Standardized digital labels: enablers of on-farm business value

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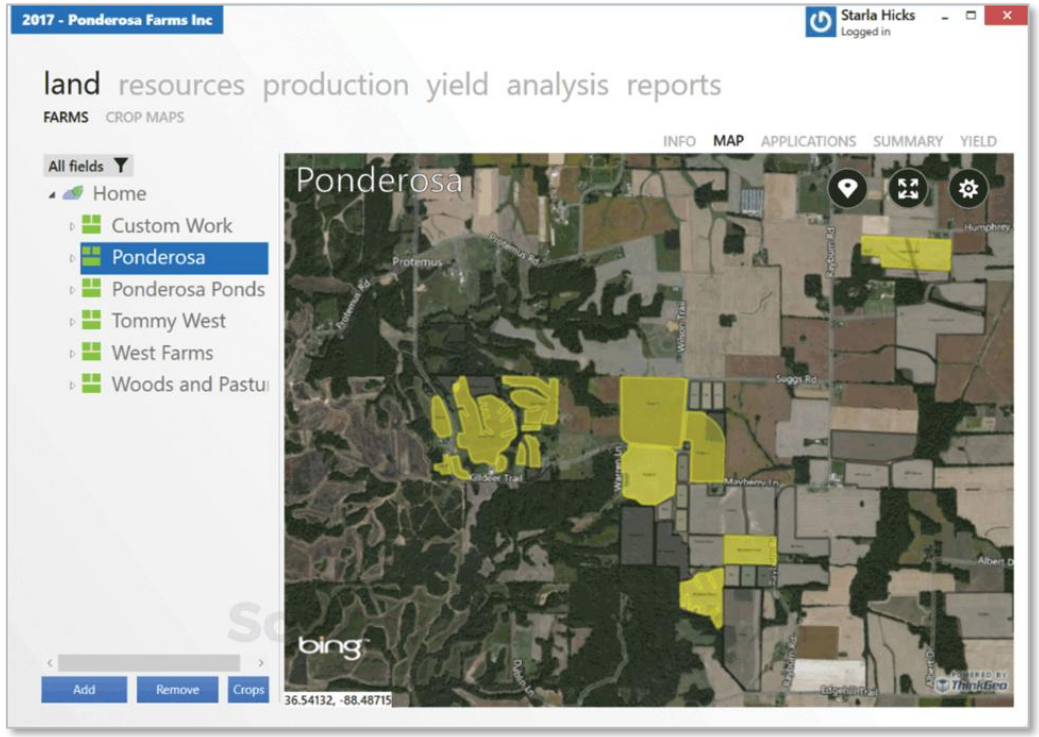
ISO/TC 347

Data-driven agrifood systems

CERSA AI-Ready Pesticide Labels: Building the Digital Foundation for Smart Agriculture

A quick story: Ag Connections



- Provided farmers with a **Farm Management Information System** (FMIS) that **helped solve business problems**, e.g.:
  - Am I making or losing money on this field?
  - Can I afford a rent increase?
  - Am I being billed properly for products?
  - Am I applying chemicals by the label?
  - Regulatory and business partner reporting
- Had to **aggregate selected data from many farmers**, to summarize their use of certain kinds of products, compare to program thresholds, and then aggregate that over different geographic regions.
- We created a powerful handheld data entry platform
- We were even able to bring in application data in from John Deere equipment and use it for record keeping… **in 2007!**

Why this worked

- Very strict in maintaining **reference data**
  - Unique codes for each crop and product
  - Product definitions included active ingredient concentrations, REIs, etc.
  - Users had to request products that were not in the database
- Very strict with grower-specific **master data**
  - Unique identifiers for each grower, farm and field
  - Unrecognized resources had to be resolved before import
- **Mass balance** was king!
  - total = rate * area
- Enabled sending reference / master data out to machines
- Invested very heavily on a skilled and friendly **support team** that managed the reference data and helped customers solve **workflow** problems.
- We worked very hard to keep the system **simple and focused on fundamentals**

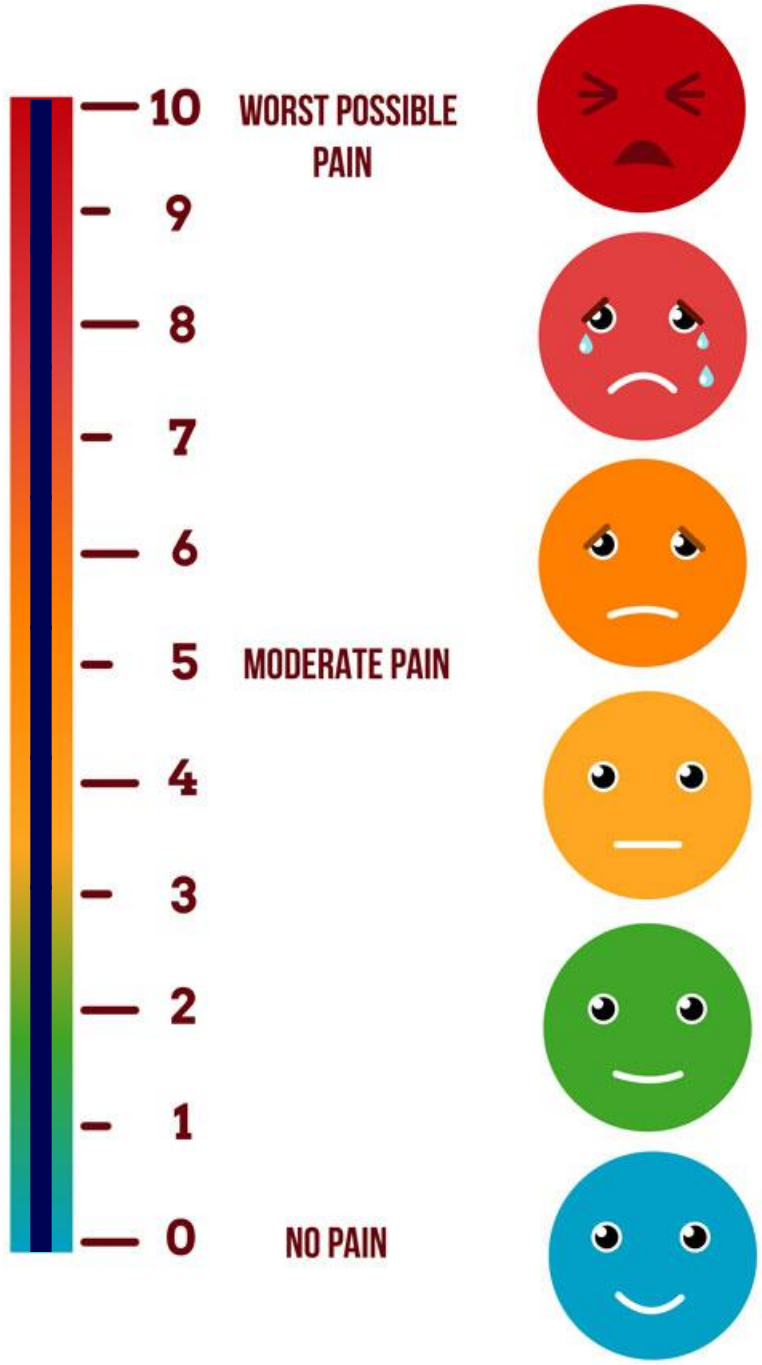
When farm management information systems start to fail

1. (Unmet) expectation of frictionless experience

- (“I don’t have time for this”)*
- Importing data from machines is difficult
- Desire for quick user-created resources
- Equipment is rarely calibrated well enough for the numbers to match
- Workflows that match scale data with precision ag data rarely work well

2. Exchanging data with business partners is painful

- There is no standard data package for regulatory and market partner reporting: processors, bankers, GAP certifications, FMIS, etc. all have their own requirements, formats and code lists
- Reporting is a huge burden!



* Typically because the value of doing this ***well*** is unclear

Yet farming is getting harder

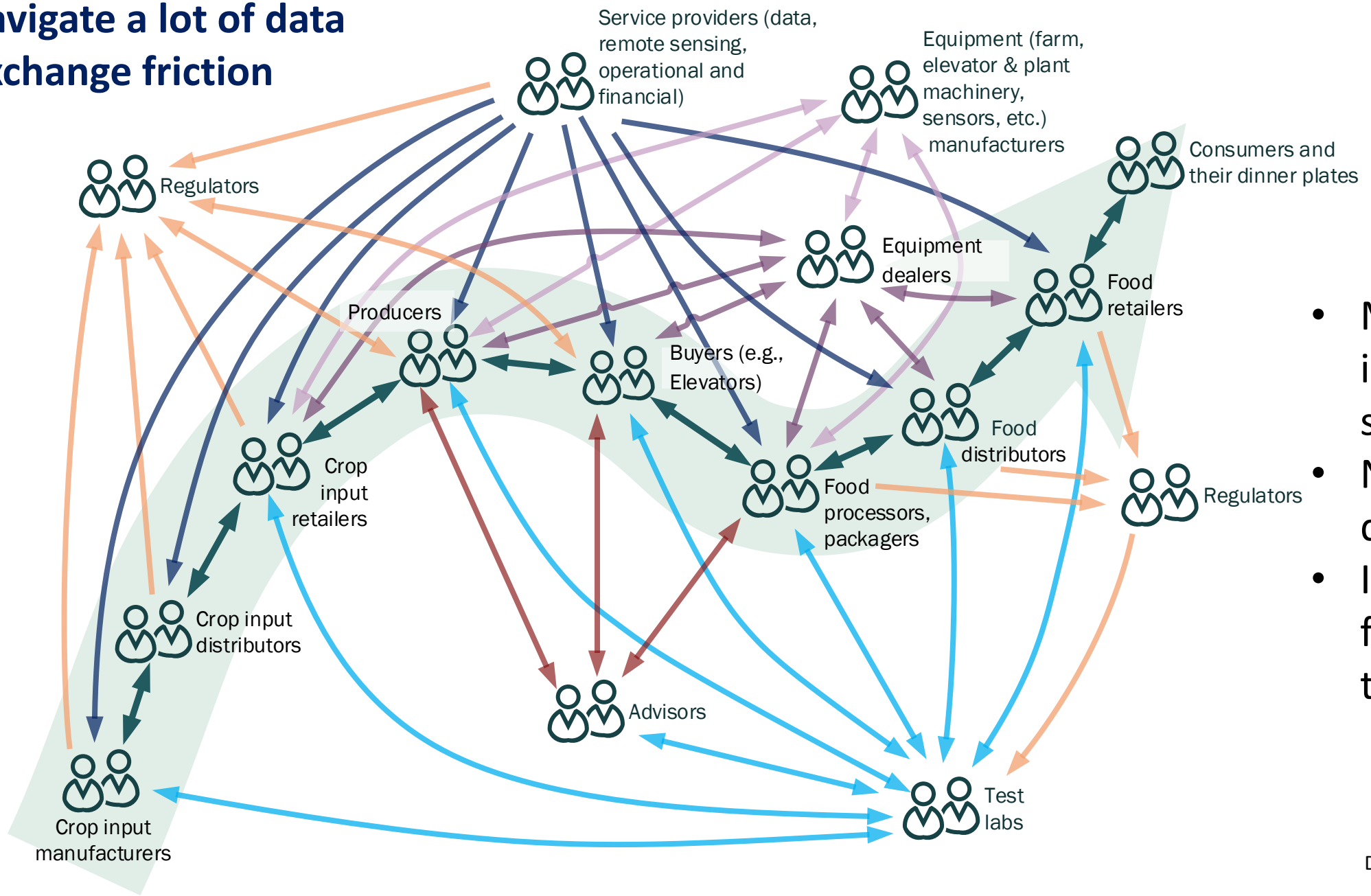
- Agricultural production is a complex, adaptive process that involves hundreds of **decisions** per crop season.
  - Complex regardless of farm size
  - Smallholders*
    - more vulnerable
    - less access to inputs, advice, finance, risk management, etc.
- In the past these decisions were often driven by traditional local customs. In this **rapidly changing world** (Climate change! Supply chain disruptions! Political unrest!), they must increasingly be made based on **data**.

* Definition varies geographically; often using farm area (e.g., < 2 ha) as a threshold

And farmers need to do so much more!!

- Ag Connections was tackling fundamental questions
- Today, answering those questions is necessary but not sufficient!
  - Farmers operate under a diminishing supply of crop inputs
    - Tools must be smarter to help with complicated optimization problems
  - Farmers face climate and supply chain disruptions
    - Require complex, data-driven risk management instruments
  - Farmers have to overcome labor shortages
    - In direct labor: not enough people available to plant, harvest, care for crops, etc.
    - Advising: Not enough extension personnel; costs too high for contractors.
  - Agrifood systems are not currently an aspirational career choice for youth!

And supply-chain actors must navigate a lot of data exchange friction



- Many data flows in the agrifood supply chain
- Normal part of doing business
- Interoperability friction throughout

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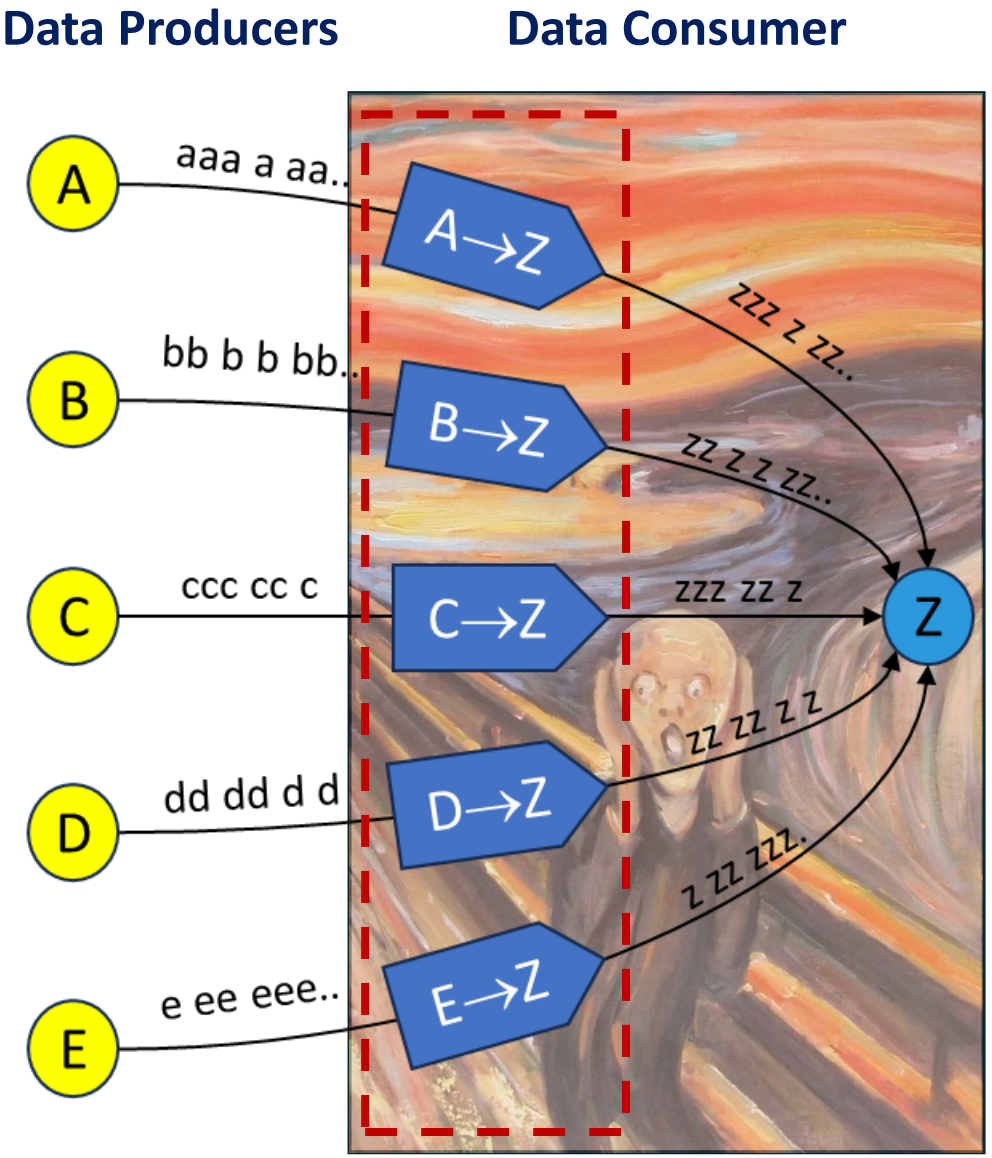
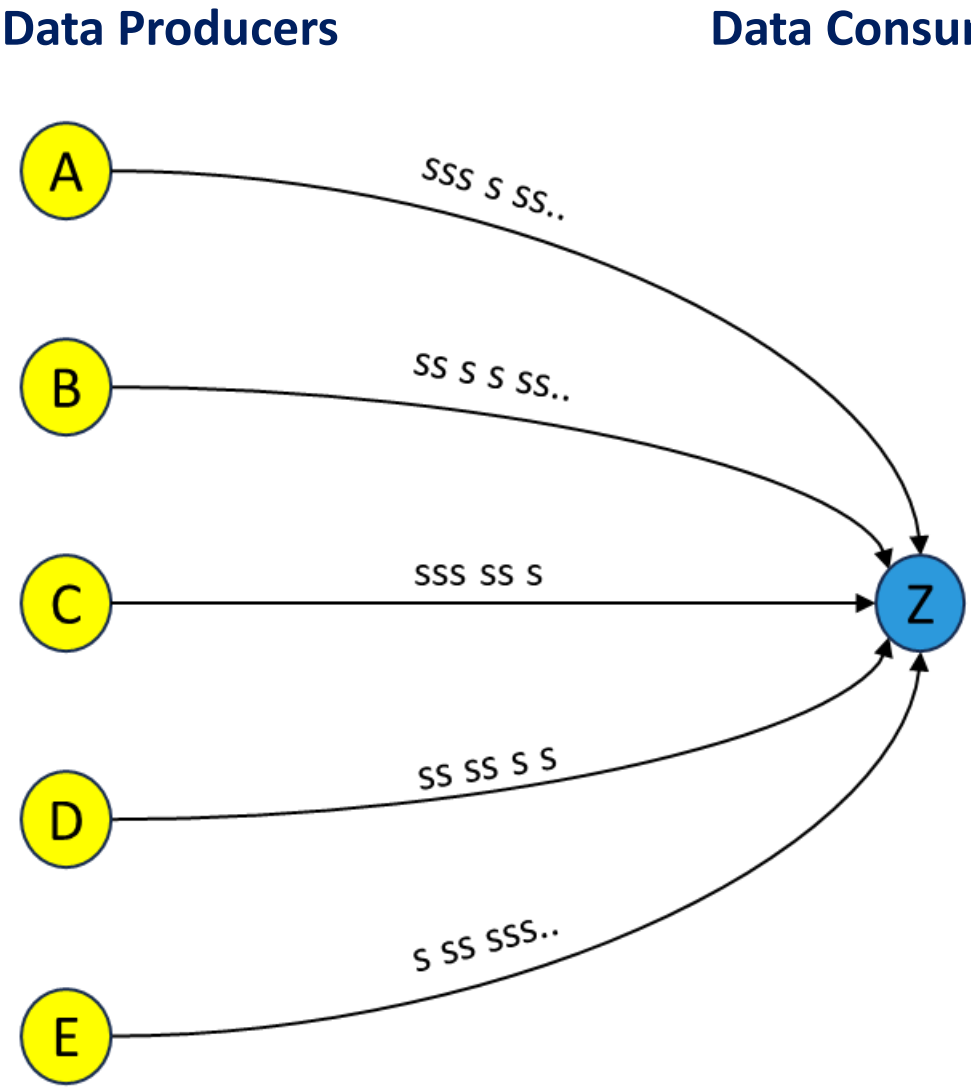


Not Using Standards:

Many translations to maintain → large burden on data consumer's system



Using Standards:

No translations needed → creating data-driven tools is much easier

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When you find yourself in a hole, stop digging

(Wordsworth Dictionary of Proverbs (2006) p 283

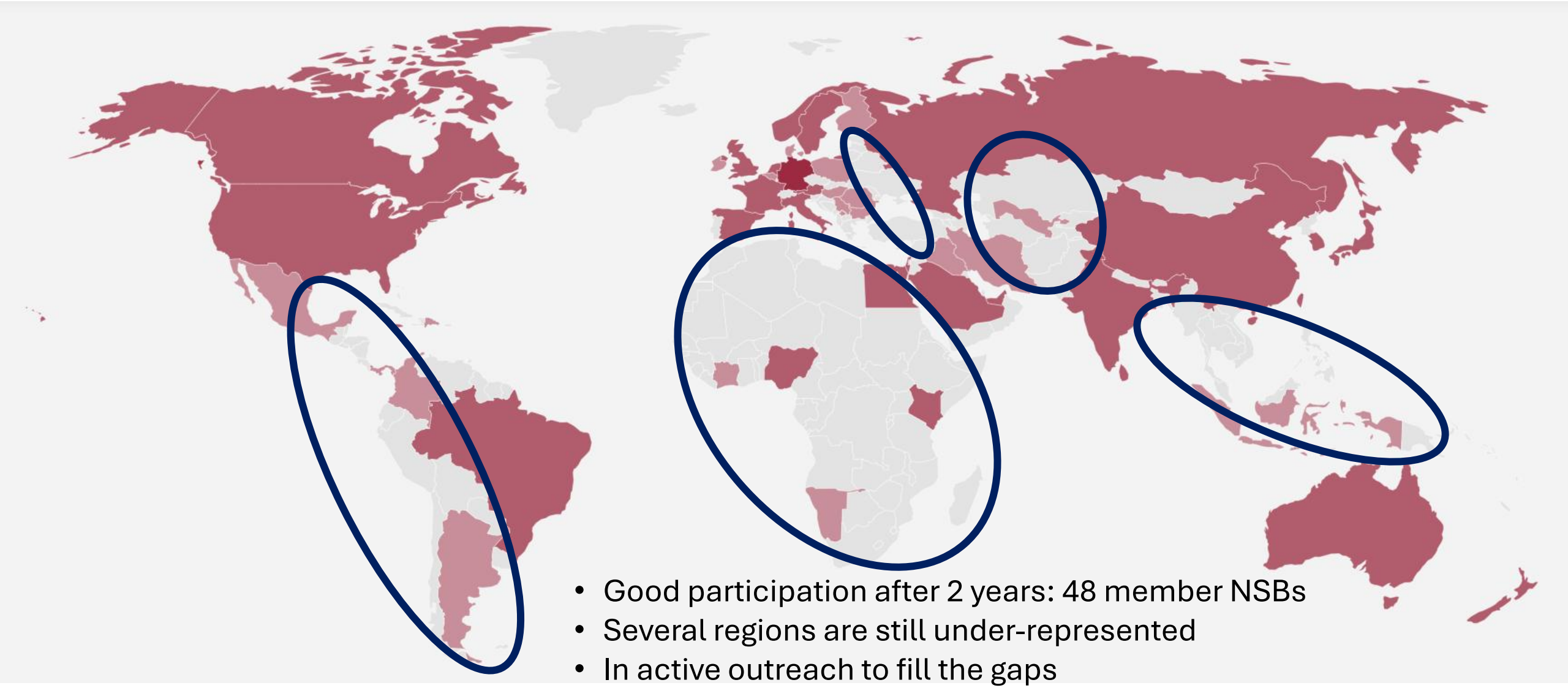
- Our industry is in a bind: our standards aren't enough to support data-driven, decision-making needed to solve modern problems / the SDGs.
- This emerges from the bottom-up growth of both the industry and its standardization efforts.
- The **International Organization for Standardization (ISO)** realized this, chartered a Strategic Advisory Group for Smart Farming
  - 180 experts from 21 national standards bodies (NSBs)
  - Mission: develop a strategy to guide hybrid top-down, bottom-up action.
- Key part of the proposed strategy: create a permanent home for standards specific to data-driven agrifood systems. This is now ISO Technical Committee 347 (ISO/TC 347).

Picture: https://upload.wikimedia.org/wikipedia/commons/a/a7/Stop_Digging_%5E_-_geograph.org.uk_-_195319.jpg

ISO and how it works

- Intl. Org. for Standardization (ISO)
  - Members → National standards bodies (**NSBs**)
    - e.g., for the USA: American National Standards Institute (ANSI)
  - ISO has technical committees & subcommittees (**TCs/SCs**)
  - When TCs/SCs are created, each participating NSB typically designates a standards development organization (**SDO**) to represent it and manage a **national mirror committee (NMCs)**.
- How national mirror committees and standardization work
  - The national mirror committees will:
    - Designate experts to develop and evaluate standards for the TC/SC.
    - Manage the experts' participation and determine the country's positions regarding standards
- How are ISO standards used?
  - Industry use is typically voluntary
  - Regulators often refer to ISO standards, e.g., if a product complies with a cited ISO standard, it is presumed to conform to legal requirements.
    - e.g. ISO 13485 (quality systems in medical devices), ISO 45001 (Occupational health and safety mgmt.)

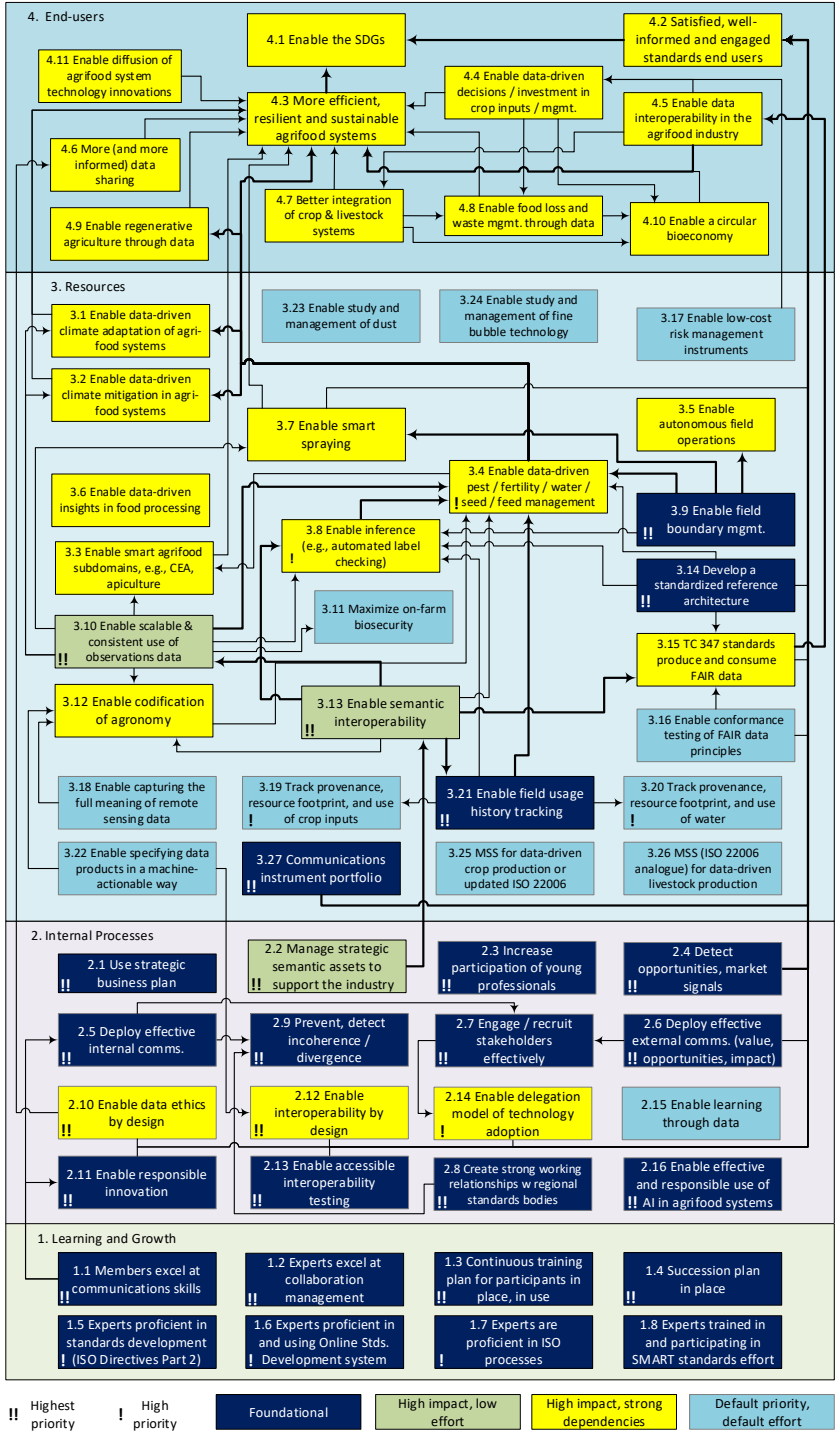
Participation in ISO/TC 347 (Members)



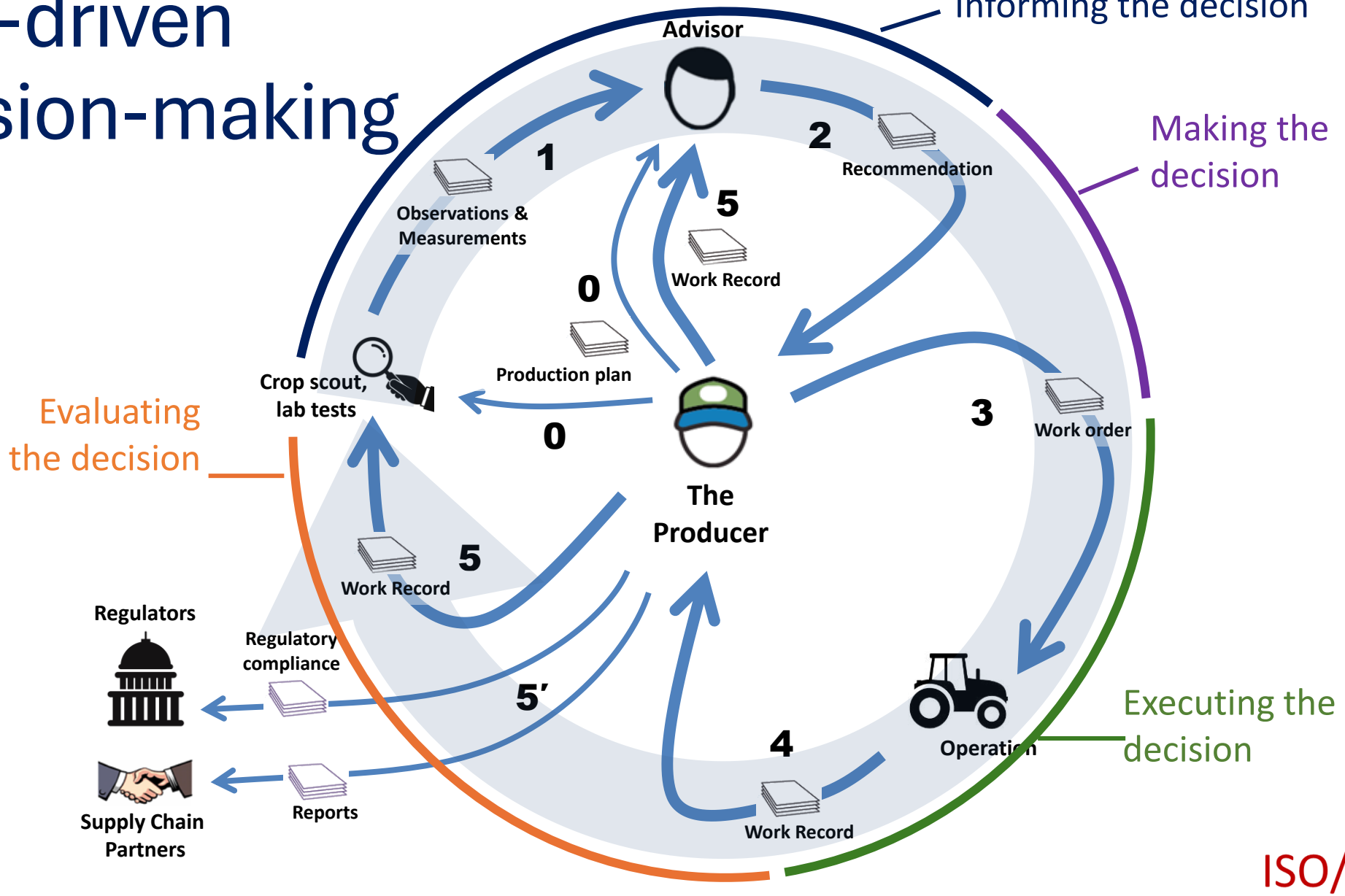
- Good participation after 2 years: 48 member NSBs
- Several regions are still under-represented
- In active outreach to fill the gaps

TC 347 strategic plan

- Set of strategic objectives
  - Seek to help attain the SDGs by enabling more efficient and resilient agrifood systems.
- We work backward from there.
- The strategy has four layers that build on one another:
  - Learning and growth
  - Internal processes
  - Resources
  - End users



Data-driven decision-making



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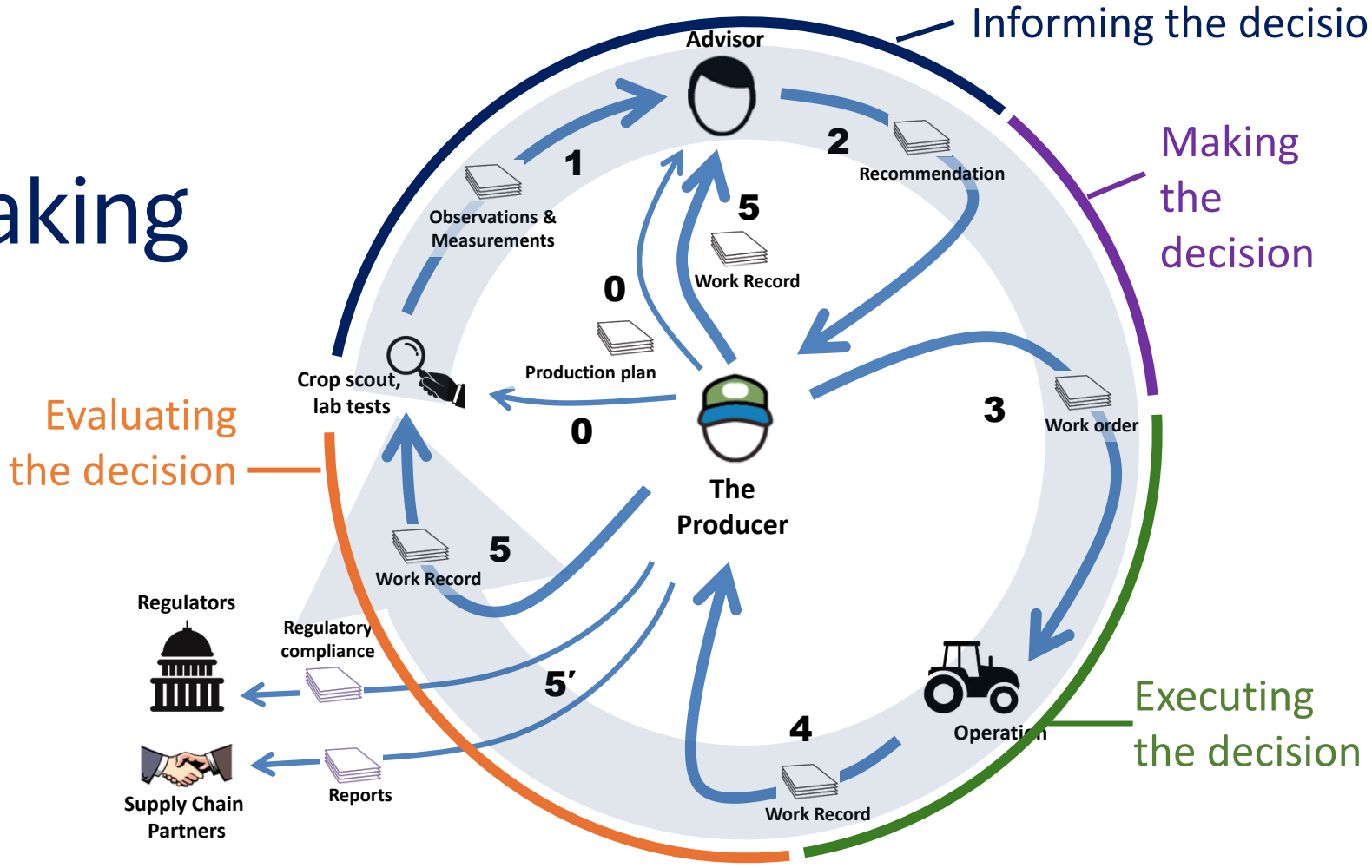
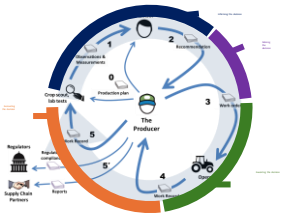
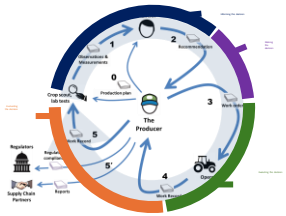
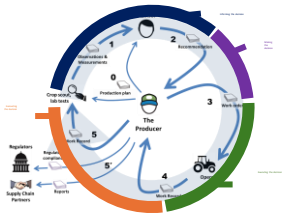
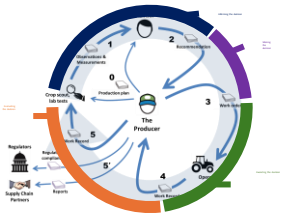
Data-driven decision-making

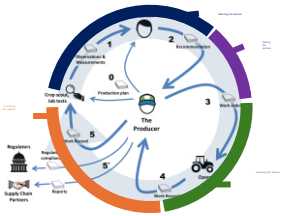


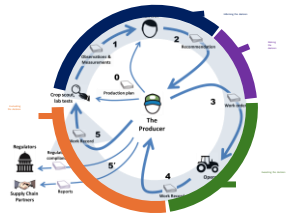

Planning/Prevention


Procurement


Planting


Crop Care


Harvesting

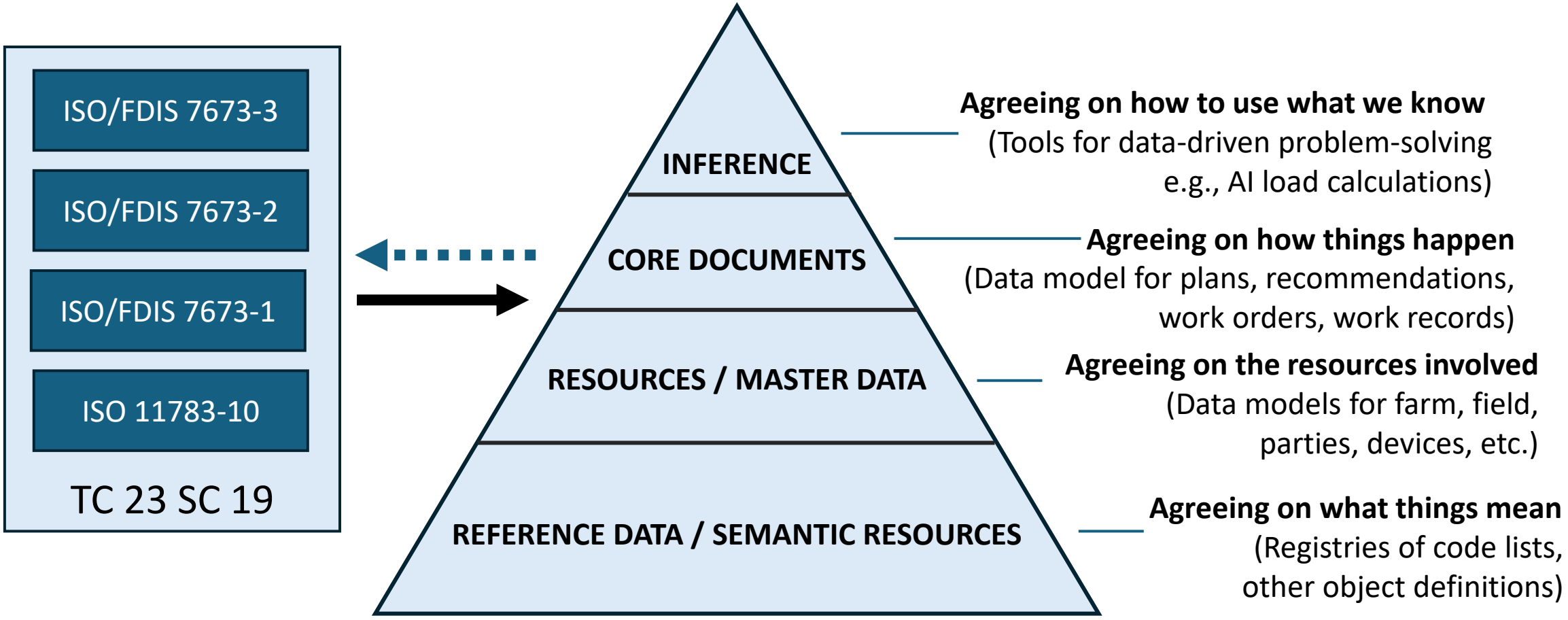

Post Harvest

Compatible with

Supports

TC 347 Early strategy

ISO Committee



Current Ad hoc groups in ISO/TC 347

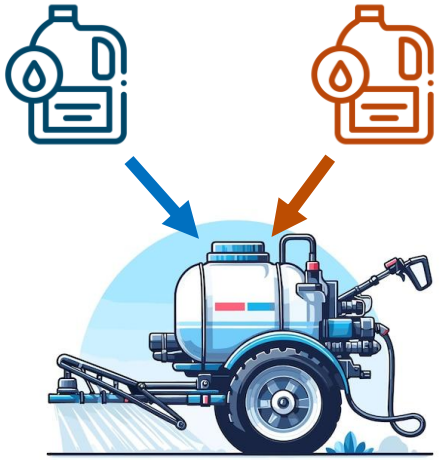
Reference	Title	Status
ISO/TC 347/AHG 1	Strategic Business Plan	Active
ISO/TC 347/AHG 2 →	Model and controlled vocabulary of crops Now WG 1 (Agrisemantics)	Active
ISO/TC 347/AHG 3	Greenhouse and controlled environment automation Now WG 2	Active
ISO/TC 347/AHG 4	Integrated Pest Management (IPM)	Active
ISO/TC 347/AHG 5 →	Annotating agrifood data for AI	Active
ISO/TC 347/AHG 6	Livestock activities tracking	Active
ISO/TC 347/AHG 7 →	Enabling actionable insights from field operations data	Active
ISO/TC 347/AHG 8 →	Digital land usage histories/ field passports	Active
ISO/TC 347/AHG 9	Digital representation of manual field operations	Active
ISO/TC 347/AHG 10 →	Digital representation of field boundaries	Active
ISO/TC 347/AHG 11	Enabling smart apiculture	**Approved** / Active
ISO/TC 347/AHG 12	Enabling smart irrigation	**Approved** / Active
ISO/TC 347/AHG 13	Enabling the use of ontologies in data-driven agrifood systems	**Approved** / Active
AHG 14?	Enabling the digital representation of externalities (incl. Livestock byproducts)	**Balloting**
AHG 15? →	Enabling the use of observations & measurements in IPM	**Balloting soon**
PWI under WG 1? →	Machine-actionable unit of measure codes	**Balloting soon**
PWI under WG 1? →	Machine-actionable representation of modes of action	

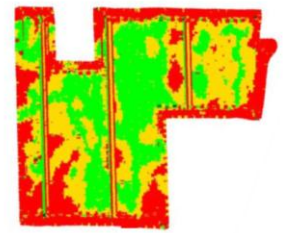
Some ways of doing business don’t work any more

- The days of selling chemicals or seeds and disengaging from how the customer uses them are disappearing.
- Input and equipment manufacturers are increasingly invested in helping the customer maximize effectiveness, safety, and on-target use of products.

Use case: Active ingredient (AI) load

- Product labels typically impose annual upper limits on the amount of active ingredients applied per unit area (e.g., kg/ha).
- Opportunity to help the user!
- Translating this into data
  - Must keep track of every product application, incl. date/time, rate
  - Must record the concentration of products in the tank mix
  - Calculate amount of each product per unit area, across all applications
  - Calculate amount of each AI per unit area, across all applications
  - Add up AI across products and applications
  - Compare against thresholds
    - **Warn user if planned application would exceed AI maximum as per label**
  - Do this when planning an application, to protect user & environment
- This requires strict management of
  - product identity
  - product formulations (e.g., gm AI / L of product)
  - active ingredient identity
  - units of measure
  - electronic (and geographically accurate) application records



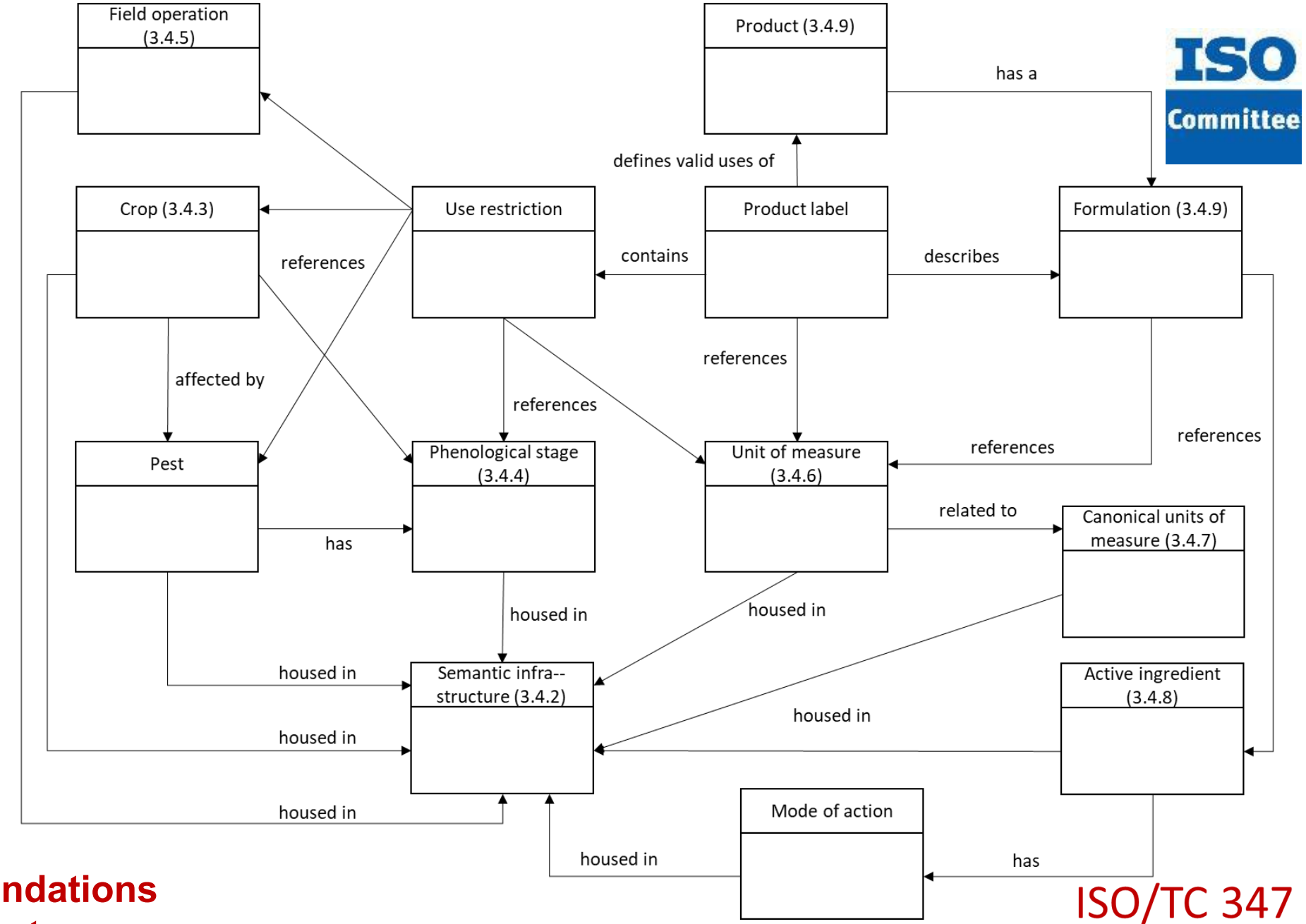


Reference data = preservation of meaning

The reference data problem

- We collect **massive** amounts of data with farm equipment, drones, etc.
  - Much of that involves recording the application of products (seeds, chemicals, fertilizers) on fields.
- These data are highly underutilized
  - A very common problem is poor identification of the applied products
  - “Product 1”, or free-form, misspelled text strings entered in the cab (best case) lead to the need for “record linkage” (reconciling these ad hoc product ids with known ids.
  - Users ***hate*** doing this; it’s unsustainable.
- While some of these are workflow problems (to be discussed later), some are also the result of poor reference data.

Objective 3.12: What's inside?



High-priority recommendations from ISO/SAG-SF Report

(find it at https://bit.ly/3MP0SXf)

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Good master data is required

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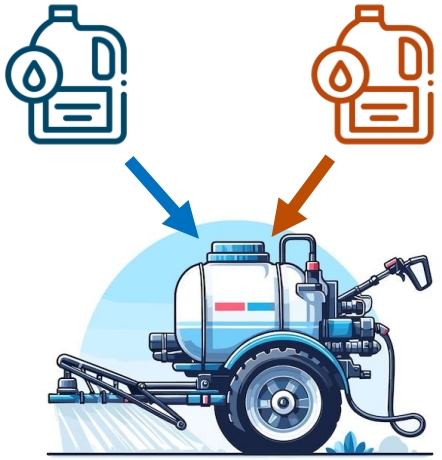
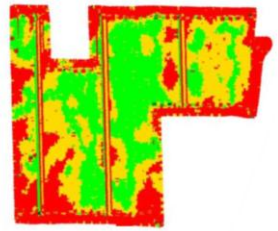
Field operations data





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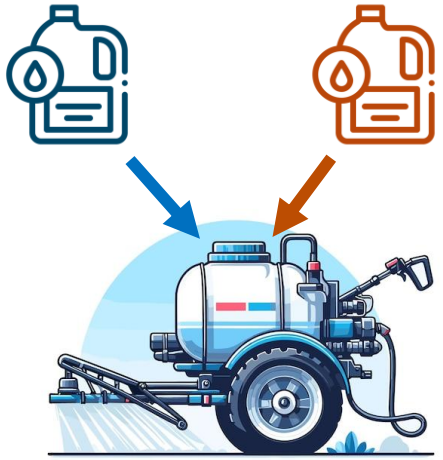
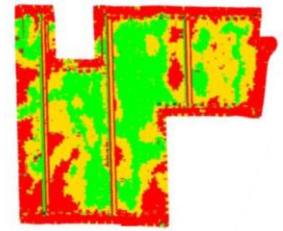


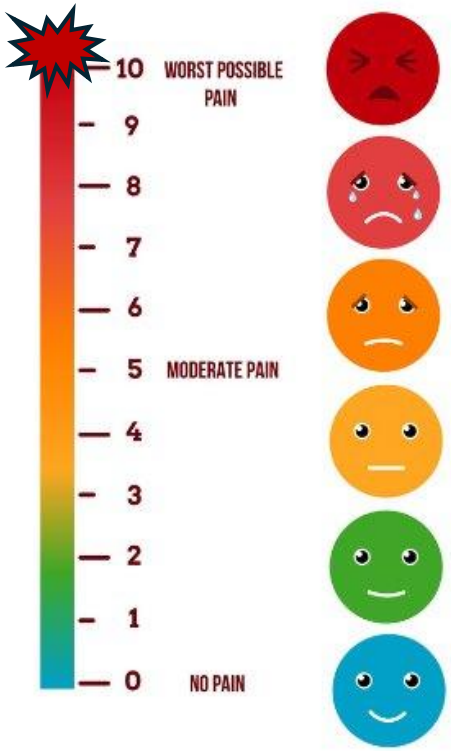


Good workflows are required

In closing

The problem and how to start solving it

- The problem
  - We collect **massive** amounts of data with farm equipment, drones, etc.
  - Intuitively we know that production data can be valuable.
  - Yet farmers have difficulty using those data to create value.
  - Semantic and syntactic interoperability have a part in this, but there's more.
- How to start solving it
  - Recognize that the users are being set up to fail.
    - It's hard to know what data you need for solving a given problem.
    - It's hard to know how good those data have to be.
    - It's hard to orchestrate getting it to the right place at the right time, in the right format and using the right set of codes.
    - Nobody explains this in a straightforward, actionable way!
  - TC 347 standards can help set technologists up for success



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Data-driven agrifood systems

What we are trying to do with standards

- **Unlock scale**: Enable scalable solutions to complex agrifood systems problems
- **Reduce friction**: Prevent tech debt in startups (less reinventing of the wheel)
- **Enable repeatable value creation**: Technologists worldwide developing decision-support and workflow management tools
- **Set farmers and other users up to succeed** in data-driven decision-making and value creation workflows

How to participate in TC 347

- Most work happens online
- Two plenary meetings per year
  - **Virtual** (October, 2 x ½ day over Zoom)
  - **In-person** with some hybrid participation (March, 4 days)
- Working groups, ad hoc groups and advisory groups meet more often, but set their own schedule
- 2 ways of contributing to TC 347:
  - **Through your national standards body**
    - Participate directly in work, help vote
  - **Through a liaison organization**
    - Participate directly in work, don't vote
- Contact us!
  - email: info@isotc347.org
  - LinkedIn: https://www.linkedin.com/company/iso-tc-347
  - Main ISO page: https://www.iso.org/committee/9983782.html

Thank you!

Email us at info@isotc347.org

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