To be determined | <p>Autonomous operation of field machinery is a promising mechanism for alleviating labour constraints in many of TC 347's member countries, but multiple conditions must be met to ensure the safety of the stakeholders, as well as the accuracy and precision of the desired operations.</p> | <ol style="list-style-type: none"> Develop or identify a standard for the co-registration of RTK networks, in collaboration with TC 211. This activity is aligned with SAG-SF Recommendation 3.4.16. Collaborate with ISO/TC 23 SC 19 on identifying and implementing data representation standards that can enable autonomous field operations. | MEDIUM |
| 3.6 | <p>Enable data-driven insights in food processing</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | To be determined | <p>Data-driven insights in food processing offer substantial opportunities for businesses to enhance operational efficiency, product quality, and sustainability. Through intelligent data collection, analysis, and real-time decision-making, companies can optimize production processes, reduce resource</p> | <ol style="list-style-type: none"> Plan and engage in systematic stakeholder engagement activities to increase the number of food, feed, fiber and fuel crop processing experts in TC 347. Develop an understanding of data interoperability gaps and standardization opportunities in the food, feed, fiber and fuel crop processing segments of the industry. Develop standards to enable data interoperability consistent with the findings from the aforementioned | MEDIUM |

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| | | | <p>consumption, and ensure food safety and traceability.</p> <p>Food loss and waste are a major problem in world food production, with estimates of total global food loss & waste hovering around 40%. While the fraction of this amount attributed to processing has been estimated at only 3%^{xxii}, that amount still represents several billions of dollars annually where gains can be made, and individual processors are increasingly interested in optimizing their production for greater profitability and sustainability^{xxiii}.</p> <p>An example of the kinds of interoperability problems that must be solved to enable these improvements: Newer food processing equipment generates telemetry streams (often in proprietary formats and encodings) that describe the operating parameters of the machine, but that information is typically not used in real- or near-real-time to improve the efficiency of the manufacturing process.</p> | <p>report, in collaboration with TC 34/SC 20 and/or TC 184 where appropriate.</p> | |
| 3.7 | <p>Enable smart spraying (Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | To be determined | <p>From SAG-SF Recommendation 3.4.27:</p> <p>Agricultural chemicals are both expensive and have can produce deleterious effects when applied off-target. It is thus a sound practice to optimize product placement, avoiding unintended drift and ensuing efficacy on the intended target.</p> <p>There is often tension, however, between the time windows available for producers to apply chemicals in, and environmental and safety considerations, especially regarding the complex and multifactorial topic of spray drift.</p> <p>ISO/TC 23/SC 6 had a (recently withdrawn) tool, ISO TS 11356, that enabled accurately capturing the spray parameters during a</p> | <ol style="list-style-type: none"> 1) Develop a working relationship with TC 23/SC 6, with liaisons in both directions. 2) Create an ad hoc group or other mechanism for exploring and developing a NWIP for a standard specifying a framework for automating the geopolitical-context-dependent and environmental and other context-sensitive decision of whether spraying of a particular tank mix is acceptable ("OK to spray") in a way that can be evaluated during the planning, preparation, and execution of a spraying operation. <ul style="list-style-type: none"> • Planning example: Ensure that the product application would not exceed annual maximum active ingredient load • Preparation example: Ensure that the application is consistent with restricted entry intervals that may be active in the field. | MEDIUM (In this first version of the SBP) |

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| | | | <p>spraying operation for <i>ex-post</i> analysis. While this may be valuable for understanding how a spray drift event or other problem happened, it does not help prevent such problems.</p> <p>Contemporary sprayers have the capability to adjust their operating parameters (boom height, pressure, speed, nozzles) to manage drift. In parallel, the availability of IoT-mediated environmental data (wind speed and direction, inversion conditions, etc.) as well as the capability to communicate these in real time and to run models, both on the cloud and on the machine controllers themselves, has grown significantly.</p> <p>A framework is needed that can bring together the need for a systematic way of representing spray-limiting conditions in real or near-real time, for modelling how the machine parameter reactions can translate into effects under those conditions, and for solving the resulting optimization problem (i.e., for machines to change their operation parameters in real time to remain compliant with regulations and other limitations). This requires integrating multiple capabilities:</p> <ul style="list-style-type: none"> • configuration management (e.g., correct nozzles, accurate offsets), • machine communication, • near-real-time weather data, • model execution, etc.) | <ul style="list-style-type: none"> • Execution example: Wind speed has increased during the operation, and the current configuration of sprayer parameters such as boom height, pressure, speed and nozzle package is inconsistent with limiting drift to the field, given the sprayer's current position with respect to the wind and the field boundary. <p>3) Develop the standard jointly with TC 23/SC 6.</p> | |
| 3.8 | Enable inference (e.g., automated label checking) <i>(Innovate to meet users' needs,</i> | To be determined | Real-world value in agrifood systems increasingly comes from the automated creation and use of insights that support operational and compliance decisions, such as label checking of planned pesticide | 1) Define a small set of priority inference use cases, such as automated label compliance or nutrient balance checks, and map required inputs to AHG 2 reference data, AHG 10 field boundaries, AHG 8 land use histories, and AHG 7 analytics workflows, metadata requirements, etc. | HIGH |

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| | Advance environmental sustainability through ISO standards) | | <p>applications or eligibility checks for sustainability programs.</p> <p>Reliable inference requires more than analytics alone, however. It depends on orchestrating machine-actionable reference data; consistent master data describing resources such as farms, fields, and field boundaries; and high-quality field operations data with clear temporal and spatial context.</p> <p>By standardizing how these data elements are defined, linked, and made interoperable, TC 347 can reduce ambiguity, enable automation at scale, and support trustworthy, repeatable decision making across diverse agrifood systems.</p> | <ol style="list-style-type: none"> 2) Specify minimum requirements for machine-actionable reference and master data, drawing on AHG 2 and AHG 10 to ensure identifiers, vocabularies, and spatial representations support automated reasoning. 3) Align land use history and operations data for inference, coordinating AHG 8, AHG 9 and AHG 7 to ensure temporal consistency and traceability needed for defensible insights. 4) Develop a lightweight inference enablement checklist or profile, describing how data must be structured, linked, and documented so that inference results are interpretable and auditable. 5) Pilot one end-to-end inference scenario within an active TC 347 activity and document lessons learned to inform future standards development. | |
| 3.9 | Enable field boundary mgmt. (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | AG 10 and subsequent WG | <p>From SAG-SF Recommendation 3.4.13:</p> <p>Although the meaning of the concept of an agricultural field or paddock (henceforth "field") may be highly dependent on a particular producer's needs, a field may have multiple boundaries (imaginable as a multi-polygon simple feature, as per TC 211 nomenclature) that change over time and have different purposes.</p> <p>Examples of different purposes include:</p> <ul style="list-style-type: none"> • nominal boundaries used to represent the idea of the field in a farm management information system, • operational or prescription boundaries used to control planting, spreading and spraying field operations, • ex-post boundaries obtained from the spatial footprint of a recorded field operation (e.g., seeding), | <ol style="list-style-type: none"> 1) Create an ad hoc group (AHG 10) to identify field boundary use cases and create a new work item proposal and a draft describing a data model to represent field boundaries (and their constituent parts such as headlands, obstacles, passable and impassable segments), their change over time, a nomenclature for their different purposes, and data quality measures usable to assess their fitness for a particular use. 2) Develop a standard from the draft described above. | VERY HIGH |

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| | | | <ul style="list-style-type: none"> • administrative boundaries used to communicate with regulators, and • spatial allocation boundaries used to allocate incoming geographical field operations work record data to a given field. <p>A boundary used for each of these different purposes would conceivably have different data quality requirements (e.g., a prescription boundary used to control a spraying operation would typically need to be very accurate compared to a nominal boundary).</p> <p>The shape of the boundaries may vary over time as a result of changing planting patterns, equipment size, land ownership or usage patterns, and so forth.</p> <p>Keeping accurate track of these different boundaries, determining their suitability for different purposes, and exchanging purpose information between the producer and other actors (e.g., advisor) is complex, and not currently standardized.</p> | | |
| 3.10 | <p>Enable scalable & consistent use of observations and measurements data</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | To be determined | <p>As pointed out by SAG-SF Recommendation 3.3.1, nearly all data-driven decisions in agrifood systems depend on observations that describe the state of an environment or asset of interest over space and time.</p> <p>The standards developed by ISO/TC 211, particularly ISO 19156 and related standards such as ISO 19157 and ISO 19115, provide a robust, domain-independent abstract model that already aligns well with agricultural data, from field scouting and laboratory analyses to monitoring of equipment and processing conditions. Its agricultural implementation, ISO 7673-2, specializes the model for agrifood use cases.</p> | <ol style="list-style-type: none"> 1) Identify priority agrifood observation types used across TC 347 activities and map them explicitly to the ISO 7673-2 model and patterns. 2) Develop a short guidance document or profile explaining how TC 347 projects should apply observations and measurements concepts, including features of interest, procedures, metadata, data quality elements and results (including units of measure), in agrifood contexts beyond primary production. 3) Coordinate with ISO/TC 23/SC 19 and ISO/TC 211 as needed to ensure alignment of terminology, modeling choices, and planned extensions relevant to agrifood systems. 4) Assess existing TC 347 deliverables and drafts to identify gaps or inconsistencies in how observations and measurements are represented and referenced. | VERY HIGH |

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| | | | By promoting consistent application of these models, TC 347 can improve data interoperability, data quality, and data reusability, and enable analytics, inference, and automation across farm, supply chain, and processing contexts. | 5) Pilot the approach in one active use case, such as field scouting or asset condition monitoring, and capture lessons learned to refine guidance for broader adoption. | |
| 3.11 | Maximize on-farm and in-plant biosecurity (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | To be determined | <p>Biosecurity failures can rapidly disrupt production, trade, and public confidence, while causing significant harm to people, animals, the environment, and the economy.</p> <p>Data-driven agrifood systems increasingly rely on interconnected sensors, workflows, and analytics that can either strengthen or weaken biosecurity depending on how they are designed and governed.</p> <p>By enabling standardized, interoperable, and trustworthy data practices for monitoring movements, conditions, and activities, TC 347 can support early detection, traceability, and prevention of biological risks across farms and processing facilities, while aligning digital innovation with resilience and risk reduction.</p> | <ol style="list-style-type: none"> 1) Define priority biosecurity use cases such as disease monitoring, controlled access to facilities, and sanitation verification, and identify the data needed to support them. 2) Identify common data elements and workflows relevant to biosecurity, including observations, activity records, asset status, and spatial context, and assess gaps in current TC 347 work. 3) Develop high-level guidance on biosecurity-relevant data interoperability, focusing on traceability, timeliness, and data quality requirements. 4) Coordinate with relevant external committees and organizations working on animal health, plant health, and food safety to align concepts and terminology. 5) Pilot a data-driven biosecurity scenario within an existing TC 347 activity and document lessons learned to inform future standards development. | LOW (In this initial version of the SBP) |
| 3.12 | Enable codification of agronomy (Innovate to meet users' needs) | To be determined | From SAG-SF Recommendation 3.4.29: Mathematical models are increasingly used to advise producers and other decision-makers. Using these models at scale to deliver advice in environments where there is scant availability of human capital mediated extension and advisory services is promising, but limited in part by interoperability problems, and a lack of understanding about how representative a model might be to specific conditions, and whether it captures the limiting factors correctly in a given environment. We need standards for both making the structure and functions of models | <ol style="list-style-type: none"> 1) Survey existing approaches to codifying agronomy, i.e., rules, models, recommendations, work records,, etc. for representing, in a machine-actionable way, causal relationships in agronomy and agricultural management. This includes: <ul style="list-style-type: none"> • Representing input and output data variables (in accordance with SAG-SF Recommendation 3.4.2), including limiting factors in a given context. • Having a controlled vocabulary for models that act upon the input variables, and a data model and registry that expresses, for those models, different versions, which inputs are required, which are optional, information regarding the sensitivity of the inputs, where to go for more information, etc. | MEDIUM (In this initial version of the SBP) |

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| | | | clearer to their potential users and enable their use at scale. | <ul style="list-style-type: none"> The possibility of representing mechanistic/functional models, statistical models, machine-learning models and expert-opinion-driven and indigenous-knowledge-based models in a standard, machine-actionable way (e.g., PMML, DMN, etc.) that enables model-execution-as-a-service. <ol style="list-style-type: none"> Contingent on the results from 1), create a data model for codifying agronomy that is based on TC 347's reference architecture, is consistent with the work being done by AHG 2, AHG 6 and AHG 8. Publish the data model for representing agronomy as one or more standards. Put in place the necessary maintenance agency processes. | |
| 3.13 | Enable semantic interoperability (Innovate to meet users' needs) | AG 2 and subsequent WG | <p>Data-driven agrifood systems depend on the ability of machines and organizations to interpret data consistently across crops, inputs, operations, locations, and regulatory contexts. The recommendations of the SAG-SF (e.g. 3.4.3 to 3.4.9) emphasize that controlled vocabularies, reference data, and machine-actionable unit of measure codes are foundational to scalable automation, analytics, and inference.</p> <p>Without semantic interoperability, data integration remains fragile, limits reuse, and increases the risk of misinterpretation in decision making, compliance, and reporting.</p> <p>By prioritizing semantics, TC 347 can help ensure that agrifood data retains meaning as it moves across systems, actors, and borders.</p> | <ol style="list-style-type: none"> Identify priority semantic assets referenced in Recommendations 3.4.3 to 3.4.9 and map them to current and planned TC 347 deliverables. Coordinate with relevant ISO committees to align terminology, identifiers, and governance approaches for crops, operations, inputs, and units of measure. Develop standards in accordance with 1) and 2). Seek and prioritize repeatable patterns for constructing semantic resources. Develop a short semantic interoperability guidance note describing how TC 347 projects should use controlled vocabularies and reference data in a machine-actionable way. Pilot semantic interoperability in one use case, such as label interpretation or field operation reporting, using standardized vocabularies and reference data. Establish a lightweight process for identifying and maintaining semantic dependencies across TC 347 work items to promote consistency over time. Communicate the state of the above points to TC 347 on an ongoing basis, through presentations at plenaries, LinkedIn and/or web page posts, etc. | VERY HIGH |
| 3.14 | Develop a standardized reference architecture | To be determined | Scalable digital transformation requires a shared architectural understanding of how | <ol style="list-style-type: none"> Define the scope and purpose of a TC 347 reference architecture, clearly identifying intended users, levels of | VERY HIGH |

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| | (Innovate to meet users' needs) | | <p>data, services, analytics, and governance components fit together.</p> <p>Recommendations 3.4.10 and 3.4.11 of the SAG-SF, and the work being done by ISO/IWA 47 highlight the need for a common reference architecture to support interoperability, reuse, and coherent implementation across diverse technologies and stakeholders. Without such an architecture, standards risk becoming fragmented and harder to implement consistently, while a well-defined reference architecture enables alignment across domains, reduces integration costs, and accelerates trustworthy adoption of data-driven solutions.</p> | <p>abstraction, and relationships to existing ISO architectures. Build on the work of IWA 47 to do this.</p> <ol style="list-style-type: none"> 2) Inventory existing architectural models and patterns referenced across TC 347 activities and related ISO committees to identify common elements and gaps. 3) Develop a high-level conceptual architecture describing core layers such as data sources, interoperability services, analytics, governance, and applications. Build on the work of IWA 47 to do this. 4) Map priority use cases from TC 347 strategic objectives to the draft architecture to test completeness and relevance. Build on the work of IWA 47 to do this. 5) Establish coordination mechanisms with relevant ISO committees to ensure alignment and avoid duplication as the architecture is refined. 6) Publish the reference architecture as an international standard. | |
| 3.15 | <p>TC 347 standards produce and consume FAIR data</p> <p>(Innovate to meet users' needs)</p> | To be determined | <p>The long-term value of data-driven agrifood systems depends on reducing friction in data management and exchange. This translates to data that can be reliably discovered, accessed, combined, and reused across organizations and borders.</p> <p>Recommendation 3.4.1 of the SAG-SF emphasizes that FAIR principles are foundational to interoperability, analytics, automation, and innovation. By embedding FAIR-aligned practices into standards, TC 347 can reduce data silos, improve trust and data quality, and enable scalable reuse of agrifood data for operational, regulatory, and sustainability objectives.</p> | <ol style="list-style-type: none"> 1) Define what FAIR means in agrifood contexts, translating high-level principles into practical expectations for data, metadata, identifiers, and access conditions. 2) Review existing TC 347 deliverables to assess how well they support findability, accessibility, interoperability, and reusability, and identify gaps. 3) Develop a concise FAIR alignment checklist for use by TC 347 working groups when drafting standards. 4) Coordinate with related ISO committees to align approaches to identifiers, metadata, and interoperability mechanisms that support FAIR data. 5) Pilot FAIR-aligned data practices in one selected TC 347 use case and document lessons learned for broader adoption. | MEDIUM (In this initial version) |
| 3.16 | <p>Enable conformance testing of FAIR data principles (3.4.1)</p> <p>(Innovate to meet users' needs)</p> | To be determined | <p>Principles alone will not provide assurance that systems actually produce and consume FAIR data in practice. Recommendation 3.4.1 of the ISO Strategic Advisory Group for Smart Farming implies the need to move</p> | <ol style="list-style-type: none"> 1) Translate FAIR principles into testable criteria, identifying observable and measurable requirements relevant to agrifood data and metadata. 2) Define conformance classes or maturity levels that reflect different degrees of FAIR implementation rather than a binary pass or fail outcome. | MEDIUM (In this initial version) |

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| | | | <p>from aspirational guidance to verifiable implementation.</p> <p>Conformance assessment enables objective evaluation, comparability across solutions, and credible claims of FAIR alignment, which are essential for trust, procurement, regulatory use, and cross-border interoperability in data-driven agrifood systems.</p> | <ol style="list-style-type: none"> 3) Identify evidence artifacts such as metadata records, identifiers, APIs, and documentation that can be used to demonstrate conformance. 4) Align with existing ISO conformance assessment frameworks, ensuring consistency with ISO rules and practices. 5) Pilot a FAIR conformance assessment approach on a representative TC 347 use case and refine the criteria based on results. | |
| 3.17 | <p>Enable low-cost risk management instruments</p> <p>(Innovate to meet users' needs)</p> | To be determined | <p>Smaller farmers, including smallholders, are the most vulnerable to adverse weather conditions, and yet typically have no access to risk management instruments such as crop insurance, weather derivatives, etc.</p> | <ol style="list-style-type: none"> 1) Study the feasibility of developing a standardized data package to represent the data needed to set up simple risk management programs, using information such as geotagged field photos, satellite-derived field boundaries, planting dates, etc as per SAG-SF rec. 3.4.15. | LOW (In this initial version of the SBP) |
| 3.18 | <p>Enable capturing the full meaning of agricultural remote sensing data</p> <p>(Innovate to meet users' needs)</p> | To be determined | <p>From SAG-SF Recommendation 3.4.24:</p> <p>Multi- and hyperspectral remote sensing images are used extensively in agriculture and livestock management for a variety of purposes. Moreover, there is an increasing interest in performing data fusion of images taken at different scales with different equipment such as satellites, unmanned aerial systems, and ground-based systems (e.g., sprayers and center-pivot irrigation systems). The interoperability of these images at scale is hindered, however, by a lack of standardization of metadata regarding the spectral bands or derived products represented by the image layers.</p> | <ol style="list-style-type: none"> 1) Survey existing approaches to machine-actionable metadata annotation for remote sensing bands and data products, both using sidecar files and embedded in image file tags. 2) Depending on results, either create implementation guidelines, or develop a standard for machine-actionable metadata for annotating multi- and hyperspectral remote sensing (satellite, UAV and ground vehicle) imagery, including specifying the data format (e.g., of tags within imagery files), the semantic resources (data types / variables, the controlled vocabularies required when those variables are enumerated) required, and the semantic infrastructure (e.g., data type registry) needed to distribute the semantic resources. We recommend that this standard be developed jointly with TC 211. | MEDIUM |
| 3.19 | <p>Track provenance, resource footprint, and use of crop inputs</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | To be determined | <p>From SAG-SF Recommendation 3.4.20:</p> <p>It is relatively common to evaluate resource footprints associated with the use of agricultural inputs (e.g., diesel consumption associated with each pass over the field, etc.) but there is less emphasis on tracking, and including in decision-making, upstream</p> | <ol style="list-style-type: none"> 1) Develop a new, or adapt an existing, standard for a controlled vocabulary and framework to describe the sources, provenance, and upstream energy requirements for producing and using agricultural inputs (e.g., fuel, machinery, fertilizer, animal feed, etc.). | HIGH |

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| | | <p>embedded energy in those inputs. Lack of accounting for upstream processes can have substantial implications on assessments of net greenhouse gas emissions and sustainability.</p> <p>There are a number of existing ISO standards in the Environmental Management, Carbon Footprint, and Lifecycle assessment domains that take a unique view of upstream emissions relative to non-ISO carbon footprinting standards where these are grouped into a “Scope 3” category that may not require even a qualitative assessment.</p> <p>The ISO 14064 series requires categorization of upstream emissions as “Controlled”, “Related” or “Affected”, thus identifying a direct link between the management of an agricultural product and its impact. Complexity is reduced by addressing only the conditions where a management change from a baseline condition has a material effect/impact on upstream emissions.</p> <p>There are, however, many gaps in collecting representative data and in standardizing inputs on a per unit of production basis. These data and quantitative approaches are needed to enable industry and consumers to make informed choices about products relative to the specific regional conditions where they were produced. For example, accurate data and comparable approaches are needed to compare concentrated protein sourced from beef cattle conversions of plant materials (indigestible by humans) on marginal lands, with protein sourced from a range of plant components grown using intensive agricultural production systems.</p> | | |
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| | | | Enhancing the capacity to make informed comparisons will help identify optimal management strategies suited to regional characteristics in support of UN SDGs, specifically 12, 13, 15. | | |
| 3.20 | Track provenance, resource footprint, and use of water (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | To be determined | SAG-SF Recommendation 3.4.21 Irrigation water is an increasingly valuable and scarce resource. Moreover, irrigation water can rarely be used without some kind of environmental impact and/or tradeoff. This impact is contingent on the water's source (e.g., groundwater, snowmelt, runoff, grey water, etc.) and provenance (where/how the water was received will translate into different embedded energy), so unambiguously representing the sources, origin / provenance and disposition of different irrigation water options would be a helpful way of making these tradeoffs more explicit during decision-making. This would enable documenting and quantifying the sustainability of irrigation with respect to UN SDGs 6, 12, 13, 14 and 15, for example. | 1) Create a smart irrigation or water resources AHG. 2) Develop a standard for a controlled vocabulary and framework for describing the sources, provenance, and ultimate disposition of water use for irrigation. | HIGH |
| 3.21 | Enable land usage history tracking (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | AHG 8 + subsequent WG. AG 4 and AG 2 in engagement. | Enabling land usage history tracking (e.g. through a "field passport") supports traceability, risk management, land evaluation and sustainability claims across agrifood systems. A standardized approach improves interoperability between data sources, enables consistent conformance assessment, and increases trust in claims related to food safety, environmental impact, climate resilience, and responsible land stewardship. It also reduces transaction costs by allowing land history information to be reused across regulatory, market, and certification contexts. | 1) Create an ad hoc group to discuss this topic (AHG 8). 2) Define the core scope and minimum data elements of a land usage history / field passport, including spatial extent, temporal coverage, and sequence of land use activities. 3) Identify and map relevant existing standards from ISO, OGC, AgGateway and related bodies to avoid duplication and ensure alignment. 4) Develop a high-level reference model showing how field passport data is created, updated, exchanged, and governed. 5) Engage priority stakeholders such as producers, regulators, certification schemes, and technology providers to validate use cases and requirements. | VERY HIGH |

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| 3.22 | <p>Enable specifying and managing data products in a machine-actionable way</p> <p>(Innovate to meet users' needs)</p> | To be determined | <p>From SAG-SF Recommendation 3.4.23:</p> <p>The ISO 19131 standard defines data product specifications as descriptions of a dataset or dataset series together with additional information that will enable it to be created, supplied to and used by another party. That standard provides a framework for representing these documents but falls short of making such documents machine actionable; this limits the scale at which they can be used.</p> <p>Additionally, the velocity and volume of agricultural data that an even modestly sized farm must handle are ever-increasing. The lifecycle management of these data cannot be left to chance because some of it is very valuable and reusable, whereas other datasets may be very voluminous and not be required beyond a certain time horizon.</p> <p>Being able to intentionally manage what happens to the data, where it is stored, for how long, etc. and to do so in a data-driven way and at scale is the motivation behind wanting a machine-actionable data management plan. A good example is the case of an agricultural technology advisor described in SAG-SF Recommendation 3.2.6. This kind of professional can only deliver services at scale if the data flows are streamlined, the necessary data is readily available, and data that are no longer as relevant are not cluttering available storage. This motivates the need for machine-actionable data management plans.</p> | <ol style="list-style-type: none"> 1) Survey existing solutions, such as the data product specifications described in ISO 19131 and the opendataproducts.org documentation. 2) Depending on results of the inquiry, either create implementation guidelines for existing materials, or develop an ISO standard to represent machine actionable data product specifications. 3) Depending on results of the inquiry, either create implementation guidelines for existing materials, or develop a standard for creating machine-actionable data management plans. | MEDIUM |
| 3.23 | <p>Enable study and management of dust</p> <p>(Innovate to meet users' needs,</p> | To be determined | <p>Wind-blown dust has deleterious effects on the growth of crops and the quality of fruits and vegetables. As many crop-producing areas of the world face rising temperatures</p> | <ol style="list-style-type: none"> 1) Develop a standard for representing and exchanging observations and measurements associated with the phenomenon of dust, both in terms of particles suspended in the air, and particles present on plant | LOW |

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| | Advance environmental sustainability through ISO standards) | | and decreasing rainfall, the frequency and severity of dust-related crop damage will only increase. Standardizing the syntax and semantics of data exchange related to observations and measurements related to dust, as well as preventive and mitigation measures associated with it, will enable more coordination in both the study and the mitigation of dust-related damage to crops. The SAG-SF also made a recommendation along these lines. (3.4.19). | surfaces. This effort is fully compatible with the ISO 19156 abstract standard and the ISO 7673-2 implementation standard currently under development in ISO/TC 23/SC 19, so the proposed standard implies creating controlled vocabularies for dust-related observed properties, features of interest, observation methods, etc. This is consistent with SAG-SF Recommendation 3.4.17. 2) Develop a standard to represent planned and actual prevention and mitigation field operations related to dust, compatibly with the work being initiated by ISO/TC 37/AHG 8. | |
| 3.24 | Enable study and management of fine bubble technology (Innovate to meet users' needs) | To be determined | From ISO/SAG-SF Recommendation 3.4.22: Fine bubble technology is an area of active research in (especially controlled-environment) agriculture, with multiple known applications ranging from promoting germination, to disinfection of surfaces and promoting nutrient uptake. ISO has a technical committee (TC 281) dedicated to this domain, but its standards focus primarily on processes for implementation of the technology, and not on representing the processes or their inputs and outputs in terms of data. Standardizing the data associated with fine bubble systems in agriculture will increase the reach of the existing TC 281 standards, paving the way for further evaluation of the technology in operational systems, as well as its use at scale. | 1) Develop a standard to represent the data associated with aspects of fine bubble technology that can enable its evaluation / use in agrifood systems. These aspects include observations and measurements (e.g., of fine bubble concentration in growth solutions), and the control variables (e.g., concentration of fine bubbles in a growth medium or irrigation water) used in managing fine bubbles, as covered by existing ISO/TC 281 (Fine Bubble Technology) standards. | LOW |
| 3.25 | Develop a MSS for data-driven crop production or updated ISO 22006 (Innovate to meet users' needs, | JWG or similar, in conjunction with ISO/TC 34 | From SAG-SF Recommendation 3.4.25: Enabling producers to formally represent the processes in their operations unlocks important strategic capabilities such as establishing management systems, from which the producers can derive multiple sources of benefit (e.g., understanding the | 1) Catalogue the perceived gaps in ISO 22006 as a standard for managing data-driven cropping systems. 2) Contingent on the results of 1), revise the ISO 22006 standard into a management system standard for data-driven cropping systems (or create a separate MSS for data-driven agrifood systems if needed), emphasizing enhancing and updating Annexes A and B, that provide | MEDIUM |

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| | Advance environmental sustainability through ISO standards) | | <p>costs associated with the different processes in their operations, managing working capital, etc.).</p> <p>Farm management information systems typically organize and represent production processes using an ad-hoc nomenclature, which makes it difficult for producers to exchange data with partners such as advisors, bankers, insurers, etc. The current version of the ISO 22006 standard provides an excellent list of processes and sub-processes (for which reason it was used as a starting point by the SAG-SF to contextualize stories, standards and capabilities), but the list is incomplete; e.g., it does not include several data-intensive processes such as risk management. A revision that includes data-related aspects would render it even more useful.</p> | <p>a set of reference processes and sub-processes for describing crop production (e.g., by including risk management). We suggest this revision be performed working jointly with TC 34 if possible.</p> | |
| 3.26 | <p>Develop a management system standard for data-driven livestock production</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | To be determined | <p>SAG-SF Recommendation 3.4.26.</p> <p>Creating a management system standard for data-driven livestock production would provide a common, auditable framework for governing data use, decision-making, and technology integration in animal agriculture. Such a standard would improve consistency, transparency, and trust in practices related to animal welfare, biosecurity, environmental performance, and productivity. It would also help organizations integrate diverse digital tools and data sources while aligning livestock operations with regulatory expectations and market requirements.</p> | <ol style="list-style-type: none"> 1) Define the scope and intended outcomes of a data-driven livestock production management system. 2) Review existing ISO management system standards and relevant livestock and animal welfare standards to identify alignment opportunities. 3) Identify priority use cases such as health monitoring, feeding optimization, emissions tracking, and traceability. 4) Draft a high-level structure and terminology set consistent with ISO management system standards. 5) Extend this work to support aquaculture. Collaborate with ISO/TC 324 accordingly (e.g., by enabling digital encoding of TC 324 standards' information recording specifications) | MEDIUM |
| 3.27 | <p>Develop and effectively use a TC 347 communications instrument portfolio</p> <p>(Innovate to meet users' needs,</p> | AG 1, ad hoc groups as needed. | <p>Looking internally, onboarding new p-members and o-members, as well as onboarding individual contributors, requires an onboarding process that we seek to streamline as a mechanism to shorten the</p> | <ol style="list-style-type: none"> 1) Assemble a set of communications guidance and education materials for members. 2) Assemble a toolkit to produce communications artifacts. | VERY HIGH |

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| | Demonstrate the benefits of standards) | | <p>time until new members can contribute, and to reduce frustration with the complexity of the ISO TC system.</p> <p>Looking externally, stakeholder engagement involves communicating value propositions, supported use cases, discussing our capability map and its coverage by existing and planned standards, etc. We need a set of communications artifacts to make this process scalable.</p> | 3) Assemble an indexed repository of artifacts available to our members. | |
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End users

| # | Objective (and supported ISO priorities) | Responsible SC or WG | Rationale | Proposed actions | Priority |
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| 4.1 | <p>Enable the SDGs (Innovate to meet users' needs, Deliver ISO standards when the market needs them, Advance environmental sustainability through ISO standards)</p> | At this stage, AG 1, possibly AG 2 | This is ultimately the mandate of our committee, given the strong impact agrifood systems have on our collective ability to attain the SDGs, and ISO's commitment to the SDGs via the London Declaration. | <p>At this early stage of the committee, we can only take indirect action through communications and stakeholder engagement, both internal and external, to raise awareness about the SDGs and TC 347's relationship with them. Early tasks to be performed include:</p> <ol style="list-style-type: none"> 1) Introduce references to the SDGs during our TC 347 webinars, 2) include the topic in our Young Professionals program, 3) clarify the rationale for our involvement with the SDGs (e.g., zero hunger, clean water, etc.), and 4) work more closely with TC 207 and external organizations such as FAO. | MEDIUM |
| 4.2 | <p>Satisfied, well-informed and engaged standards end-users (Innovate to meet users' needs, Demonstrate the benefits of standards,</p> | At this stage, AG 2, with help from AG 1 | The success of TC 347's efforts will depend on the extent to which its work is implemented by practitioners. The ISO strategic advisory group for smart farming (ISO/SAG-SF) pointed out that there exists a standardization awareness gap among technology implementors in the data-driven | <ol style="list-style-type: none"> 1) Develop a continuous improvement mechanism to <ul style="list-style-type: none"> • monitor and increase stakeholder awareness of, and satisfaction with, ISO standardization efforts and their applicability to these act/tors' own circumstances. This effort will involve instruments such as surveys, and emphasis will be placed on iteration and successive refinement. | MEDIUM |

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| | <p>Deliver ISO standards when the market needs them,</p> <p>Capture future opportunities for international standardization)</p> | | <p>agrifood systems domain; i.e. technologists who could benefit greatly from using ISO (and other) standards end up implementing their own solutions, duplicating efforts, and so forth, unaware of the existence of ISO standards that could make implementation easier and more scalable.</p> <p>This objective represents the measurable result of all preceding activities.</p> | <ul style="list-style-type: none"> • detect opportunities for making standards more usable (e.g., more machine actionable) through schemas, registries, SMART development, etc. • Identify and implement best practices for integrating standards into the agrifood systems domain. • Identify and implement best practices used by other standardization committees (from ISO and elsewhere) for developing, organizing, and enabling the implementation of standards <p>2) Implement the continuous improvement method.</p> | |
| 4.3 | <p>Enable more efficient, sustainable and resilient agrifood systems</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | AG 1 coordinating with AHGs 2, 6, 7, 8 and the WGs they spawn. | This, together with Objective 4.2, are keys to enabling the SDGs. At this early stage of TC 347's work, it is an aspirational goal, but which will serve to keep TC 347's work aligned. | 1) Cultivate and communicate, internally and externally, a systems perspective of how the different, lower-level objectives in this model, especially a reference architecture and the need to prevent divergence/incoherence, contribute to enabling this goal. | MEDIUM |
| 4.4 | <p>Enable data-mediated investment in crop inputs / management</p> <p>(Innovate to meet users' needs)</p> | Ad hoc / working groups to be determined | Farmers, especially those with less land and resources, tend to be risk averse; this often manifests as a reluctance to invest in crop inputs (e.g., fertilizer) because of the perception that if the year is very bad (e.g. in terms of weather) then they will be unable to recover their investment in crop inputs. While this approach limits their losses in bad years, it also places a limiting upper bound on the yields of their crops and their farm's income, leads to soil nutrient depletion, etc. | 1) Develop a series of standards for a data-driven decision- and discussion-support framework including the standardized connection of crop simulation models, weather data (including forecasts) along with crop input prices and available risk management product availability, to enable technologists to build lightweight tools to optimize yields, minimize risks, etc. | MEDIUM |
| 4.5 | <p>Enable data interoperability in the food industry</p> <p>(Innovate to meet users' needs)</p> | Initially do this in the context of a CAG or interoperability advisory group. | This is the fundamental means toward the ends expressed in our more aspirational objectives: an ongoing process of identifying and developing the standards necessary for data to flow as needed by the agrifood industry. | 1) Continuously review TC 347's reference architecture; identify and prioritize standardization needs. 2) Continuously review opportunities for incorporating new technologies (e.g., AI) that can accelerate solutions to, or gainfully transform, interoperability problems in agrifood systems. | MEDIUM |
| 4.6 | More, informed data sharing | AG 1 and others TBD | More informed data sharing facilitates trust, transparency, and better decision-making by | 1) Develop and deploy mechanisms to assess the degree to which data sharing is happening. | MEDIUM |

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| | (Innovate to meet users' needs) | | <p>clearly communicating the quality, origin, and limitations of data. Establishing robust standards for data exchange and data traceability reduces ambiguity, mitigates risks associated with data misuse, and ensures compliance with ethical and regulatory frameworks. By enabling / supporting secure and effective collaboration across stakeholders, informed data sharing drives innovation, improves operational efficiency, and contributes directly to achieving the SDGs as well. Please refer to the Open Data Institute's Theory of Change work associated with data sharing.^{xxiv}</p> <p>This objective is informed by SAG-SF recommendations 3.4.14 and 3.4.11,</p> | <ul style="list-style-type: none"> • This involves collating statistics on access, use, and certification relating to TC 347's standards. <ol style="list-style-type: none"> 2) Promote the data-ethics-by-design / responsible innovation approach of TC 347 among stakeholders. 3) Emphasize the importance of data quality and data provenance tracking in TC 347's reference architecture standard(s) and follow-up publications. 4) Develop a standard for a simple, usable framework for summarizing and communicating terms, conditions and privacy policies used in producer- and service-provider-facing data contracts (e.g., based on a set of graphic symbols). (See SAG-SF Recommendation 3.4.14). 5) Identifying and amplifying instances of standards implementation and their benefits. 6) Building a repository of artifacts demonstrating use cases and impacts of standards. | |
| 4.7 | <p>Better integration of crop & livestock systems</p> <p>(Innovate to meet users' needs, Advance environmental sustainability through ISO standards)</p> | AHG 6, 2, and 8, and the WGs that arise from them | <p>Following SAG-SF Recommendation 3.4.19:</p> <p>There is an increasing global emphasis on reducing the resource footprint of agriculture and livestock production. Integrated crop-livestock systems can be a powerful tool to advance this idea, but when lifecycle analyses are performed and sustainability indicators are calculated, it is often the case that they fail to properly account for the transfer of materials and energy between crop and livestock components (e.g., a crop not suitable for sale can be fed to cattle, waste from livestock can be used to reduce commercial fertilizer use, etc.).</p> <p>This is the result of a lack of standardization and of management information systems for crops and livestock having been developed independently and by different providers.</p> | <ol style="list-style-type: none"> 1) Develop a standard to enable data exchange at different spatial (e.g., farm, field and subfield) and temporal (seasonal, daily) scales between farm and livestock management systems. Identify points of contact between these systems, model the data involved, and enable their exchange. Examples include daily pasture biomass production, grazing by the herd, water and nutrient balance, applications of manure, disposition of a lost crop as animal feed, manure pit management, etc. 2) Develop educational materials to help practitioners integrate crop & livestock system data in pursuit of more profitable, sustainable and compliant agrifood systems. | MEDIUM |
| 4.8 | Enable food loss and waste mgmt. through data | New AHG or JWG | Estimates of how much of the world's food production is lost or wasted hover around 40%. Reducing food loss and waste is a | <ol style="list-style-type: none"> 1) Following SAG-SF Recommendation 3.4.12, engage with TC 34/SC 20/WG 2 in joint work to model data | MEDIUM |

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| | (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | | straightforward way to increase available food supply and improve global food security without the need to add arable land or additional crop inputs. | payloads to represent food loss and waste disposition events. | |
| 4.9 | Enable regenerative agriculture through data (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | New AHG | Enabling regenerative agriculture through data would help translate regenerative principles into measurable, comparable, and verifiable practices. Standardized data frameworks improve consistency in how soil health, biodiversity, water outcomes, and carbon dynamics are measured and reported, increasing credibility and trust in regenerative claims. This also supports scalability by allowing data to be reused across farms, supply chains, markets, and policy contexts while lowering barriers to participation for producers. | <ol style="list-style-type: none"> 1) Define a common set of regenerative agriculture outcomes and associated data categories (i.e., reference data). 2) Identify existing standards and metrics relevant to soil, biodiversity, water, and carbon and map gaps. 3) Extend the observations & measurements and land use histories data models (and semantic resources) for collecting, managing, and exchanging regenerative agriculture data, including biodiversity metrics. 4) Engage producers, researchers, buyers, and certification bodies to validate priority use cases and data needs. | MEDIUM |
| 4.10 | Enable a circular bioeconomy (Innovate to meet users' needs, Advance environmental sustainability through ISO standards) | New AHG | Enabling a circular bioeconomy through data would support efficient use, reuse, and valorization of biological resources across agrifood systems. Standardized data models and governance practices improve traceability of biomass flows, reduce information asymmetries, and increase confidence in sustainability, safety, and origin claims. This enables innovation, supports regulatory compliance, and helps scale circular practices while reducing waste and environmental impacts. | <ol style="list-style-type: none"> 1) Identify priority circular bioeconomy use cases in agrifood systems such as byproduct reuse, nutrient cycling, and bioenergy. 2) Define core data elements and indicators needed to track biological materials across their life cycles. 3) Map relevant existing standards from ISO and related organizations to ensure alignment and interoperability. 4) Develop a high-level reference model for data exchange and governance in circular bioeconomy applications. | MEDIUM |
| 4.11 | Enable diffusion of agrifood system technological innovations (Innovate to meet users' needs, | New AHG, AG 1, AG 2, AG 3 | <p>There are many innovations of great value to agrifood systems that do not directly lend themselves to standardization.</p> <ul style="list-style-type: none"> • “Innovation” in this context is anything that can be represented as a digital asset, such as blueprints for a simple planter, software source code, digital documentation, etc. | <ol style="list-style-type: none"> 1) Establish liaisons with ISO/TC 324 (Sharing economy) 2) Create an AHG to explore a standard for a federated platform for diffusion of innovations. <ul style="list-style-type: none"> • This could be analogous to a Github with reputation management layers for contributors, implementors and users. • Instances of the platform could be implemented by innovation hubs, universities, etc. | MEDIUM |

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| | | | <p>There is a need for a way to make these innovations visible and accessible (via different business models), linking:</p> <ul style="list-style-type: none"> • contributors (e.g., inventors, software developers), • implementors (e.g., a village blacksmith / entrepreneur) and • users (e.g., farmers) world-wide. | <ul style="list-style-type: none"> • The federated aspect would allow users to search across instances. <ol style="list-style-type: none"> 3) Review TC 324's ISO 42500 series of standards. Determine what gaps (e.g., an agrifood systems specific metadata scheme) exist that must be resolved to implement a federated system of diffusion of innovation. 4) Identify appropriate partners and work with them to demonstrate the system through a pilot. 5) Produce a standard or technical specification and implementation guidelines to enable replication. | |
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Annex A: Phased operational roadmap, dependency management, and AI

To strengthen resource focus and reduce the risk of fragmented work, ISO/TC 347 will manage its strategic objectives using an explicit phased roadmap, analogous to the 3-horizon strategic roadmap of the ISO Strategic Advisory Group for Smart Farming (SAG-SF) final reportⁱ, with clear dependencies between foundational deliverables and sector-specific standards. This roadmap does not replace ISO’s project approval processes; rather, it provides an internal discussion-support tool for prioritizing proposals, aligning subgroups, and sequencing work so that outputs are mutually reinforcing.

Phase 1 (Foundational): shared semantic and architectural backbone

Phase 1 emphasizes completion and stabilization of the shared foundations on which most TC 347 deliverables will depend, including the agrisemantics framework emerging from AHG 2 work, reference architecture components (e.g., capability model, use cases, baseline terms and definitions) emerging from ISO/IWA 47, and other cross-cutting resources needed to ensure coherence across the portfolio.

This phase can be imagined as a pyramid (Figure 2), where each layer supports and enables the ones above it, starting with the bottom, semantics-heavy layer.

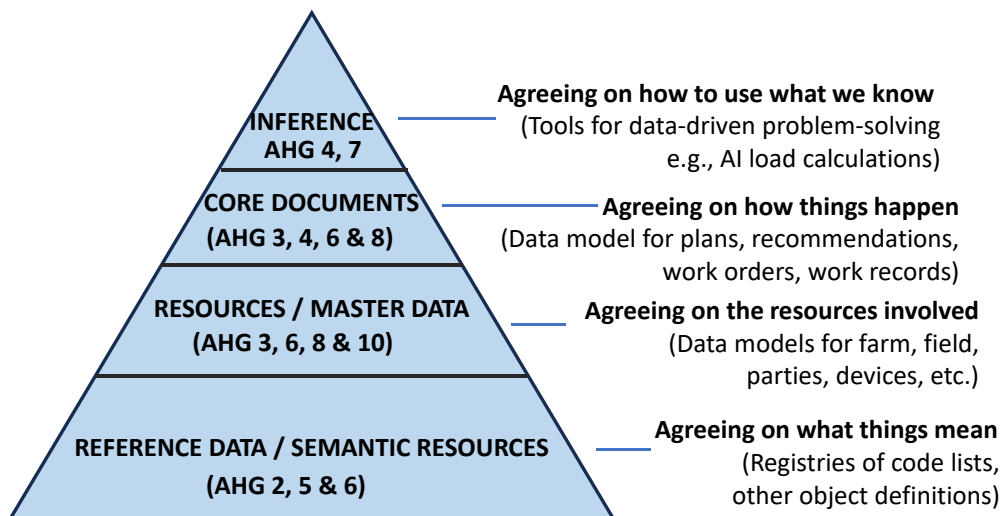


Figure 2: TC 347 Phase 1 strategy

Phase 2 (Sectoral): domain- and value-chain-specific standards built on Phase 1

Phase 2 prioritizes standards and guidance that apply the Phase 1 foundations to specific subdomains (e.g., livestock, arable crops, controlled environment agriculture, supply chains and logistics, sustainability reporting) using modular, reuse-oriented structures. Phase 2 initiatives will be expected to reference, conform to, and when possible, contribute to the Phase 1 foundations, or else explicitly justify deviations (e.g., where legacy ecosystems require transitional pathways).

Roadmap governance and entry criteria

TC 347 will maintain a lightweight dependency register that identifies which objectives, projects, and work products are prerequisites for others, based on (and enriching, where appropriate) the dependencies shown in the strategy matrix below. When proposing new sectoral work, proponents will identify:

- which Phase 1 foundations are required (or missing),
- how the proposed work will reuse (not duplicate) existing foundations,
- if/how the proposed work will contribute to as-yet unfinished foundations,
- what implementation partners exist for early validation, and
- how the work reduces fragmentation by harmonizing with related ISO committees and recognized liaison organizations.

This approach enables TC 347 to “get the basics right first” while still allowing timely sectoral work when market signals justify acceleration.

Future-proofing: data governance and Generative AI considerations

Given the accelerating use of data-driven models, including Generative AI, in agrifood decision-making, ISO/TC 347 will ensure its strategic objectives explicitly account for data governance concerns that materially affect trust, interoperability, and responsible adoption. This includes addressing how data is sourced, attributed, protected, and used in AI-enabled systems, with particular attention to the realities of agrifood value chains and smallholder contexts.

Priority governance themes to address across TC 347 deliverables

- Data provenance and traceability: ensure that TC 347 standards enable documenting origin, lineage, transformations, and quality of data (including sensor, lab, and human-entered data) so that downstream users can assess fitness for purpose. See actions 2.16.4 and 4.6.3 below.
- Ethical use of AI in decision-making: promote transparency and accountability for AI-assisted recommendations, including appropriate human oversight and risk-aware use cases. See actions 2.10.1 to 2.10.6, 2.11.2, 2.11.4, 2.16.3 (Aligned with Seoul Statement), 2.16.4, 4.6.2.
- Data ownership and rights in AI contexts: recognize and support clear articulation of data rights, permissions, and obligations when agrifood data is used to train or operate large models, including considerations for benefit sharing and contractual clarity where applicable. See activity 4.6.4, based on SAG-SF Recommendation 3.4.14.

Implementation approach

TC 347 will treat these topics as cross-cutting requirements for standards design (e.g., metadata expectations, auditability hooks, and interoperability of governance-related information) and will coordinate them through its responsible innovation function (AG 3) and liaison relationships with relevant ISO and IEC committees. Where appropriate and as mentioned in several of the abovementioned actions, TC 347 will publish guidance (e.g., technical reports or implementation guidelines) that helps implementers apply governance principles consistently without impeding innovation.

Annex B: Strategic performance management and SMART KPIs

ISO/TC 347 will complement its qualitative strategy map and strategic objective descriptions with a small set of quantitative, time-bound key performance indicators (KPIs)ⁱ to increase clarity, measurability, and accountability. These indicators will be designed as SMART KPIs (specific, measurable, achievable, relevant, and time-bound) and will be maintained as a living instrument that supports portfolio decisions, resource focus, and transparent communication with both internal and external stakeholders.

KPIs will be aligned with the four perspectives used in TC 347's strategy map (Learning & growth, Internal processes, Deliverables, End-users). The number of KPIs will be kept at a minimum, to limit measurement overhead. For each KPI, TC 347 will define: an operational definition, a baseline, a target (typically 12–36 months), the cadence of measurement, the data source, and accountable role(s) for maintaining the KPI.

A committee-level KPI dashboard will be reviewed at each plenary and summarized at least annually. Where feasible, KPI tracking will leverage existing ISO systems and subgroup reporting to avoid duplication and reduce burden on experts. A possible (non-exhaustive) set of KPI set includes:

- Standards output: number of International Standards (IS), Technical Specifications (TS), and Technical Reports (TR) published; and number of active projects progressing on schedule.
- Inclusive participation: change in P-member participation and expert engagement, especially from developing countries (e.g., attendance, leadership roles, editor roles, and contributions).
- Architecture uptake: evidence of adoption of the TC 347 reference architecture (and associated semantic foundations) by external platforms and initiatives.
- Implementation traction: number of successful pilots, testbeds, plugfestsⁱ, or implementations that use TC 347 standards or draft deliverables, including captured lessons learned.
- The “big picture”: progress on delivering the ISO Strategic Advisory Group for Smart Farming's (SAG-SF) 49 recommendations.

KPI definitions and targets will be periodically validated against perceived market needs and stakeholder feedback to ensure that performance management remains an enabler of agility, not a constraint.

Notes

ⁱ For greater clarity on the meaning of this statement, please refer to ISO's *ISO Strategy 2030 document*, available online at <https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100364.pdf>

ⁱⁱ In this document the word “billion” means 1 000 million when referring to numbers of people or currency. Other uses will be marked.

ⁱⁱⁱ FAO, Almost half the world's population lives in households linked to agrifood systems, 2023, online available at <https://www.fao.org/newsroom/detail/almost-half-the-world-s-population-lives-in-households-linked-to-agrifood-systems/en>

^{iv} Statista, Food – Worldwide, 2023, online available: <https://www.statista.com/outlook/cmo/food/worldwide>

^v FAO, Family Farming Knowledge Platform, 2014, online available: <https://www.fao.org/family-farming/detail/en/c/281544/>

^{vi} WTO, Charts – World trade in agricultural products, 2022, available online at: https://www.wto.org/english/tratop_e/agric_e/ag_imp_exp_charts_e.htm

^{vii} UN, The remarkable trade rebound of 2021 and 2022, 2023, available online at: https://unctad.org/system/files/official-document/ditctab2023d1_en.pdf

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- viii FAO, Markets and Trade, 2024, online available: <https://www.fao.org/markets-and-trade/areas-of-work/emerging-trends-challenges-and-opportunities/en/>
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- xxi ISO Strategic Advisory Group for Smart Farming, 2023. *Final report with recommendations*. Available online at <http://go.iso.org/SAG-SF-report>
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