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Rye grass breeding techniques: What Patent Analysis Reveals

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7 April, 2025

Rye grass breeding challenges

Patents: More Than Just Legal Documents - A Goldmine of Innovation Insights for Plant Breeders

Image generated by AI

Patents & Plant Breeding - Let's Connect the Dots

Understand Emerging Trends

- **See where innovation is heading in graminea, legume, and forage breeding.**

Identify Key Players & Competitors

- **Know who the active researchers and organizations are, globally and in specific areas.**

Discover New Techniques & Approaches

- **Learn about cutting-edge breeding methods being patented (like CRISPR) and their applications.**

Spot Collaboration Opportunities

- **Identify potential partners based on co-patenting activity.**

Avoid Redundancy & Focus Your Research

- **See what's already patented to guide your own innovation directions and avoid reinventing the wheel.**

Patent Analysis: Turning Data into Actionable Intelligence

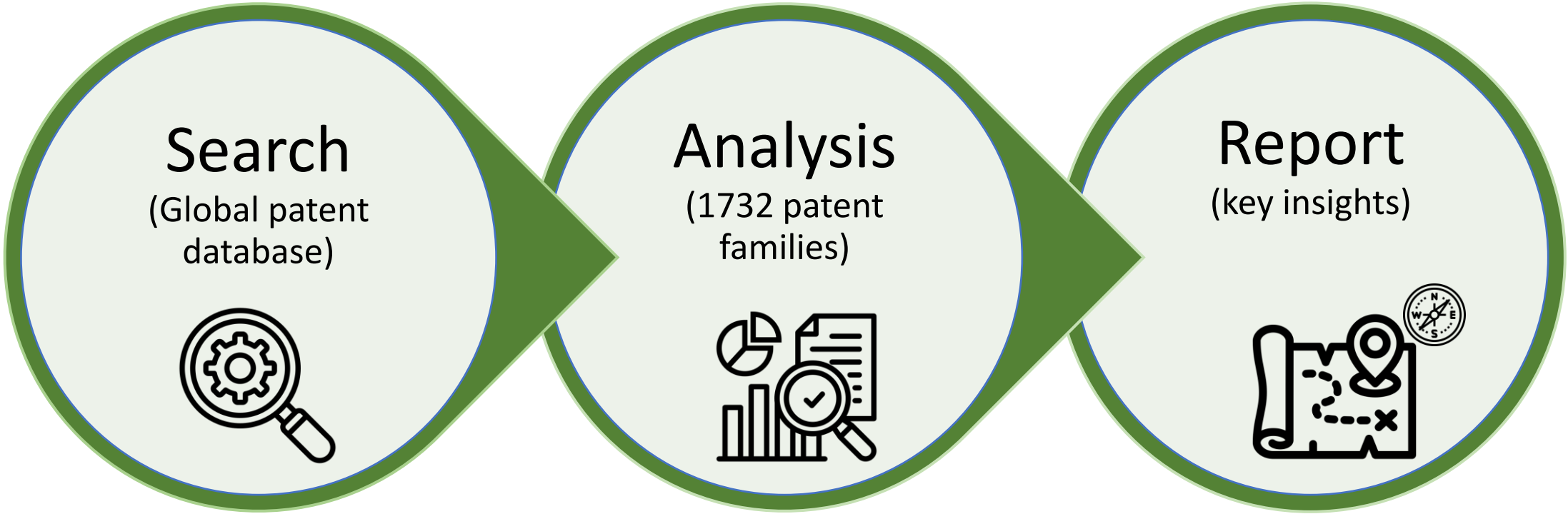
Graminea
Poaceae
Lolium
Rye Grass

Forage
Pasture

Legume
Fabaceae
Clover
trifolium

Breeding
techniques

Patent Analysis: Turning Data into Actionable Intelligence



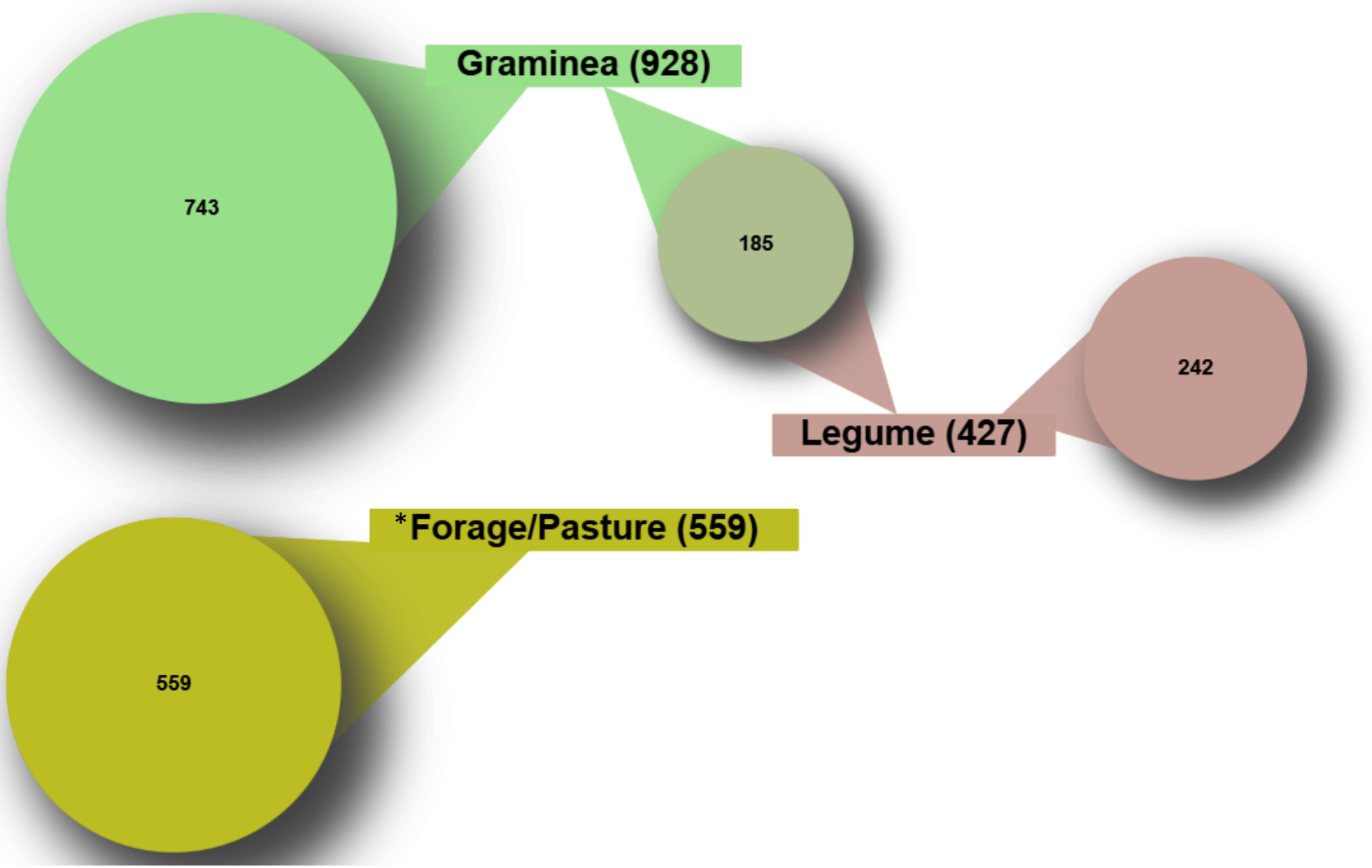
Our Journey Today: Key Sections of the Patent Analysis Report

- General Overview
- Regional activity
- Worldwide activity
- Focus on CRISPR
- Overall key take-aways

General overview

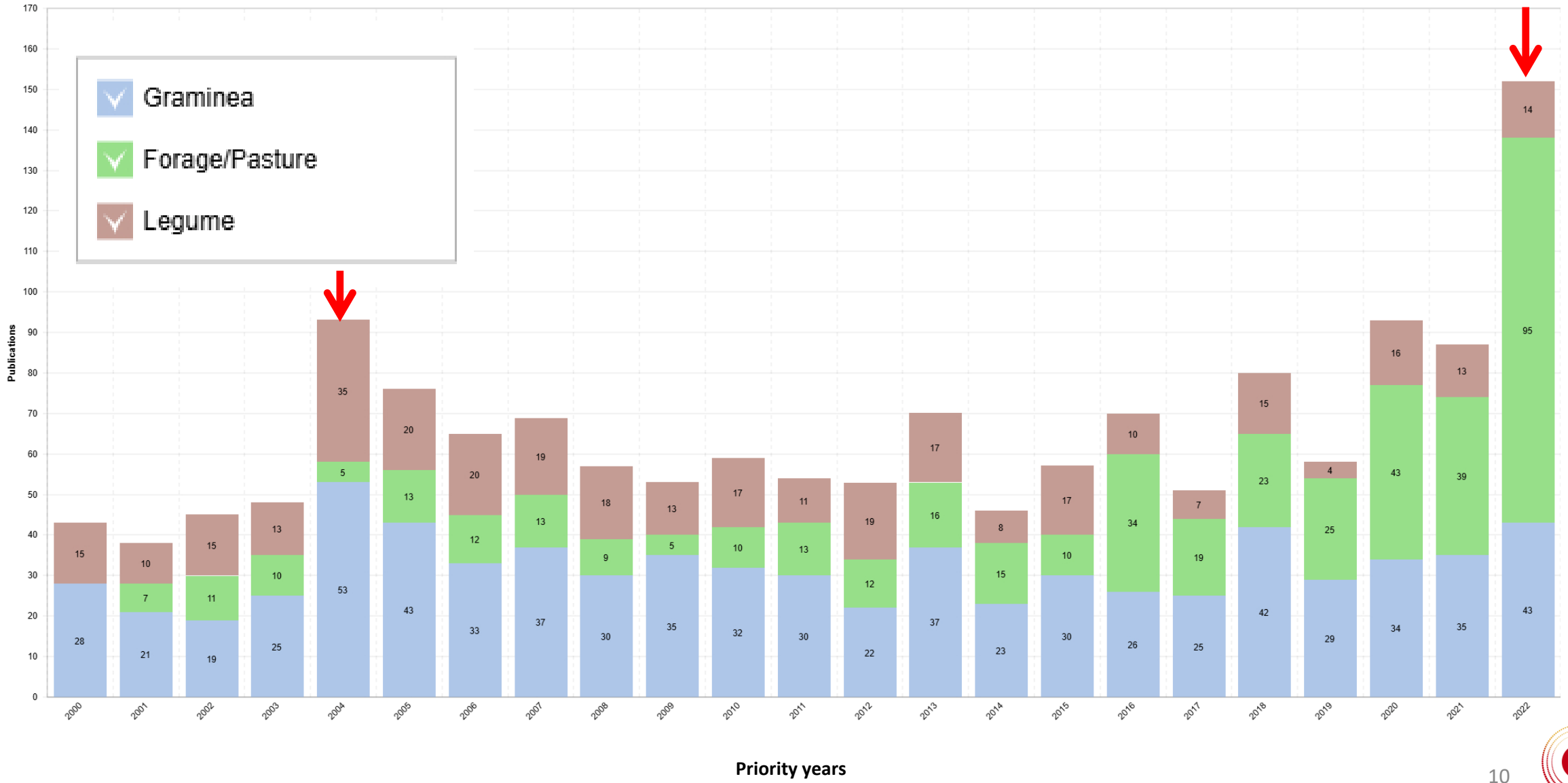
- Overview of the global rye-grass breeding patenting activity

Gramineae species are the main focus of patents and include some overlap with the Legume patent families



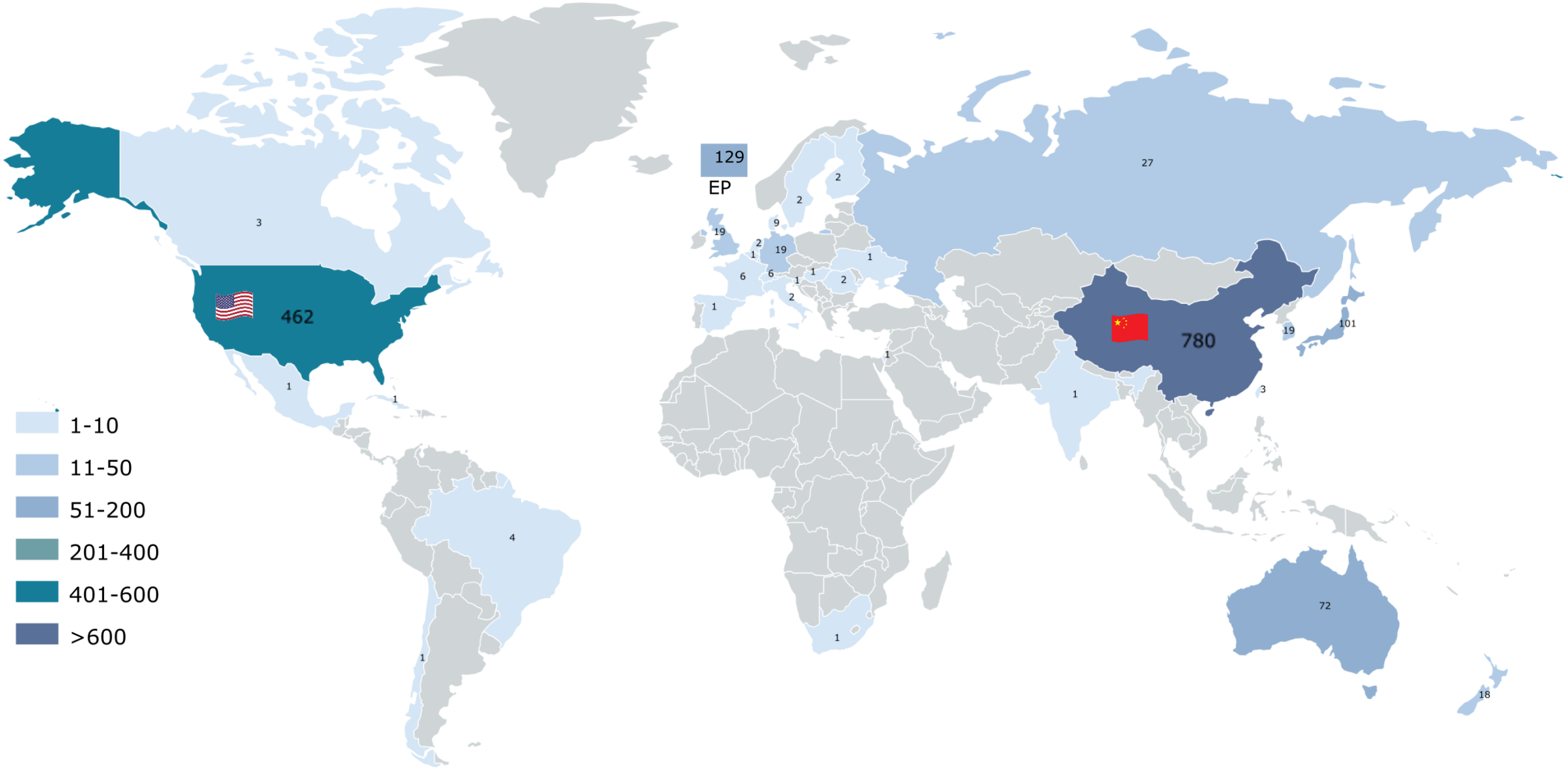
* *'Forage/Pasture'* refers to patents that do not explicitly mention Gramineae or Legumes.

Generic forage breeding is a primary Chinese focus from 2022!

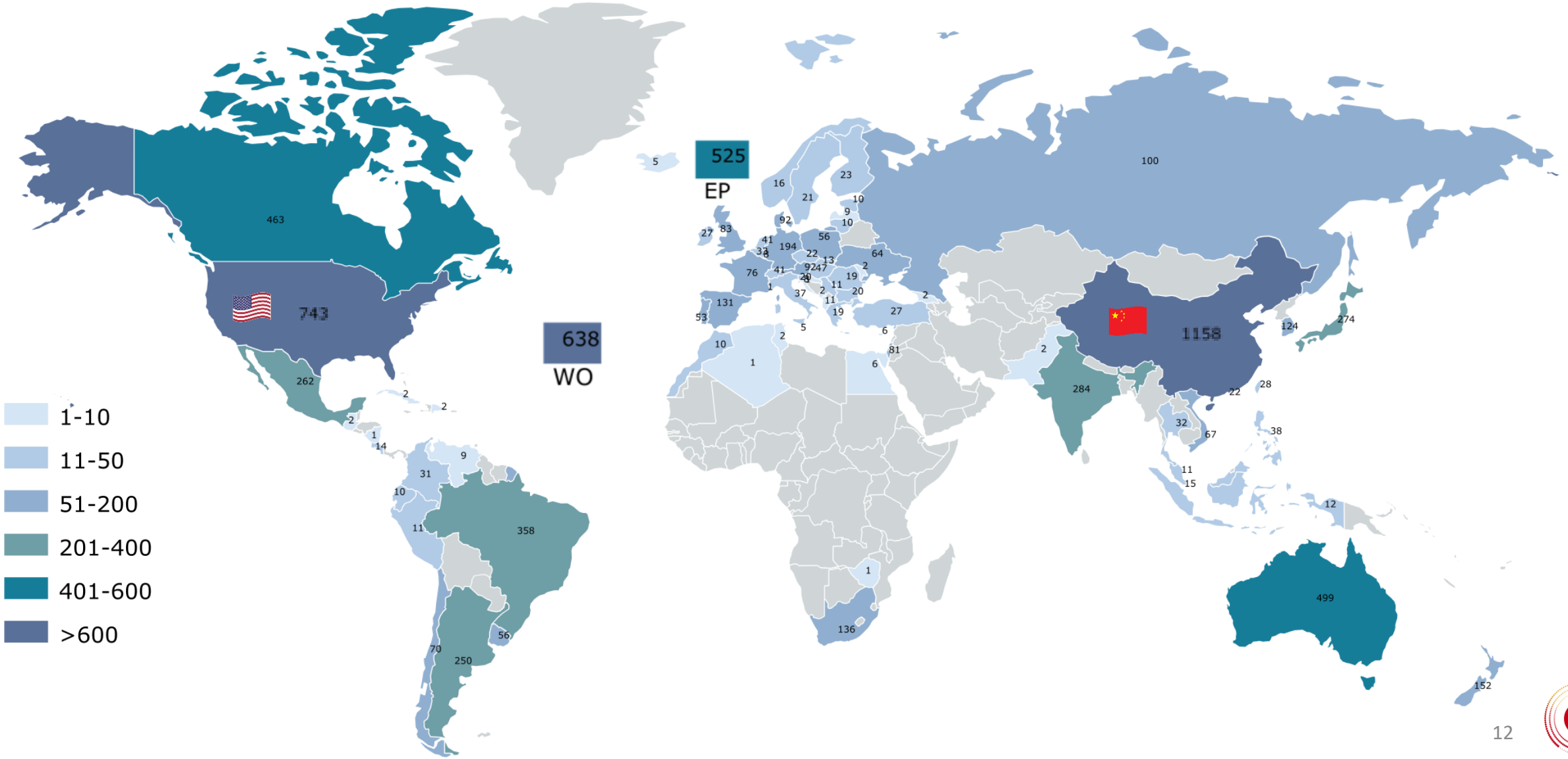


The year 2024 might not be complete due to the delay of publication

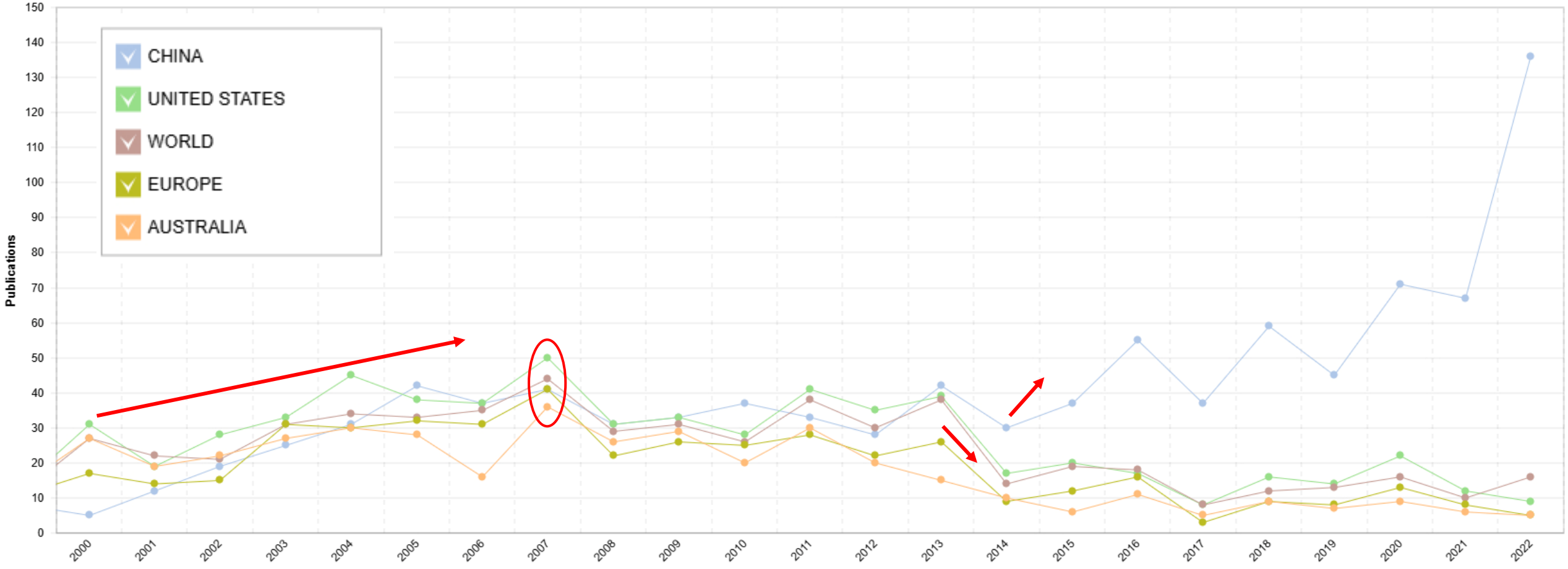
Where is the research located? China (>45%) and the US (~26%) dominate the patent filing



Where are inventions protected? Besides China and the US, there are many WO, EP, AU and CA patents



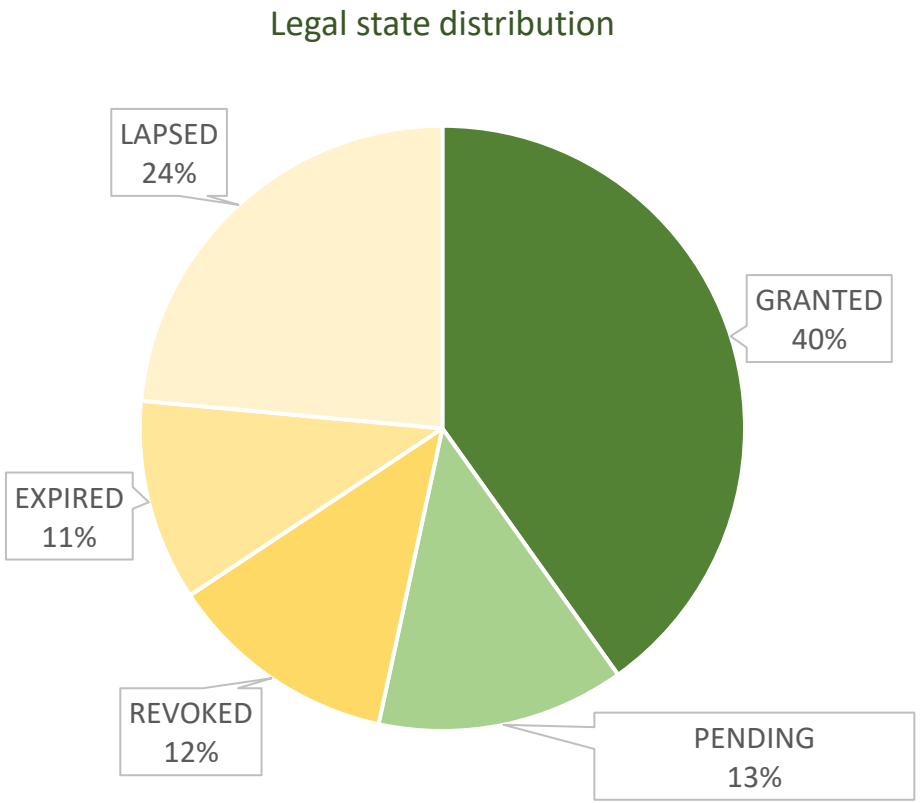
Breaking point in 2013 between China and the rest of the world



Temporal distribution of patent publication (from 2000)

Only ~half of the portfolio is active!

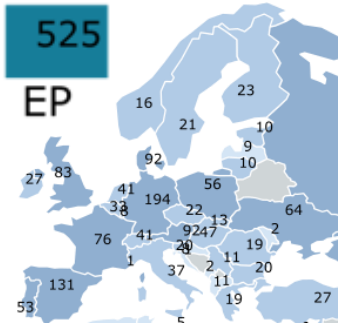
1732 Patented inventions
922 Active patents



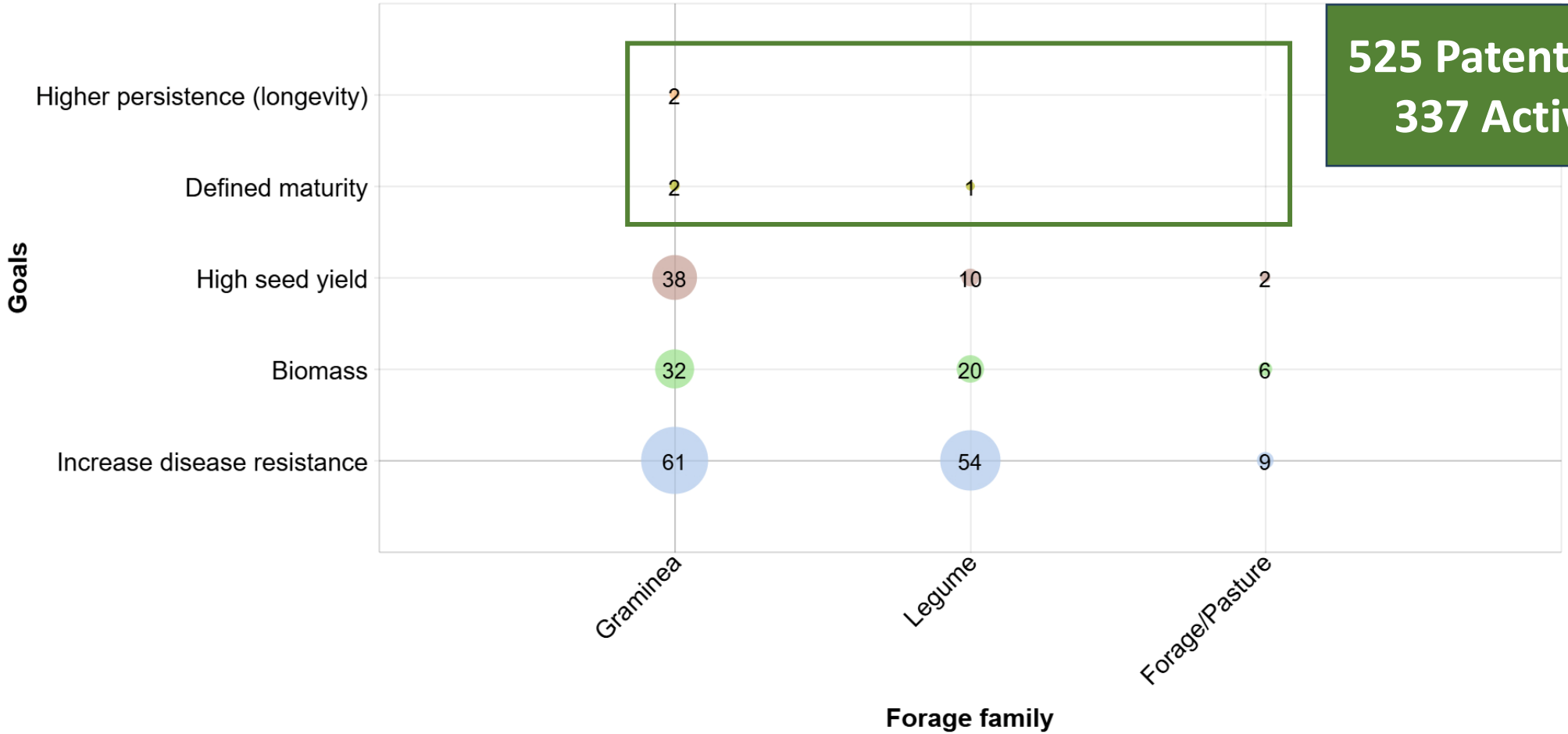
Regional activity

- Focus on patents in Europe and Switzerland

Graminea dominates EU breeding focus; persistence & maturity remain underexplored → opportunity!

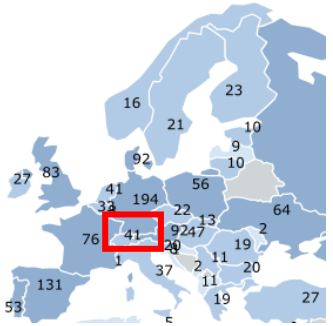


525 Patented inventions
337 Active patents*



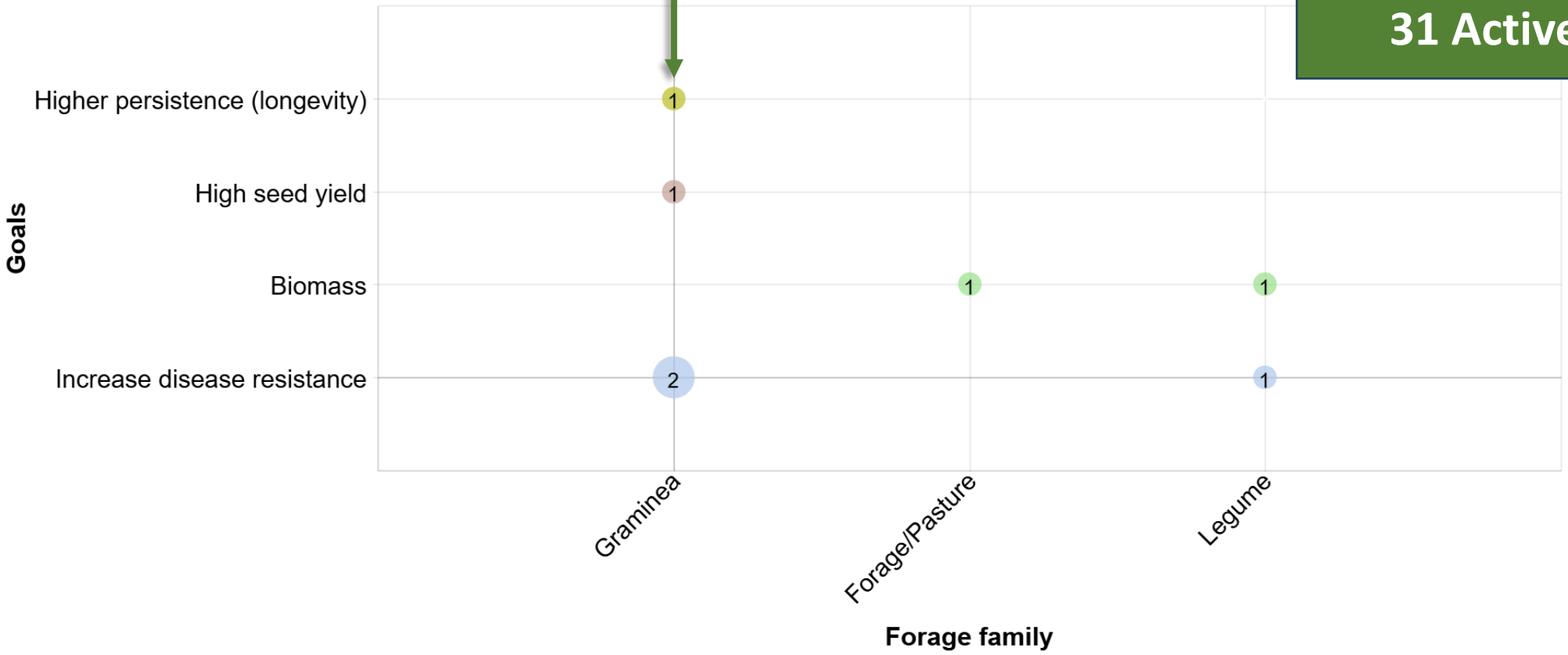
** Active patents have at least one active patent member, but not necessarily the EP.*

Only one patent specifically mentions ryegrass and one of your goals in patents in Switzerland



RAGT (FR): Uses **LpTG-3 RGT18 endophyte** to enhance **ryegrass vigour, persistence**, and **stress tolerance** via beneficial **alkaloid production**.

41 Patented inventions
31 Active patents



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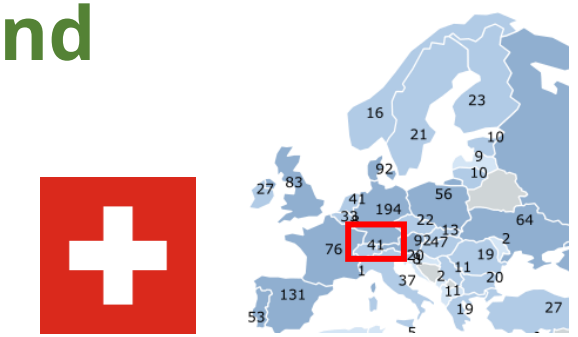
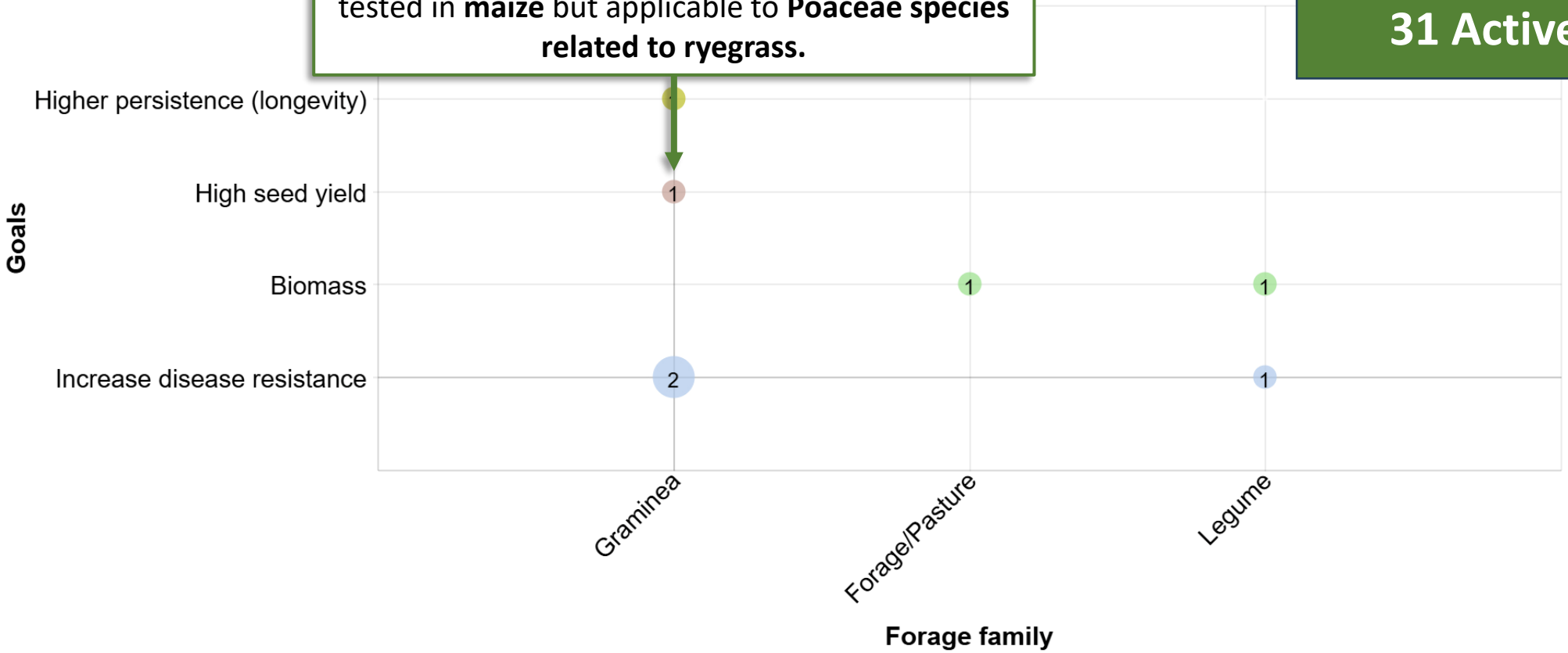


Corteva Agriscience (US): Moisture-timed defoliation to **boost seed yield** and uniformity, tested in **maize** but applicable to **Poaceae species related to ryegrass.**

41 Patented inventions
31 Active patents



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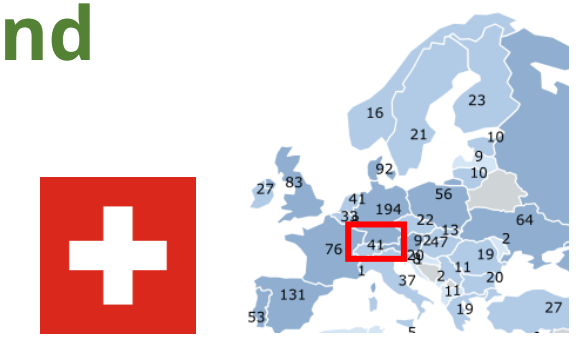
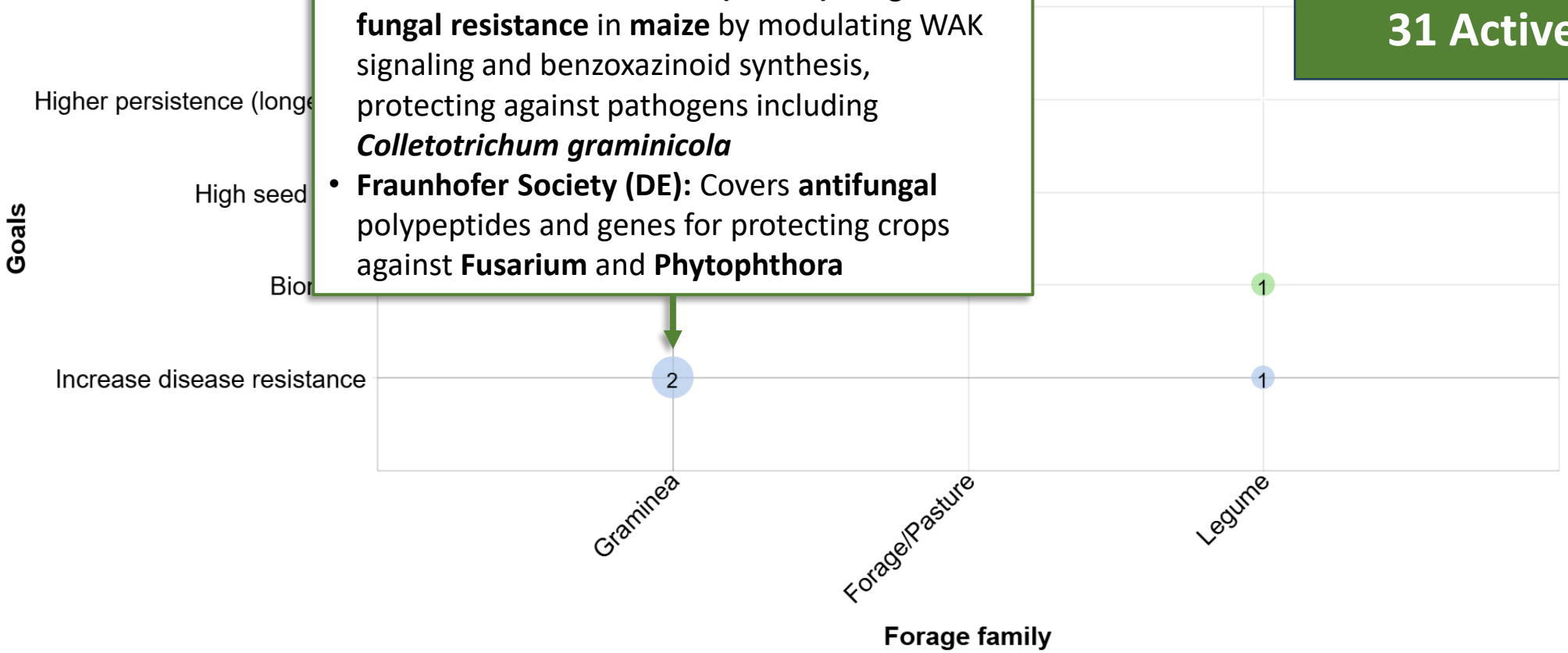


41 Patented inventions
31 Active patents

- **Univ Bern/UZH/KWS Saat (CH/DE):** Targets **fungal resistance** in **maize** by modulating WAK signaling and benzoxazinoid synthesis, protecting against pathogens including ***Colletotrichum graminicola***
- **Fraunhofer Society (DE):** Covers **antifungal** polypeptides and genes for protecting crops against **Fusarium** and **Phytophthora**



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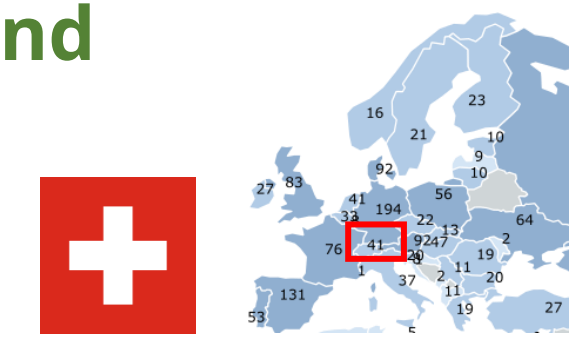
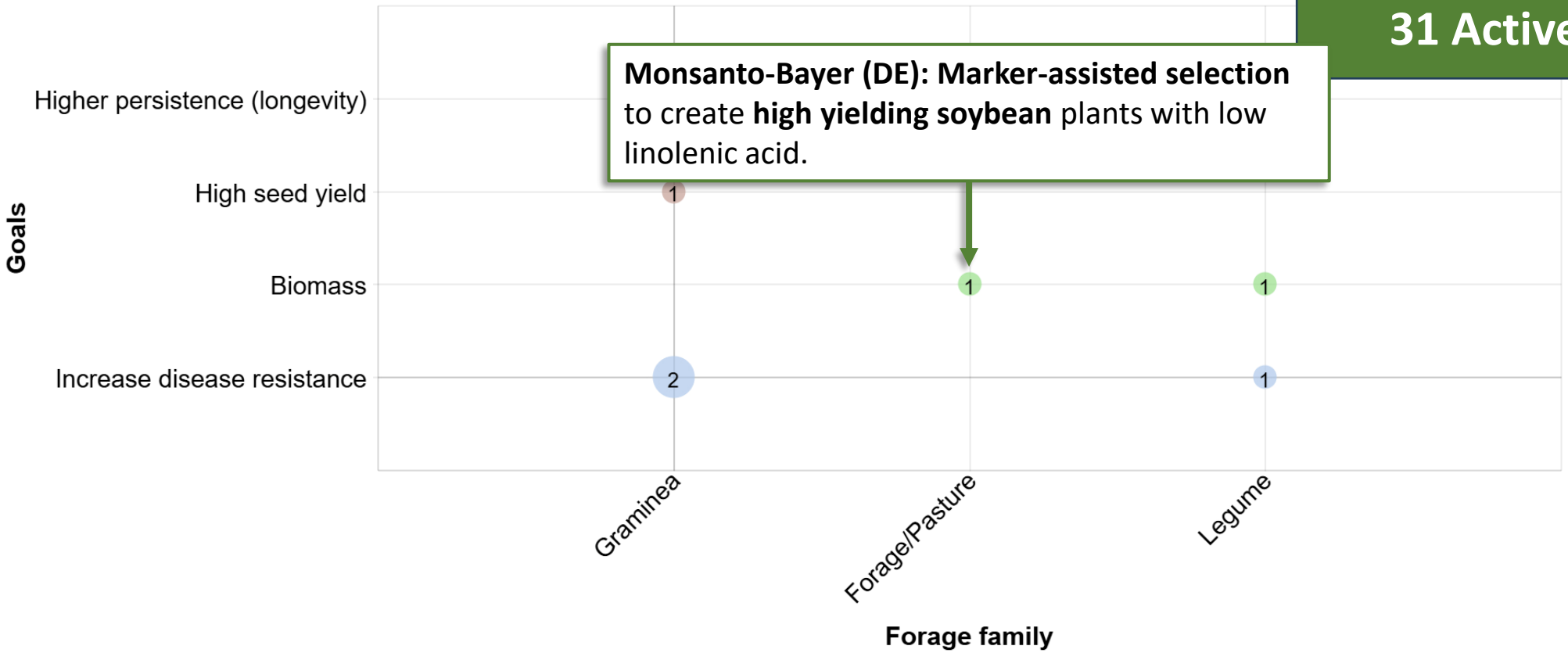


41 Patented inventions
31 Active patents

Monsanto-Bayer (DE): Marker-assisted selection to create **high yielding soybean** plants with low linolenic acid.



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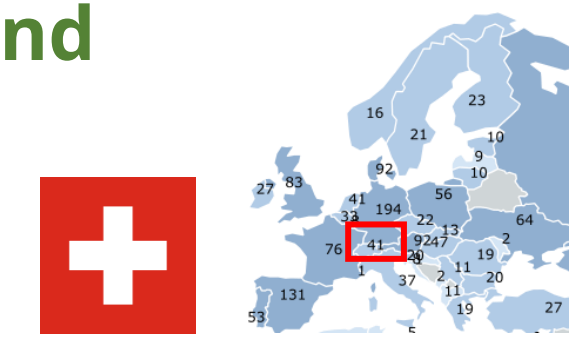
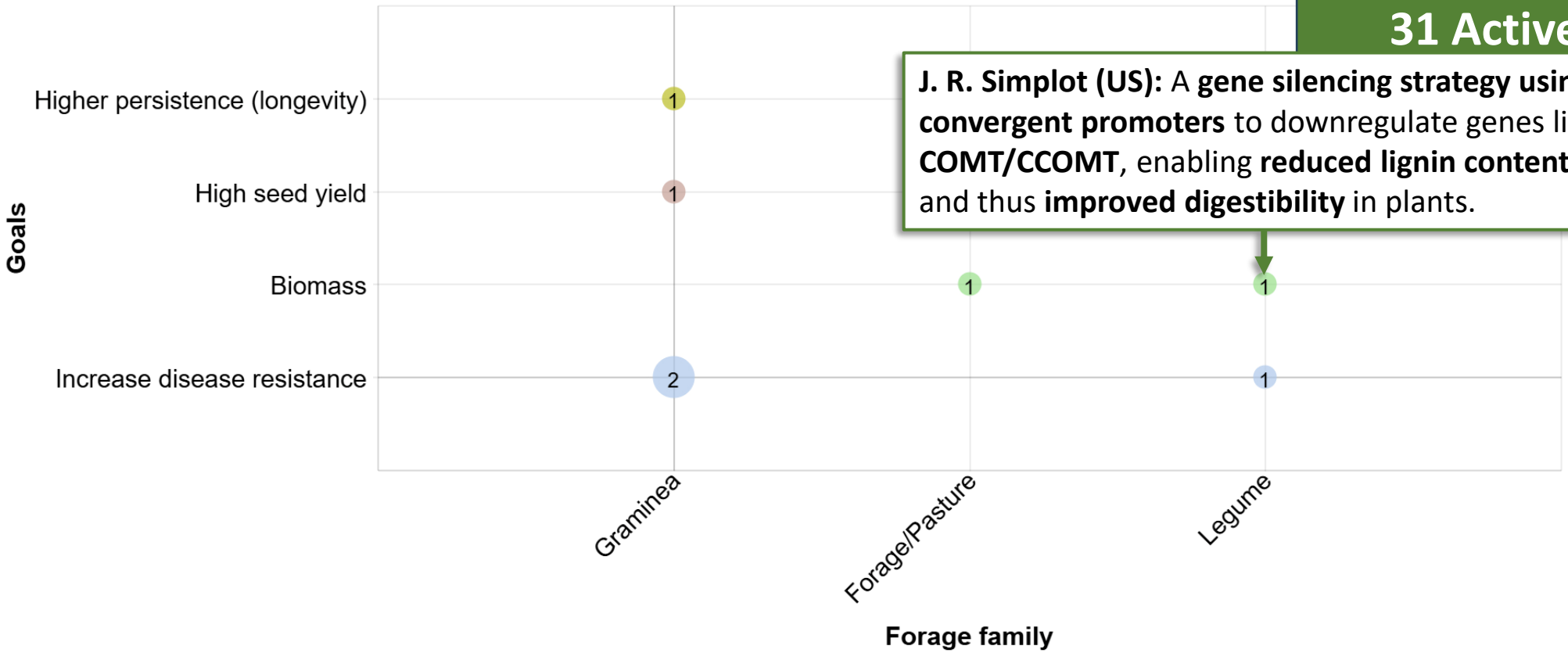


41 Patented inventions
31 Active patents

J. R. Simplot (US): A **gene silencing strategy using convergent promoters** to downregulate genes like **COMT/CCOMT**, enabling **reduced lignin content** and thus **improved digestibility** in plants.



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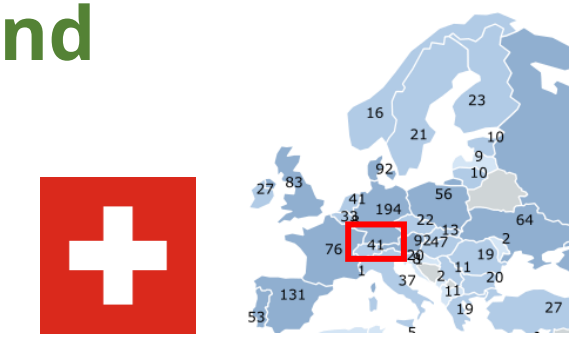

41 Patented inventions
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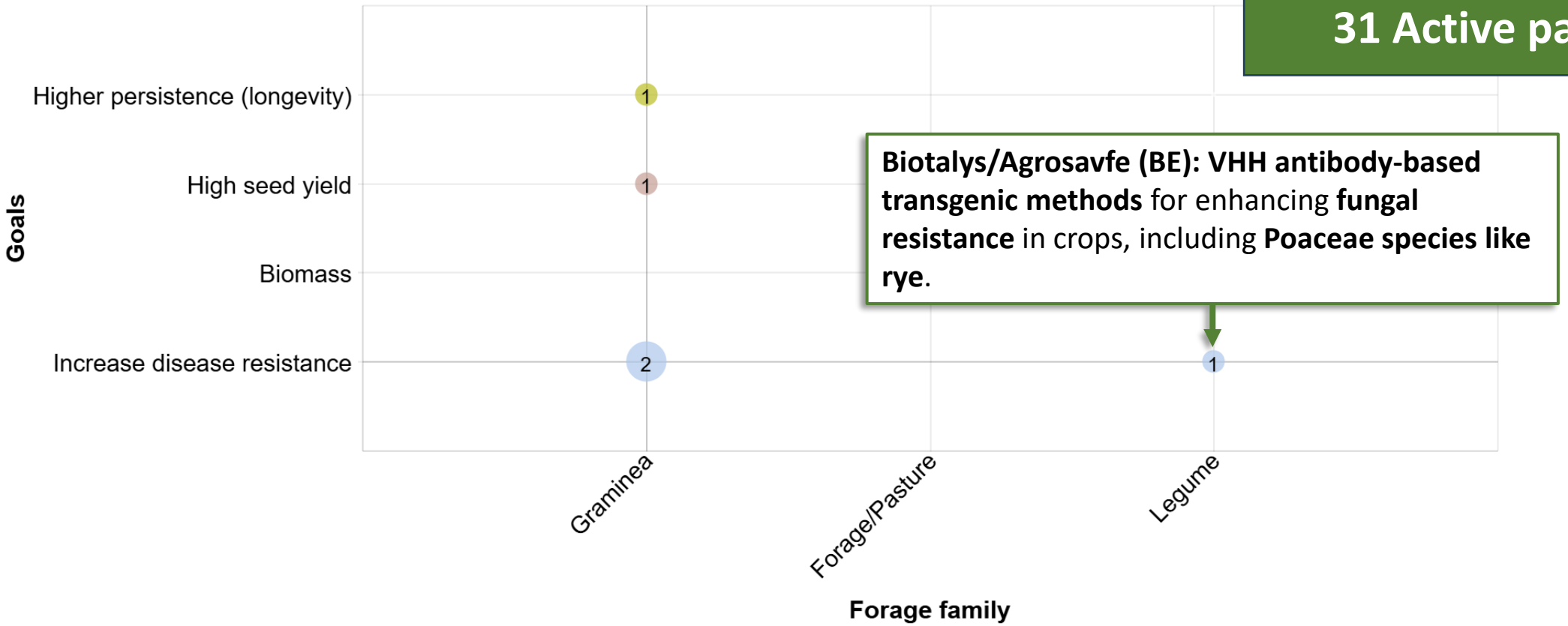


Biotalys/Agrosavfe (BE): VHH antibody-based transgenic methods for enhancing **fungal resistance** in crops, including **Poaceae species like rye**.

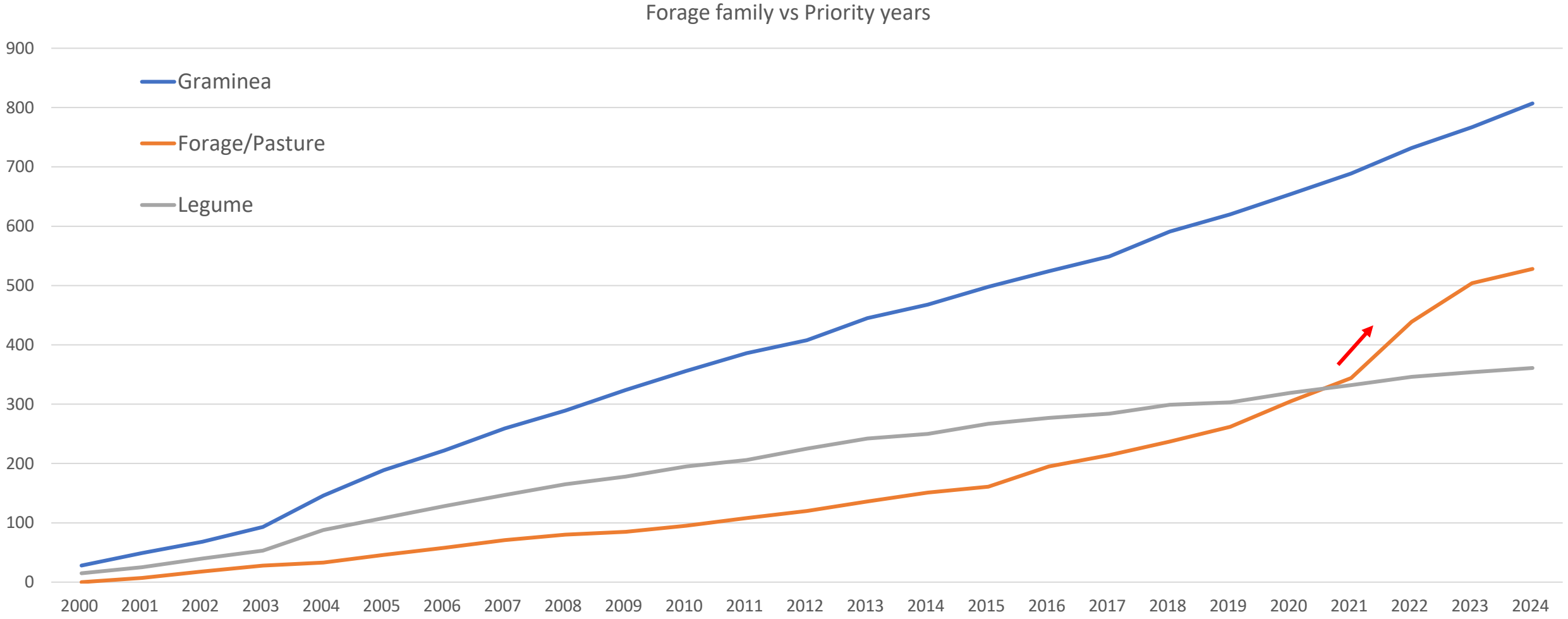
There are few active patents in Switzerland on ryegrass and your breeding goals — you're free to explore and innovate.

If a patent is expired or not active in your region, its technologies can usually be used freely. Patents can also inspire new ideas.

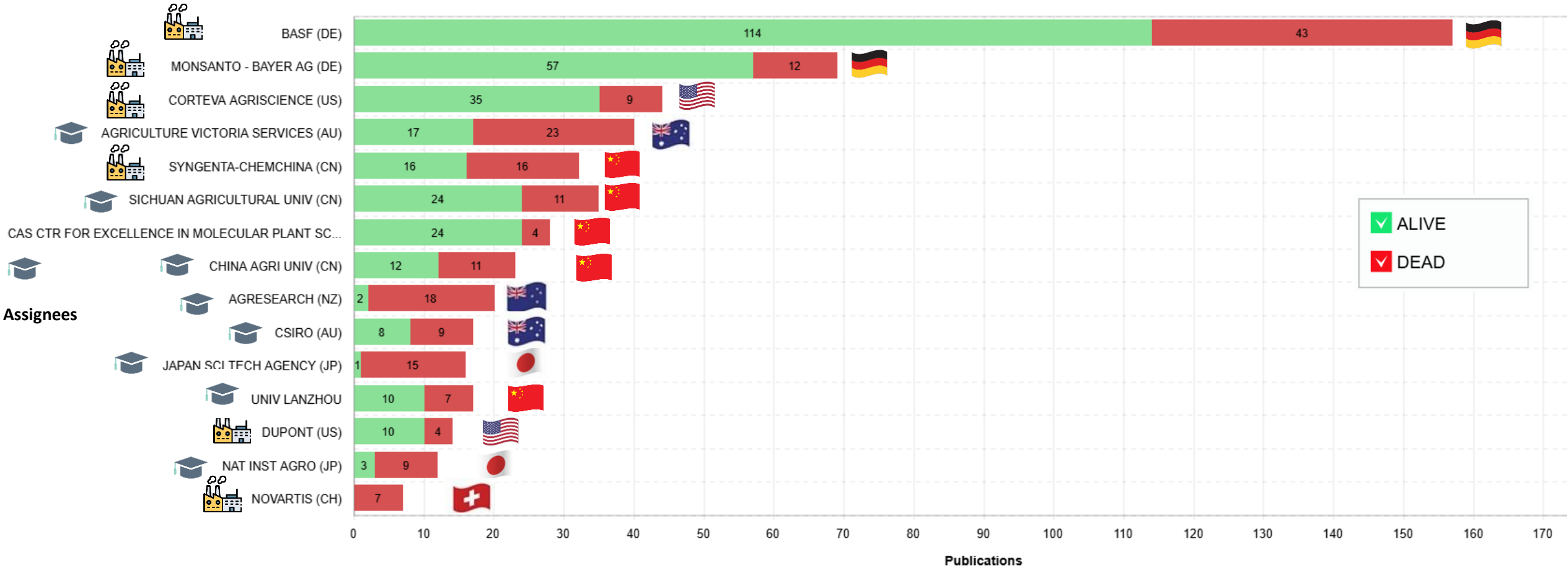
Worldwide activity

- Focus on the major assignees patenting worldwide

Generic fodder has seen a sharp increase since 2020, mainly due to Chinese patent filings



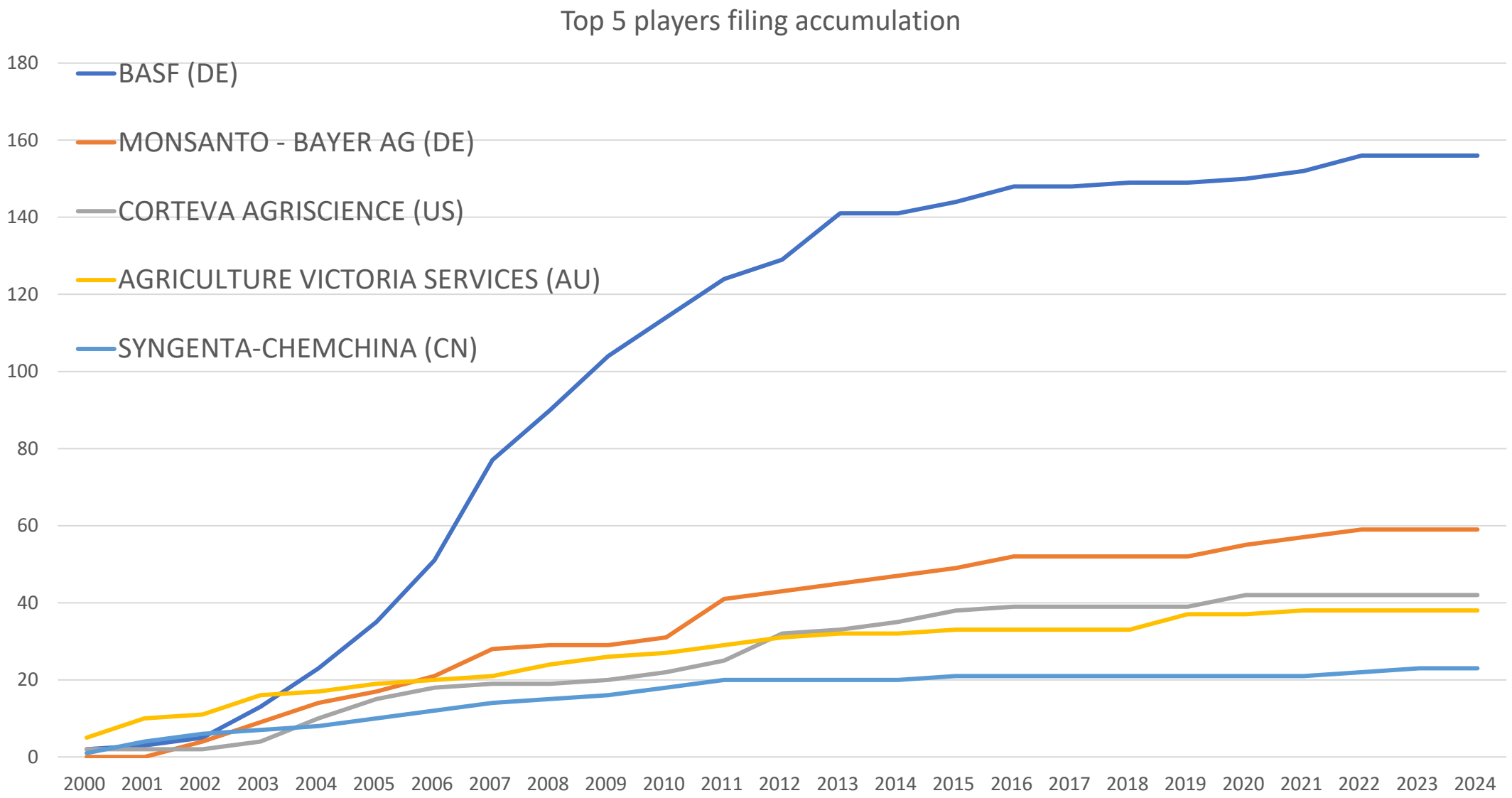
Top players are a mixture of industrial and academic, with two German industries leading the field



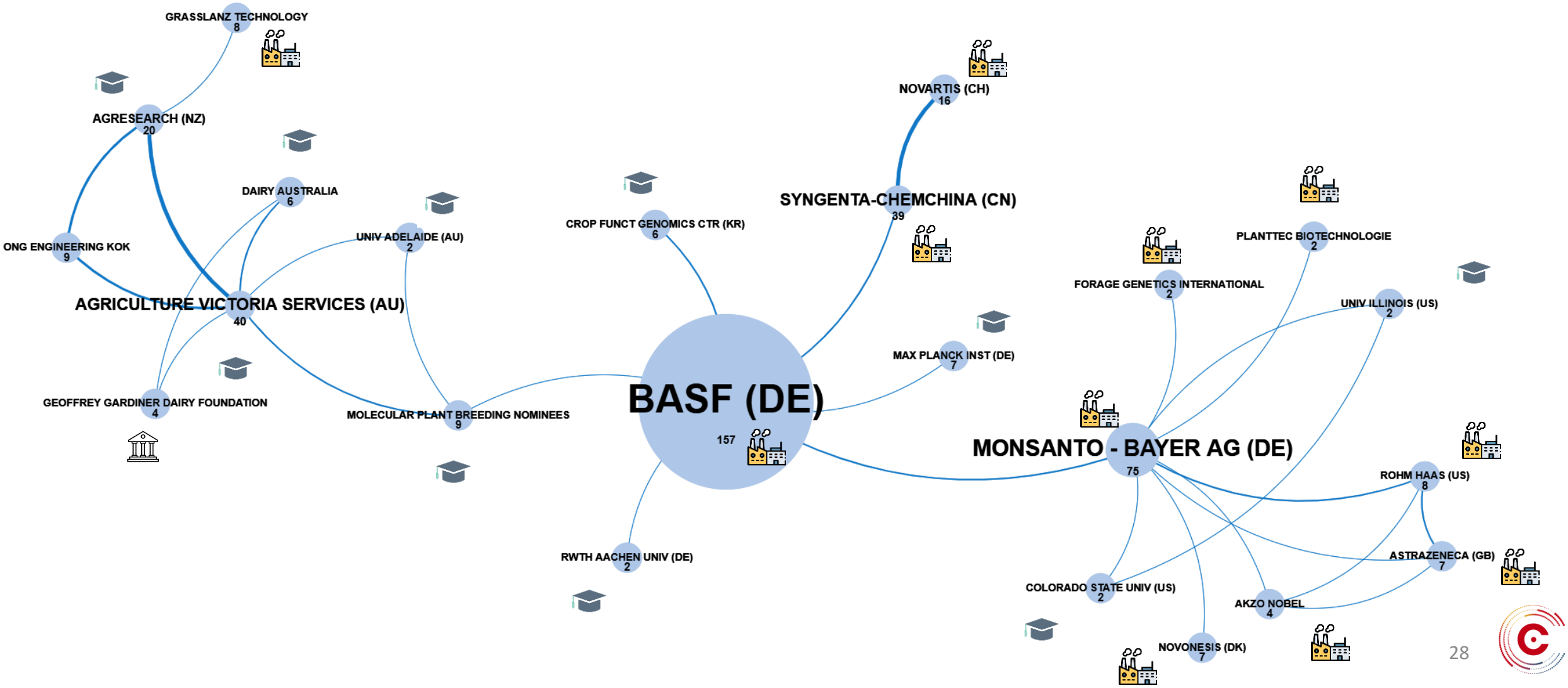
Top 15 players filling

*Note: an active patent family is a family comprising at least one active patent member (e.g. pending patent application or in force granted patent).

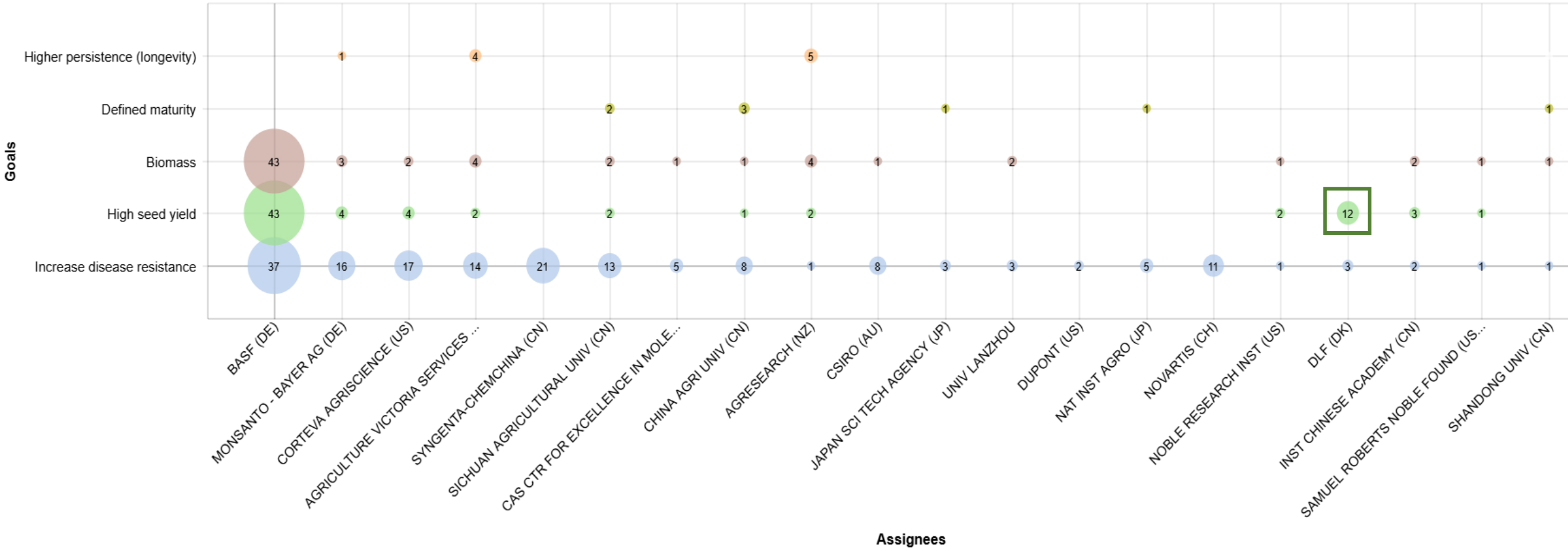
BASF peaked in 2007 and then declined, mirroring other major players from 2013 onwards



The top players (BASF, Monsanto-Bayer, Syngenta and Agriculture Victoria Service) co-filed patents with other industrial and academic players

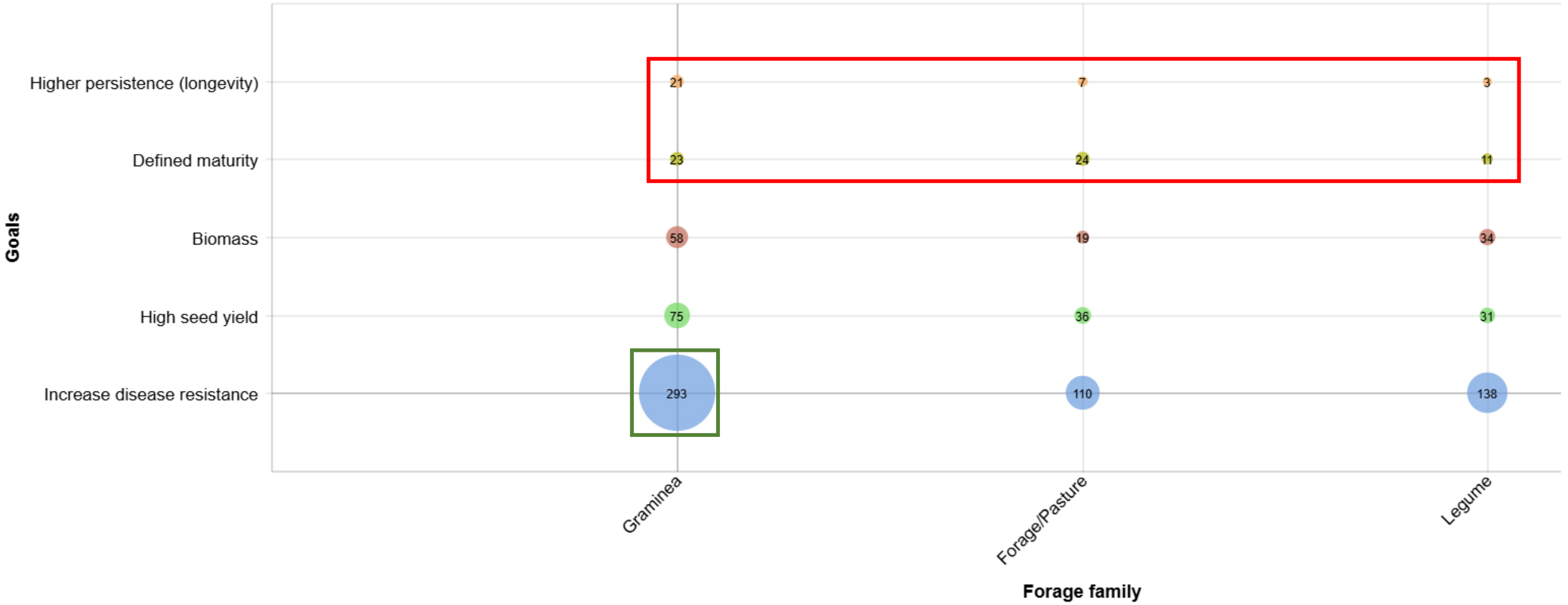


Most players file patents on multiple goals; DLF focuses strongly on seed yield → interesting for collaboration



Goals vs Top 20 Players

Disease resistance in graminea is the most patented area; persistence & maturity remain underexplored



2023 – PENDING

DANSTAR FERMENT AG (CH)

- **Patent Number :** EP4478875
- **Patent Title**: A method for increasing the digestibility and/or assimilability of plants
- **Abstract**: The present disclosure concerns a method for increasing digestibility and/or assimilability and/or energy content and/or nutritional value of forage plants comprising contacting a plant, a plant part or a plant seed with at least one **endophytic** fungus species to colonize the roots of the plant or a plant grown from the plant seed. The present disclosure further relates to a method for increasing digestibility and/or assimilability and/or energy content and/or nutritional value of forage plants…

GOALS : High biomass quality for animal nutrition (mainly digestibility)

2012 – GRANTED

CAS CENTER FOR EXCELLENCE MOLECULAR PLANT SCIENCES (CN)

- **Patent Number :** CN103290024
- **Patent Title**: A kind of plant seed absciss layer district developmental regulation gene and application thereof
- **Abstract**: The invention relates to a plant seed separation layer area developmental regulation gene and an application thereof, and discloses a gene for effectively regulating the shattering performance of the grass family, i.e. the **SHAT1 gene**. The SHAT1 gene can regulate the plant separation layer area cell development, so that the shattering performance of plants is improved. The gene can be applied to plant cross breeding so as to obtain the plants with improved shattering performance or improved breeds.

GOALS : Low seed shattering

2020 – PENDING

AGRICULTURE VICTORIA SERVICES(AU)

- **Patent Number :** EP3998854
- **Patent Title**: Novel xanthomonas strains and related methods
- **Abstract:** The present invention relates to an **endophyte** strain isolated from a plant of the Poaceae family, wherein said endophyte is a strain of Xanthomonas sp. which provides bioprotection and/or biofertilizer phenotypes to plants into which it is inoculated. The present invention also discloses plants infected with the endophyte and related methods.
- **Advantages:** The invention offers several advantages over prior art, including the ability of the Xanthomonas endophytes to produce specific bioprotectant compounds that enhance plant defense mechanisms against pests and diseases.

GOALS : Increase disease resistance

*Note: some of the patent families mentioned in this section have **multiple members***

2023 – PENDING

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- **Patent Title**: A method for increasing the digestibility and/or assimilability of plants
- **Abstract**: The present disclosure concerns a method for increasing digestibility and/or assimilability and/or energy content and/or nutritional value of forage plants comprising co[illegible] plant part or a plant[illegible] one **endophytic** f[illegible] colonize the roots of [illegible] grown from the plant seed. The present disclosure further relates to a method for increasing digestibility and/or assimilability and/or energy content and/or nutritional value of forage plants…

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2012 – GRANTED

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- **Patent Title**: A kind of plant seed absciss layer district developmental regulation gene and application thereof
- **Abstract**: The invention relates to a plant seed separation layer area developmental regulation gene and an application [illegible] regulate the plant separation layer area cell development, so that the shattering performance of plants is improved. The gene can be applied to plant cross breeding so as to obtain the plants with improved shattering performance or improved breeds.

GOALS : Low seed shattering

2020 – PENDING

AGRICULTURE VICTORIA SERVICES(AU)

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- **Patent Title**: Novel xanthomonas strains and related methods
- **Abstract:** The present invention relates to an **endophyte** strain isolated from a plant of the Poaceae family, wherein said endophyte is a strain of Xanthomonas sp. [illegible] protection and/or [illegible]es to plants into [illegible]ted. The present [illegible]es plants infected with the endophyte and related methods.
- **Advantages:** The invention offers several advantages over prior art, including the ability of the Xanthomonas endophytes to produce specific bioprotectant compounds that enhance plant defense mechanisms against pests and diseases.

GOALS : Increase disease resistance

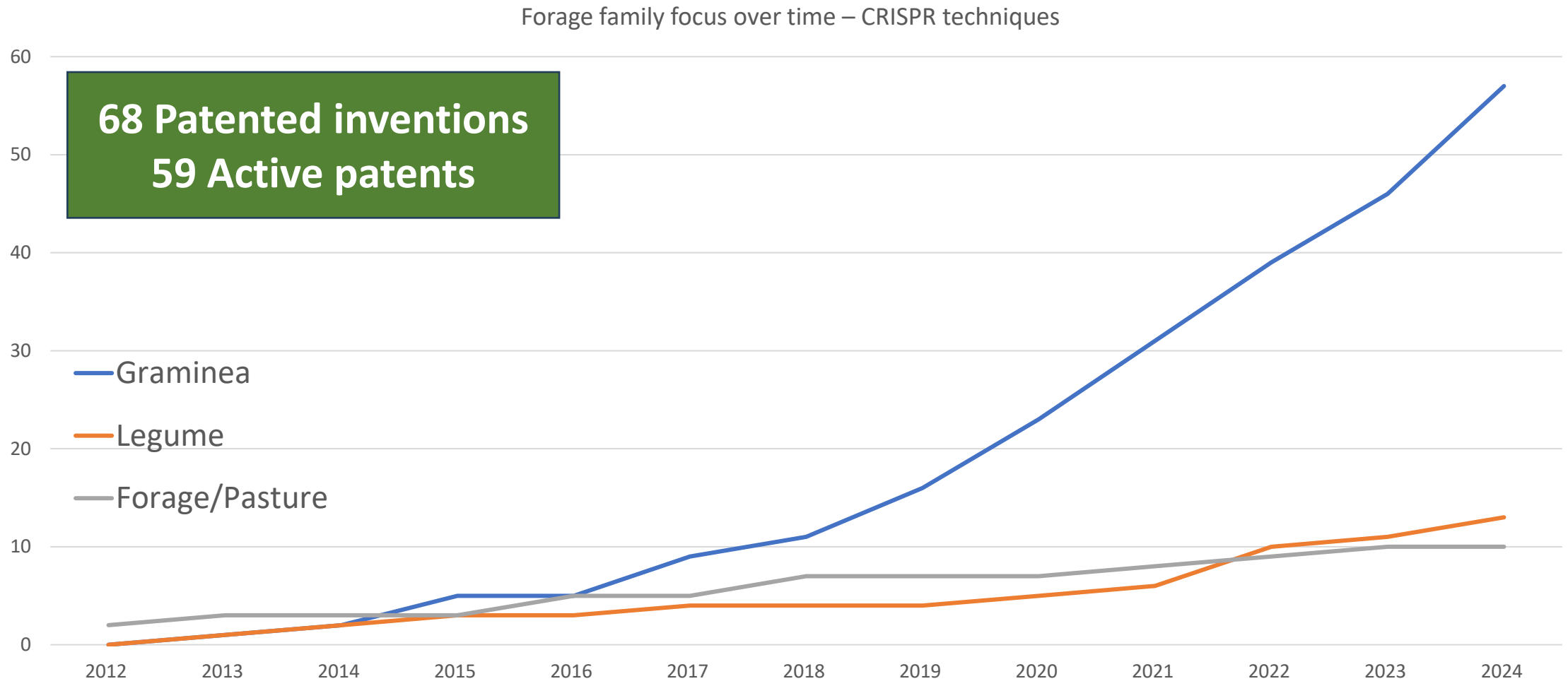
Patents not only show innovation trends but also disclose technical details

*Note: some of the patent families mentioned in this section have **multiple members***

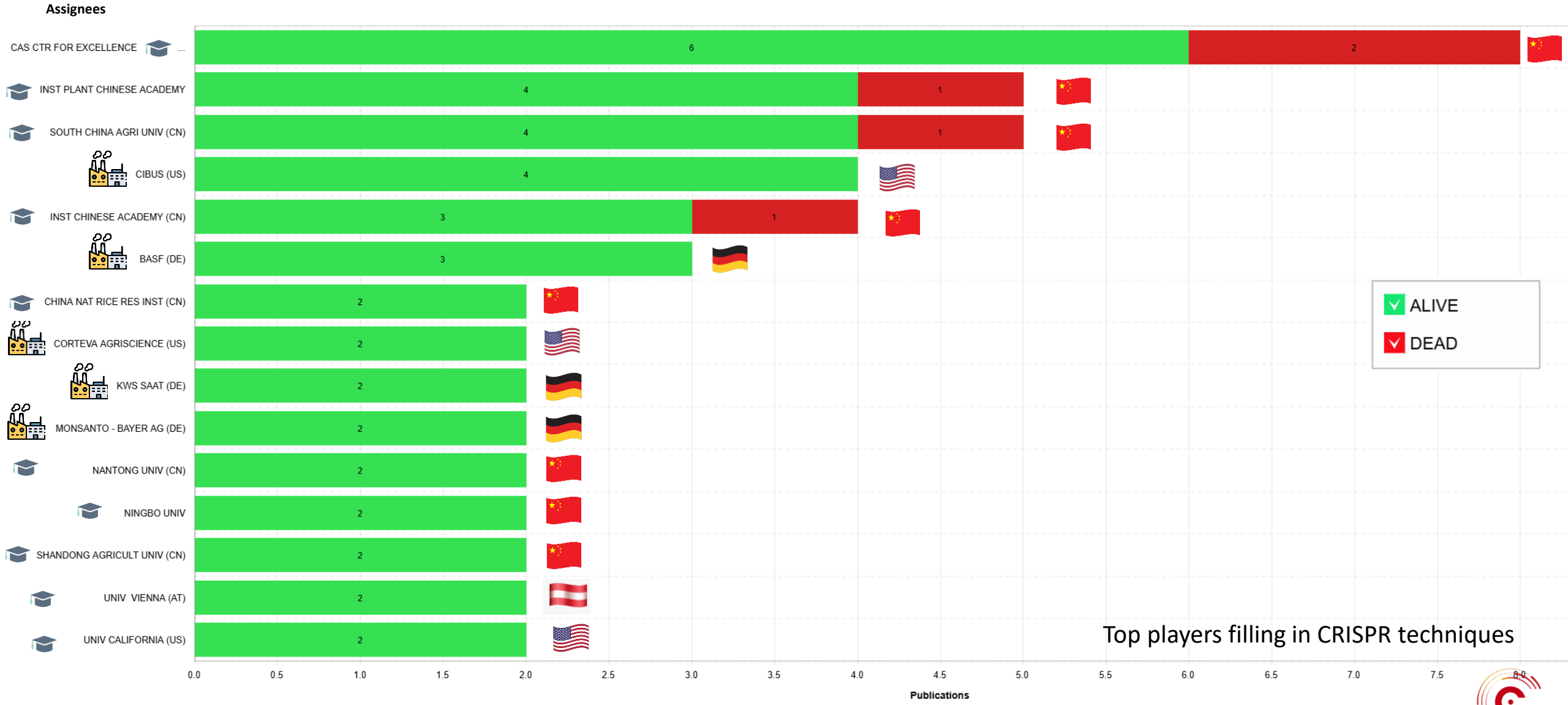
CRISPR techniques

- Focus on the CRISPR techniques applied in rye-grass breeding innovation

The use of CRISPR techniques in forage breeding is emerging for 5 years, particularly in Graminea breeding



Top filers in CRISPR ryegrass breeding are primarily Chinese institutions



Top players filling in CRISPR techniques

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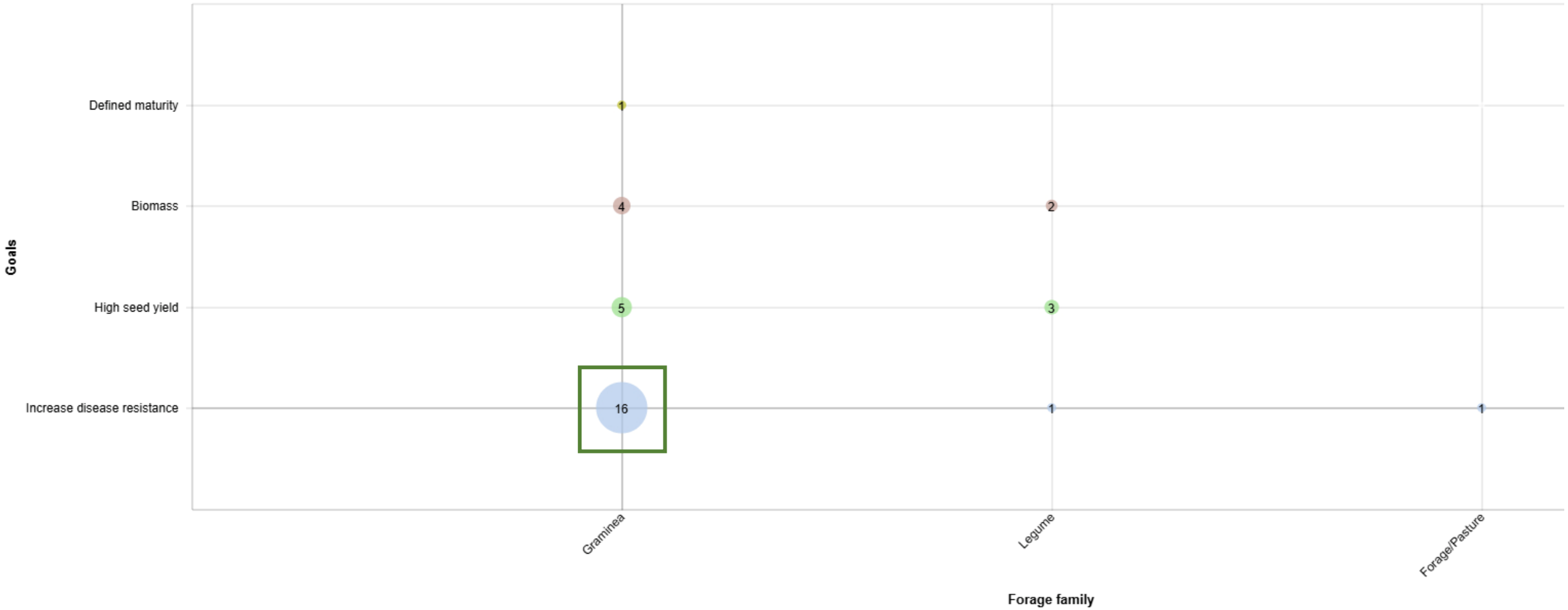
CRISPR methods targeting disease resistance in graminea is the most patented area



Overall key take-aways

- Focus on the key insights resulting from this patent analysis

Patents: Another Path to Forage Breeding Innovation

Trends in the field

- **Disease resistance** is the **#1** patented trait, particularly in Graminea
- **Biomass quality (digestibility) and seed yield** are **emerging** as innovation targets
- Patent filings are booming in **China** and **the US** – with many public research institutes filing as well

Opportunities

- **Low IP saturation in Switzerland** on ryegrass and specific goals
- **Expired patents** or those not active in Switzerland are **free to use** and serve as inspiration
- **Limited patenting of public research in Europe** leaves room to innovate and to contribute to shaping the patent landscape

Start leveraging patent knowledge for breeding strategy. SCBT is here to support you!