NEW EDITION:
ADDITION OF NEW CROPS
2022/2023 SEASON

BRAZILIAN
AGRICULTURAL SCENARIOS

STUDY OF THE MAIN MODALITIES OF APPLICATION OF PESTICIDES BY CULTIVATION IN BRAZIL

Prepared by
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

With support from:
MINISTÉRIO DA AGRICULTURA E PECUÁRIA
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kynetec
Incorporating Spark

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Brazilian agricultural scenarios:

A study on the main application methods of pesticides by cultivation in Brazil

4th Edition

Jundiaí - SP
ProHuma Institute of Scientific Studies
2025

RESEARCH BY KYNETEC COMPANY
GRAPHIC DESIGN AND LAYOUT:
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IMAGES:
SHUTTERSTOCK, ISTOCKPHOTO, ALAMY, FREEPIK E PEXEL

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4th Edition

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Contents

Presentation

The ProHuma Institute for Scientifc Studies is a consortium currently with 15 companies in the pesticide sector of Brazil. Its purpose is to promote science, develop technologies, systems, mitigation factors and generate data to support and assess human and environmental exposure to agricultural pesticides. Its main objective is to develop a database representative of Brazilian scenarios of exposure of rural workers to pesticides to support the implementation of risk assessment of exposure of operators, re-entry workers, residents and passersby in the country.

For the development of this database, it was necessary to size and characterize the most important modalities of pesticide application in the main Brazilian agricultural crops. For this, ProHuma developed the research "Brazilian Agricultural Scenarios: a study of the main application modalities of pesticides by cultivation in Brazil" with its 1st edition published in 2018.

In this important project, ProHuma uses market research conducted by Kynetec do Brasil on several crops as a basis. The work was conducted through market research carried out by Kynetec, a company whose statistical approach in the country's main agricultural crops collected, from rural producers (more than 14,600 farmers), information dealing with the use of pesticides and their application methods. Kynetec's research respects statistically reliable samples and includes the main producing regions of each specific crop. It should be highlighted that the market studies conducted by Kynetec represented 98% of the total sprayed area.

This 4th edition presents a survey of the main application methods carried out by Brazilian producers during the last 3 seasons (20/21; 21/22 and 22/23), expanding the history of data and information obtained since the 1st edition (2014/15 season), bringing crops added to the detailed database and also segmented information for equipment as tractor-mounted in cabs and non-Cabinadoed, increasingly enriching this publication of consistent and current information on the pesticides application scenario in the most diverse crops.

Good reading!
Prohuma Board of Directors

Acknowledgments

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We thank the associated companies, who made their technical professionals available to participate in this activity.

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01 Objective

TO SIZE AND CHARACTERIZE THE MAIN PESTICIDE APPLICATION MODALITIES IN THE LEADING AGRICULTURAL CROPS IN BRAZIL

Context

01 Understand the main pesticide application modalities per crop and their segmentations in Brazil, as well as their respective representativeness in Total Sprayed / Treated Area;

02 Evaluate the top indicators of application modalities by crop (Number of Applications, Adoption, Total Sprayed Area);

03 Understand the relationship between formulation type and major application modalities;

04 Learn about the adoption of the practice of seed treatment in 04 different crops in Brazil.

02

Methodology

This project was conducted using market research carried out by **Kynetec** whose statistical approach in the country's main agricultural crops collected, from rural producers, information that deals with the use of pesticides and their application methods. Kynetec's research respects statistically reliable samples and includes the main producing regions of each specific crop.

It should be highlighted that the market studies conducted by Kynetec represented 98% of the total sprayed area. In the case of smaller crops, the work includes representative estimates of average behavior, researched through published studies and also from regional and/or knowledgeable sources.

The sources accessed include:

- **CONAB** (National Supply Company);
- **ABCSEM** (Brazilian Seed and Seed Trade Association);
- **IAC** (Agronomic Institute of Campinas);
- **EMBRAPA** (Brazilian Agricultural Research Company);
- **APTA** (São Paulo Agribusiness Technology Agency);
- **Producer associations;**
- **Agricultural spraying service providers;**
- **Technical assistance consultants and agronomists;**
- **Agriculture houses;**
- **EPAGRI** (Agricultural Research and Rural Extension Company of Santa Catarina);
- **EMATER** (Brazilian Rural Extension Company);
- **Rural producers and others.**

SOURCE OF DATA AND CROP REFERENCE:

GRAINS

Paddy rice (22/23), **Barley** (2019),
Bean (22/23), **Interim-harvest Corn (winter)** (2023),
Summer Corn (22/23), **Soybean** (22/23),
Wheat (2023), **Peanut** (22/23),
Oats (2023), **Sunflower** (22/23),
Sorghum (22/23), **Triticale** (2023)

FRUITS

SEASONED

Apple (22/23), **Grape** (22/23)
Persimmon (22/23), **Fig** (22/23),
Peach/Plums/Nectarines (22/23)

TROPICAL

Citrus (22/23), **Watermelon** (22/23),
Melon (22/23), **Papaya** (22/23),
Passion Fruit (22/23), **Banana** (22/23),
Mango (22/23), **Avocado** (2023),
Pineapple (22/23), **Cashew** (2019),
Coconut (22/23), **Guava** (22/23).

VEGETABLES

Potato (22/23), **Tomato** (22/23), **Onion** (22/23),
Garlic (22/23), **Sweet Pepper** (22/23), **Brassicas**
(22/23), **Carrot** (22/23), **Leafy greens** (2023),
Cucubitaceae (2023),
Flowers and Ornamental Plants (2023),
Scarlet eggplant/Eggplant/Okra (2023).

SPECIAL CROPS

Cotton (22/23), **Coffee** (22/23),
Cane (2023), **Forest** (22/23),
Tobacco (22/23), **Mate herb** (22/23),
Cassava (22/23)

Kynetec Coverage

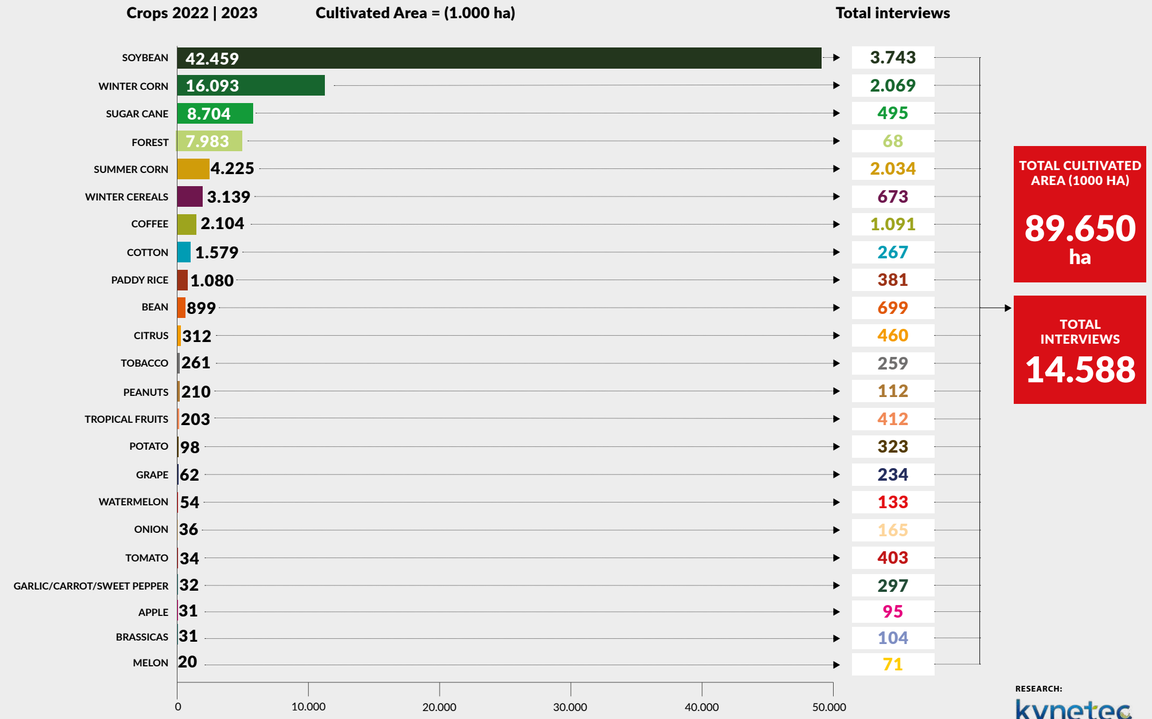
The material prepared by Kynetec has a high degree of detail, allowing information with statistical reliability on points such as: formulations used, number of average applications, adoption of each application method used in management and the quantity of products in tank mix, whose information is the main data used in the study.

The applied area sizing metrics can be analyzed under **3 DIFFERENT MODES IN KYNETEC'S WORK:**

- **NET AREA:** sizes the physical area that received *some type of pesticide application;*
- **TOTAL SPRAYED AREA:** measures the amount of sprayed area by taking into account *the applied area (Net Area) and the number of spraying entries* (Number of Applications);
- **TREATED LINEAR AREA:** scales the amount of Total Sprayed *Area and the number of products in the tank (product mix).*

For purposes of compliance with the work of the second methodology, we will be considering the TOTAL SPRAYED AREA as a common metric unit between the two methodologies

Samples per crop

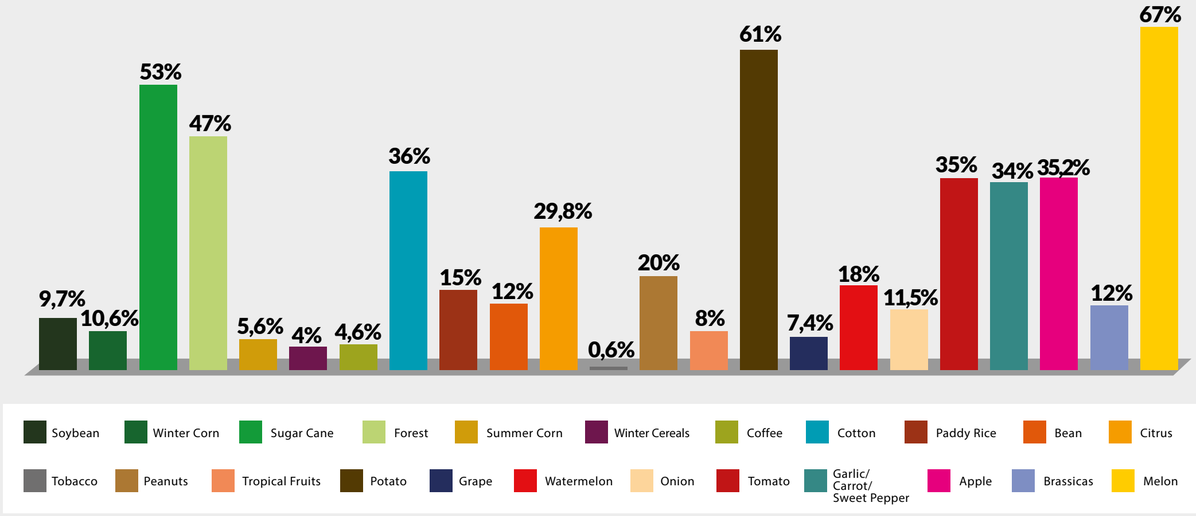


TOTAL CULTIVATED AREA (1000 HA)
89.650 ha

TOTAL INTERVIEWS
14.588

RESEARCH: kynetec

% of Investigated Area



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec

Application Modalities by Crop

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SOYBEAN
- Self-propelled
- Tractor
- Aerial (airplane)

COFFEE
- Tractor
- Backpack sprayer
- Aerial (airplane)

WHEAT
- Self-propelled
- Tractor

TOMATO
- Stationary
- Self-propelled
- Tractor
- Backpack sprayer
- Irrigation

SUGAR CANE
- Self-propelled
- Tractor
- Aerial (airplane)

COTTON
- Self-propelled
- Aerial (airplane)
- Tractor

APPLE
- Tractor
- Bait

FOREST
- Tractor
- Bait
- Aerial (airplane)
- Backpack sprayer

WINTER CORN
- Self-propelled
- Tractor
- Aerial (airplane)

PADDY RICE
- Aerial (airplane)
- Tractor
- Self-propelled

CITRUS
- Tractor
- Stationary
- Backpack sprayer
- Bait

GRAPE
- Tractor
- Stationary
- Backpack sprayer
- Irrigation

SUMMER CORN
- Self-propelled
- Tractor
- Aerial (airplane)

POTATO
- Tractor
- Self-propelled

BEAN
- Self-propelled
- Tractor
- Backpack sprayer

PEANUTS
- Tractor
- Self-propelled

Application Modalities by Crop

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incorporating Spark

ONION

- Tractor
- Self-propelled
- Backpack sprayer
- Irrigation

WATERMELON

- Tractor
- Backpack sprayer
- Self-propelled

MELON

- Tractor
- Self-propelled
- Stationary
- Irrigation
- Backpack sprayer

BRASSICAS

- Tractor
- Backpack sprayer
- Stationary

MANGO

- Tractor
- Backpack sprayer
- Bait

GARLIC

- Self-propelled
- Tractor

BANANA

- Backpack sprayer
- Aerial (airplane)
- Tractor

TOBACCO

- Tractor
- Backpack sprayer

PAPAYA

- Tractor
- Backpack sprayer

SWEET PEPPER

- Stationary
- Tractor
- Backpack sprayer
- Drip

PASSION FRUIT

- Quadricycle
- Tractor
- Backpack sprayer
- Stationary

CARROT

- Tractor
- Self-propelled

Regions investigated

The points on the map correspond to the municipalities investigated in the 2021 | 2022 season.

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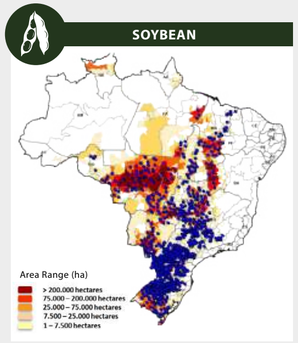
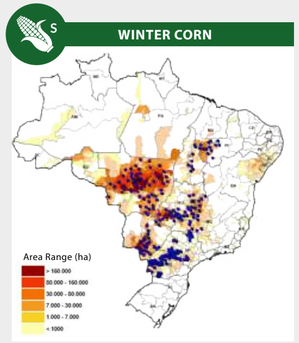
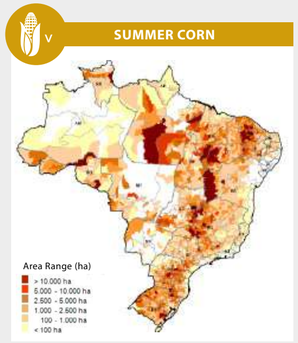
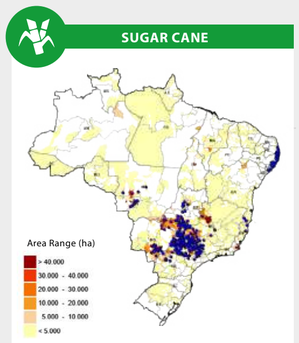
Regions investigated by Crop

The points on the map correspond to the municipalities investigated by the research.









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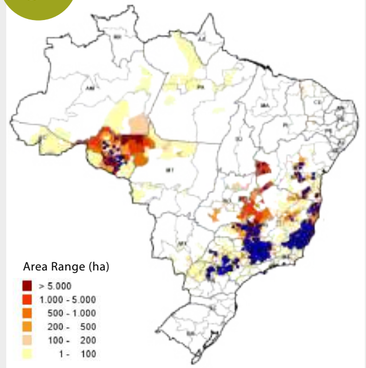
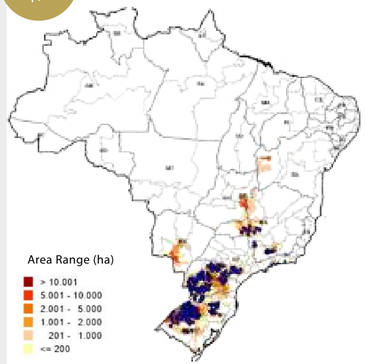
Regions Investigated by Crop

The points on the map correspond to the municipalities investigated by the research.

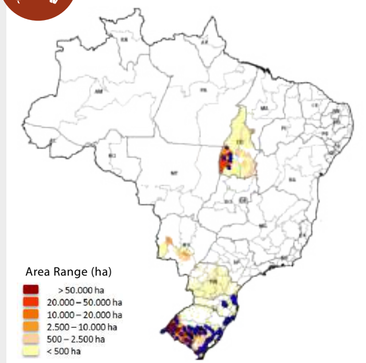
COFFEE



WHEAT



PADDY RICE



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Regions Investigated by Crop

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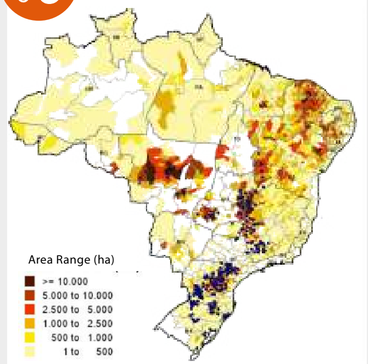
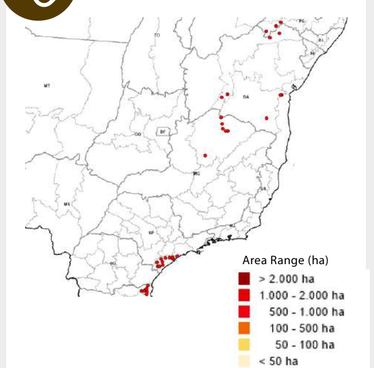
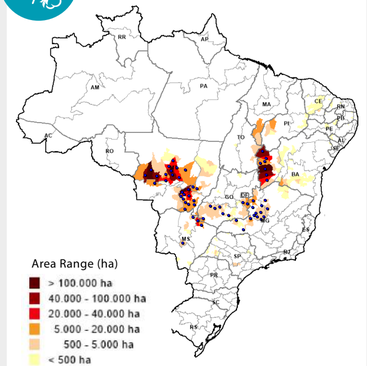
BEAN



POTATO



COTTON



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Regions Investigated by Crop

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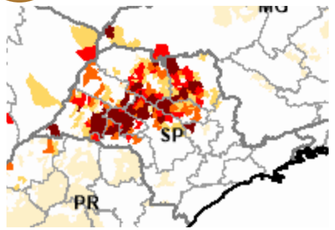
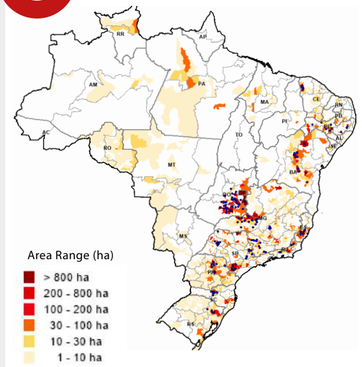
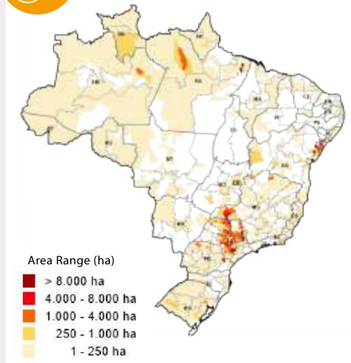
PEANUTS



TOMATO



CITRUS



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Regions Investigated by Crop

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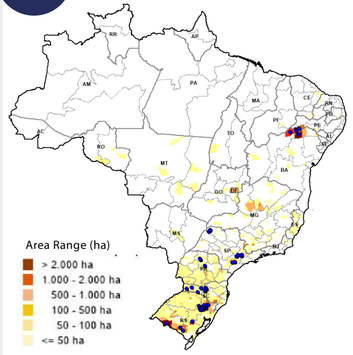
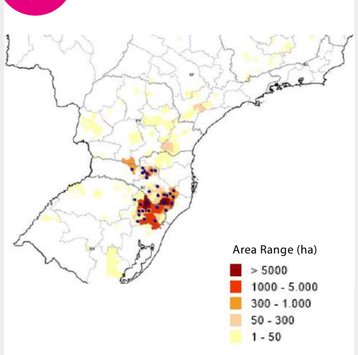
GRAPE



APPLE



FOREST

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Regions Investigated by Crop

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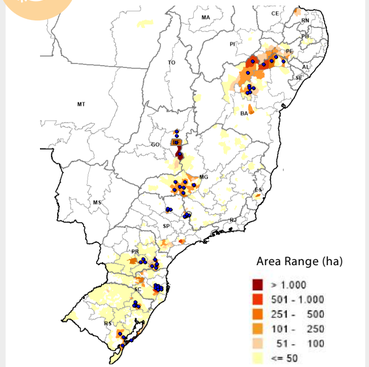
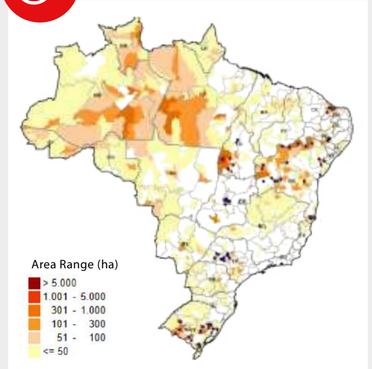
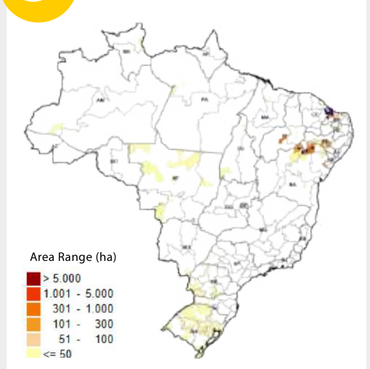
ONION



WATERMELON



MELON



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Regions Investigated by Crop

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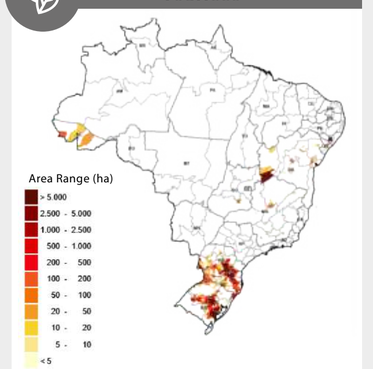
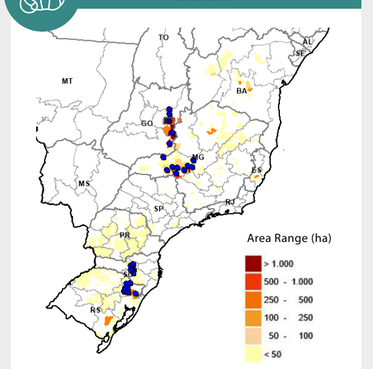
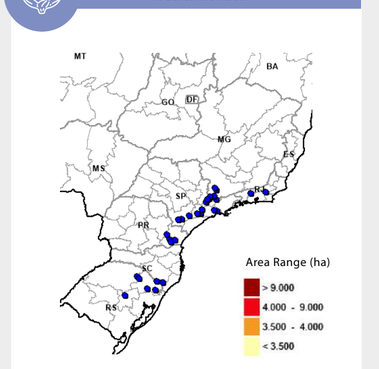
TOBACCO



GARLIC



BRASSICAS



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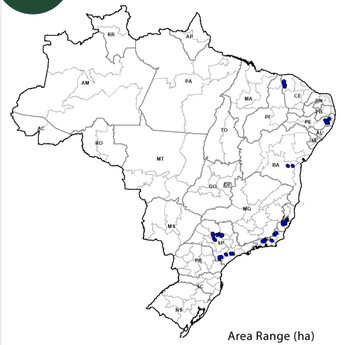
Regions Investigated by Crop

The points on the map correspond to the municipalities investigated by the research.

CARROT

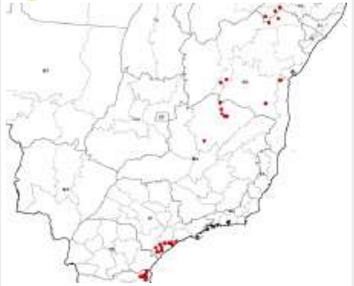
Area Range (ha)

SWEET PEPPER



Area Range (ha)

BANANA



Area Range (ha)

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Regions Investigated by Crop

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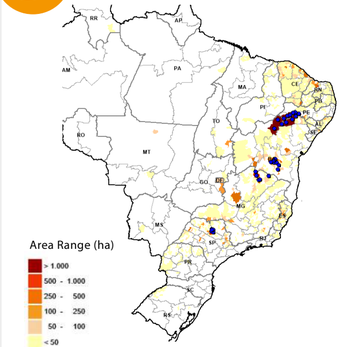
MANGO



PAPAYA

Area Range (ha)

PASSION FRUIT

Area Range (ha)

Cultivation detailing

03

SEASON

2020 | 2021

2021 | 2022

2022 | 2023

Brazil has more than 78.5 million hectares of cultivated land, being the second largest producer of grain in the world, with 319.8 million tons produced in the 2022/2023 season, according to CONAB. The country only stands behind the US and shows more and more its importance in the global agricultural scenario.

Due to the importance of Brazilian agriculture in large markets such as soybeans, corn, sugar cane, cotton, coffee, wheat, among others, and, aiming to understand more clearly the main application modalities for the management of the main crops in Brazil, ProHuma, through data collected by Kynetec, carried out a survey of the main application methods carried out by Brazilian producers during the last 3 seasons (20/21; 21/22 and 22/23). This survey was carried out for the following crops: **soybeans, winter corn, sugar cane, summer corn, winter cereals (wheat and barley), paddy rice, bean, cotton, coffee, potatoes, tomatoes, grapes, citrus, apple, onion, peanut, forest, watermelon, melon, tobacco, carrot, sweet pepper, garlic, brassicas, mango, papaya, passion fruit and banana.** Among the main objectives of the study is the evaluation of the major indicators of the application modalities, such as the number of applications, the adoption of each procedure, formulations of the products used and the penetration of modalities in each property.

Based on what was mentioned, we started our analyzes by data on cultivated area obtained in the study, it is observed that the main crops are:

SOYBEAN	42.459 ha
WINTER CORN	16.093 ha
SUGAR CANE	8.704 ha
FOREST	7.983 ha
SUMMER CORN	4.225 ha

Correlating crop data with the Number of Average applications realized per crop, we come to **Total Sprayed Area.**

A point to note when analyzing the indicator of Number of Applications in large crops such as:

- Soybean (7.2 applications);
- Winter Corn (5.3 applications);
- Coffee (5.6 applications);
- Summer Corn (3.9 applications).

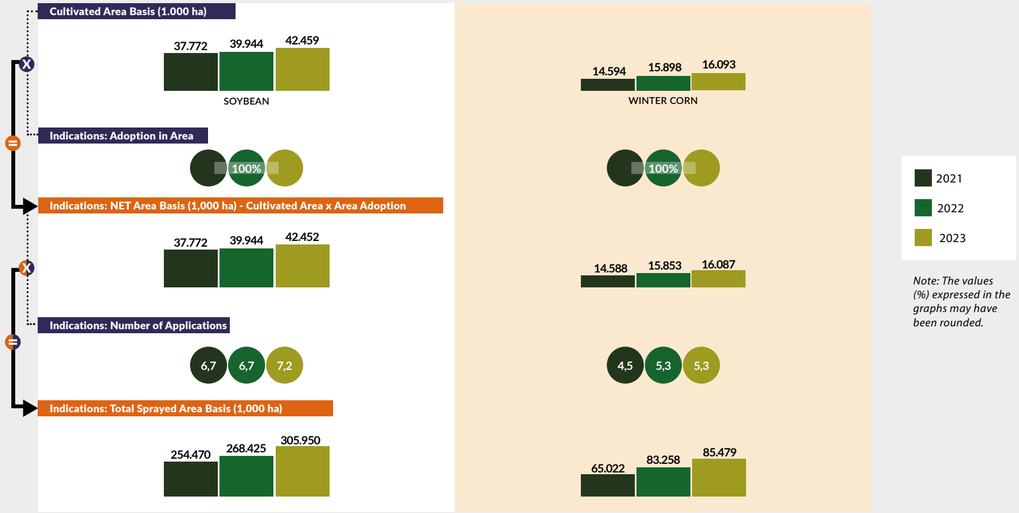
There are a less expressive number of applications when compared to crops such as:

- Tomato (36.7 applications);
- Cotton (26.3 applications) which has smaller cultivated area.

Net area, number of applications and total sprayed area per crop:

TOTAL GRAIN:
2020 | 2021
2021 | 2022
2022 | 2023

The number of applications does not consider the Seed Treatment



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH:

Cultivation detailing:

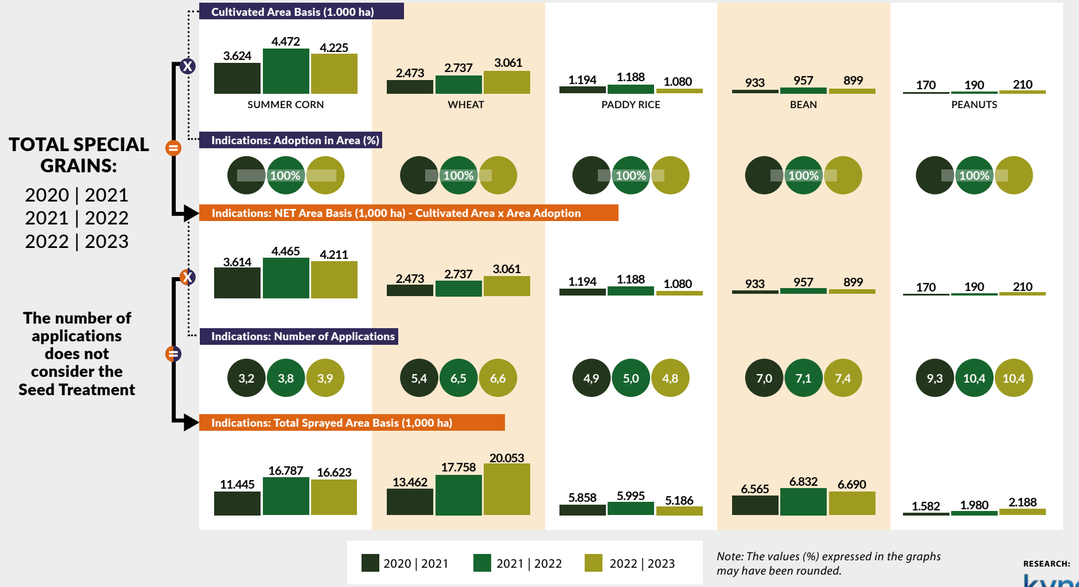
Soybean is the main crop in terms of cultivated area in Brazil and in the world, and as we can see it has been growing every year. In the last season, it went from 39.9 million hectares to 42.4 million. Management was adopted by 100% of producers and the number of applications was 7.2 entries in the area. This increase in area and technology, consequently, also increased the total sprayed area of the crop, reaching 305 million hectares sprayed in the last season.

Winter corn followed the same trend of increase in planted area, going from 15.8 million hectares to 16.1 million. The number of applications in the crop was 5.3 applications, resulting in 85.4 million hectares sprayed, which represented an increase of 3%.

This expansion in the area of these crops is mainly due to Brazil's strategic scenario in their production, mainly due to the attractiveness in terms of financial compensation of the price of these commodities. The expansion of technology also grows, largely due to increased pressure from pests and diseases, and the compensation of this return on investment in these crops by attractive prices makes producers start to invest more in management.

RESEARCH:

Net area, number of applications and total sprayed area per crop:



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Cultivation detailing:

Summer corn had a 6% drop in planted area in the last season. The 2022/23 season was marked by periods of climate instability, while some areas faced drought at the beginning of the cycle, which hampered crop development, others suffered from excessive rainfall that delayed planting and compromised ideal crop management. Thus, the total sprayed area of the crop was impacted by the drop in the cultivated area, however, the number of applications increased from 3.8 to 3.9. Therefore, there was a small reduction in the sprayed area from 16.8 million to 16.6 million hectares applied. Wheat had a significant increase in planted area, mainly due to the global shortage of the product impacted by the war in Ukraine. The impacts of expanding area and technology were fundamental factors in the increase in the total sprayed area, reflecting an increase of 13%.

Rice, although there was a lot of expectation for expansion of the area of the crop due to the large increase in prices of the product in the previous year, showed a drop of 9% in cultivated area and consequently the applied area also reduced. This drop in planted area follows a trend in the country due to the competition between the crop and soy due to the planting season and attractive prices of commodities, in addition to other climatic factors that also make this crop planting option difficult.

Beans had an increase in area of 6% and the number of applications increased from 7.1 to 7.4, resulting in an increase in the sprayed area of 2%.

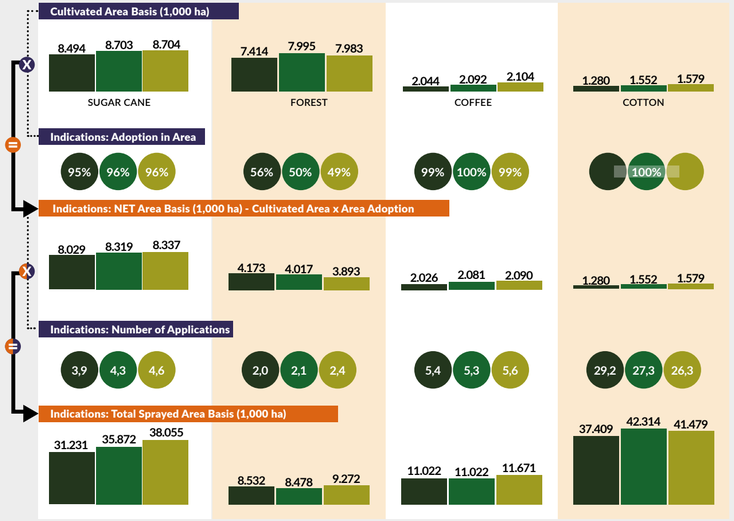
Finally, within grains, we have **peanut**, which has a planted area of 210 thousand hectares, producers make an average of 10.4 applications, resulting in a total sprayed area of 2.2 million hectares.

RESEARCH: kynetec Incorporating Spark smarter decisions

Net area, number of applications and total sprayed area per crop:

TOTAL FRUITS:
2020 | 2021
2021 | 2022
2022 | 2023

The number of applications does not consider the Seed Treatment



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Cultivation detailing:

Among the special crops, **sugar cane** stands out in cultivated area. The crop has been showing stability in terms of planted area: last year, it presented 8.7 million hectares and the number of applications increased from 4.3 to 4.6, which directly reflects the increase in applied area. **Forest** areas, on the other hand, have been expanding due to increased consumption of cellulose and wood in steel mills, with 7.9 million hectares planted in the last year and a sprayed area of 9.2 million.

As for **coffee**, Brazil is the largest producer of this grain. It is a perennial crop and we can observe stability in the planted area, as the number of applications in the last harvest went from 5.34 to 5.6, leaving the total sprayed area of the crop stable at 11.6 million hectares.

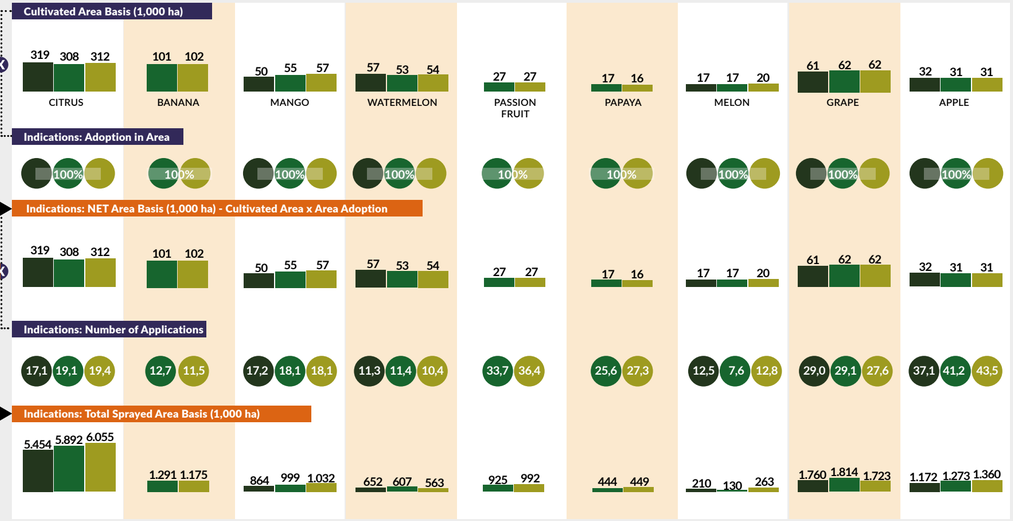
Regarding **cotton**, despite the increase in cultivated area in the last harvest, we noticed a reduction in the number of applications, from 27.3 to 26.3. This reduction in the number of applications is directly related to the greater investment by producers in seeds with biotechnology to control caterpillars and tolerance to herbicides that help in the management of weeds.

RESEARCH: kynetec Incorporating Spark smarter decisions

Net area, number of applications and total sprayed area per crop:

TOTAL FRUITS:
2020 | 2021
2021 | 2022
2022 | 2023

The number of applications does not consider the Seed Treatment



Note: The values (%) expressed in the graphs may have been rounded.

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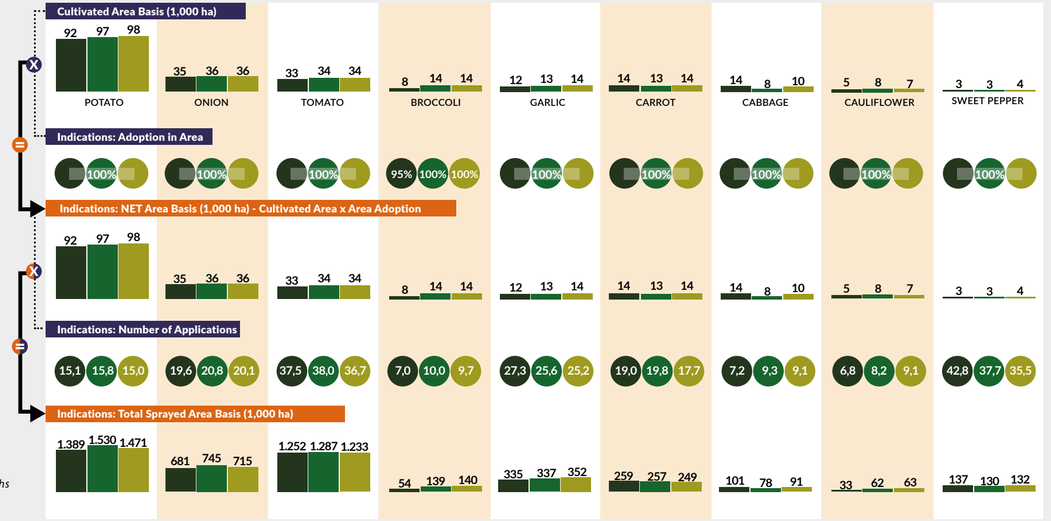
Net area, number of applications and total sprayed area per crop:

TOTAL VEGETABLES:
2020 | 2021
2021 | 2022
2022 | 2023

The number of applications does not consider the Seed Treatment



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Cultivation detailing:

With regard to the fruits included in the **Kynetec study, citrus (orange, lemon and tangerine)** stands out with 312 thousand hectares cultivated and an average number of applications of 19.4. Although the crop area practically remained unchanged in the last season, the increase in the number of entries increased the sprayed area by 3%.

Banana stands out as the second crop in a cultivated area with 102 thousand hectares, 11.5 applications and a total sprayed area of 1,175 hectares. **Grape and apple** crops did not have significant variations in area or technology adoption and practically kept their sprayed areas stable. **Mango and watermelon** appear with 57 and 54 thousand hectares in planted area respectively, resulting in 1 million and 563 thousand hectares applied.

RESEARCH: kynetec Spark

Cultivation detailing:

In **horticultural** crops, potatoes had an increase in area from 97 thousand hectares to 98 thousand, however, there was a drop in the number of applications, which together contributed to a reduction in the sprayed area of the crop (-4%).

Onion has 36 thousand hectares cultivated, 20.1 applications and consecutively 715 thousand hectares sprayed. Tomato, compared to the last season, showed stability in the planted area, totaling 34 thousand hectares, a reduction in the average number of applications from 38.0 to 36.7, resulting in a sprayed area of 1,233 thousand hectares. The other crops have a planted area without great representation and therefore without major variations.

RESEARCH: kynetec Spark

Consolidation Crop - Kynetec

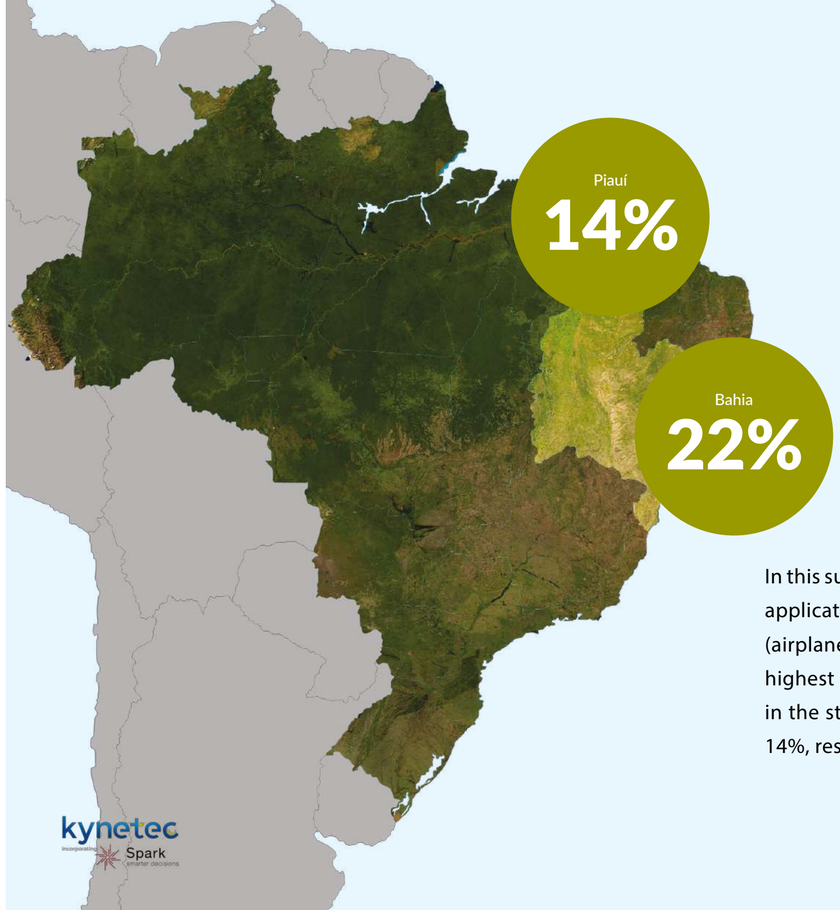
04

Analyzing all the crops investigated, we reached a total sprayed area o**f 562.4 million hectares**, where self-propelled, tractorized and aerial (airplane) represent **71%, 19% and 7%,** respectively, of the sprayed area in Brazil, where the definitions of these main methods are:

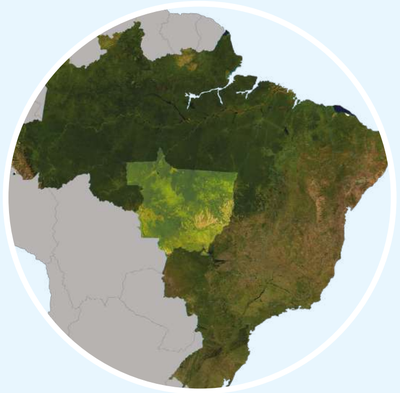
- **SELF-PROPELLED:** According to the Regulatory Norm of the Ministry of Labor No. 12, self-propelled or automotive machine is that which moves in terrestrial environment with its own propulsion system;

- **TRACTOR:** application of products through a machine that features no self-propulsion;

- **AERIAL (AIRPLANE) SPRAYING** "... a specialized service that seeks to protect or promote the development of agriculture through the in-flight application of fertilizers, seeds and agrochemicals, population of lakes and rivers with fish, reforestation and firefighting in fields and forests" (Available at: http://www.agricultura.gov.br/assuntos/sustentabilidade/tecnologia-agropecuaria/aviacao-agricola)



In this survey, differences in the use of different application modalities are observed. Aerial (airplane) application, for example, has the highest adoption over its total sprayed area in the states of Bahia and Piauí, with 22% and 14%, respectively.



MATO GROSSO

Mato Grosso has larger total sprayed area than other states, **170.8 million,** since it has an area of soybean, cotton and winter corn higher than the national average. Because it is a state with larger areas and technification of producers, the percentage of sprayed area by both the self-propelled method and aerial (airplane), is larger than Brazilian average.

BAHIA

As well as the state of **Bahia,** which has a sprayed area of **34.9 million** hectares and predominantly adopts the self-propelled application method (63%), followed by aerial (airplane) application (22%).

OTHER STATES

Considering the grouping of what we call other Brazilian states (MA, PA, RO, ES, PE, AL, PB, RN, SE, RJ and CE), the scenario of the backpack sprayer application method is above the Brazilian average, due to the presence in this group of the state of ES, which plants coffee, and CE, which plants passion fruit and whose main method is this one. On the other hand, the percentage of adoption of self-propelled and tractor application methods is below the general average of the states.

APPLICATION MODALITIES

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Modalities of application

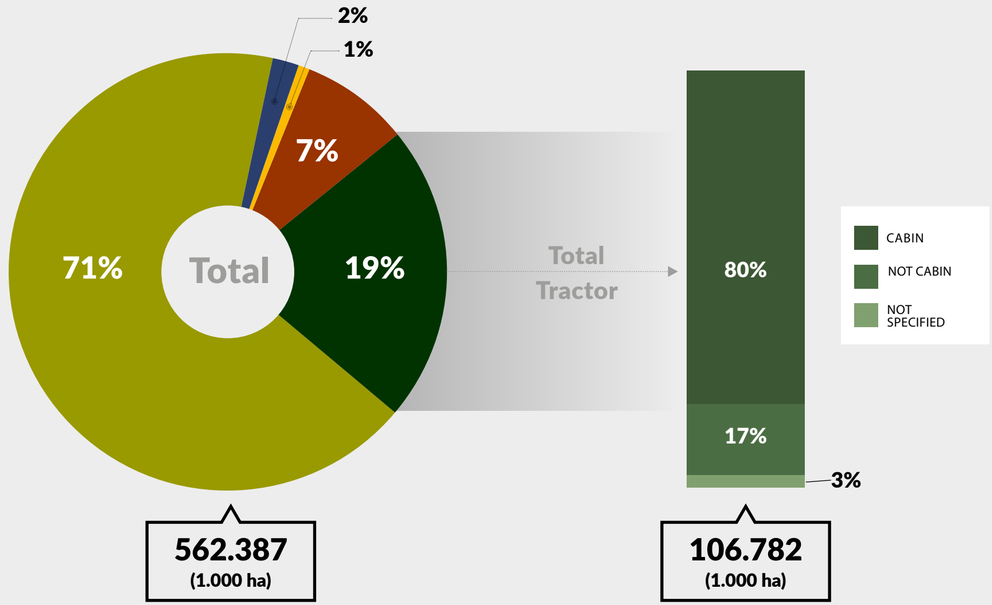
SEASON - 22/23

Indications in %: Total Sprayed Area Basis (1,000 ha).

- SELF-PROPELLED
- TRACTOR
- AERIAL (AIRPLANE)
- BACKPACK SPRAYER
- OTHERS*

**Bait, Quadricycle, Drone, Stationary, Irrigation*

Note: The values (%) expressed in the graphs may have been rounded.



RESEARCH:
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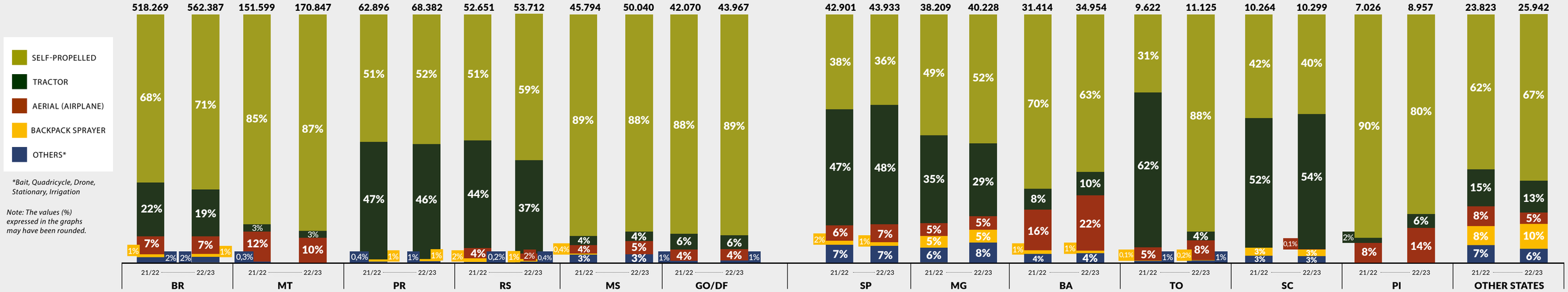
Application modalities by states

SEASONS – 21|22 – 22/23

Indications in %: Total Sprayed Area Basis (1,000 ha).



RESEARCH: kynetec Incorporating Spark smarter decisions

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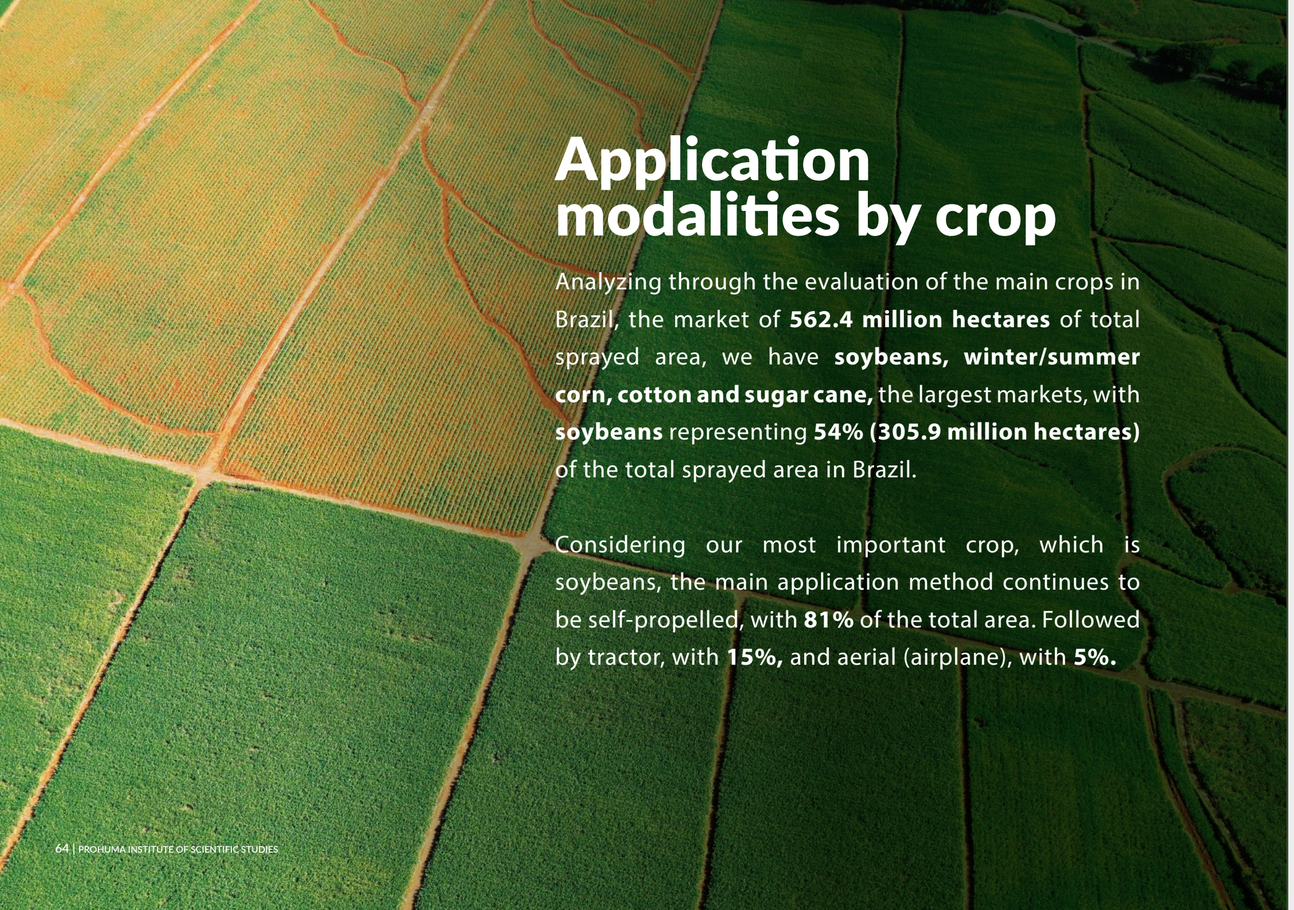
Application modalities by states

SEASONS – 21|22 and 22|23

RESEARCH: kynetec Incorporating Spark smarter decisions



Application modalities by crop

Analyzing through the evaluation of the main crops in Brazil, the market of **562.4 million hectares** of total sprayed area, we have **soybeans, winter/summer corn, cotton and sugar cane,** the largest markets, with **soybeans** representing **54% (305.9 million hectares)** of the total sprayed area in Brazil.

Considering our most important crop, which is soybeans, the main application method continues to be self-propelled, with **81%** of the total area. Followed by tractor, with **15%,** and aerial (airplane), with **5%.**

We can observe that for **soybean, winter corn, cotton, sugar cane, wheat, summer corn, beans, wheat and peanut** crops, there is a predominance of self-propelled applications. Next in these crops we have the tractor application method, with the exception of cotton, where aerial (airplane) is the second most used method (**18%**), and is still the crop that most employs the adoption of this method. The second crop with a percentage very close to cotton in the use of the aerial (airplane) method is paddy rice, with **28%**. Sugarcane also ranks above the average for crops in using this method, with **23%.**

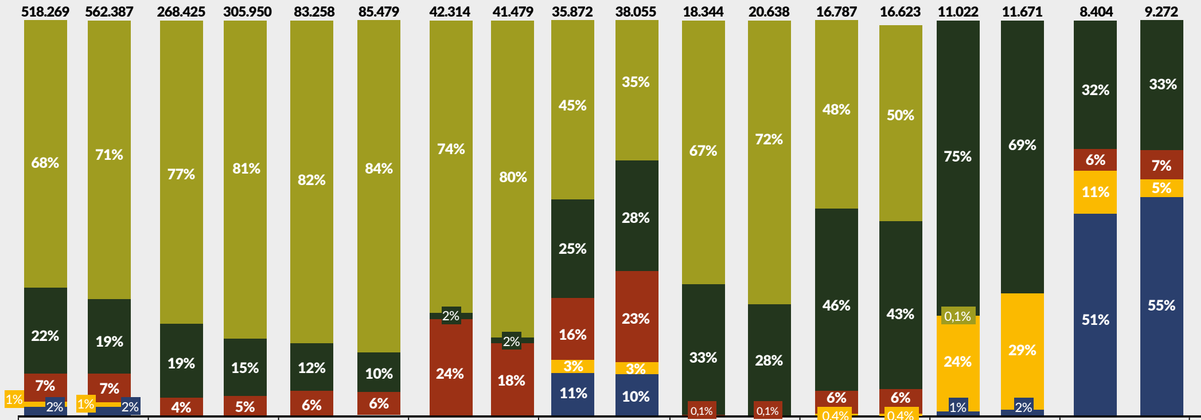
The tractor method is the most used in crops such as coffee, paddy rice, citrus, grape, potato, peanut, apple, onion, watermelon and melon. In tomato crops, there is a growth in other application methods, leveraged by the use of stationary applications. In forest and apple, other methods are due to the intensive use of bait application. Sugar cane, in turn, includes in other methods the modalities of quadricycle and drone application.

RESEARCH:

Application modalities by crop

SEASONS – 20|21 e 21|22

Indications in %: Total Sprayed Area Basis (1,000 ha).



**Bait, Quadricycle, Drone (specifically sugar cane - biological control), Stationary, Irrigation*

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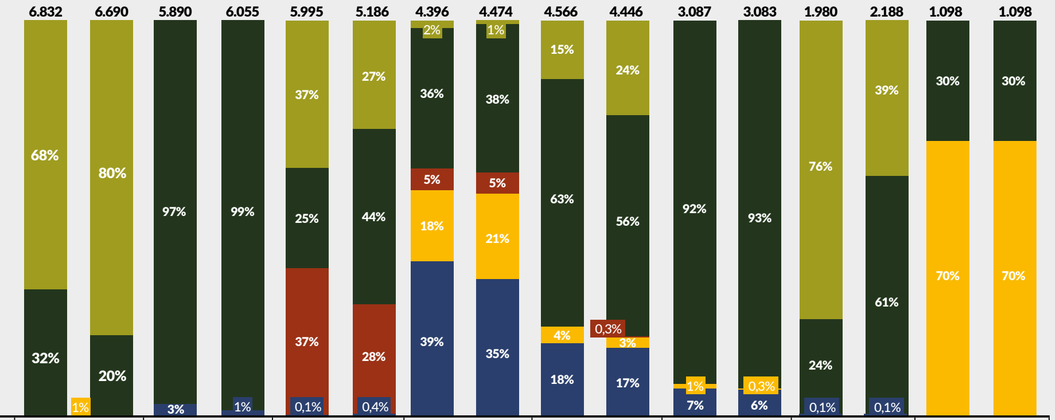
Application modalities by crop

SEASONS – 21/22 e 22/23

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Bait, Quadricycle, Drone (specifically sugar cane - biological control), Stationary, Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

Formulations by application modalities

To perform formulation analysis by application methods, we do not use the total sprayed area as a basis, but the TREATED LINEAR AREA (ALT). The formulation market we reviewed equals 1.656 billion of hectares of Treated Linear Area.

The most commonly used formulations in the main application modalities are:

- **CONCENTRATED SUSPENSION (SC):** formed by an active ingredient dispersed in water, suitable for many active ingredients with low solubility in water, small-sized particles of active ingredient, no flammable dust and liquid.
- **EMULSIBLE CONCENTRATE (EC):** combination of an active ingredient dissolved in a solvent with emulsifiers. The types of most common crop protection formulations in the world;
- **SOLUBLE CONCENTRATE (SL):** homogeneous liquid formulation for application after dilution in water as a true solution of active ingredient;
- **WATER DISPERSIBLE GRANULES (WG):** solid formulation consisting of granules for suspension application after disintegration and dispersion in water.

Fonte disponível em: http://www.ebah.com.br/content/ABAAAAfiEAF/defesa-vegetal-no-brasil?part=10)

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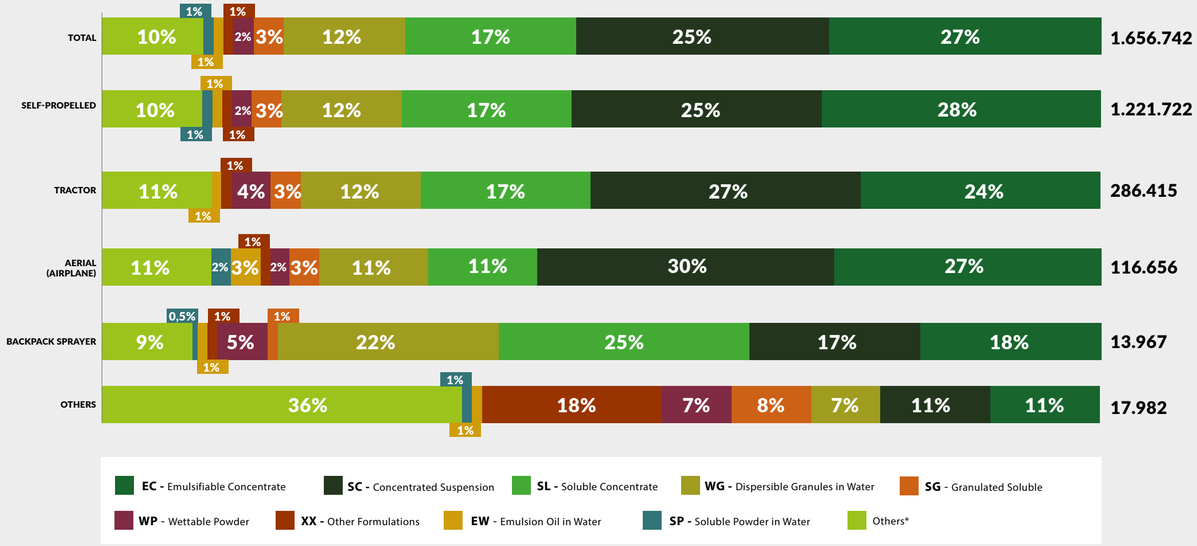
Formulations by application modalities

TOTAL CROPS – 22|23 - Indicações %. Base em ALT (1.000 ha)



*Adjuvants.

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH:
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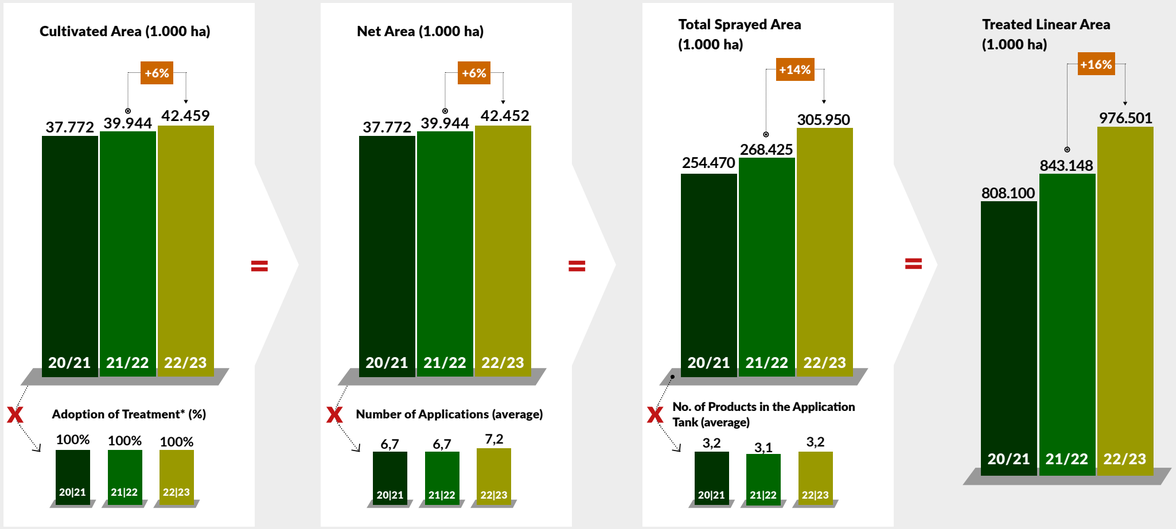
FarmTrak™

SOYBEAN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

SOYBEAN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
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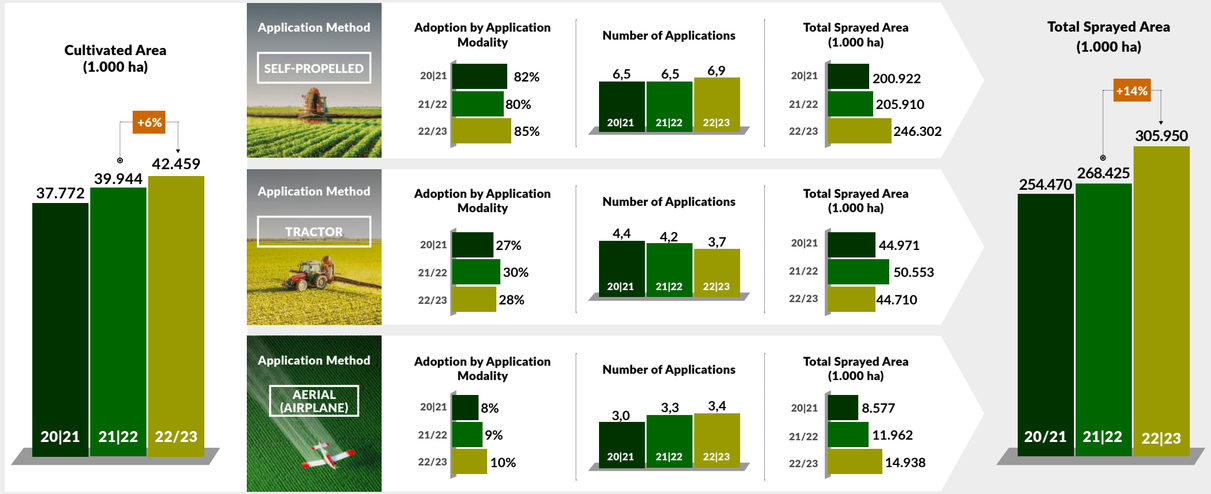
Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

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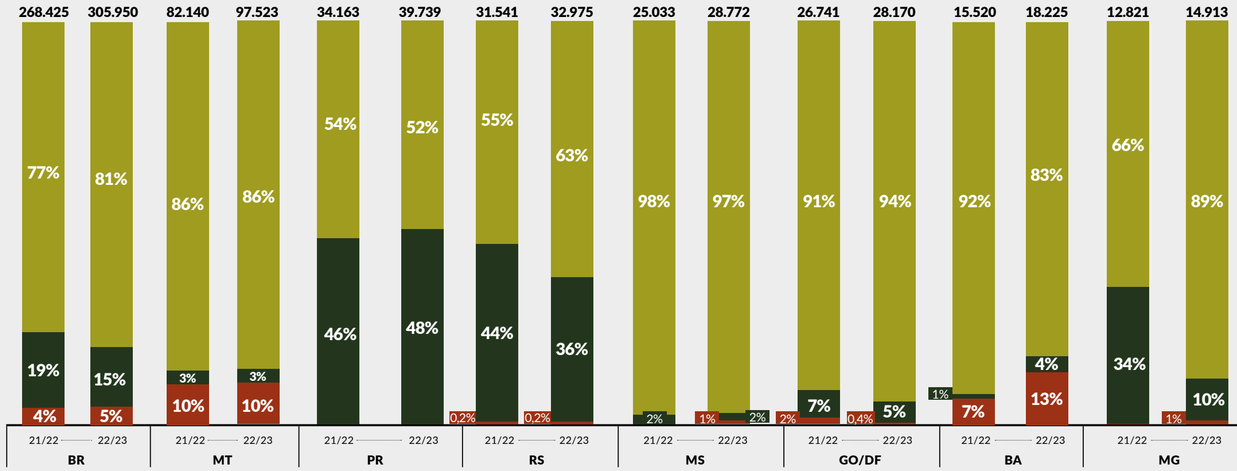
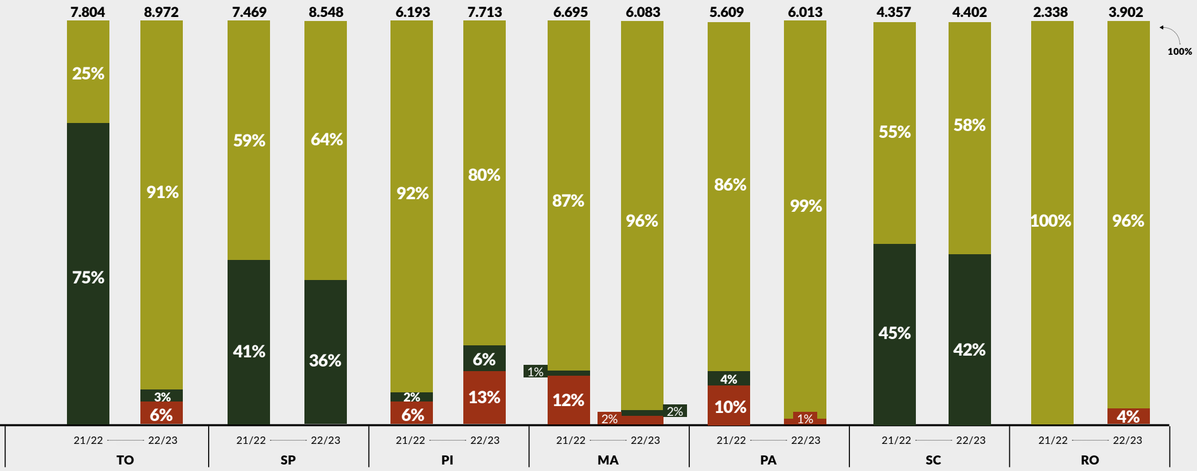
Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)





SELF-PROPELLED TRACTOR AERIAL (AIRPLANE)

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

SOYBEAN: 2021 | 2022 2022 | 2023 *Bases by indicators.*

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Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

SELF-PROPELLED TRACTOR AERIAL (AIRPLANE)

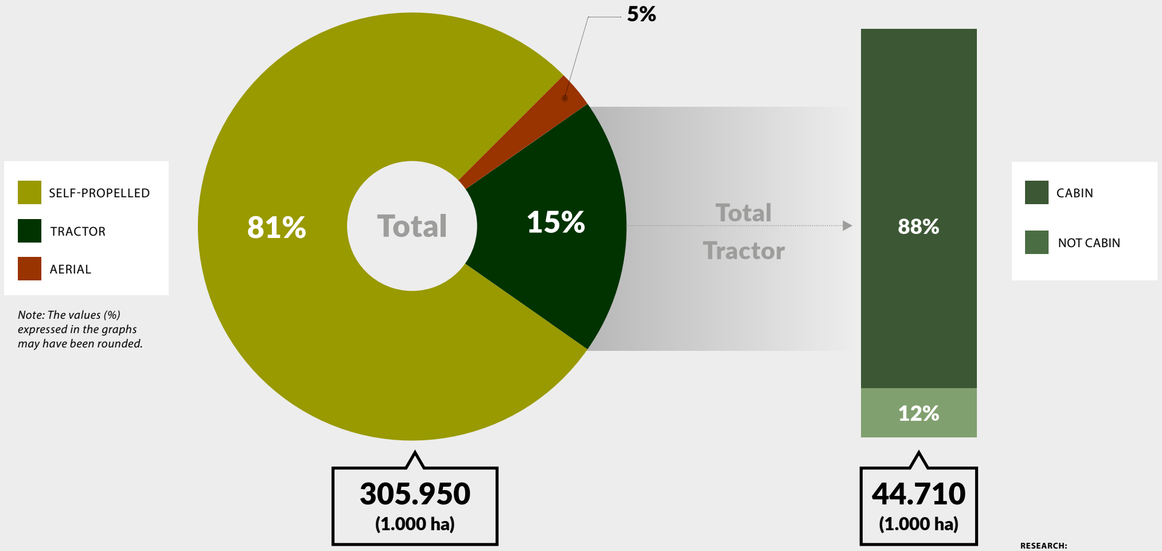
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

SOYBEAN:
2022 / 2023
Bases by indicators.

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH:
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SOYBEAN:
2022 / 2023
Bases by indicators.

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Formulações por Modalities of application

Indications %: Base in ALT (1,000 ha)

*Adjuvants.

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH:
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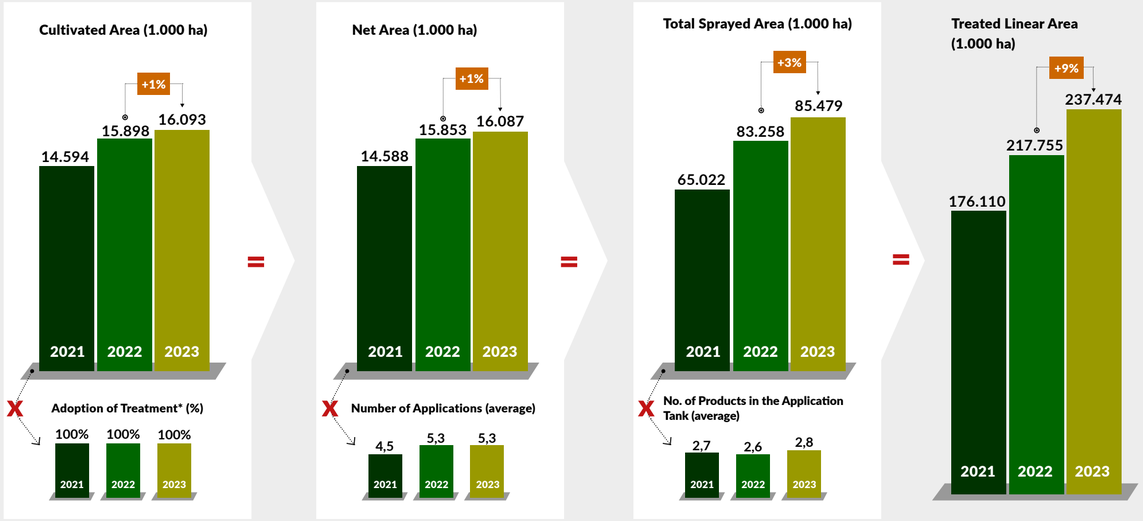
FarmTrak™

WINTER CORN: 2021 2022 2023

Bases by indicators

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

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WINTER CORN: 2021 2022 2023

Bases by indicators

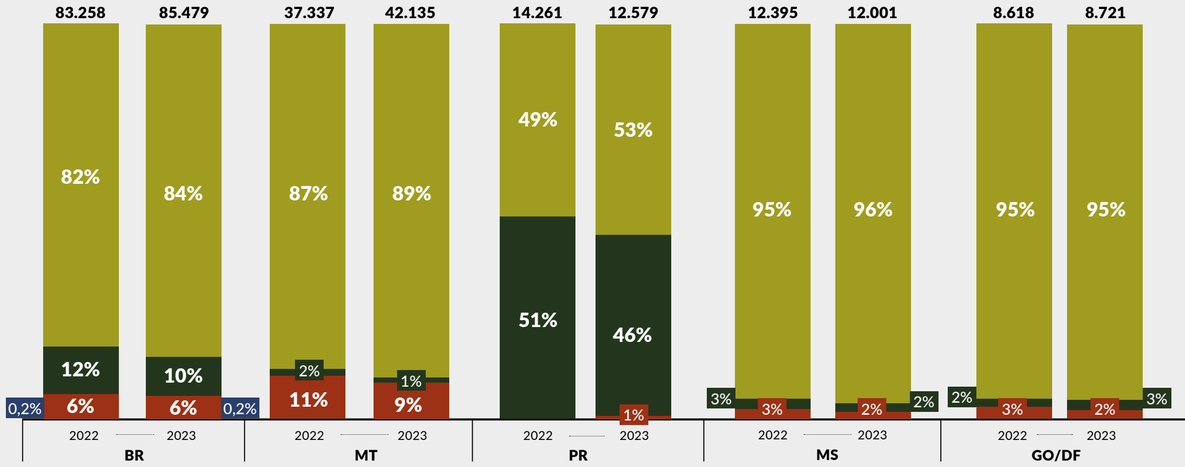
Main indicators

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



SELF-PROPELLED | TRACTOR | AERIAL (AIRPLANE) | OTHERS*

Note: The values (%) expressed in the graphs may have been rounded.
**Drone, Backpack sprayer*

RESEARCH: kynetec incorporating Spark smarter decisions

WINTER CORN: 2022 2023 Bases by indicators

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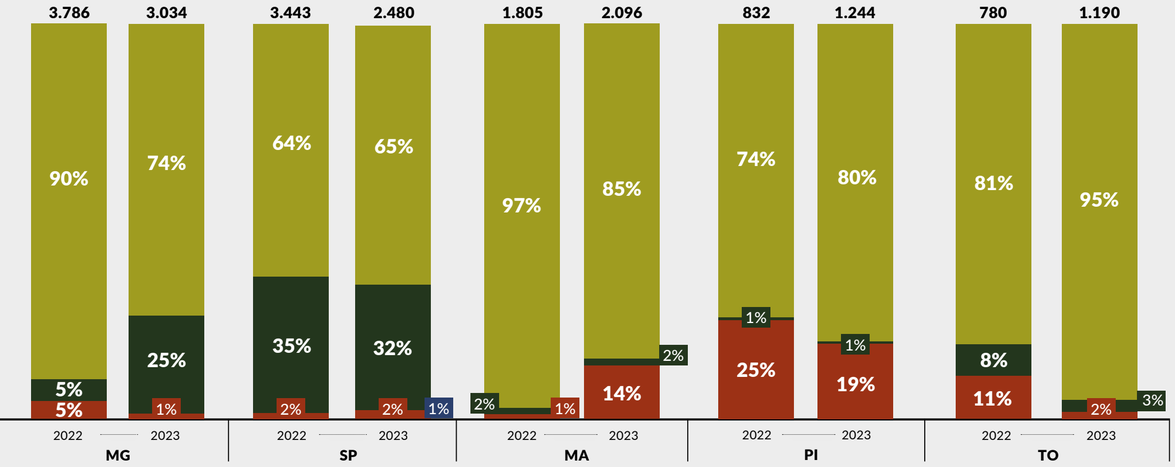
Modalities of application por estados

Indications in %: Total Sprayed Area Basis (1,000 ha)



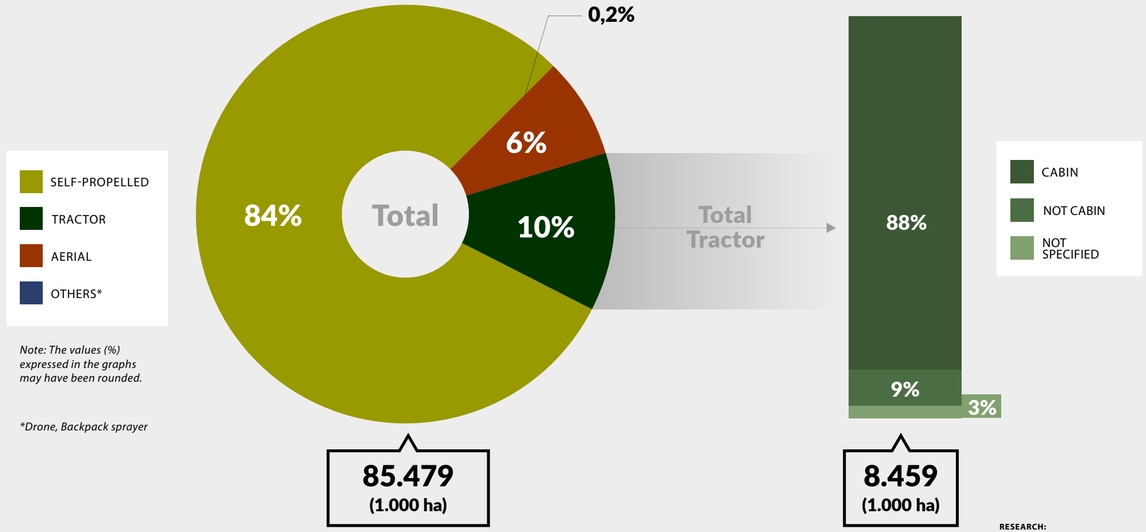
SELF-PROPELLED | TRACTOR | AERIAL (AIRPLANE) | OTHERS*

Note: The values (%) expressed in the graphs may have been rounded.
**Drone, Backpack sprayer*

RESEARCH: kynetec incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Drone, Backpack sprayer*

RESEARCH: kynetec Incorporating Spark smarter decisions

WINTER CORN: 2023

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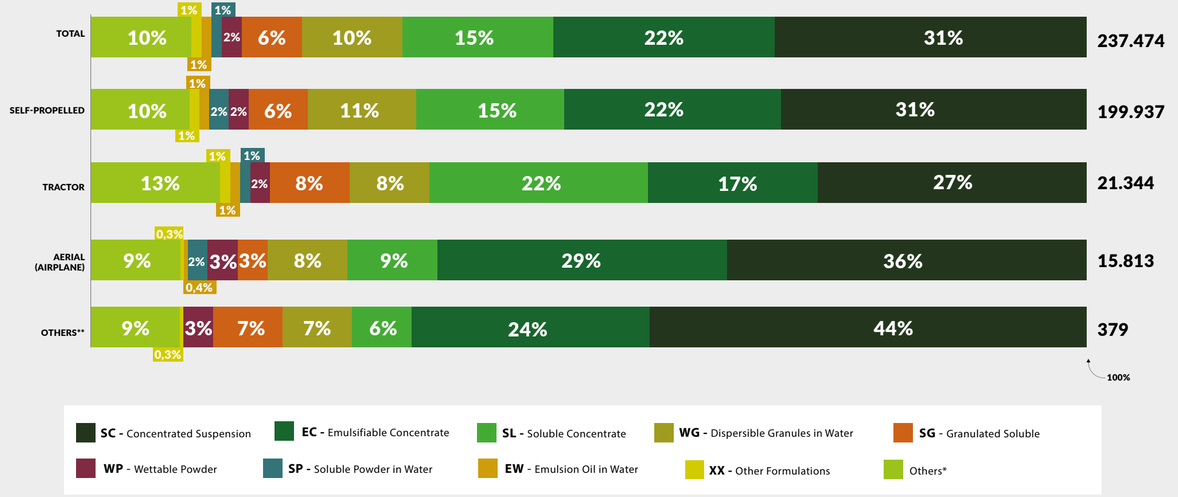
Formulations by application modalities

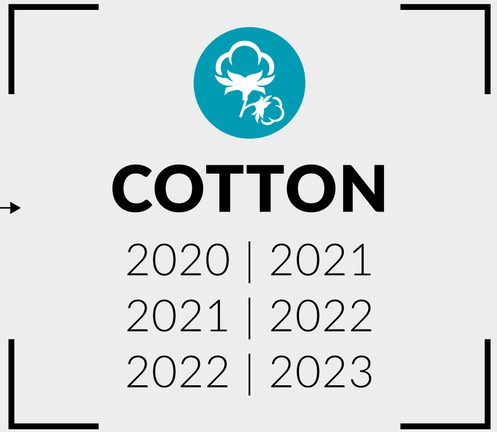
Indicações %. Base em ALT (1.000 ha)



**Adjuvants.* ***Drone, Backpack sprayer*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions



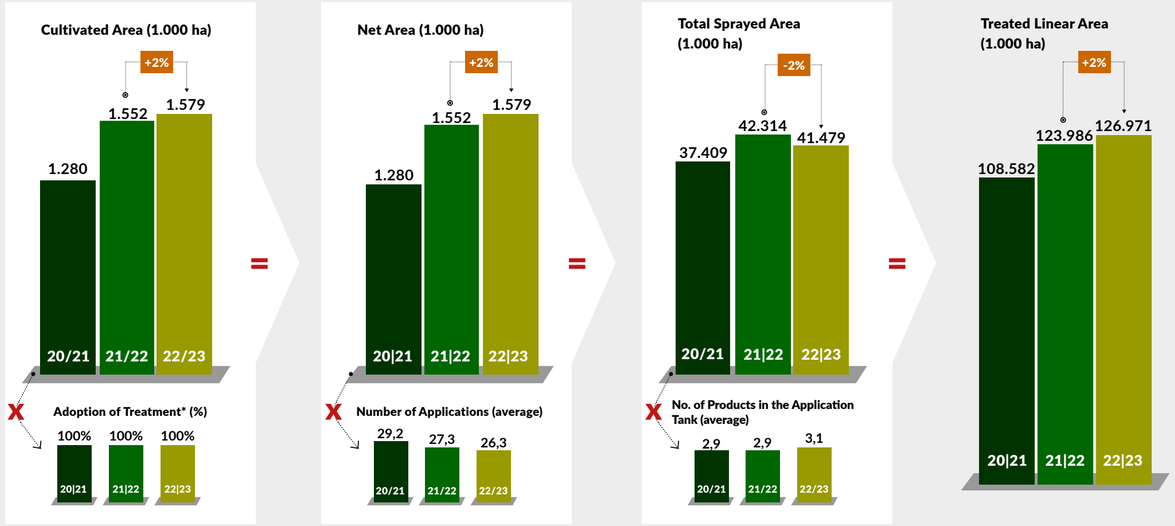
RESEARCH: kynetec Incorporating Spark smarter decisions

RESEARCH: kynetec Incorporating Spark smarter decisions

COTTON: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

*Treatment may have been performed using chemicals or biologicals.

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COTTON: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

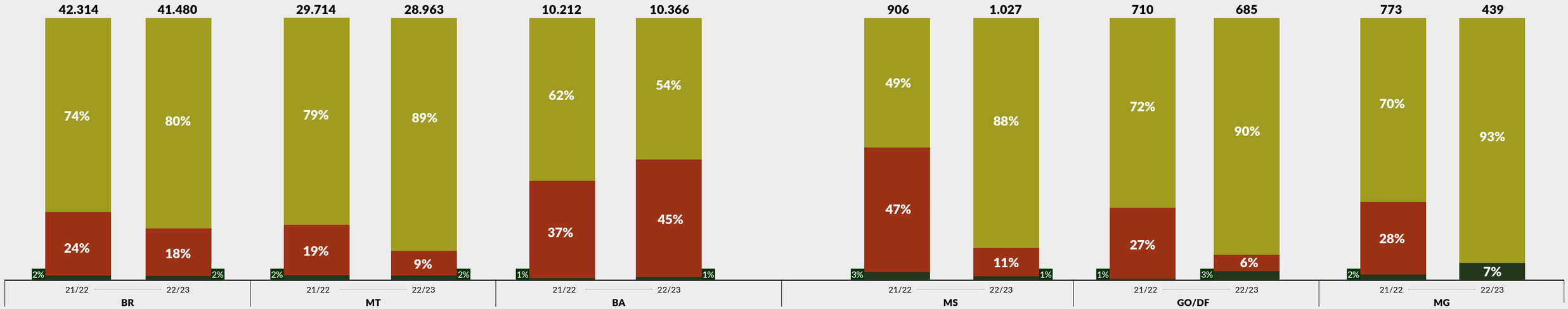
Main indicators

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

COTTON: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

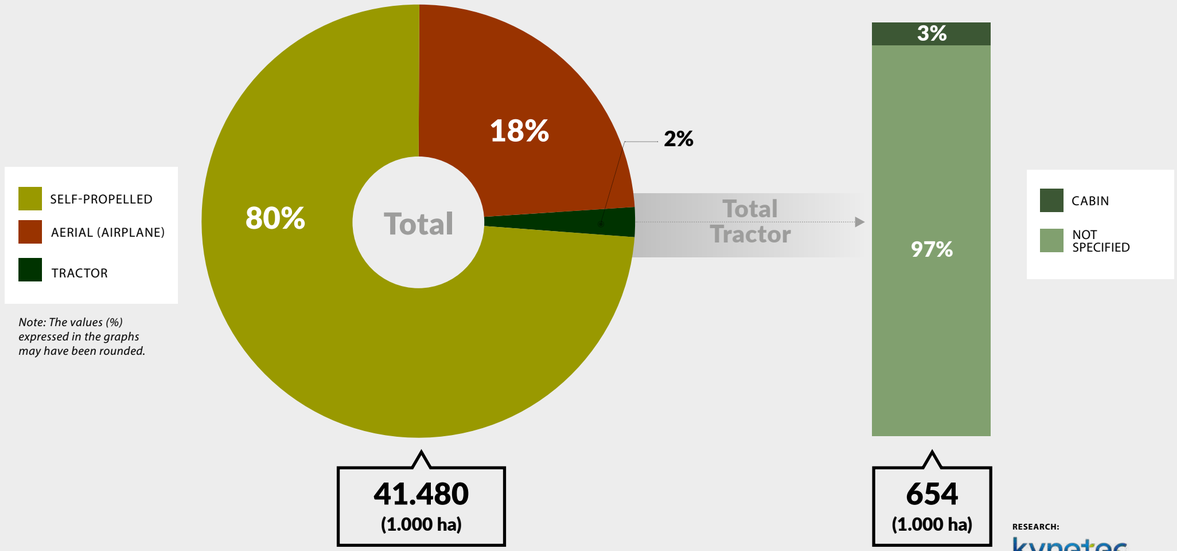
SELF-PROPELLED
AERIAL (AIRPLANE)
TRACTOR

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).

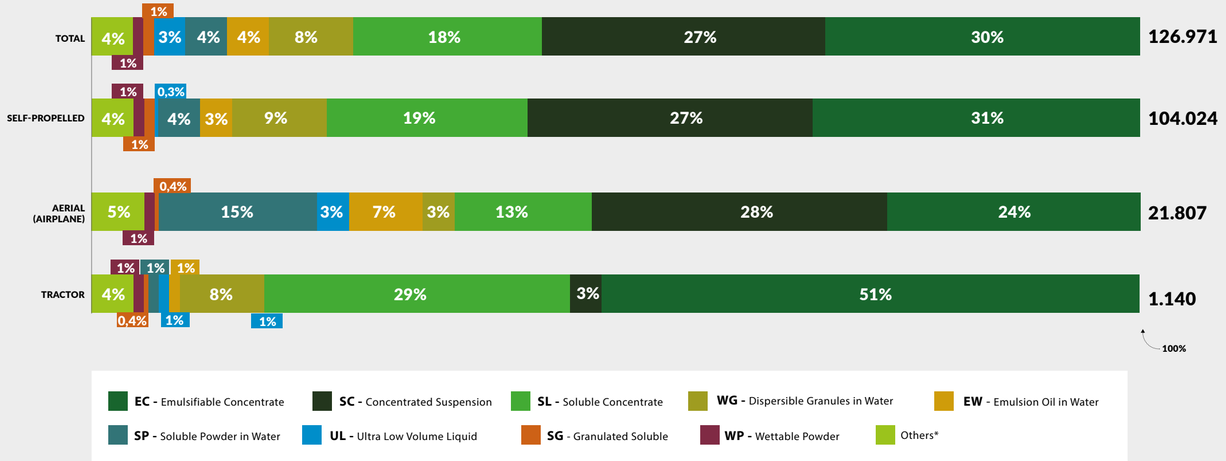


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



*Adjuvants.

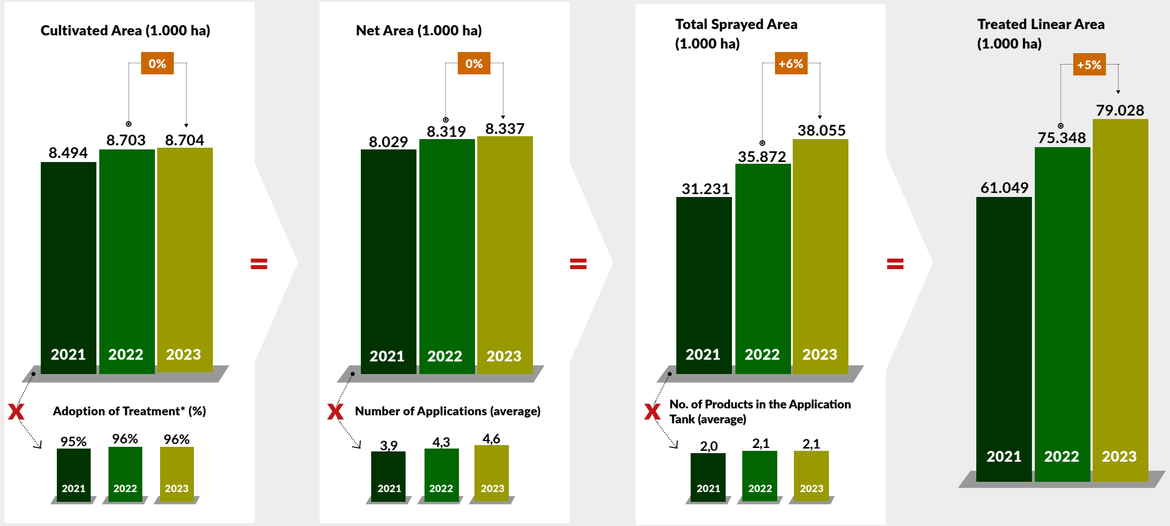
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

SUGAR CANE: 2021 2022 2023
Bases by indicators.

Main indicators



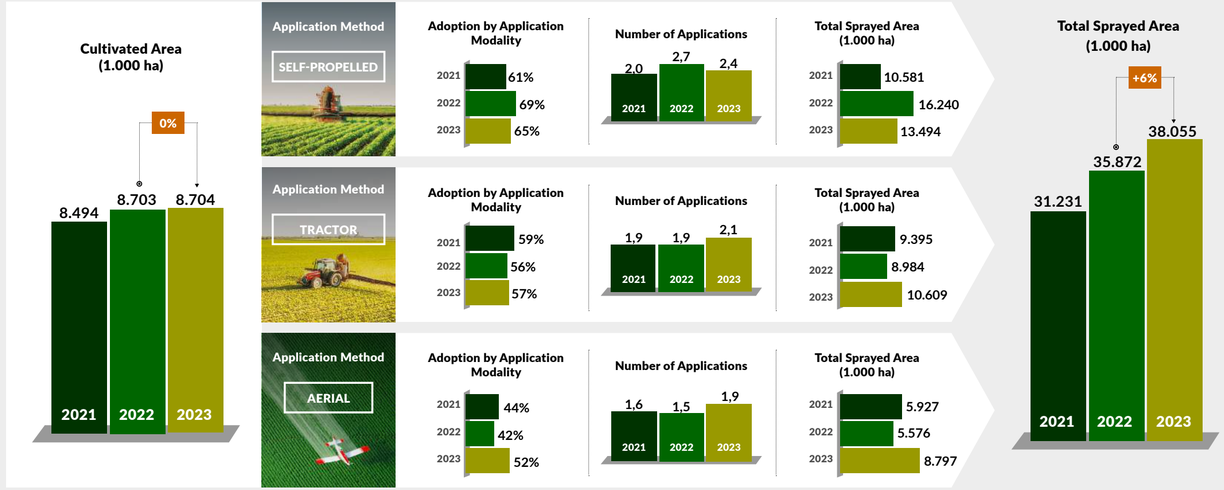
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

SUGAR CANE: 2021 2022 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

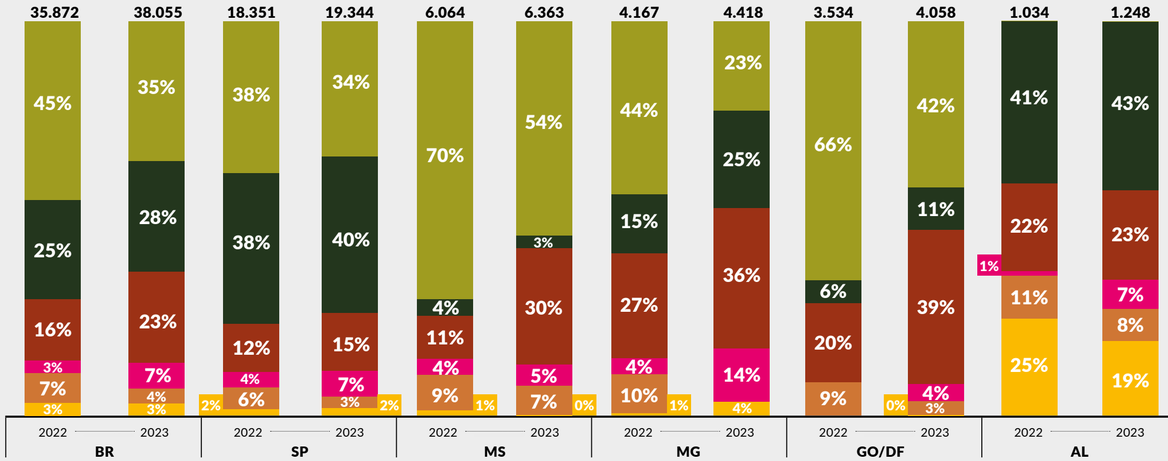


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



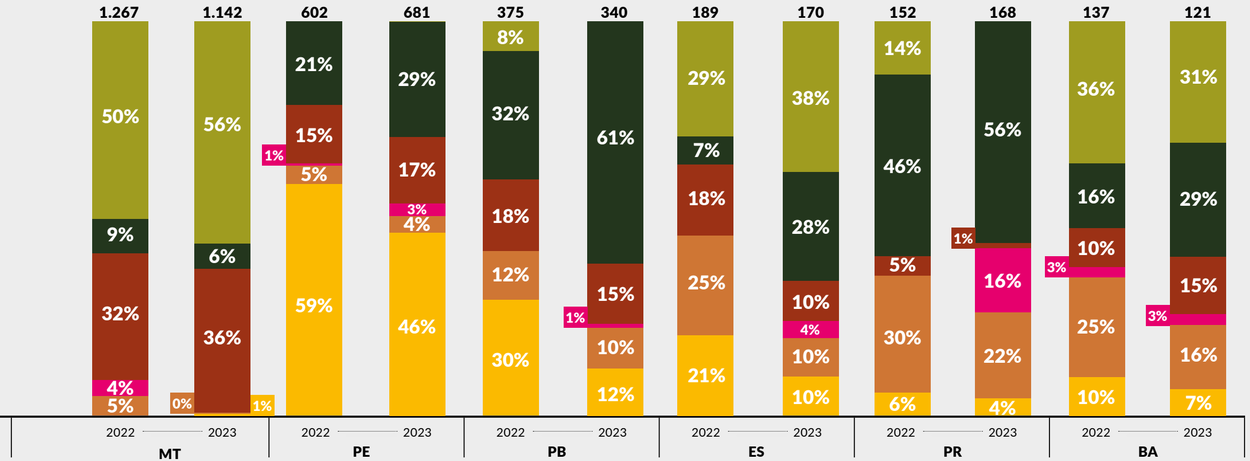
Note: The values (%) expressed in the graphs may have been rounded.

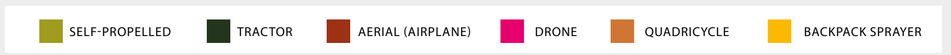
RESEARCH: kynetec Incorporating Spark smarter decisions

SUGAR CANE: 2022 2023 *Bases by indicators*

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states



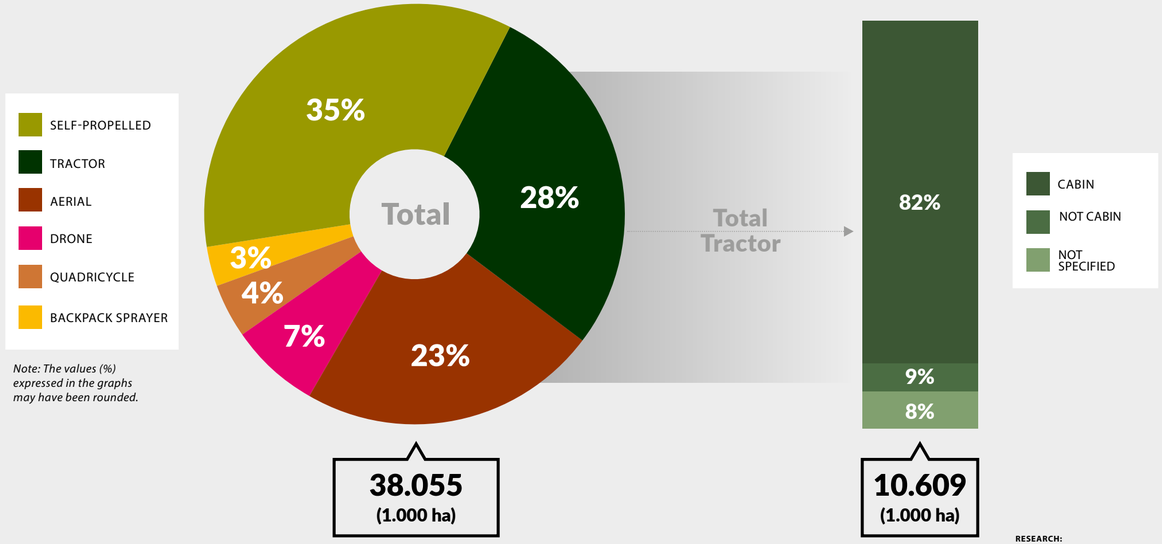


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

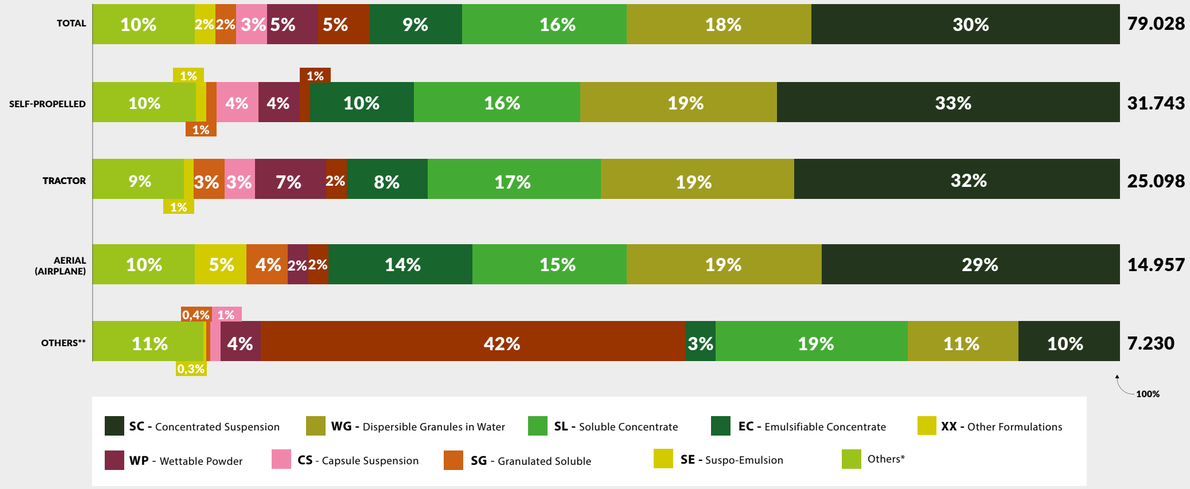
RESEARCH: kynetec Incorporating Spark smarter decisions

SUGAR CANE: 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indicações %. Base em ALT (1.000 ha)



***Drone, Backpack sprayer e Quadricycle.*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

WHEAT
2021
2022
2023

RESEARCH: kynetec Incorporating Spark smarter decisions

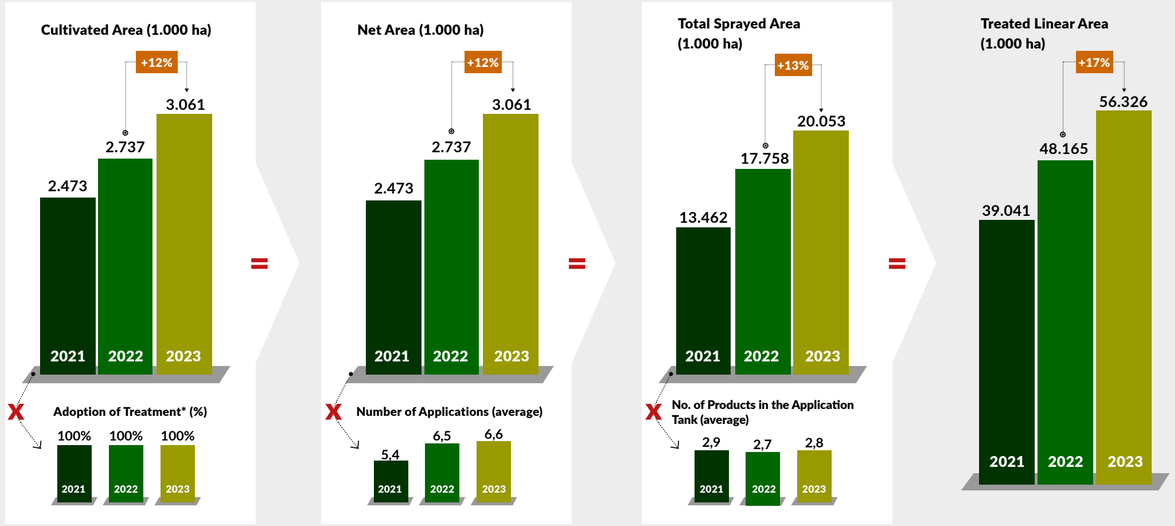
RESEARCH: kynetec Incorporating Spark smarter decisions

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

WHEAT: 2021 2022 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

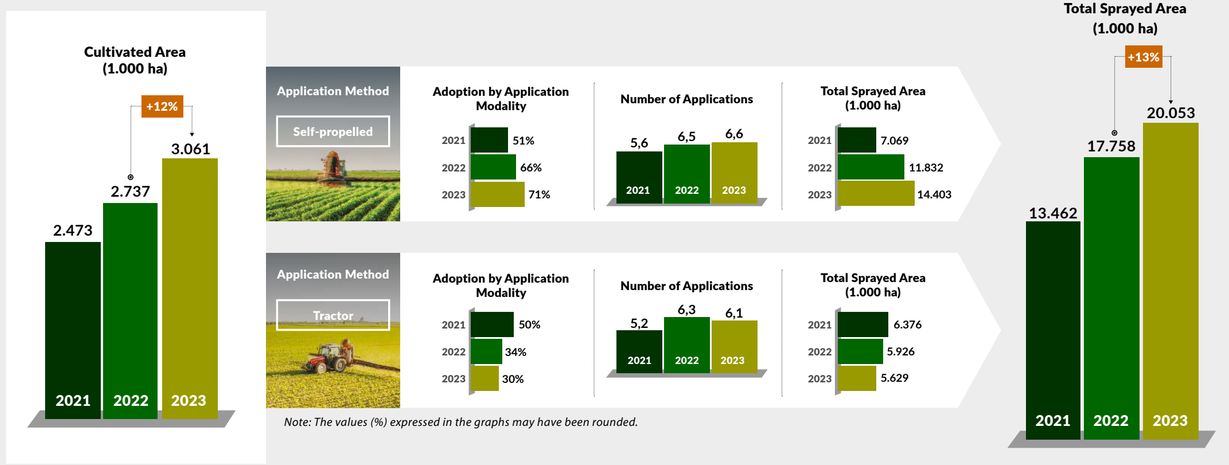
RESEARCH: kynetec Incorporating Spark smarter decisions

WHEAT: 2021 2022 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

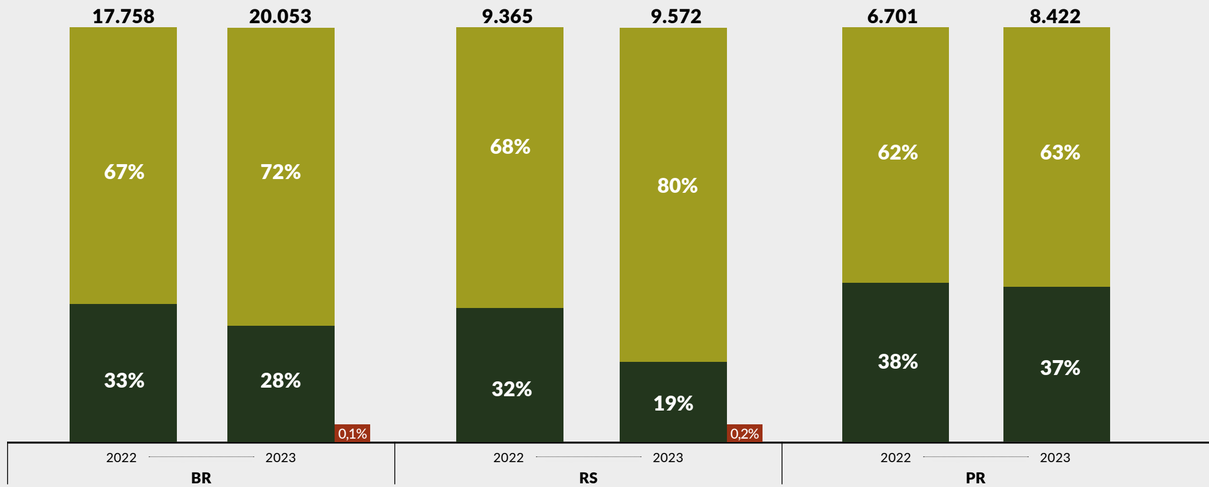
RESEARCH: kynetec Incorporating Spark smarter decisions

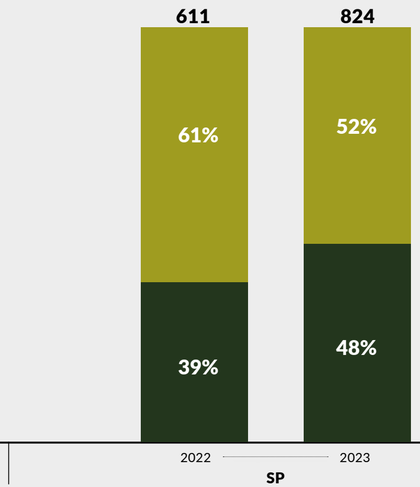
WHEAT: 2022 2023

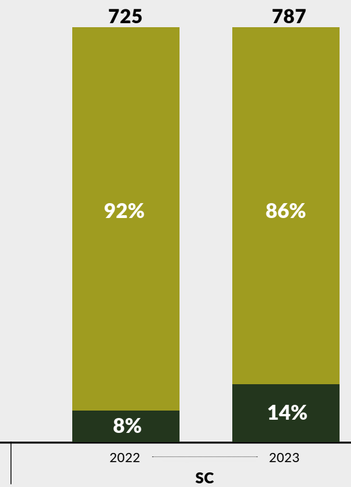
Bases by indicators.

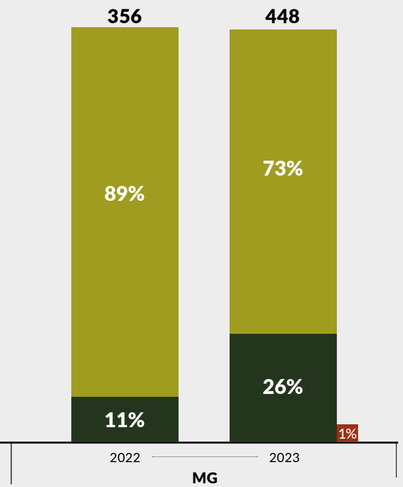
Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)









SELF-PROPELLED TRACTOR AERIAL (AIRPLANE)

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

WHEAT: 2022 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

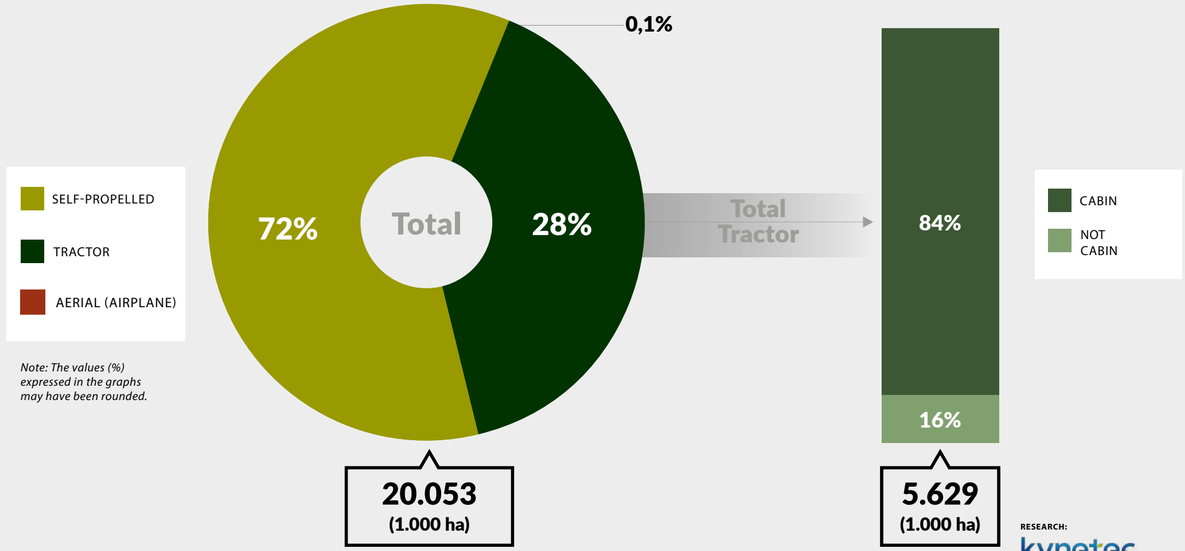
SELF-PROPELLED TRACTOR AERIAL (AIRPLANE)

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

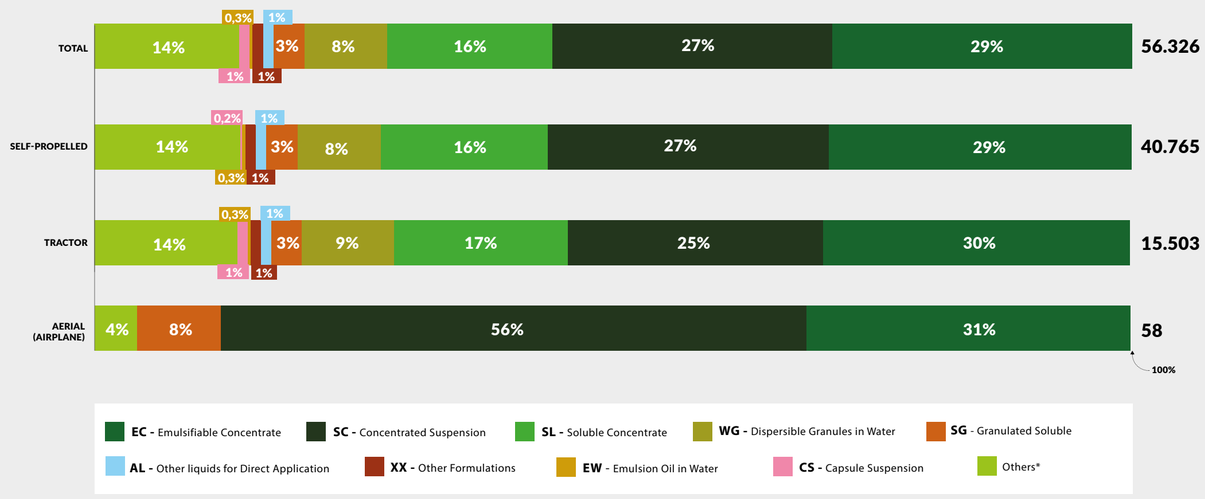
RESEARCH: kynetec Incorporating Spark smarter decisions

WHEAT:
2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulações por Modalities of application

Indicações %. Base em ALT (1.000 ha)



**Adjuvants*

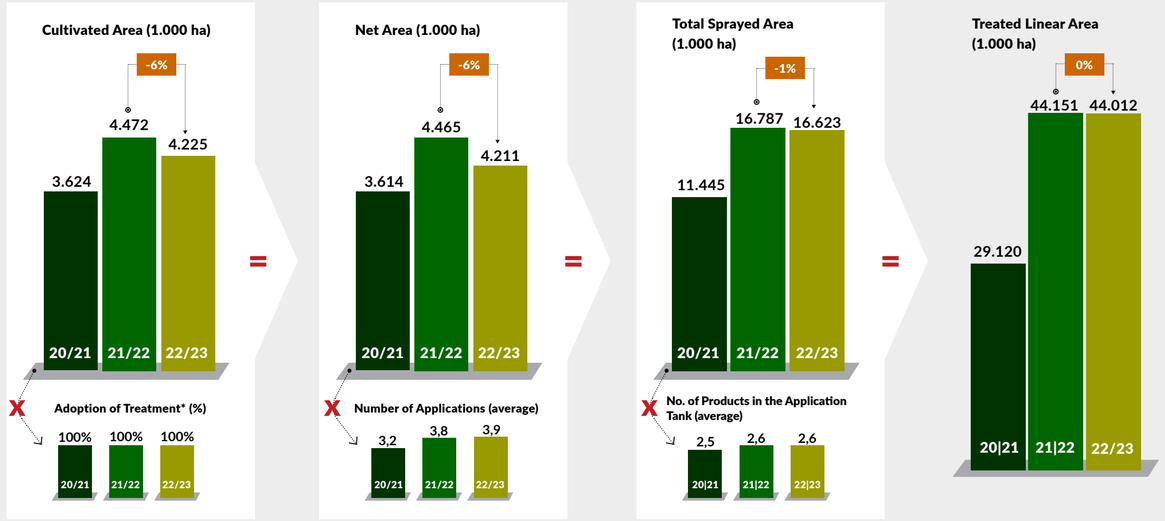
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

SUMMER CORN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



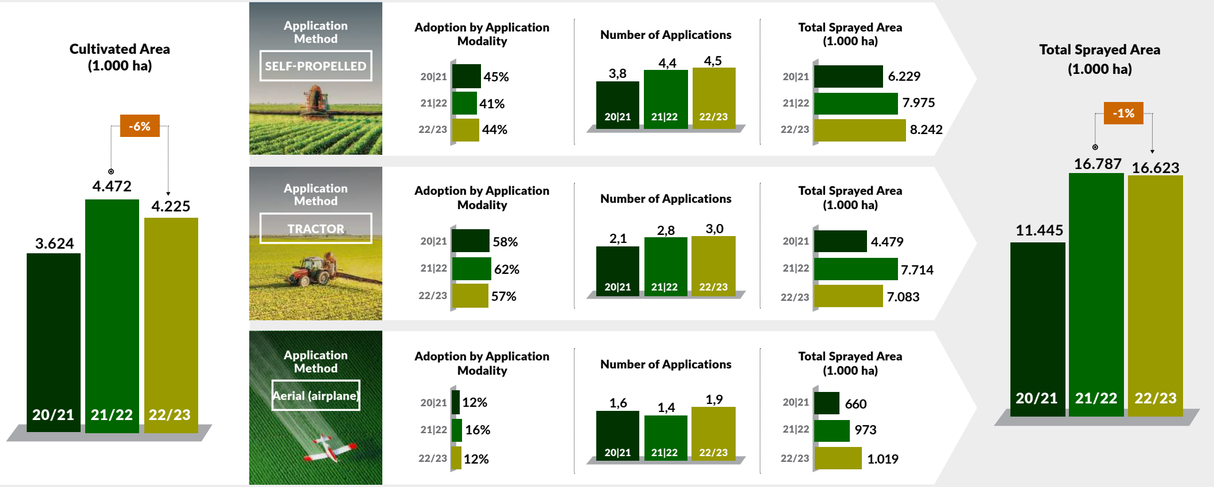
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

SUMMER CORN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

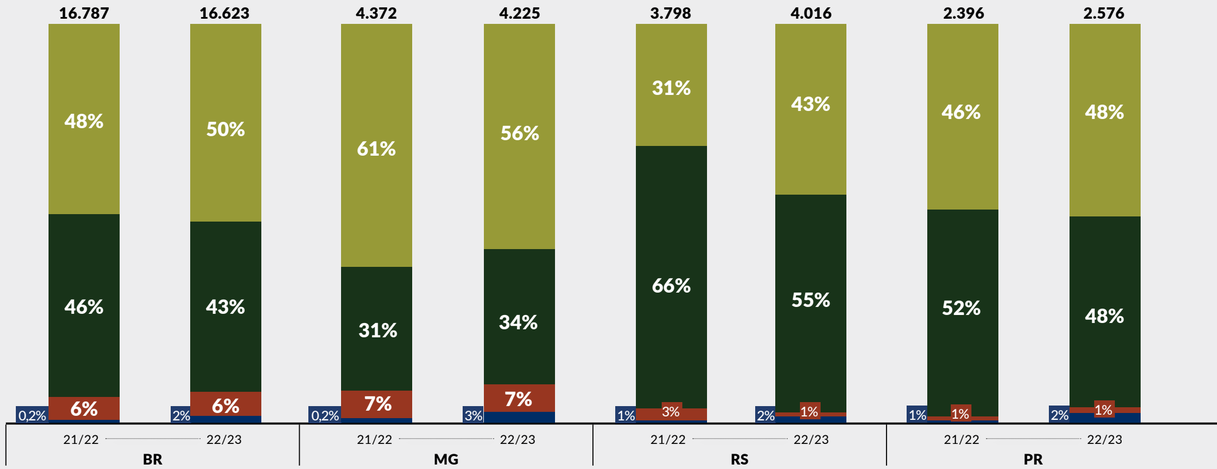


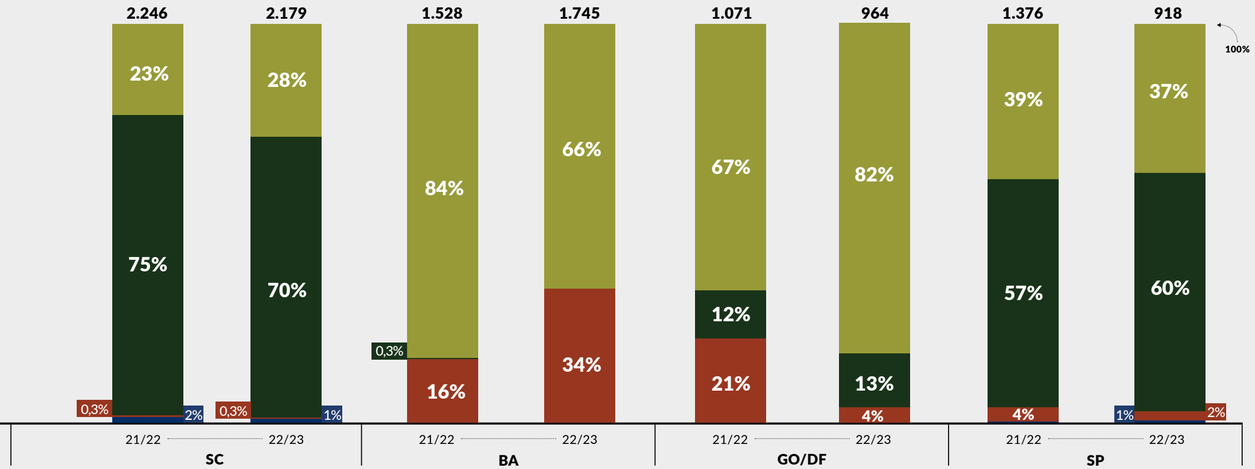
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)





SELF-PROPELLED | TRACTOR | AERIAL (AIRPLANE) | OTHERS*

Note: The values (%) expressed in the graphs may have been rounded.

**Drone, Backpack sprayer, Irrigation*

RESEARCH: kynetec incorporating Spark smarter decisions

SUMMER CORN: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

SELF-PROPELLED | TRACTOR | AERIAL (AIRPLANE) | OTHERS*

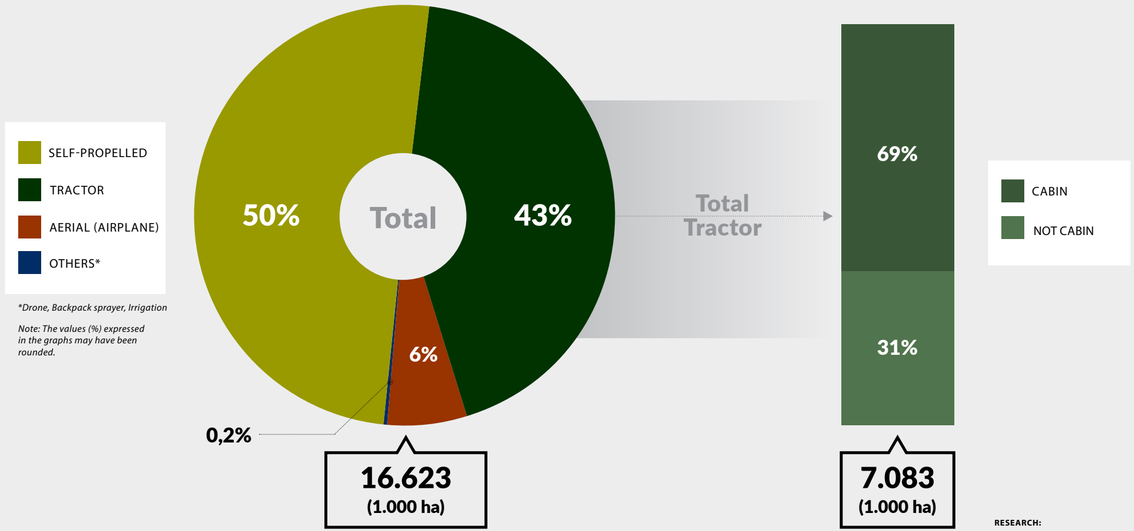
Note: The values (%) expressed in the graphs may have been rounded.

**Drone, Backpack sprayer, Irrigation*

RESEARCH: kynetec incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



*Drone, Backpack sprayer, Irrigation

Note: The values (%) expressed in the graphs may have been rounded.

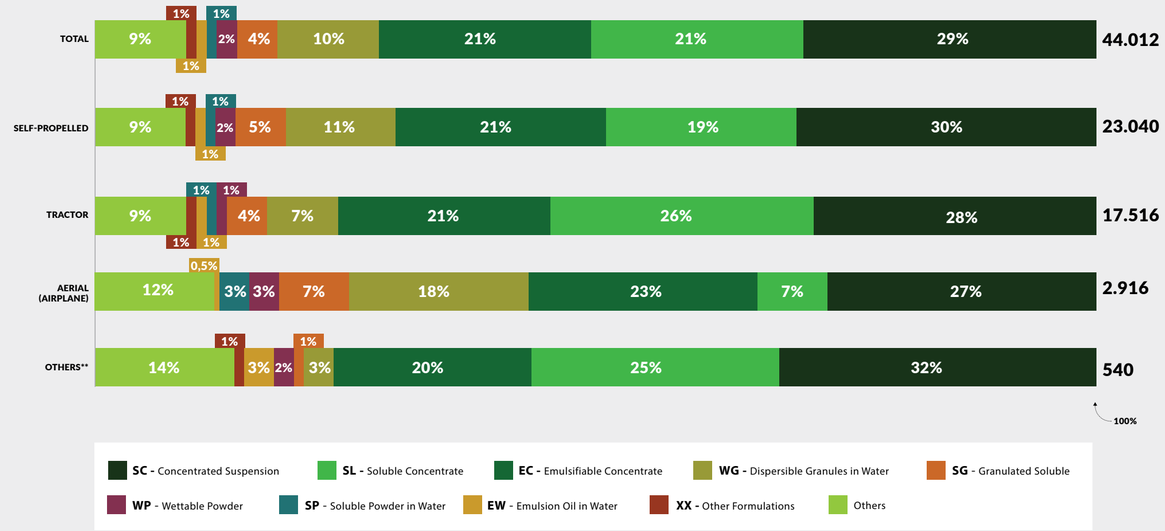
RESEARCH: kynetec Incorporating Spark smarter decisions

SUMMER CORN:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



*Adjuvants. **Drone, Backpack sprayer, Irrigation Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

COFFEE

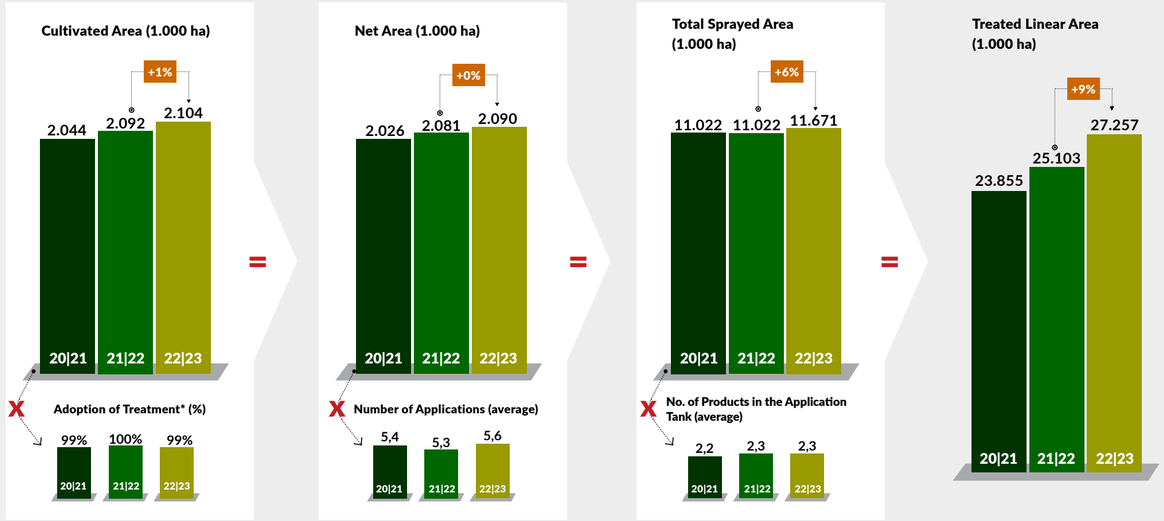
2020 | 2021

2021 | 2022

2022 | 2023

COFFEE: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



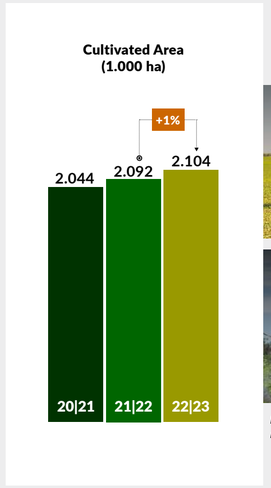
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

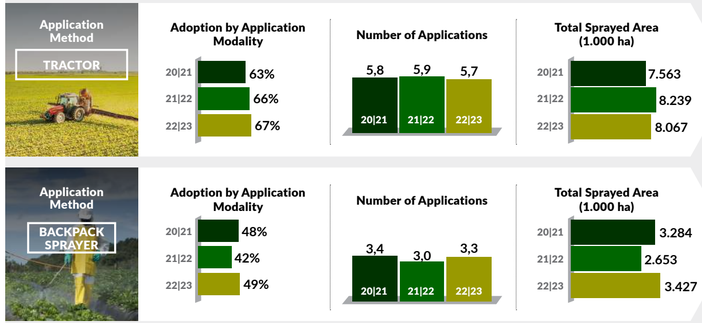
RESEARCH: kynetec Incorporating Spark smarter decisions

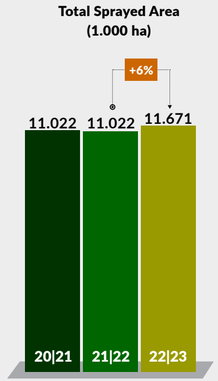
COFFEE: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators





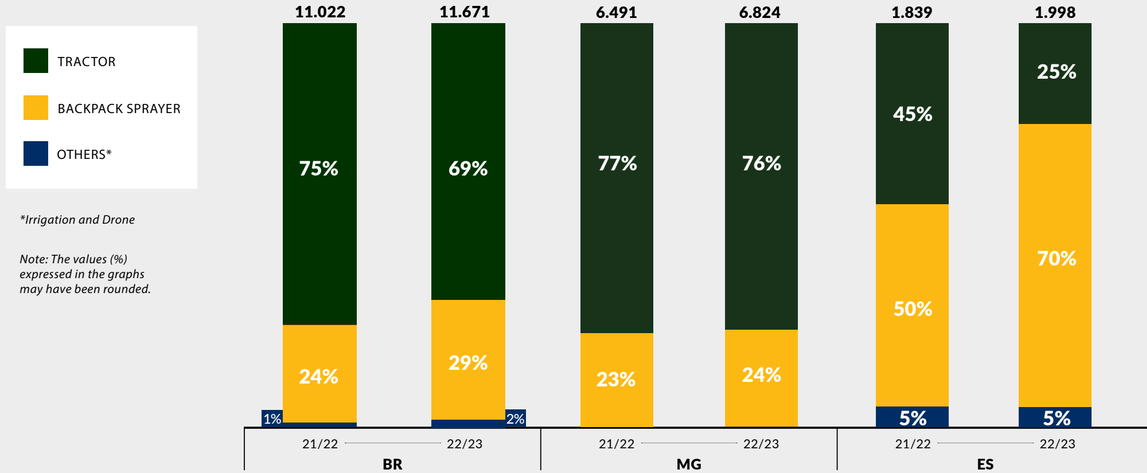


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



**Irrigation and Drone*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

COFFEE: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

TRACTOR
BACKPACK SPRAYER
OTHERS*

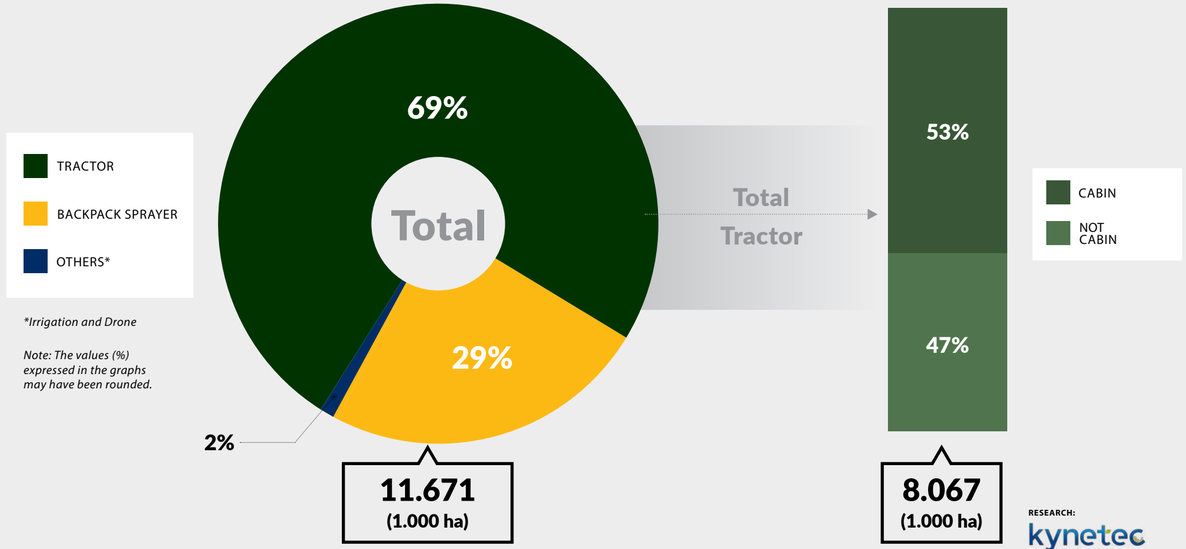
**Irrigation and Drone*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



**Irrigation and Drone*

Note: The values (%) expressed in the graphs may have been rounded.

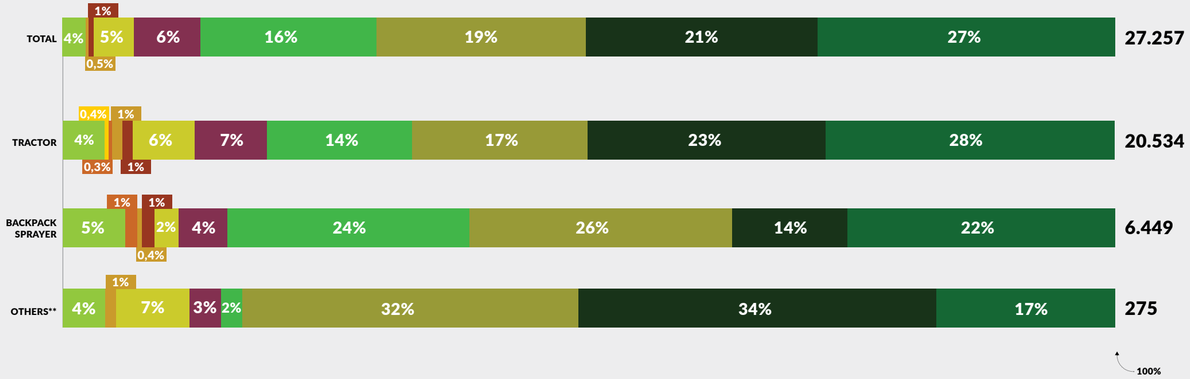
RESEARCH: kynetec Incorporating Spark smarter decisions

COFFEE: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



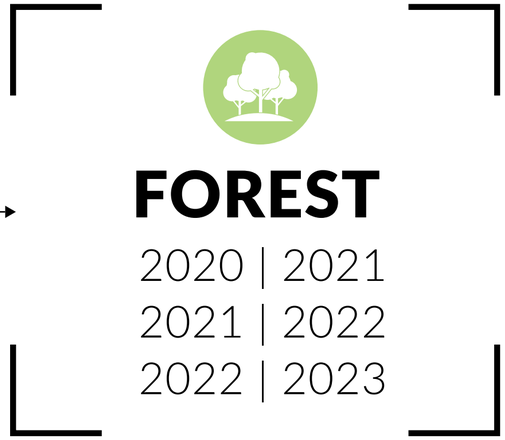
EC - Emulsifiable Concentrate | **SC -** Concentrated Suspension | **WG -** Dispersible Granules in Water | **SL -** Soluble Concentrate | **WP** - Wettable Powder | **SE** - Suspo-Emulsion

XX - Other Formulations | **EW** - Emulsion Oil in Water | **SG -** Granulated Soluble in Water | **OD -** Dispersion in Oil | Others*

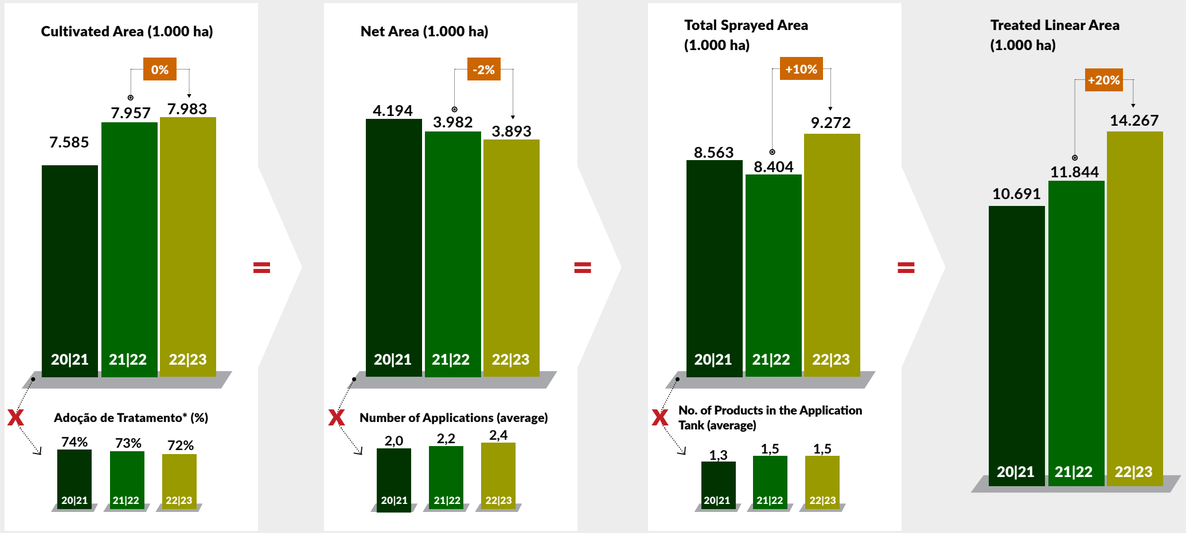
**Adjuvants.* ***Irrigation and Drone* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



Main indicators



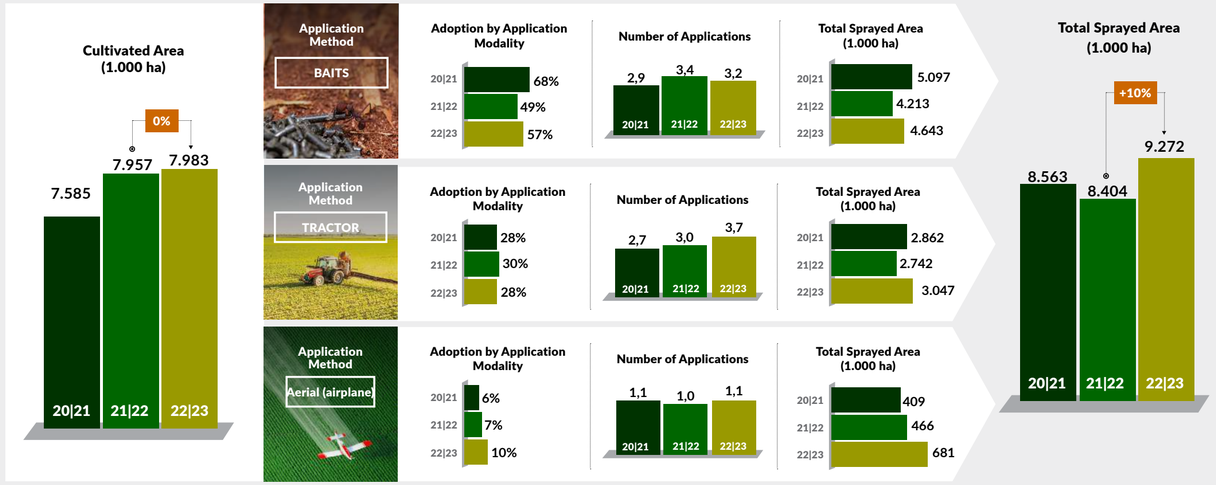
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FOREST: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

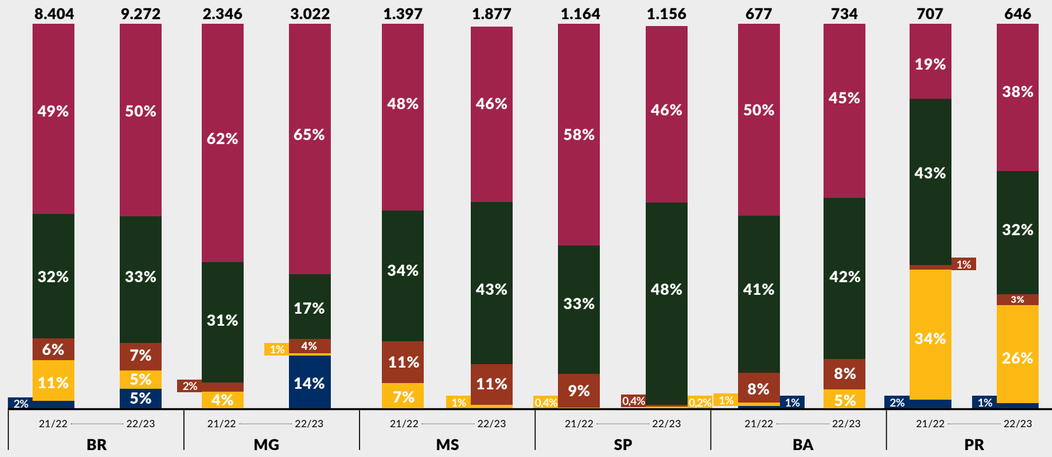


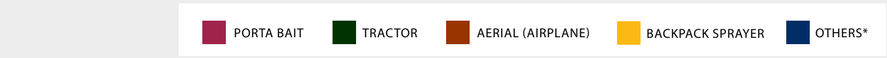
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).





**Drone*

Note: The values (%) expressed in the graphs may have been rounded.

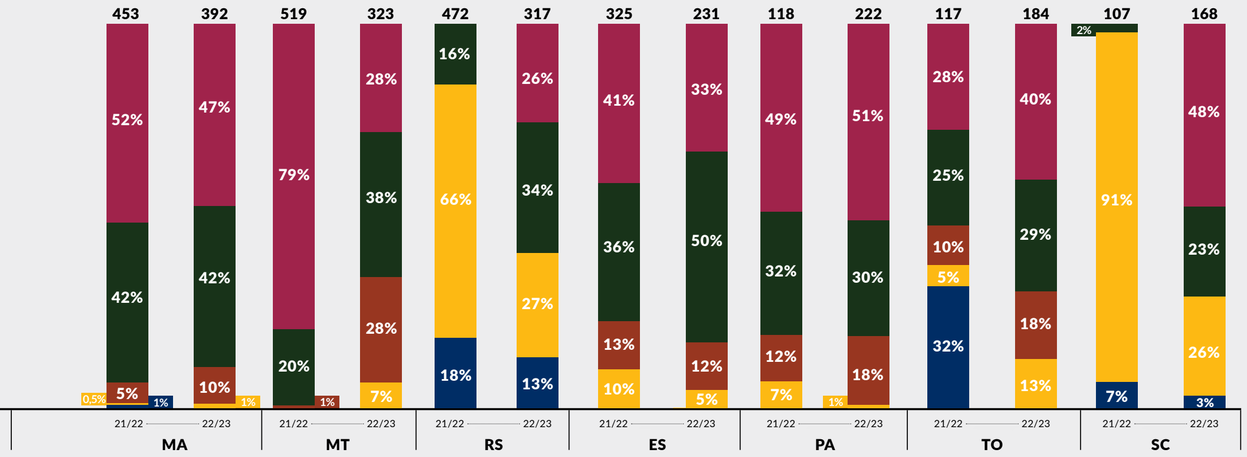
RESEARCH: kynetec Incorporating Spark smarter decisions

FOREST: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



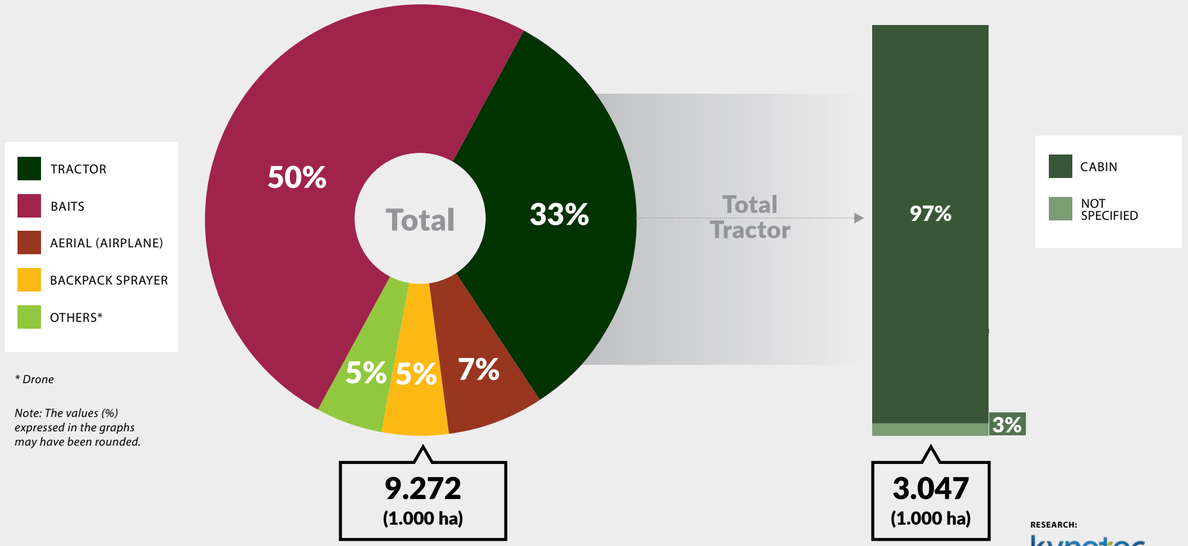
**Drone*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



** Drone*

Note: The values (%) expressed in the graphs may have been rounded.

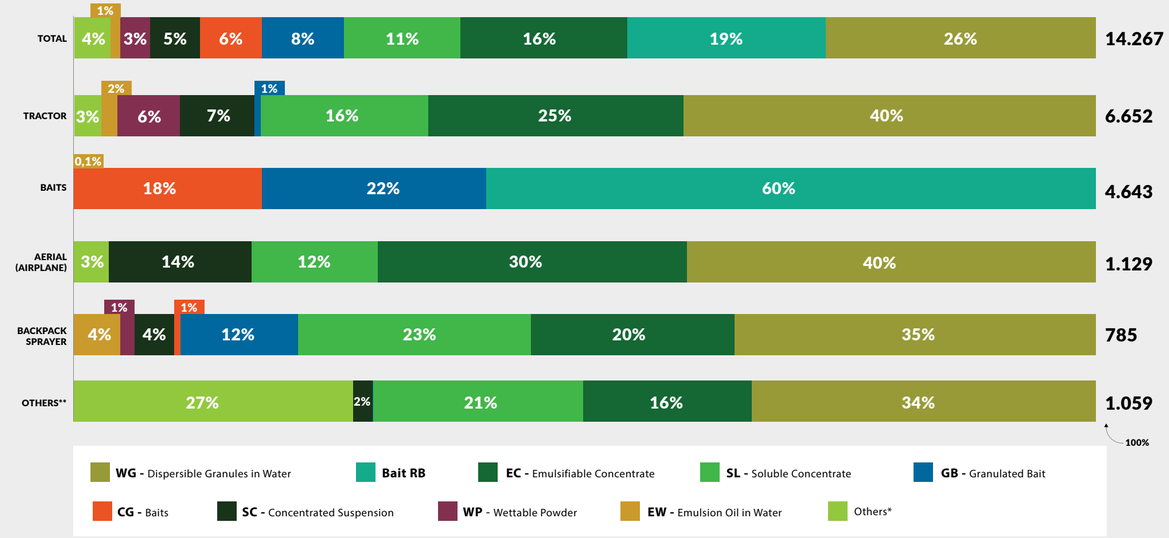
RESEARCH: kynetec Incorporating Spark smarter decisions

FOREST:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

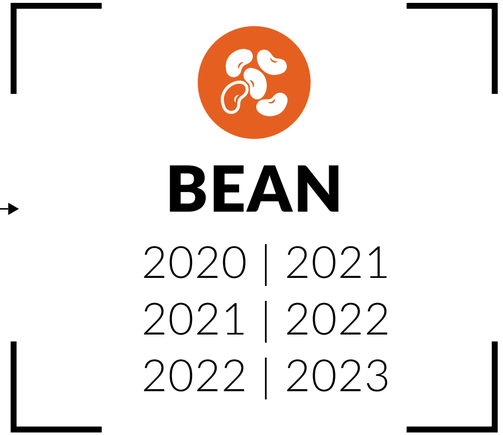
Indications %. Base in ALT (1,000 ha)



Adjuvants.* * Drone.* *Note: The values (%) expressed in the graphs may have been rounded.*

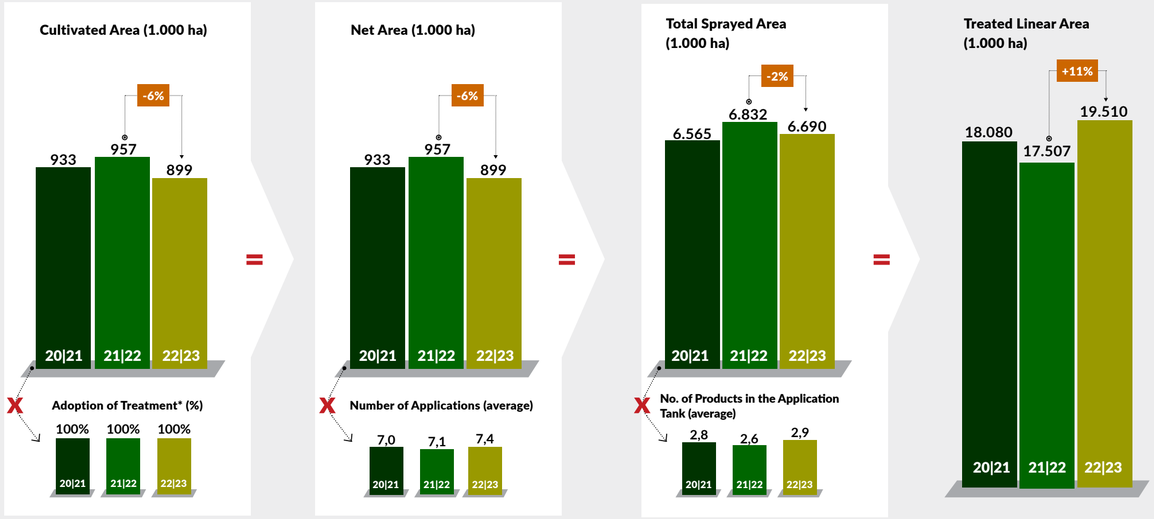
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



BEAN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



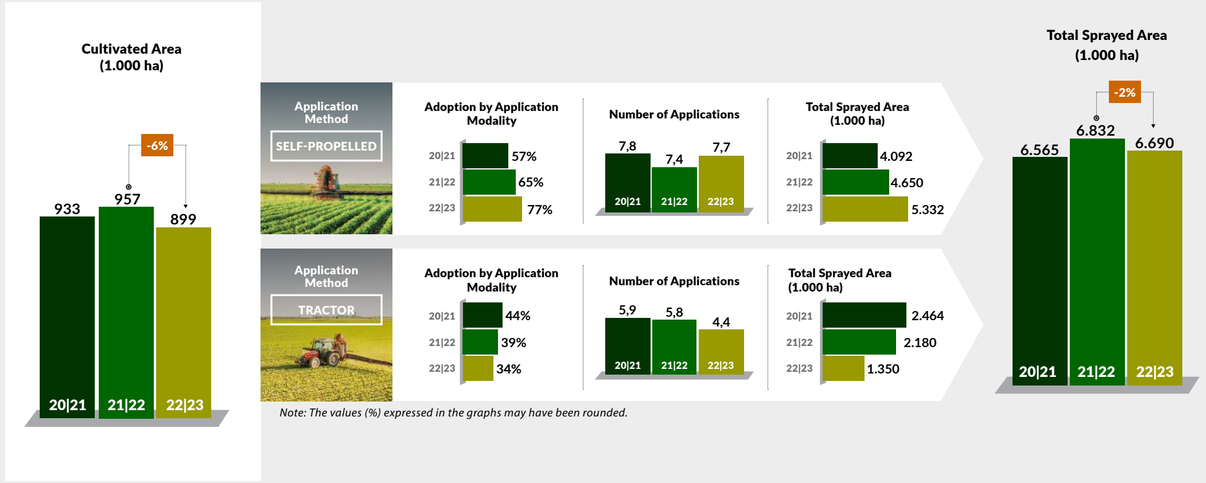
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

BEAN: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

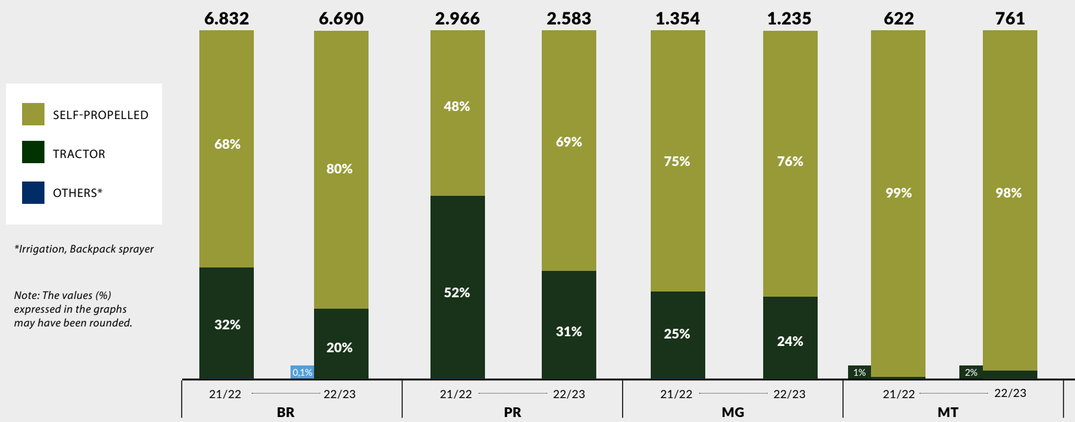


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



**Irrigation, Backpack sprayer*

Note: The values (%) expressed in the graphs may have been rounded.

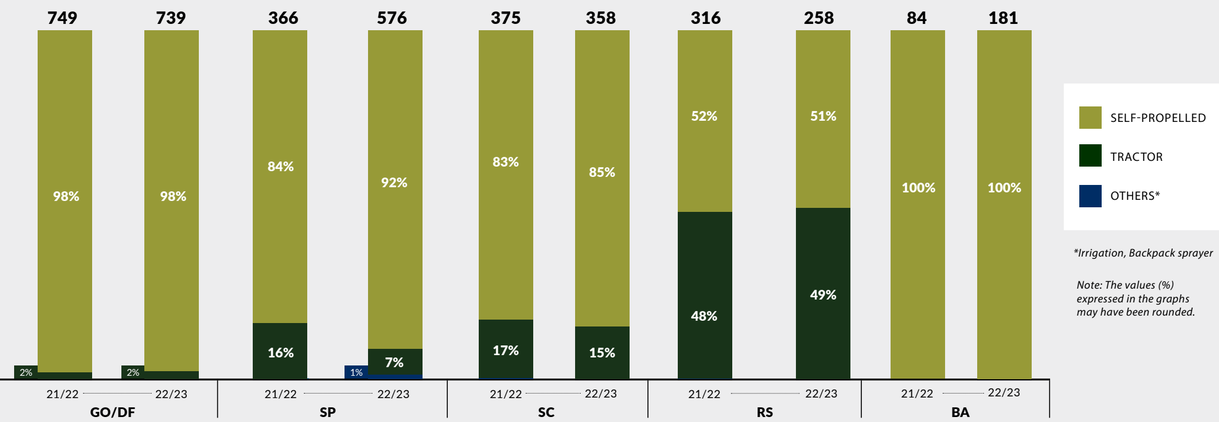
RESEARCH: kynetec Incorporating Spark smarter decisions

Bean: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



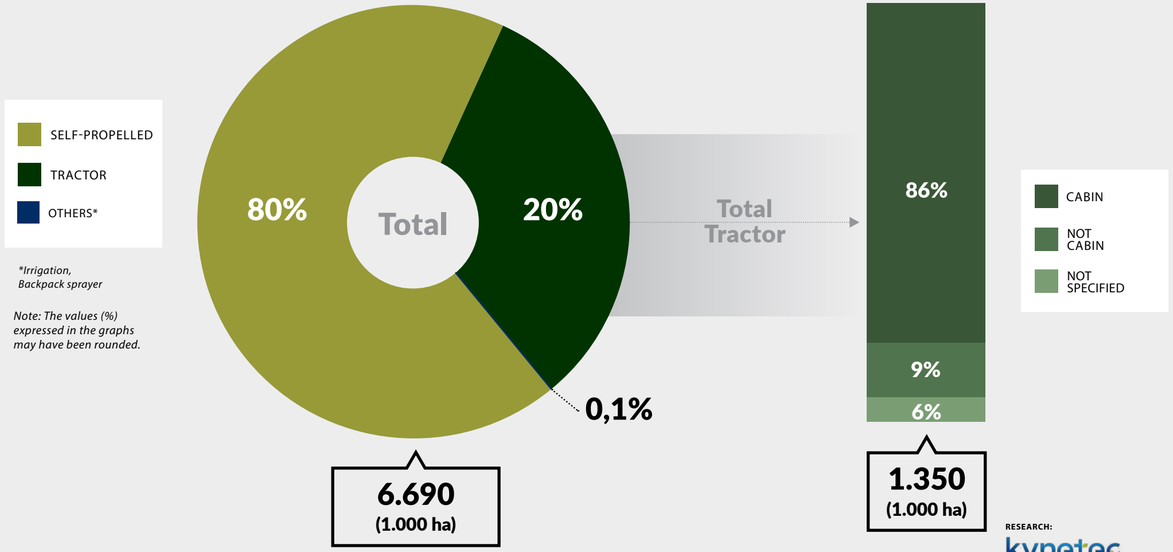
**Irrigation, Backpack sprayer*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



**Irrigation, Backpack sprayer*

Note: The values (%) expressed in the graphs may have been rounded.

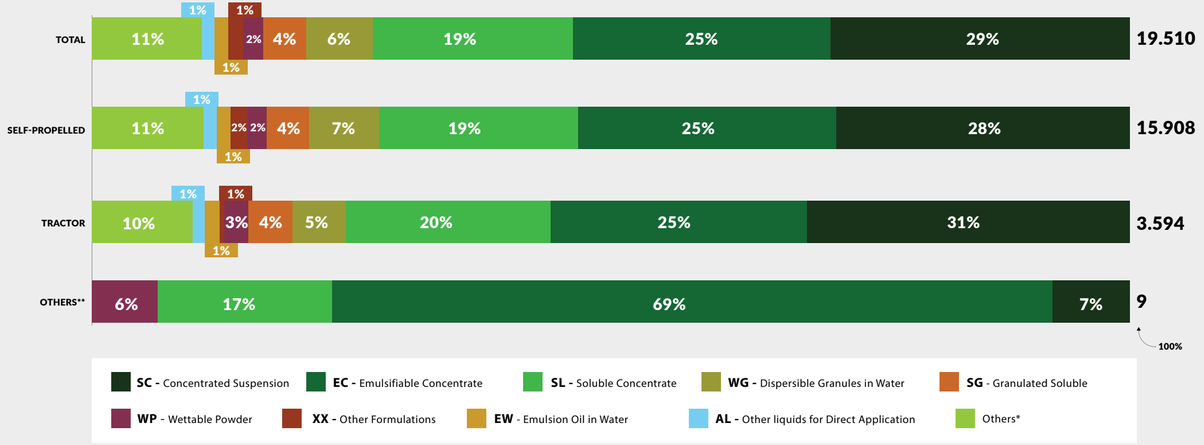
RESEARCH: kynetec Incorporating Spark smarter decisions

BEAN:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)

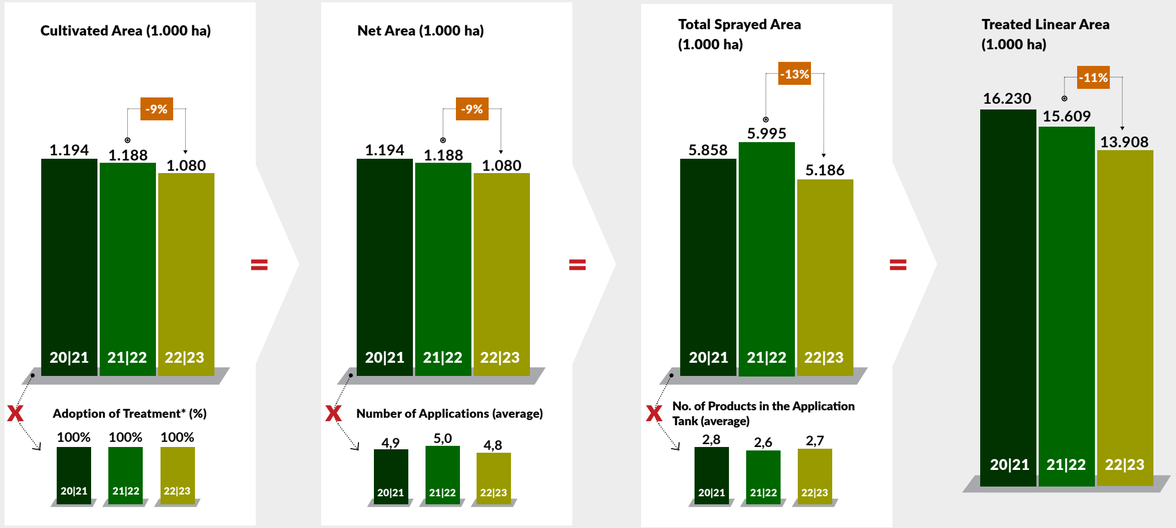


**Adjuvants.* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

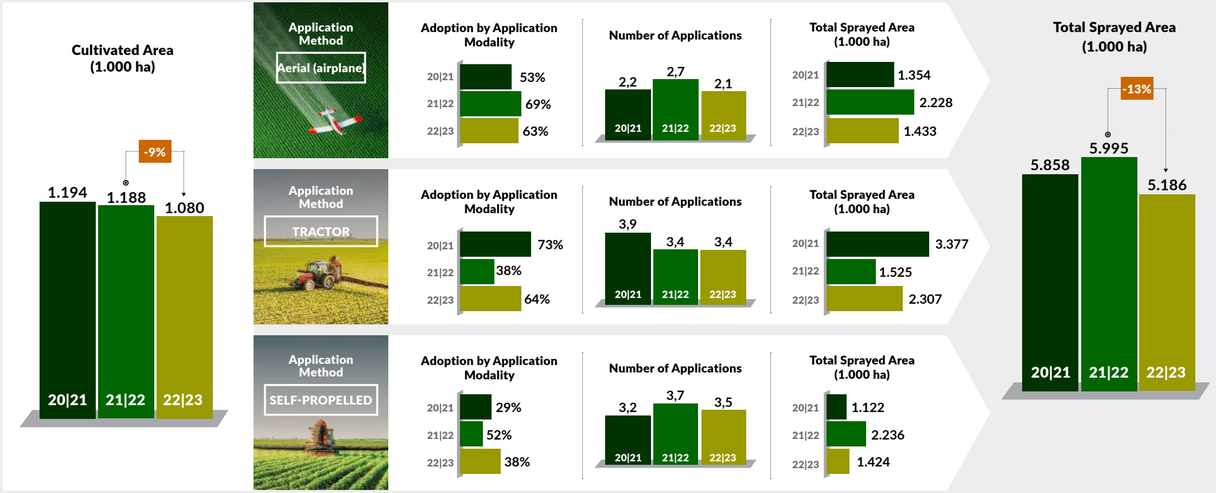
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

PADDY RICE: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

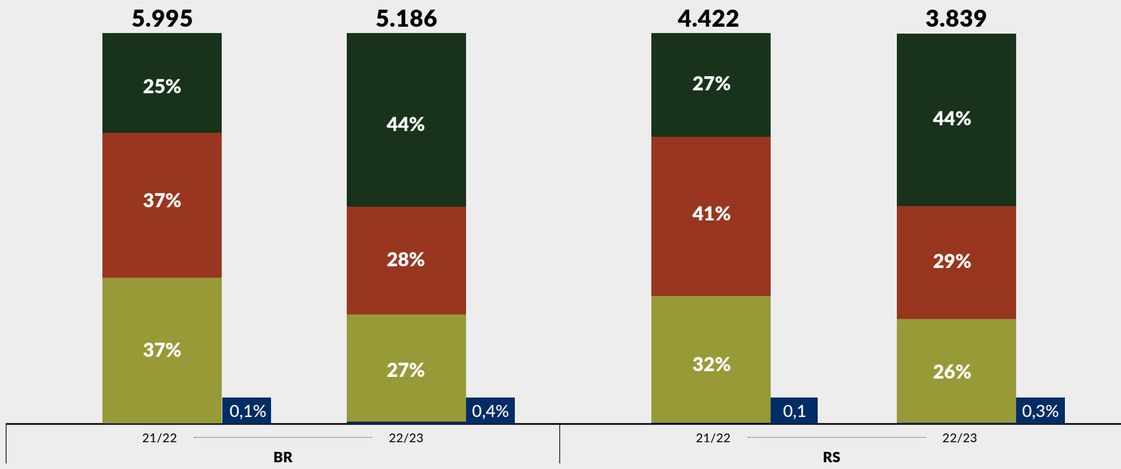


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.
**Drone; Backpack sprayer*

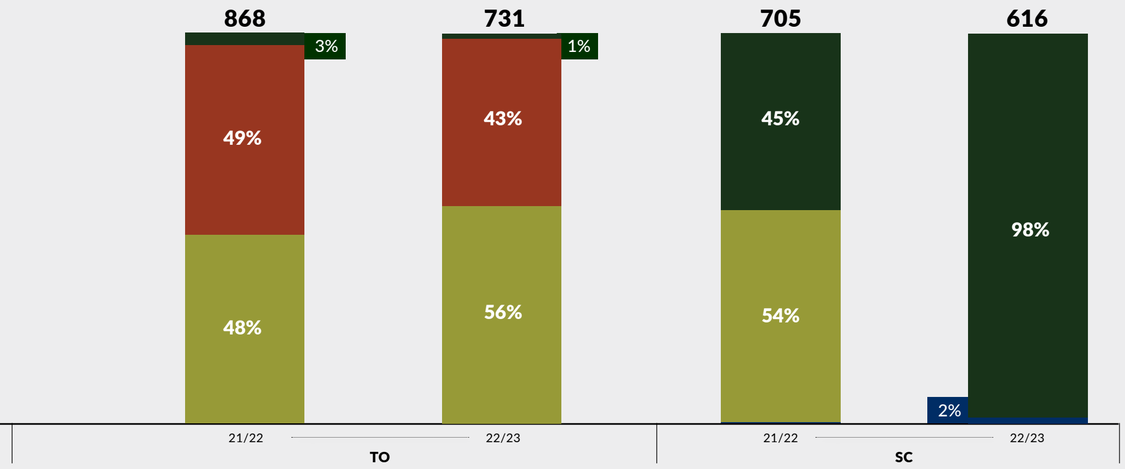
RESEARCH: kynetec Incorporating Spark smarter decisions

PADDY RICE: 2021 | 2022 2022 | 2023 *Bases by indicators.*

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

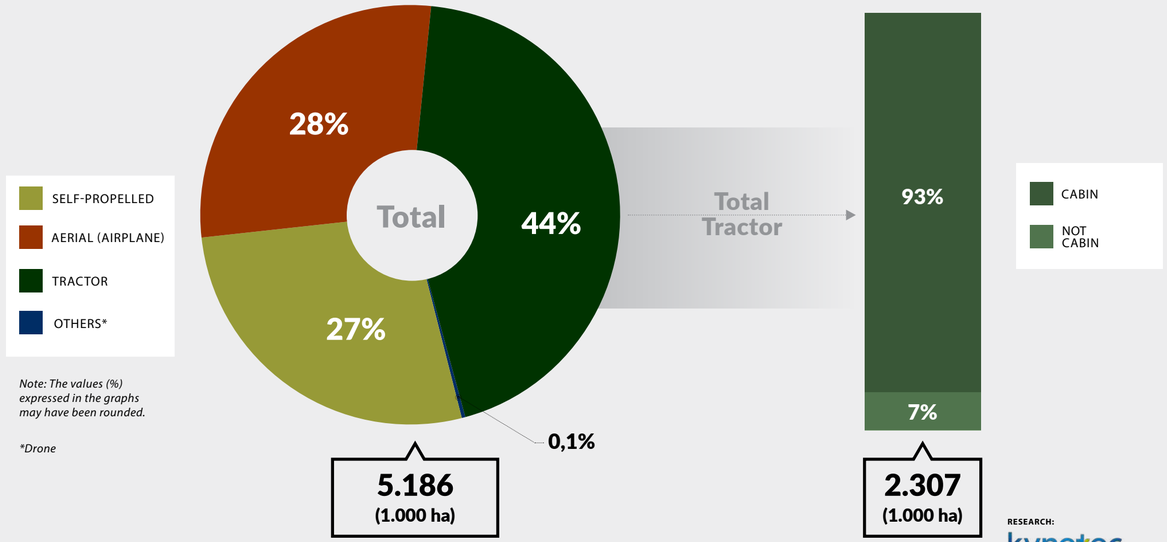


Note: The values (%) expressed in the graphs may have been rounded.
**Drone; Backpack sprayer*

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Drone*

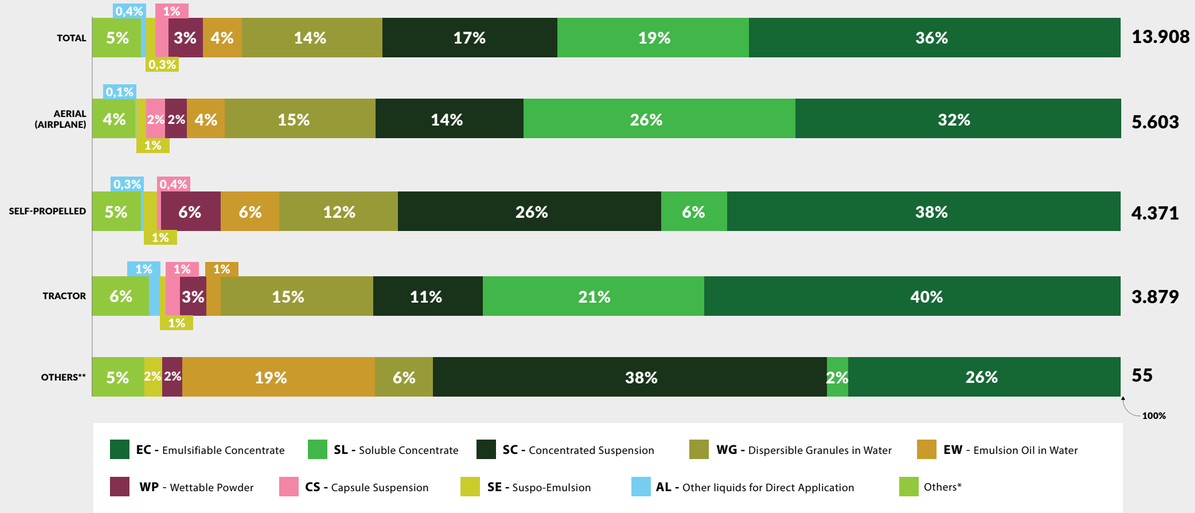
RESEARCH: kynetec Incorporating Spark smarter decisions

PADDY RICE:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

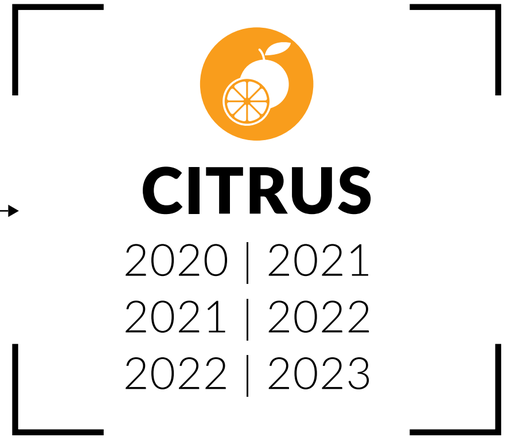
Indications %. Base in ALT (1,000 ha)



**Adjuvants.* ***Drone* *Note: The values (%) expressed in the graphs may have been rounded.*

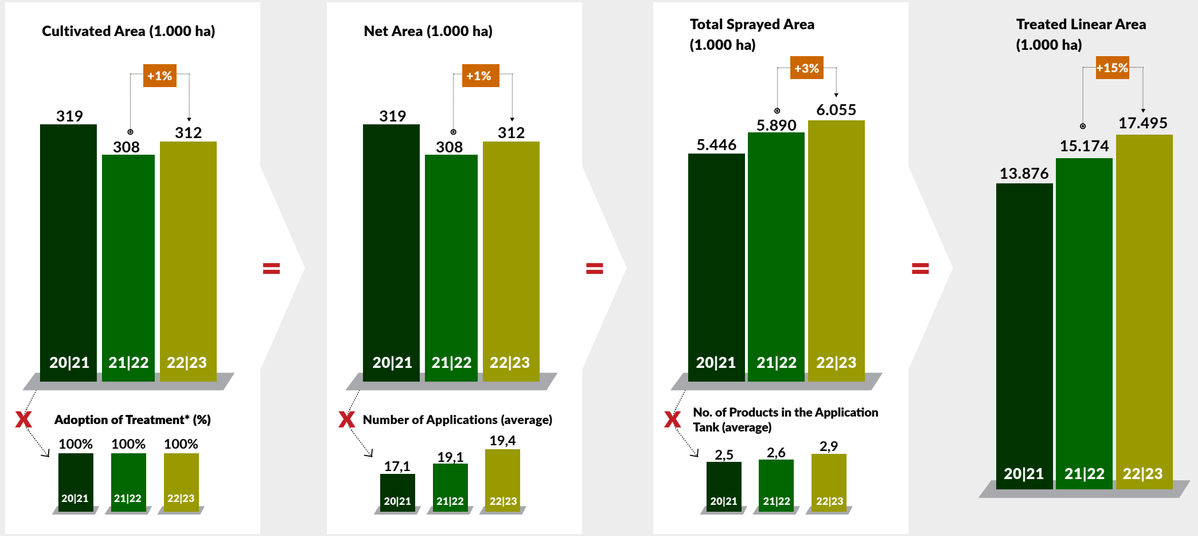
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



CITRUS:** 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

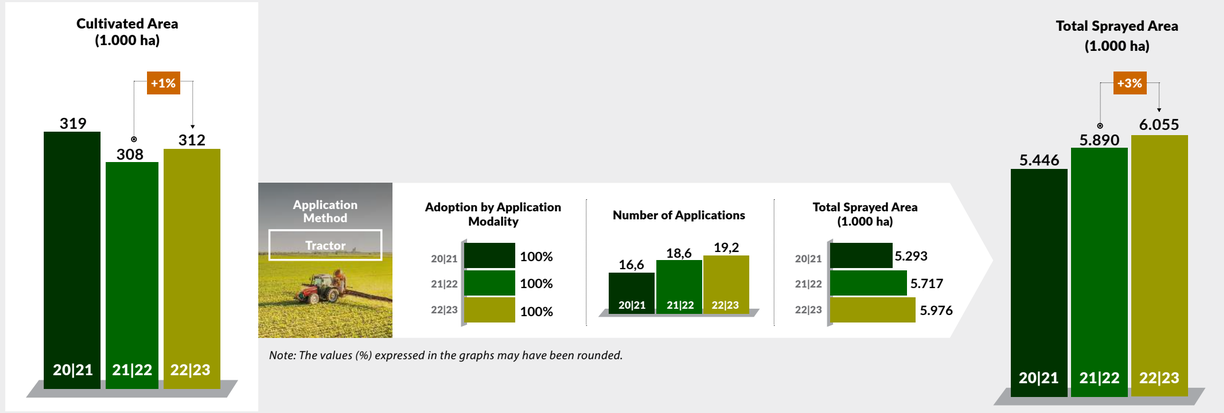
***Citrus (tangerine, lemon and orange)*

RESEARCH: kynetec Incorporating Spark smarter decisions

CITRUS:** 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

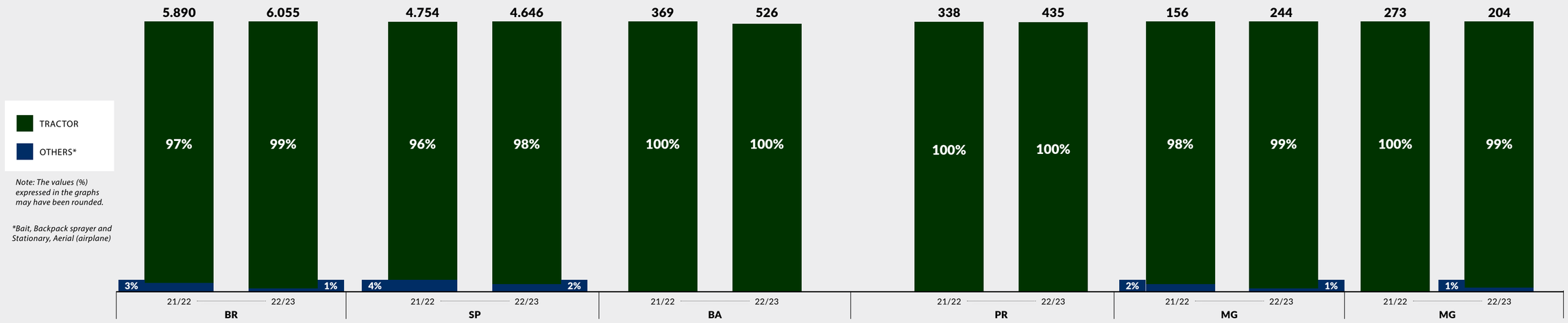


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

**Bait, Backpack sprayer and Stationary, Aerial (airplane)*

RESEARCH: kynetec Incorporating Spark smarter decisions

CITRUS**: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

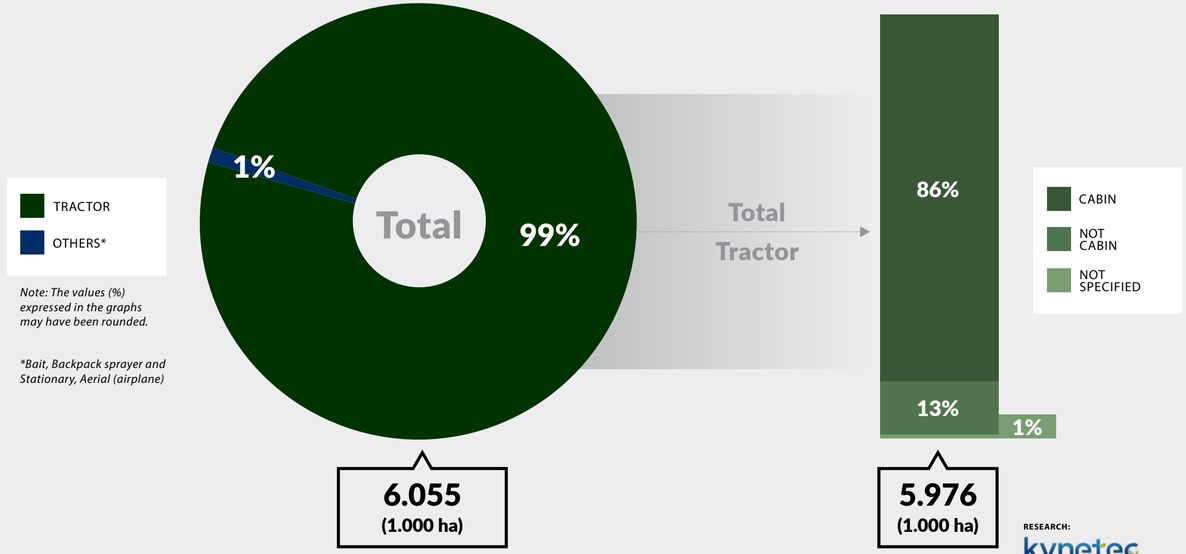
Note: The values (%) expressed in the graphs may have been rounded.

**Bait, Backpack sprayer and Stationary, Aerial (airplane)*

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



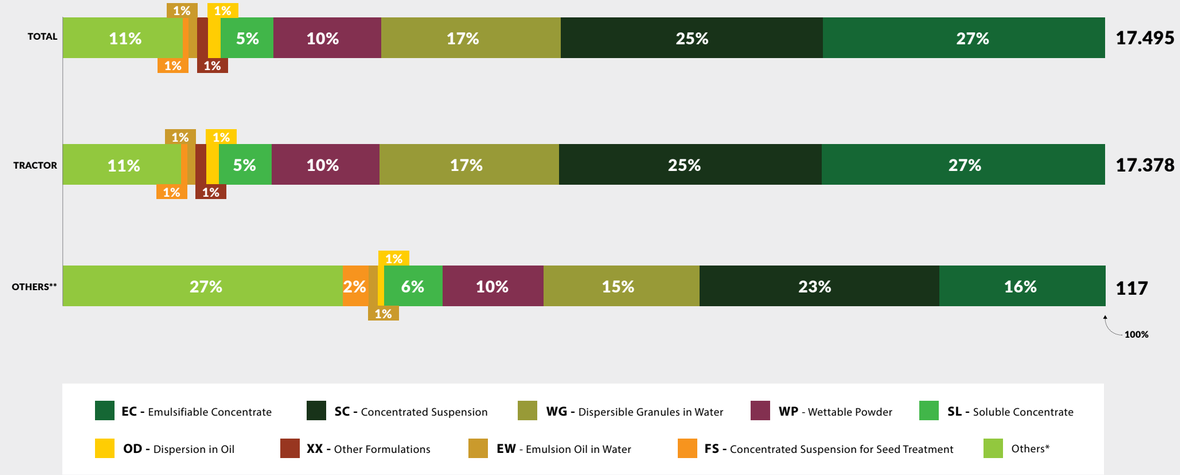
RESEARCH: kynetec Incorporating Spark smarter decisions

CITRUS**:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

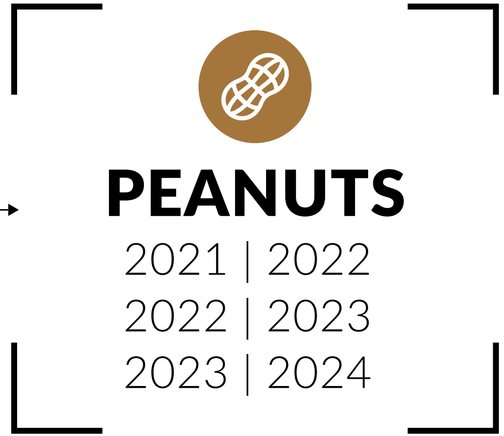
Indications %. Base in ALT (1,000 ha)



*Adjuvants. *Bait, Backpack sprayer and Stationary, Aerial (airplane) Note: The values (%) expressed in the graphs may have been rounded.

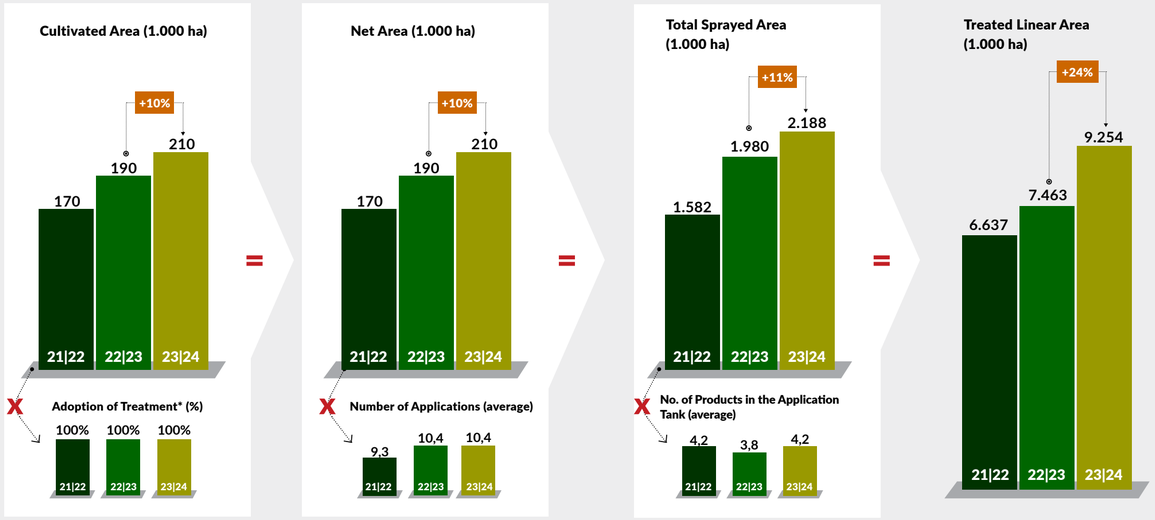
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



PEANUTS:
2021 | 2022
2022 | 2023
2023 | 2024
Bases by indicators.

Main indicators



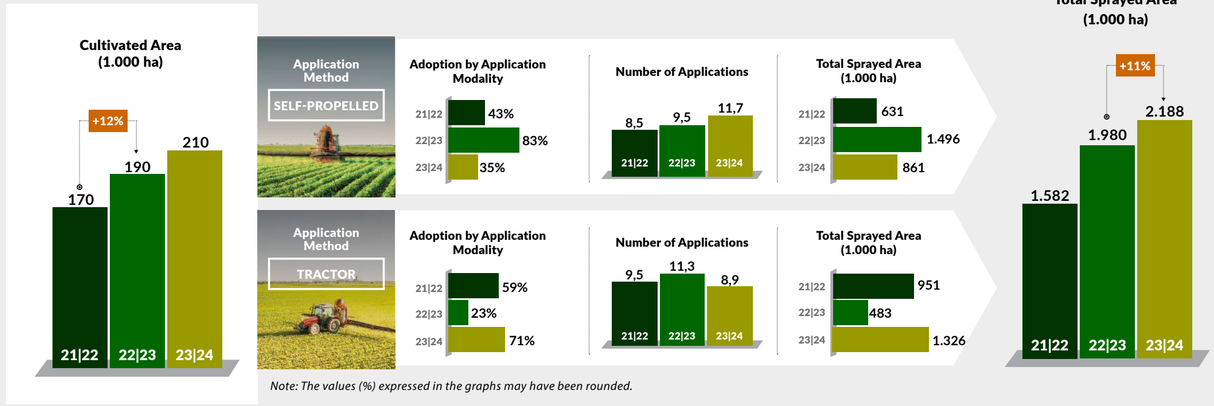
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

PEANUTS:
2021 | 2022
2022 | 2023
2023 | 2024
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



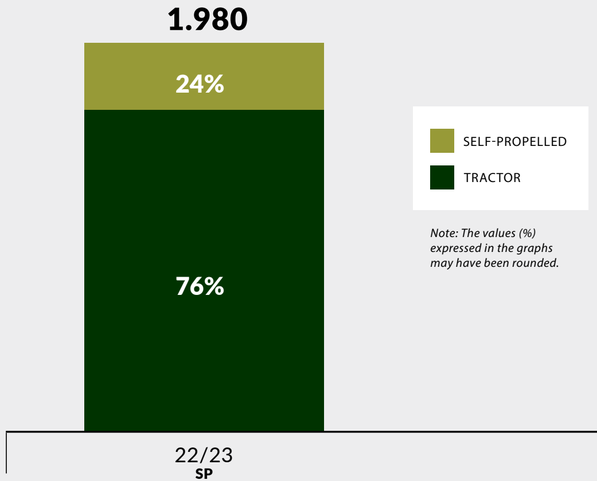
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

PEANUTS:
2022 | 2023
2023 | 2024
Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

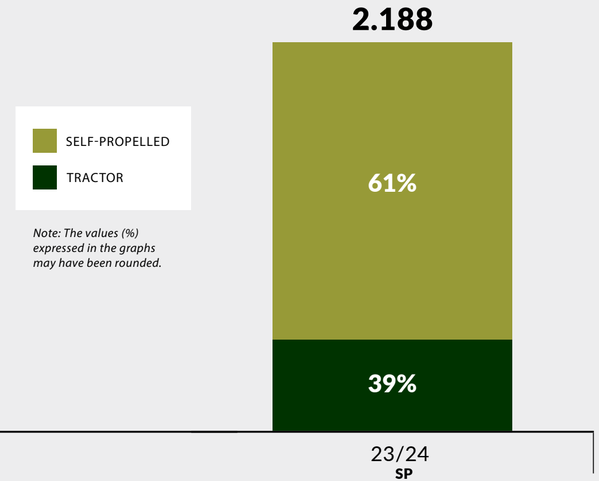
RESEARCH: kynetec Incorporating Spark smarter decisions

PEANUTS:
2022 | 2023
2023 | 2024
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

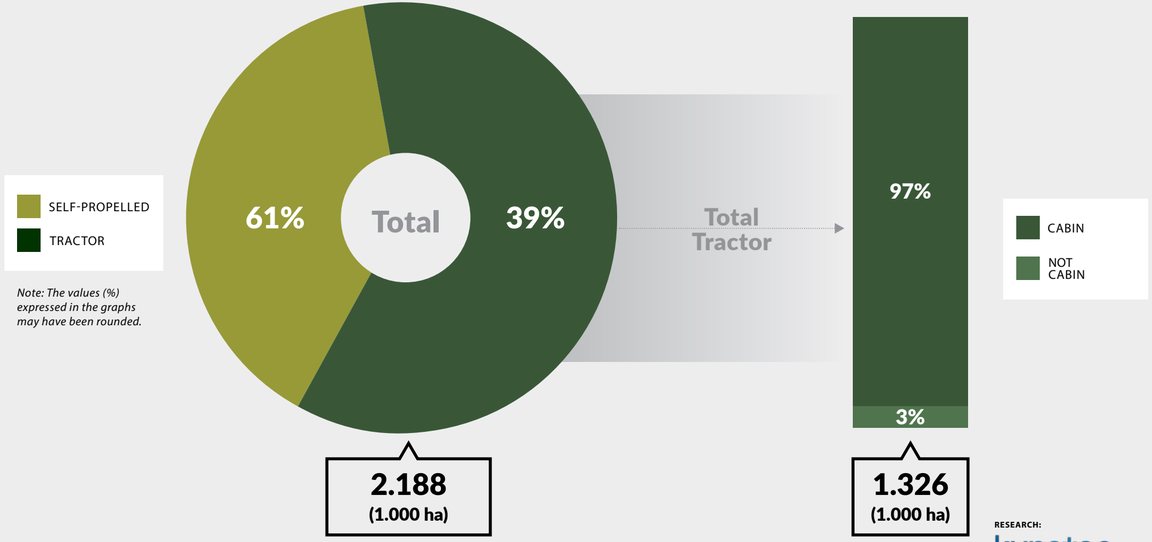


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



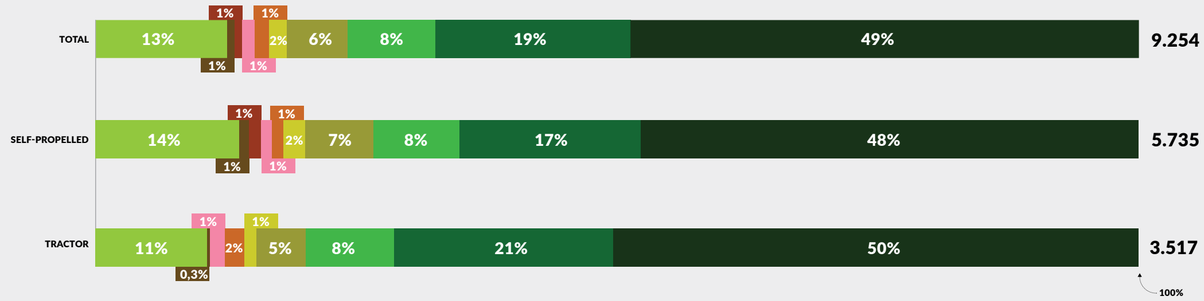
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

PEANUTS:
2023 | 2024

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



SC - Concentrated Suspension | **EC -** Emulsifiable Concentrate | **SL -** Soluble Concentrate | **WG -** Dispersible Granules in Water | **SE -** Suspo-Emulsion
SG - Granulated Soluble in Water | **CS -** Capsule Suspension | **XX -** Other Formulations | **DC -** Dispersible Concentrate | Others*

**Adjuvants.* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

GRAPE

2020 | 2021

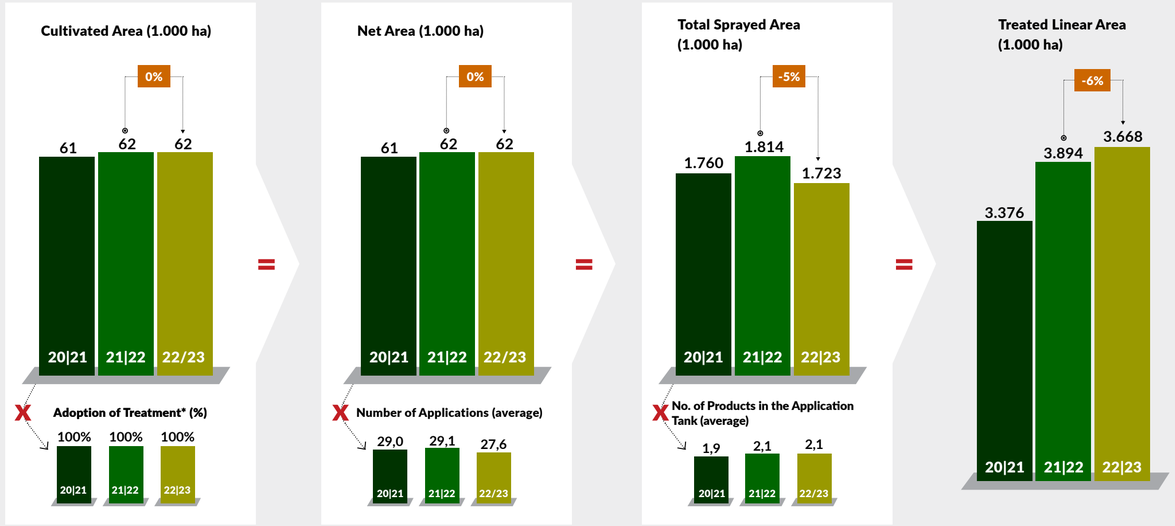
2021 | 2022

2022 | 2023

GRAPE: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

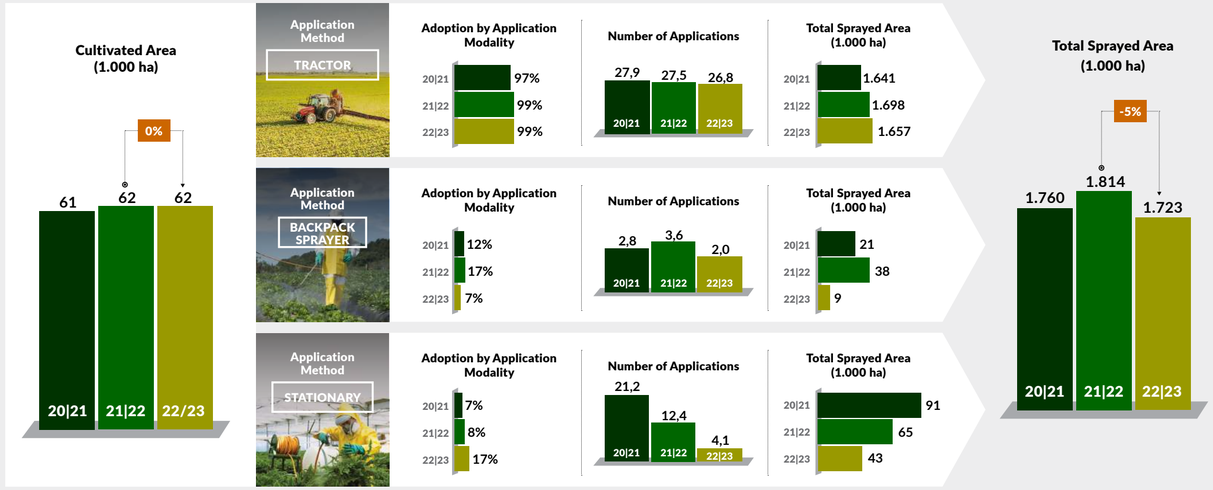
RESEARCH: kynetec Incorporating Spark smarter decisions

GRAPE: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

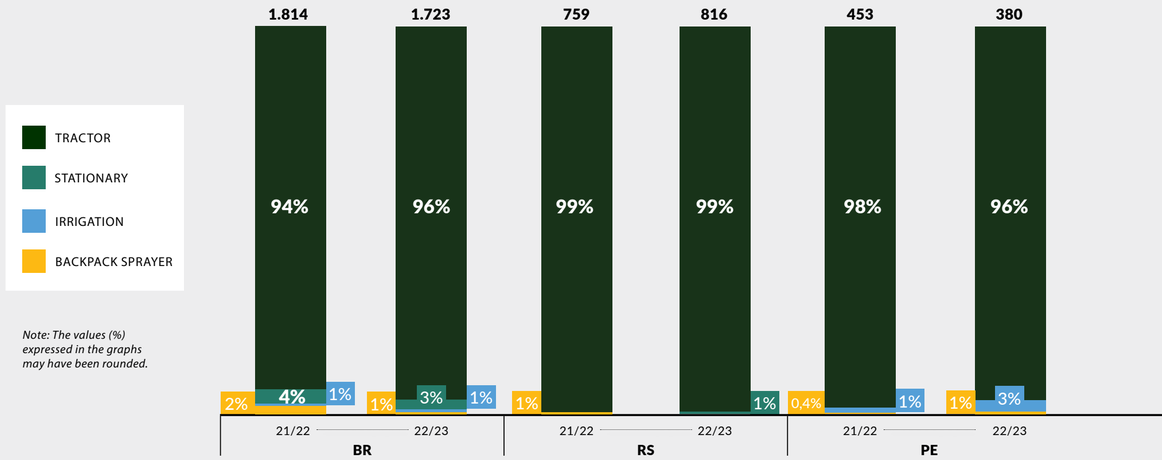


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

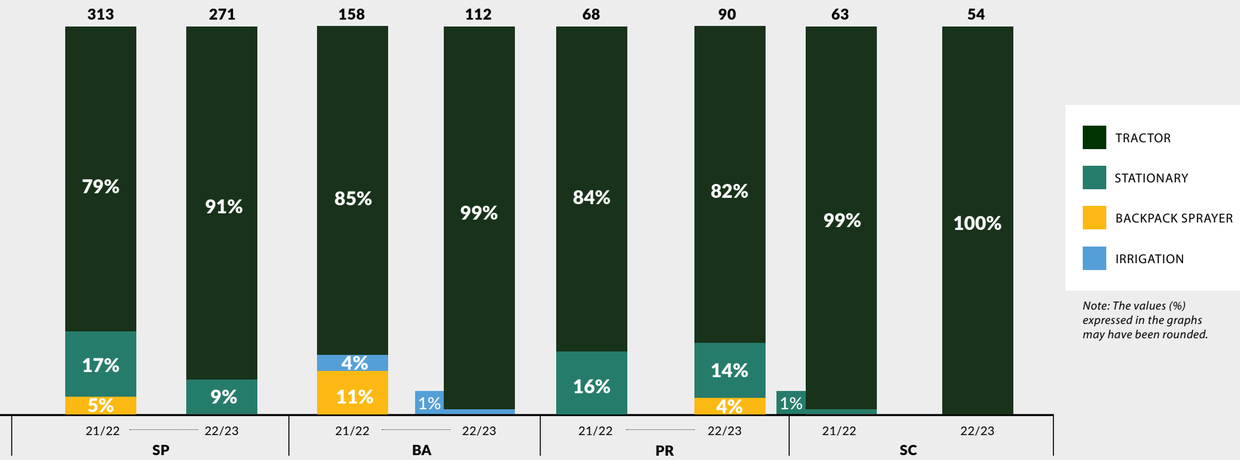
RESEARCH: kynetec Incorporating Spark smarter decisions

GRAPE: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

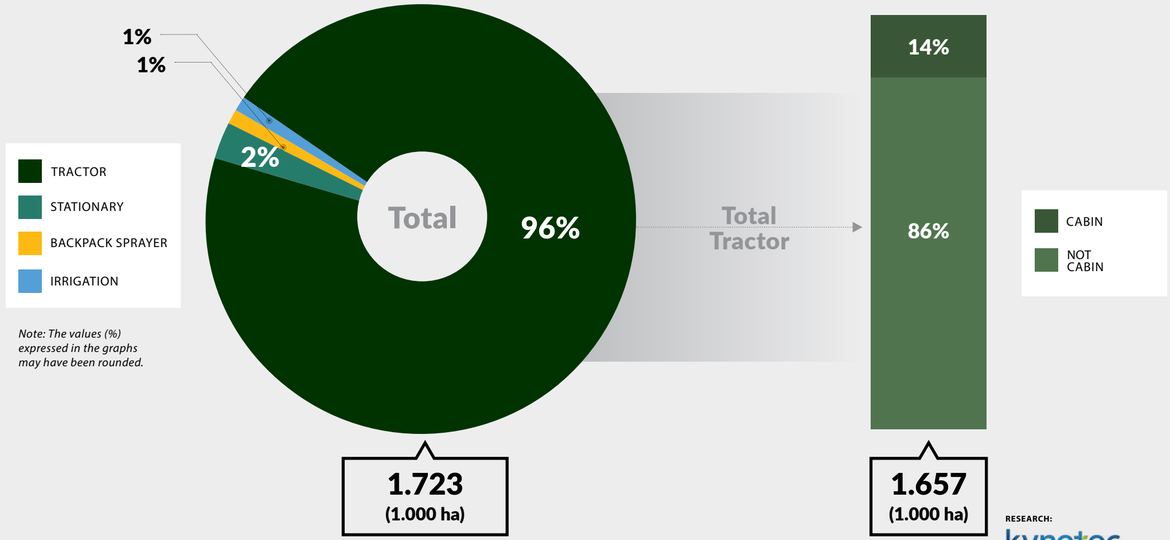


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

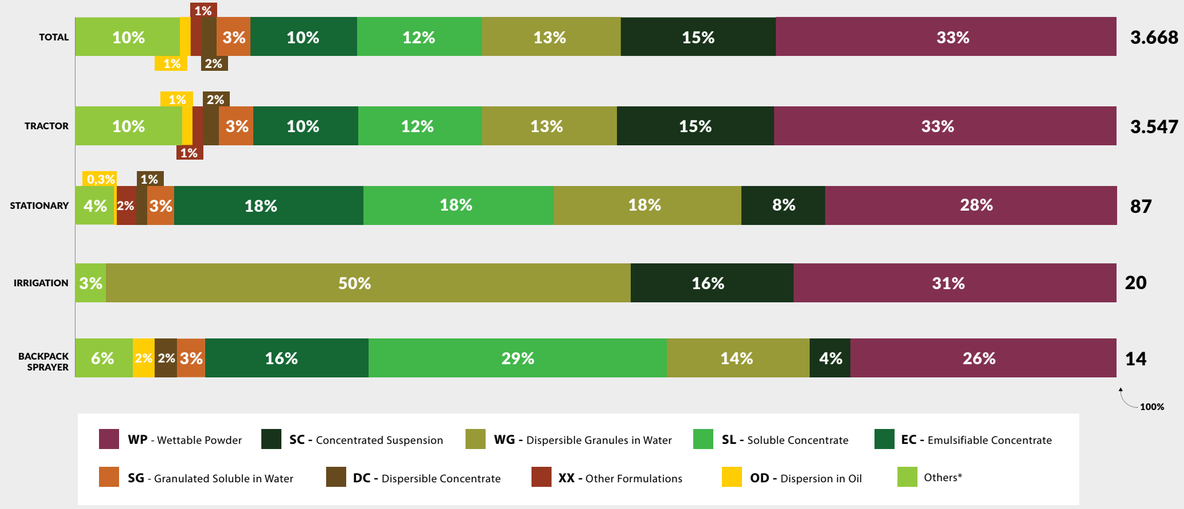
RESEARCH: kynetec

GRAPE:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

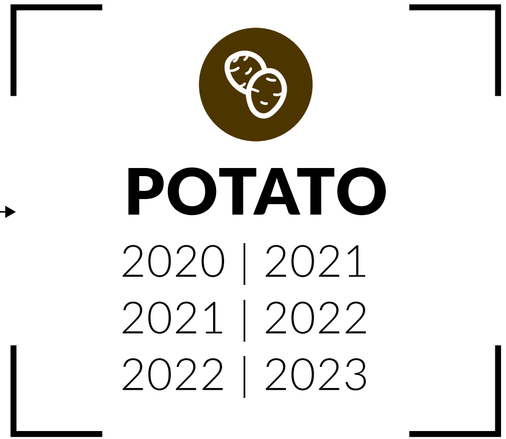
Indications %. Base in ALT (1,000 ha)



**Adjuvants.* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec

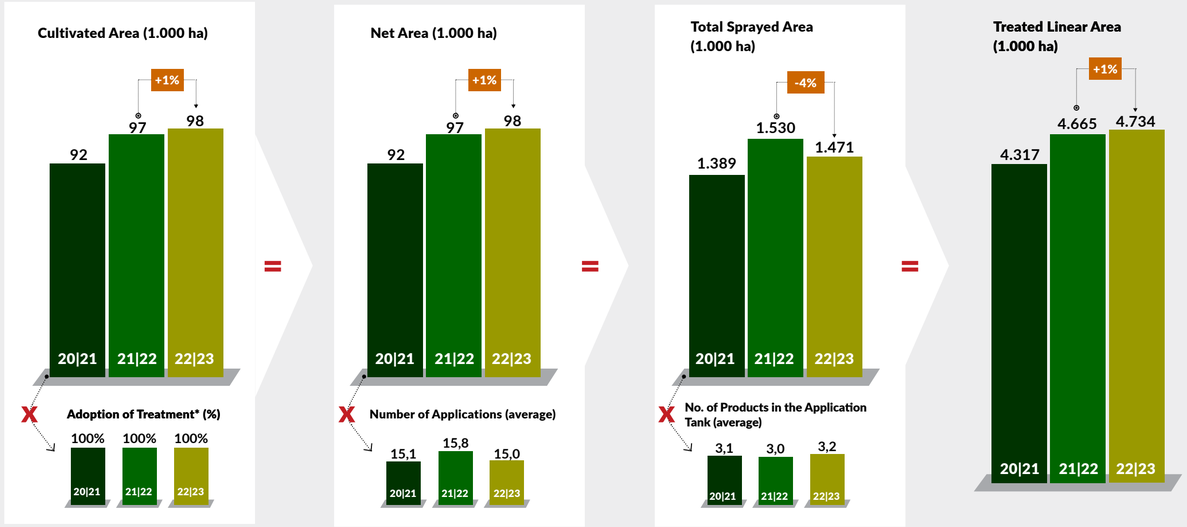
FarmTrak™



POTATO: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

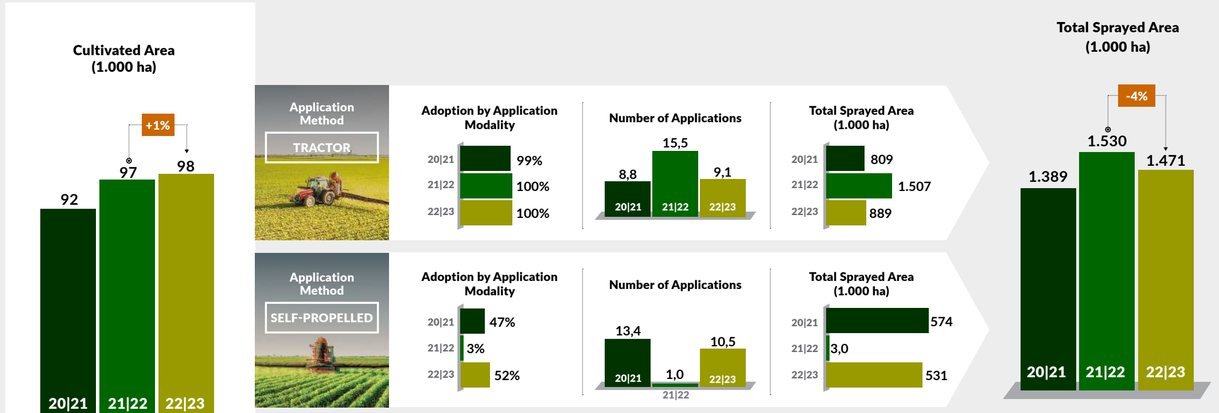
RESEARCH: kynetec Incorporating Spark smarter decisions

POTATO: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

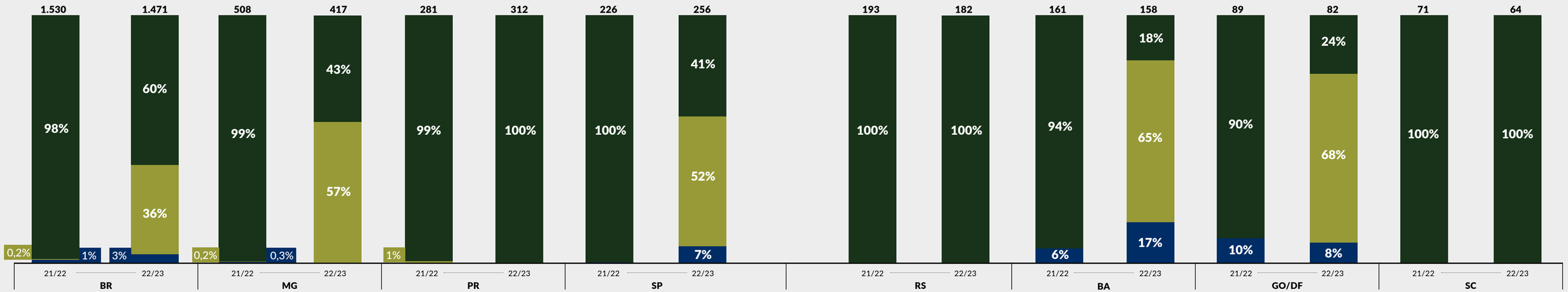


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



**Irrigation, Backpack sprayer, Aerial (airplane)*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

POTATO: 2021 | 2022
2022 | 2023
Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

TRACTOR
SELF-PROPELLED
OTHERS*

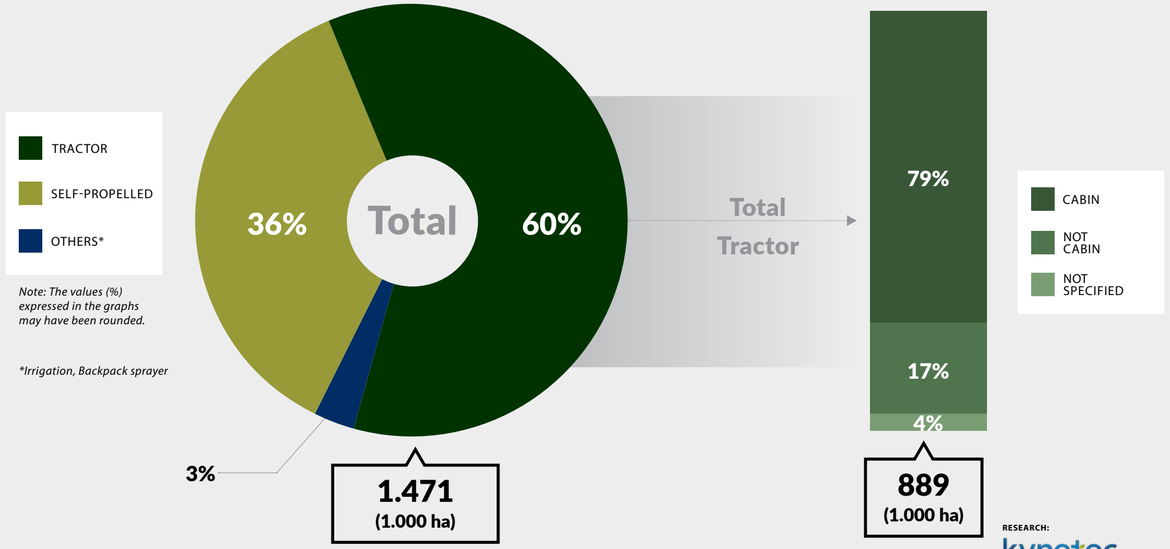
**Irrigation, Backpack sprayer, Aerial (airplane)*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Irrigation, Backpack sprayer*

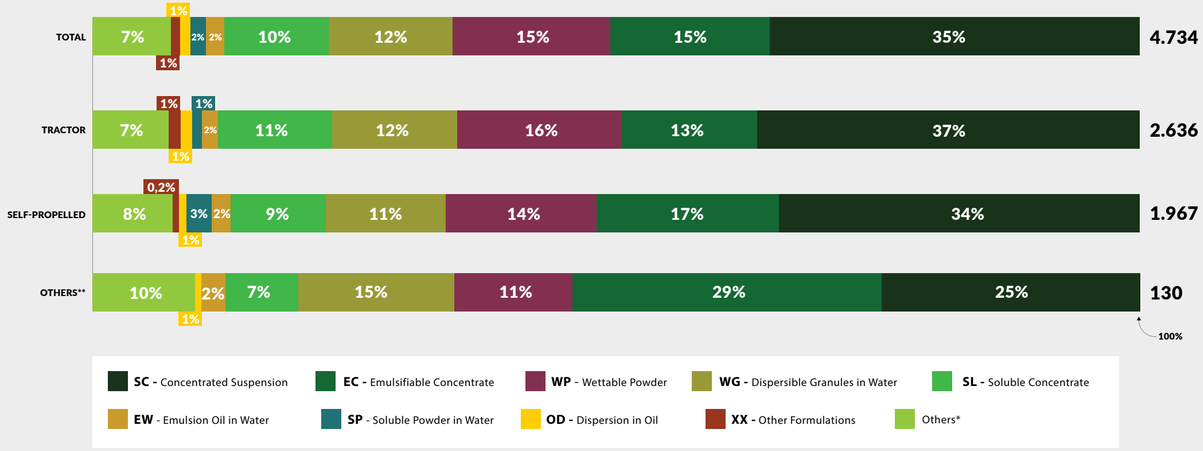
RESEARCH: kynetec

POTATO:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

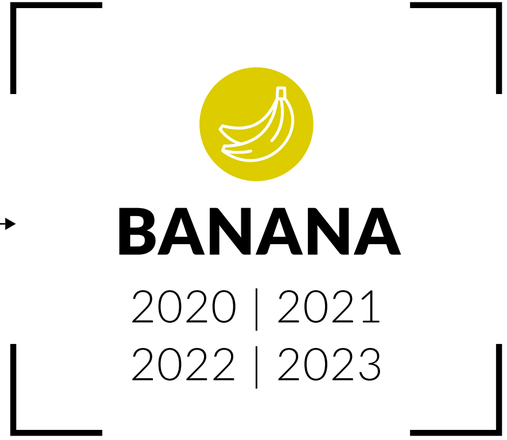
Indications %. Base in ALT (1,000 ha)



*Adjuvants. ** Irrigation, Backpack sprayer, Aerial (airplane) Note: The values (%) expressed in the graphs may have been rounded.*

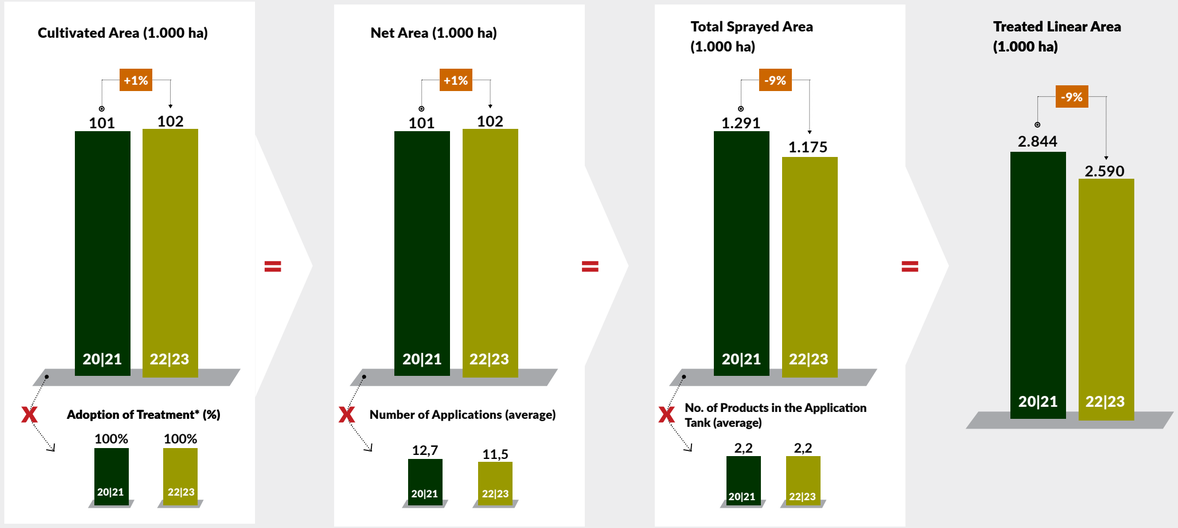
RESEARCH: kynetec

FarmTrak™



BANANA: 2020 | 2021
2022 | 2023
Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

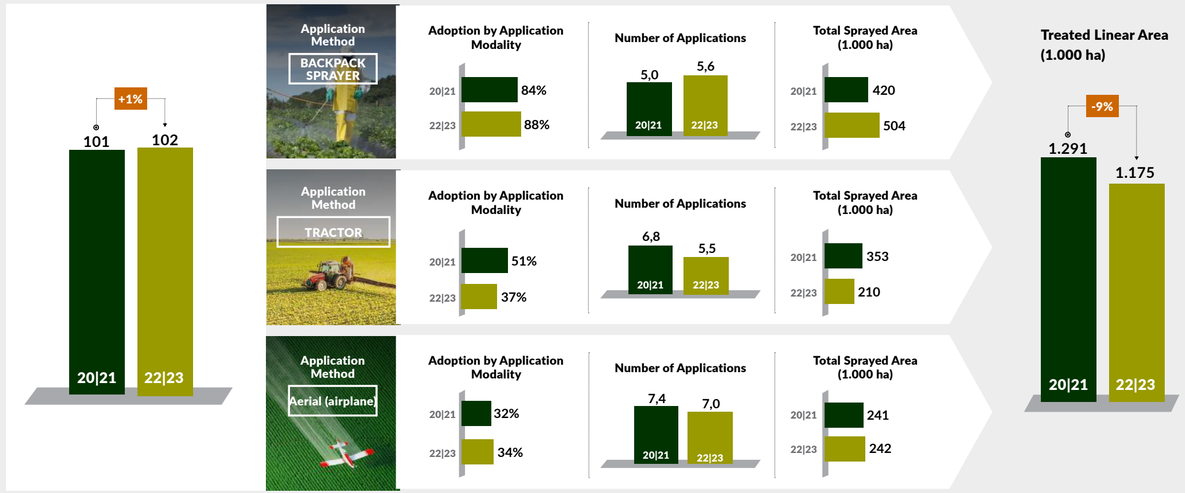
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

BANANA: 2020 | 2021
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

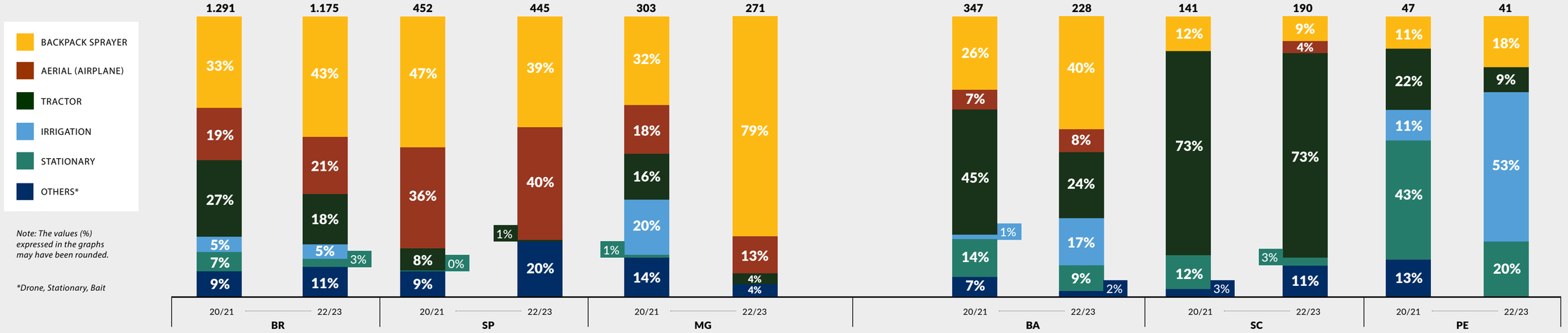
Main indicators



RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

**Drone, Stationary, Bait*

BANANA: 2020 | 2021 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

BACKPACK SPRAYER
AERIAL (AIRPLANE)
TRACTOR
IRRIGATION
STATIONARY
OTHERS*

Note: The values (%) expressed in the graphs may have been rounded.

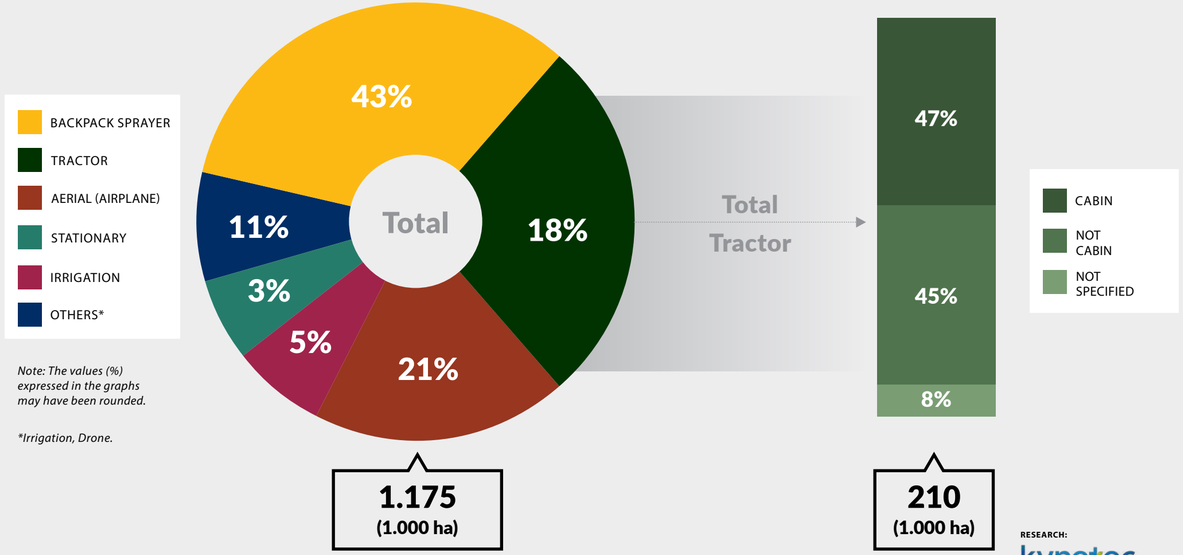
**Drone, Stationary, Bait*

RESEARCH: kynetec Incorporating Spark smarter decisions

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Irrigation, Drone.*

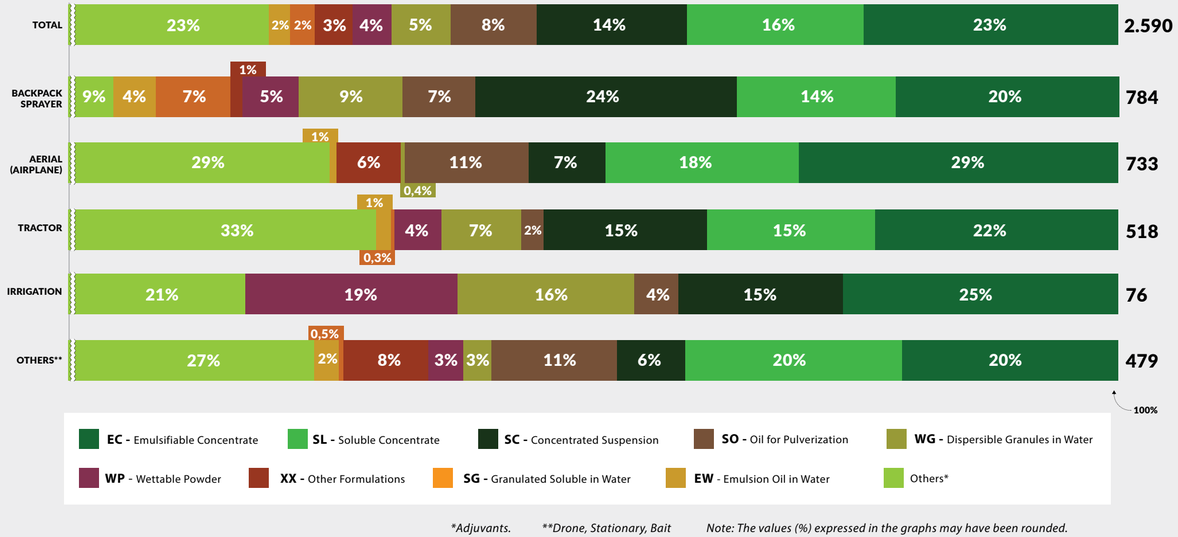
RESEARCH: kynetec Incorporating Spark smarter decisions

BANANA: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

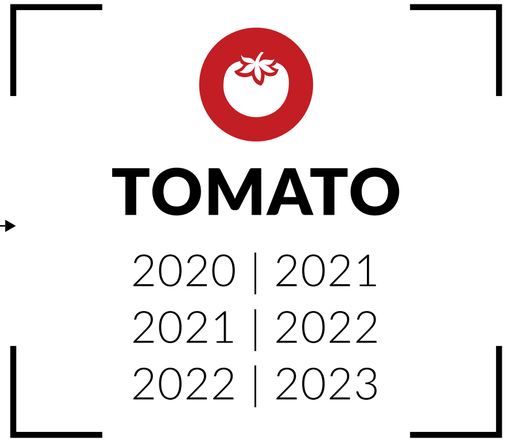
Indications %. Base in ALT (1,000 ha)



**Adjuvants.* ***Drone, Stationary, Bait* *Note: The values (%) expressed in the graphs may have been rounded.*

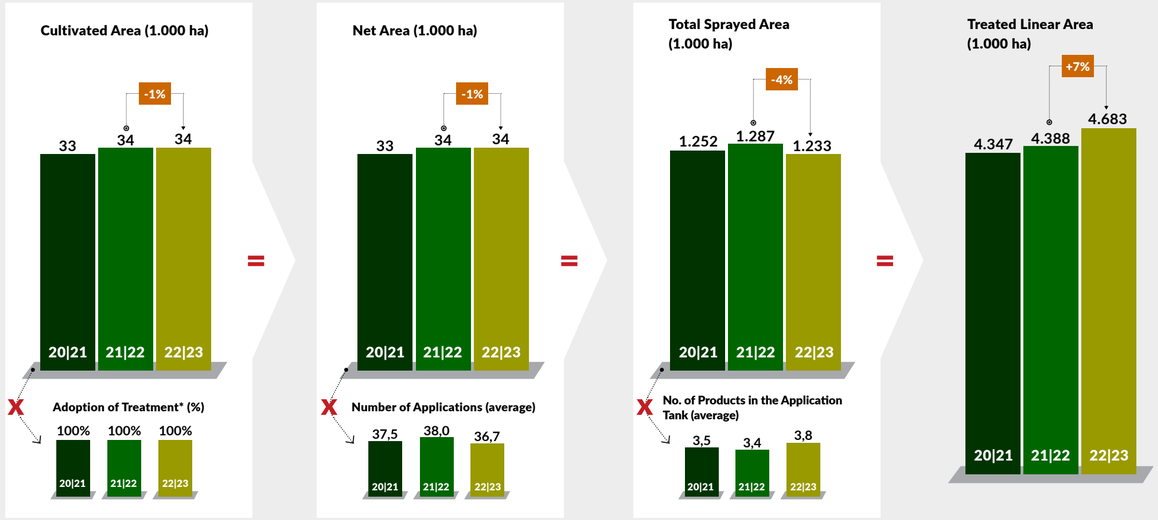
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



TOMATO: 2010 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

TOMATO: 2010 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

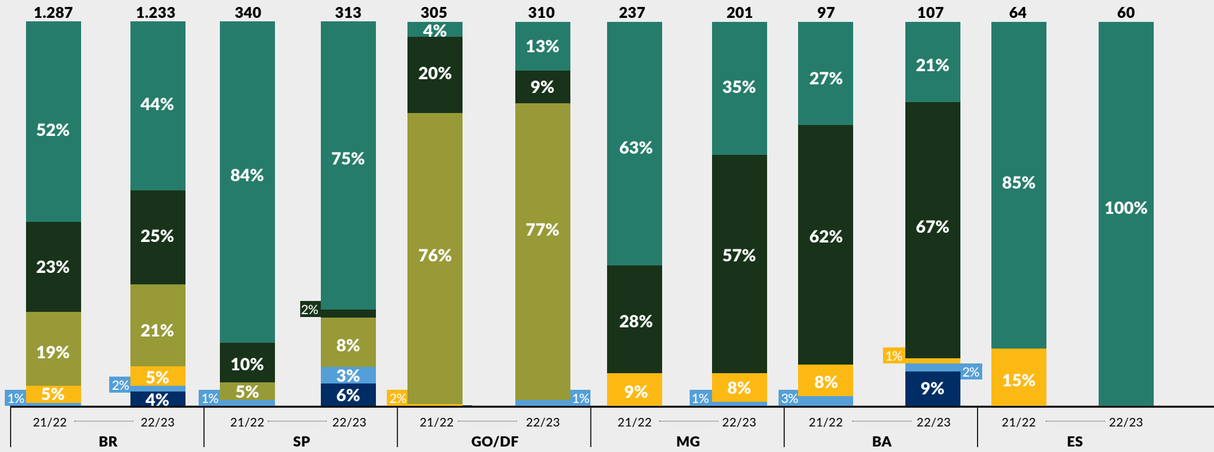
Main indicators

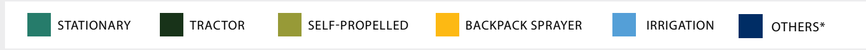
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)





Note: The values (%) expressed in the graphs may have been rounded.

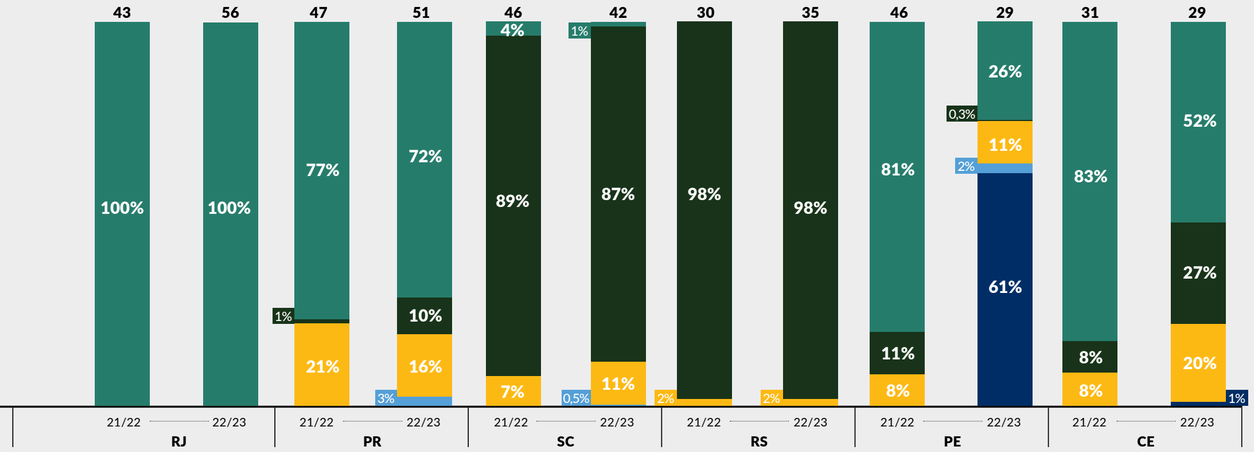
RESEARCH: kynetec Incorporating Spark smarter decisions

Tomato: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

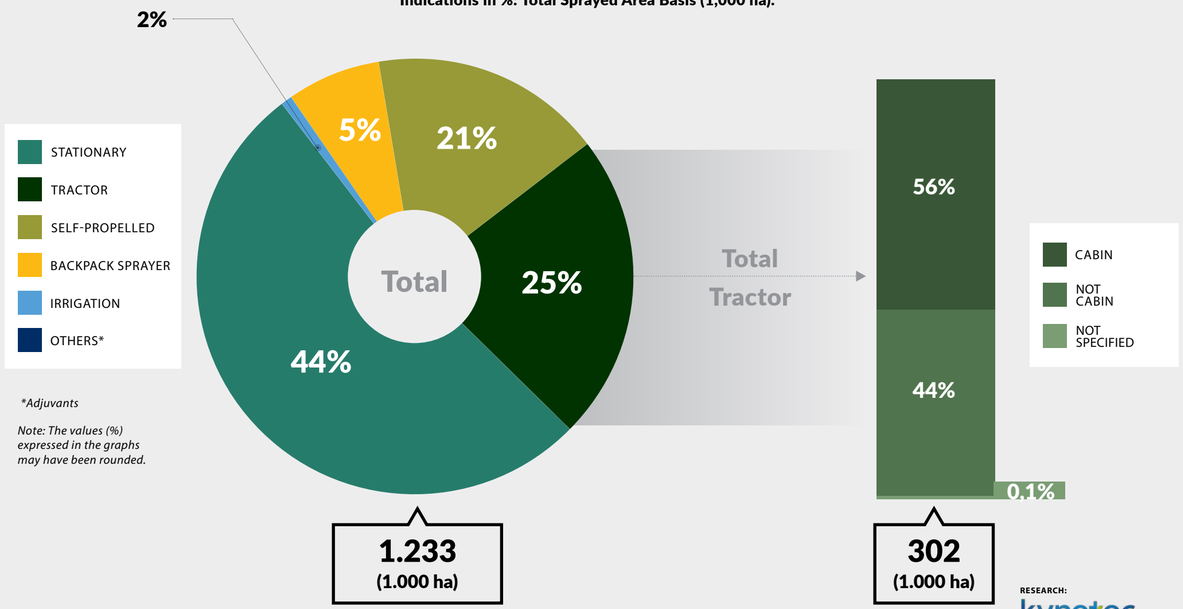


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



*Adjuvants

Note: The values (%) expressed in the graphs may have been rounded.

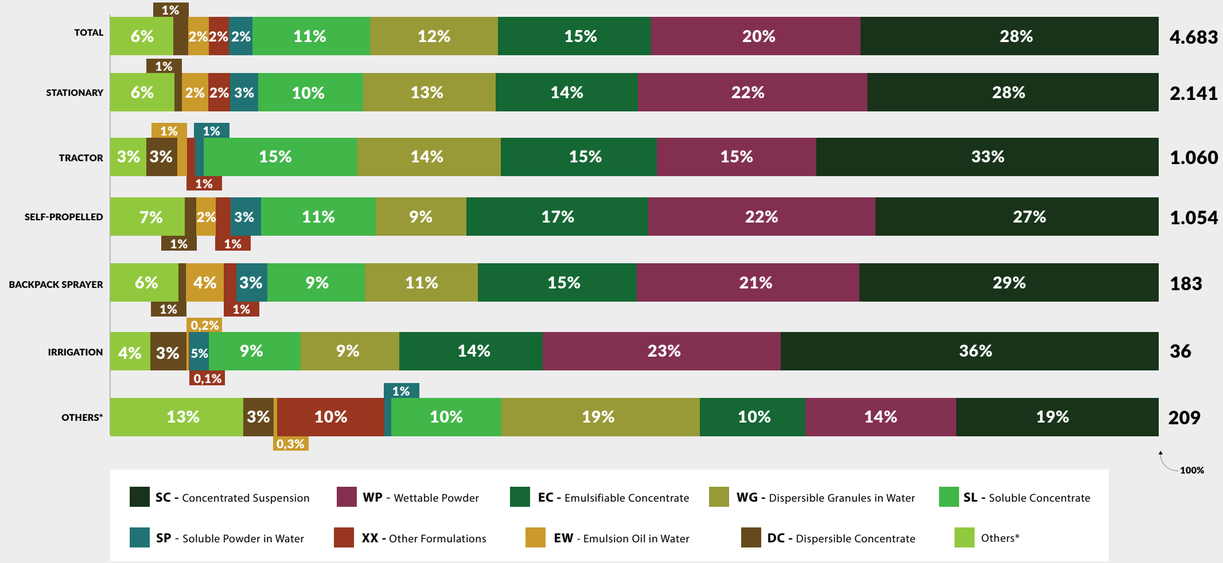
RESEARCH: kynetec

TOMATO:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

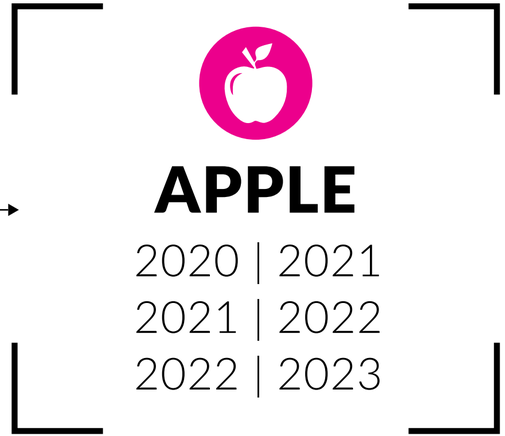
Indications %. Base in ALT (1,000 ha)



*Adjuvants *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec

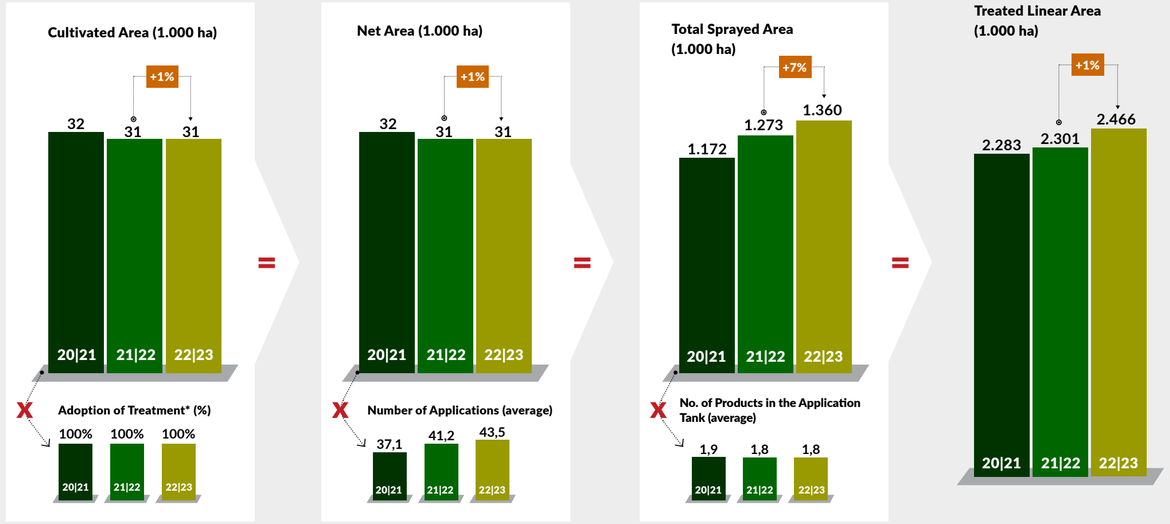
FarmTrak™



APPLE: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

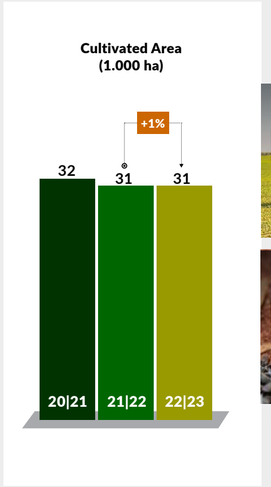
RESEARCH: kynetec Incorporating Spark smarter decisions

APPLE: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



Adoption by Application Modality

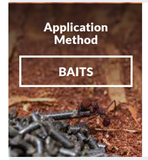
20|21	100%
21|22	100%
22|23	100%

Number of Applications

20|21	33,0
21|22	37,0
22|23	38,9

Total Sprayed Area (1.000 ha)

20|21	1.042
21|22	1.142
22|23	1.217



Adoption by Application Modality

20|21	95%
21|22	95%
22|23	89%

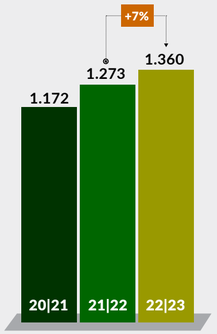
Number of Applications

20|21	4,3
21|22	4,5
22|23	5,1

Total Sprayed Area (1.000 ha)

20|21	130
21|22	131
22|23	142

Total Sprayed Area (1.000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

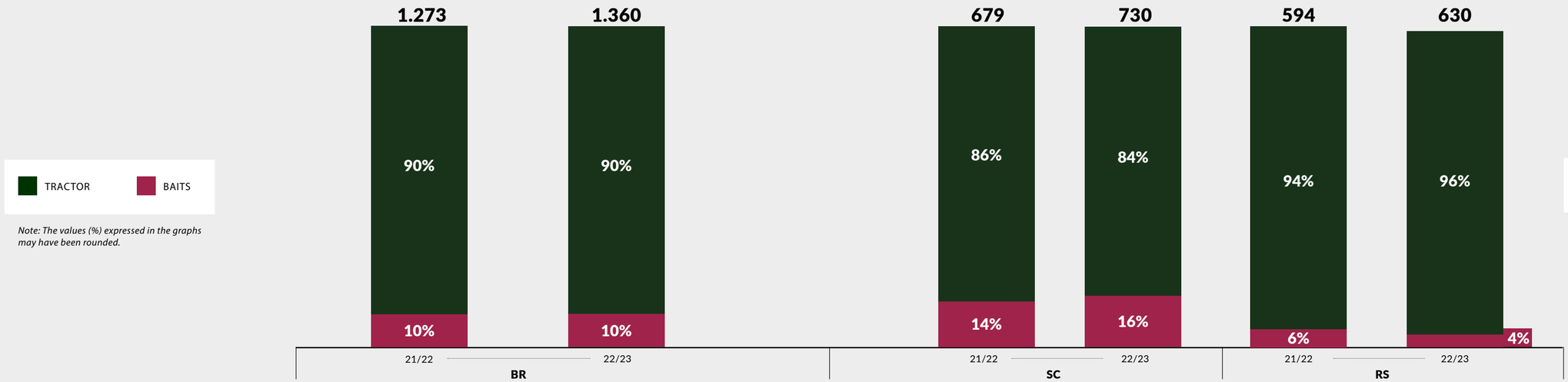
RESEARCH: kynetec Incorporating Spark smarter decisions

APPLE: 2021 | 2022
2022 | 2023

Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

APPLE: 2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

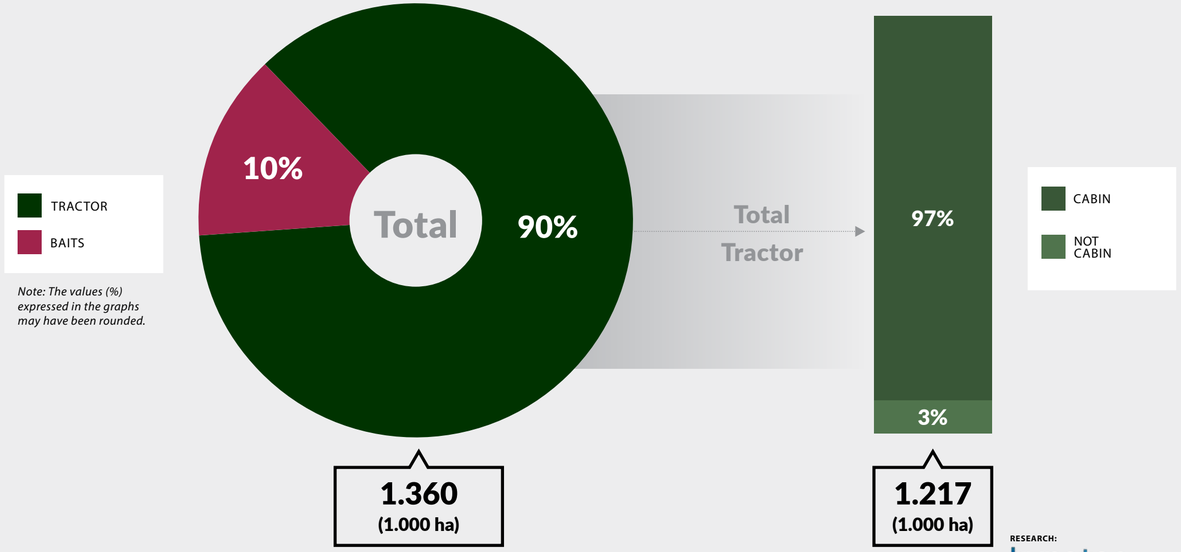
TRACTOR
BAITS

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

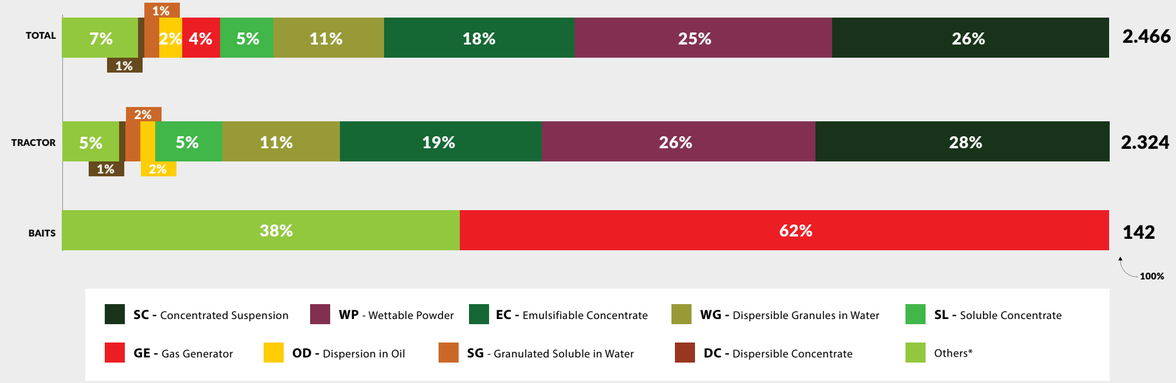
RESEARCH: kynetec Incorporating Spark smarter decisions

APPLE:
2022 | 2023

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



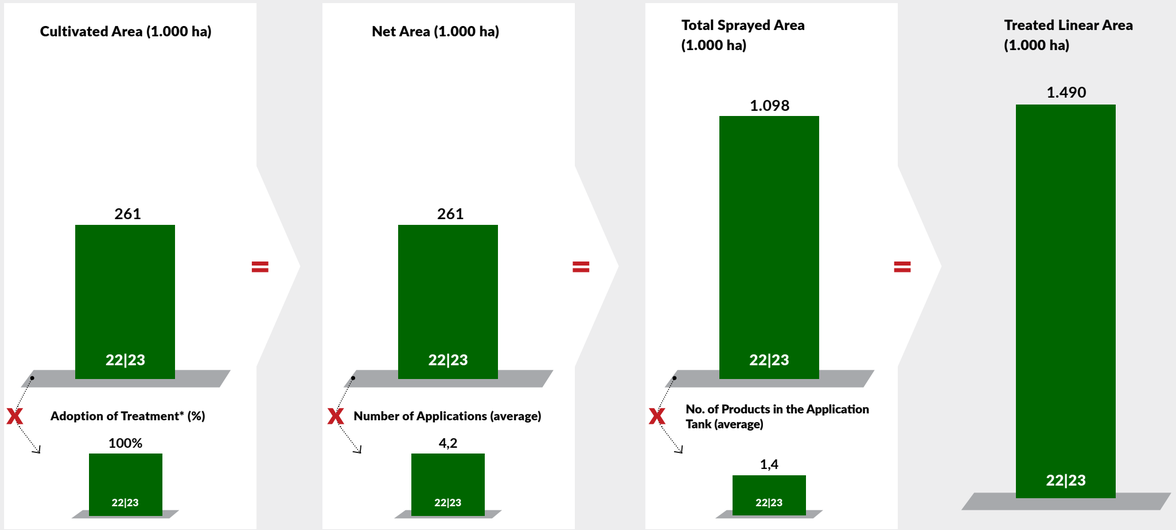
**Adjuvants.*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

Main indicators



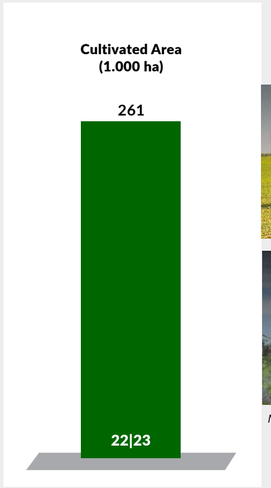
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

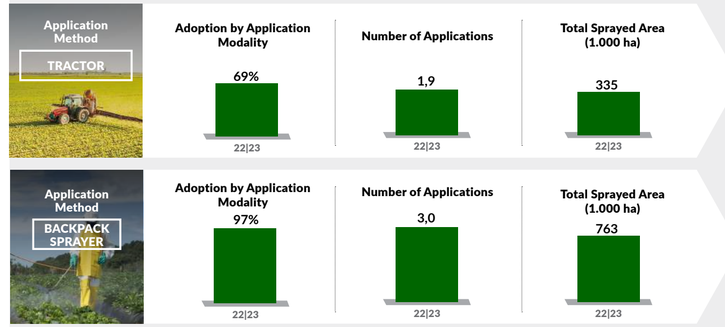
RESEARCH: kynetec Incorporating Spark smarter decisions

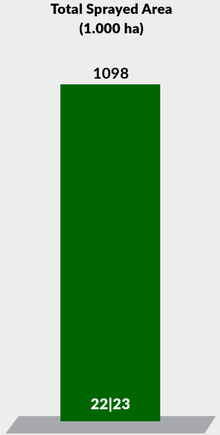
TOBACCO: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators





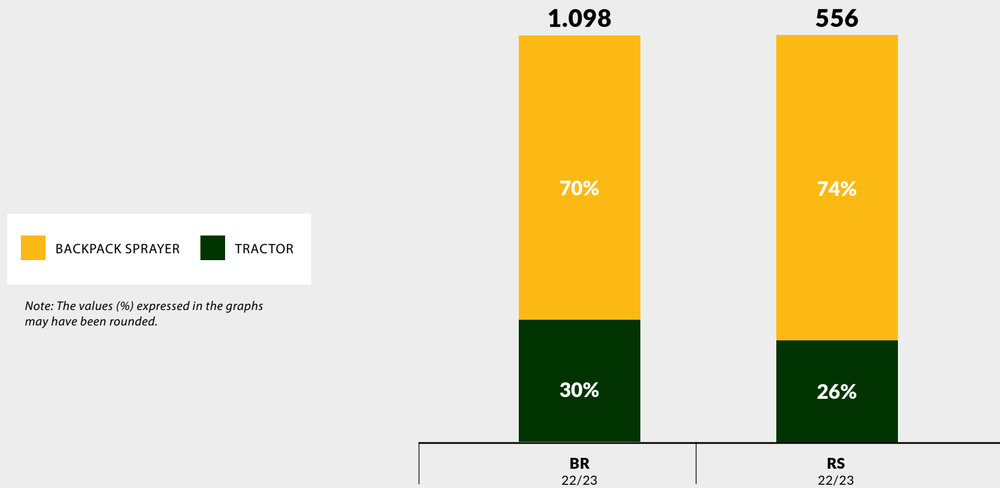


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

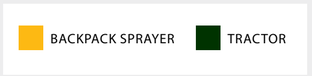
RESEARCH: kynetec Incorporating Spark smarter decisions

TOBACCO: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

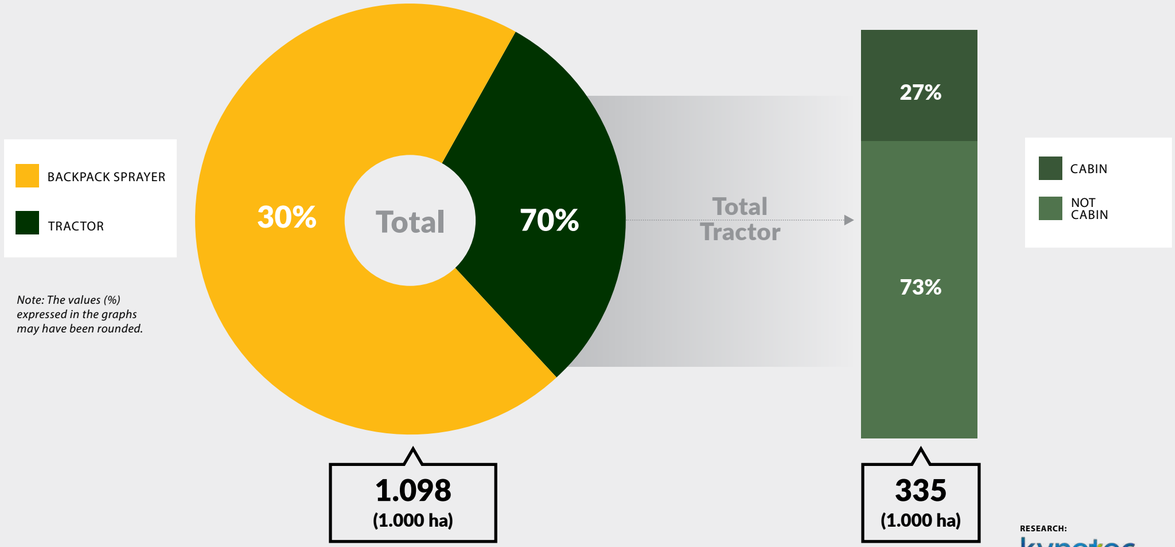


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

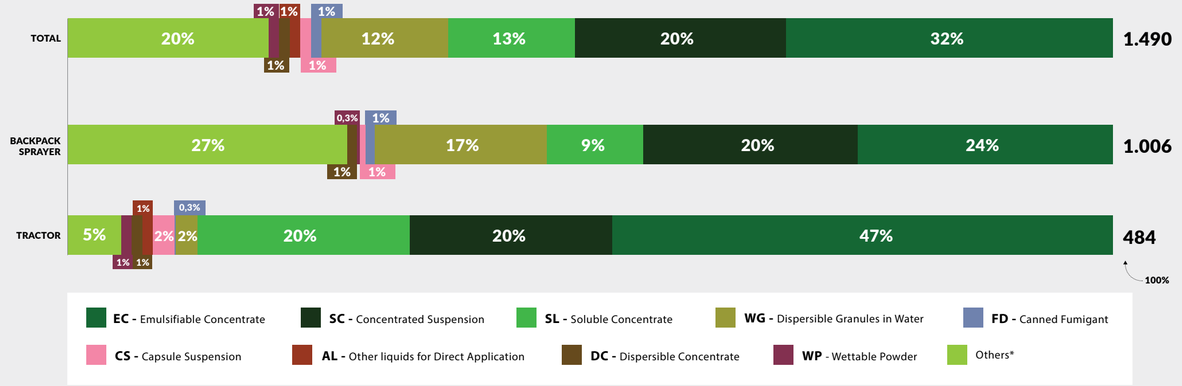
RESEARCH: kynetec Incorporating Spark smarter decisions

TOBACCO: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

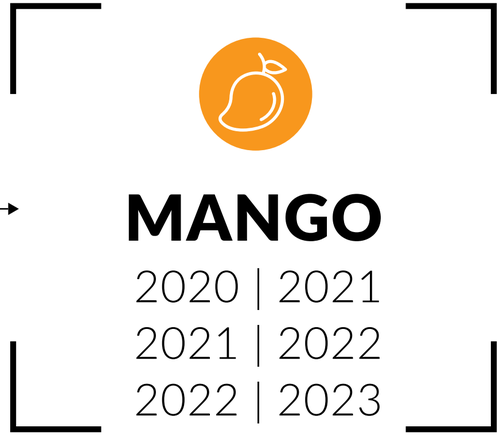
Indications %. Base in ALT (1,000 ha)



**Adjuvants.* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



MANGO: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

Main indicators

Note: The values (%) expressed in the graphs may have been rounded.

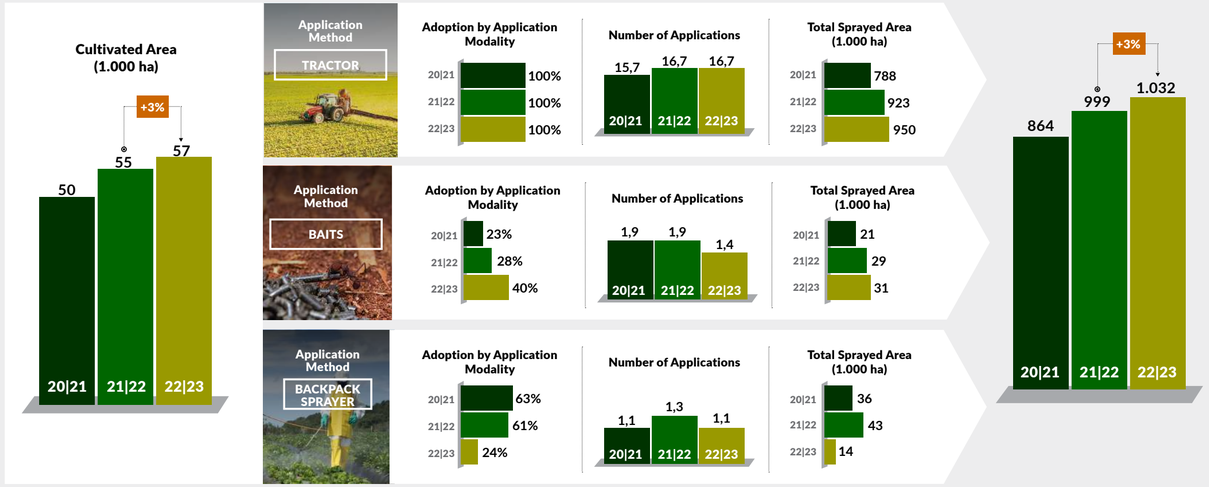
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

MANGO: 2020 | 2021
2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

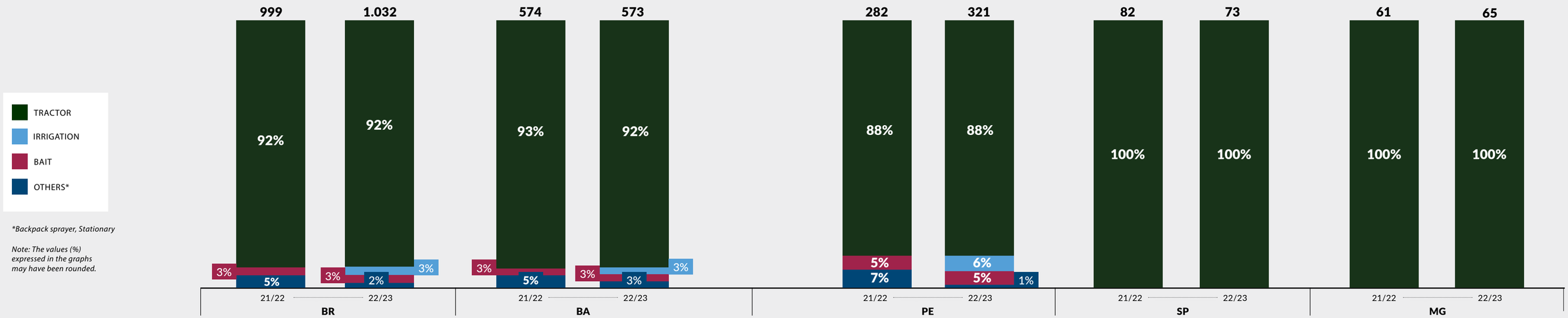
RESEARCH: kynetec Incorporating Spark smarter decisions

MANGO: 2021 | 2022
2022 | 2023

Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



*Backpack sprayer, Stationary

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

MANGO: 2021 | 2022
2022 | 2023

Bases by indicators.

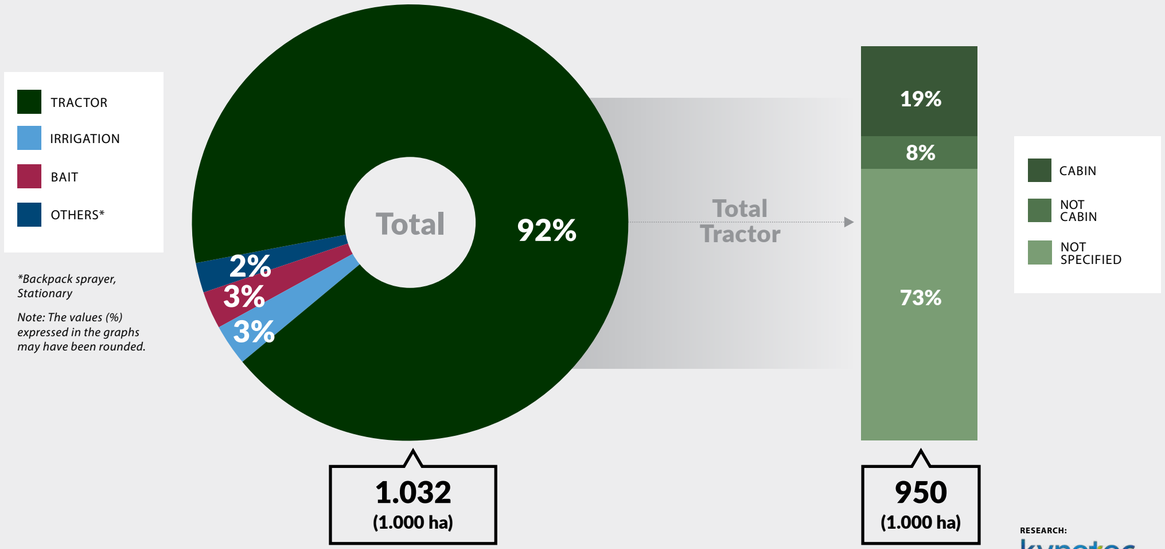
Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



**Backpack sprayer, Stationary*

Note: The values (%) expressed in the graphs may have been rounded.

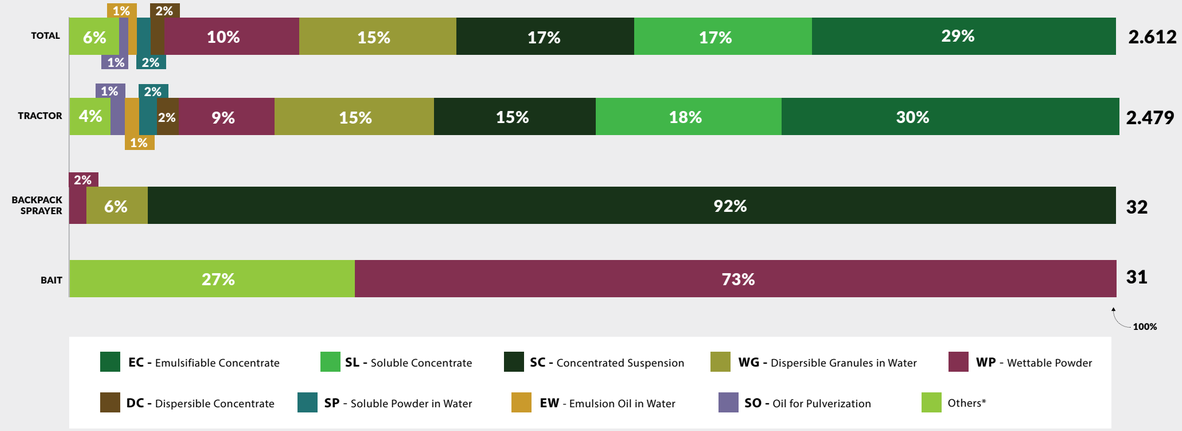
RESEARCH: kynetec Incorporating Spark smarter decisions

MANGO: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



**Adjuvants*

Note: The values (%) expressed in the graphs may have been rounded.

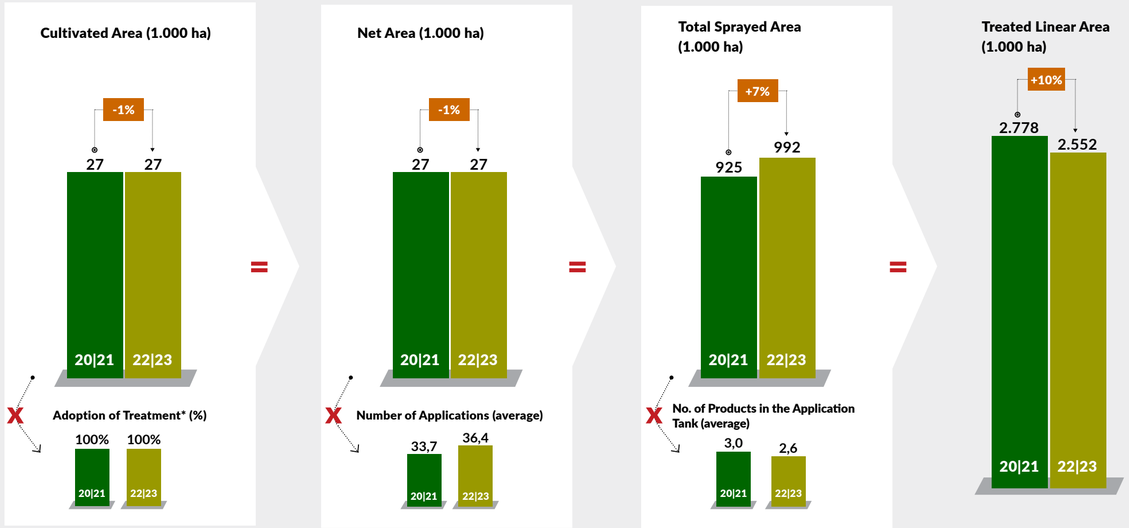
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

PASSION FRUIT: 2020 | 2021 2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

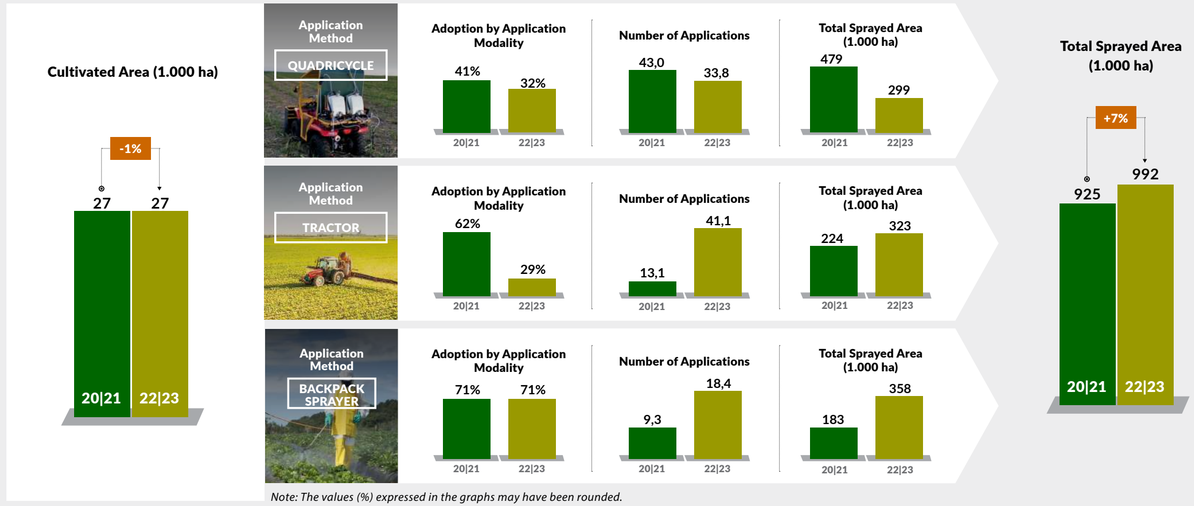
RESEARCH: kynetec Incorporating Spark smarter decisions

PASSION FRUIT: 2020 | 2021 2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

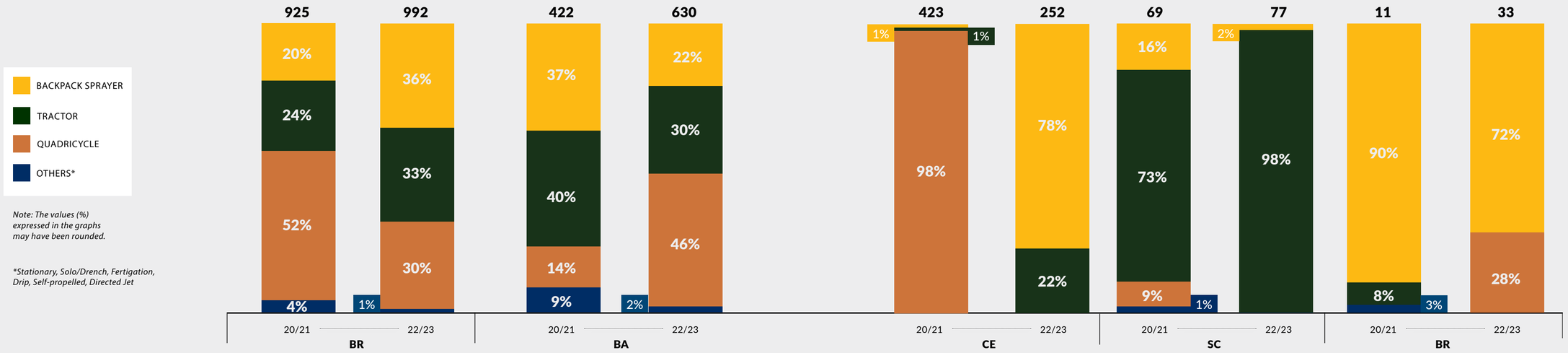


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

**Stationary, Solo/Drench, Fertigation, Drip, Self-propelled, Directed Jet*

RESEARCH: kynetec Incorporating Spark smarter decisions

PASSION FRUIT: 2020 | 2021 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

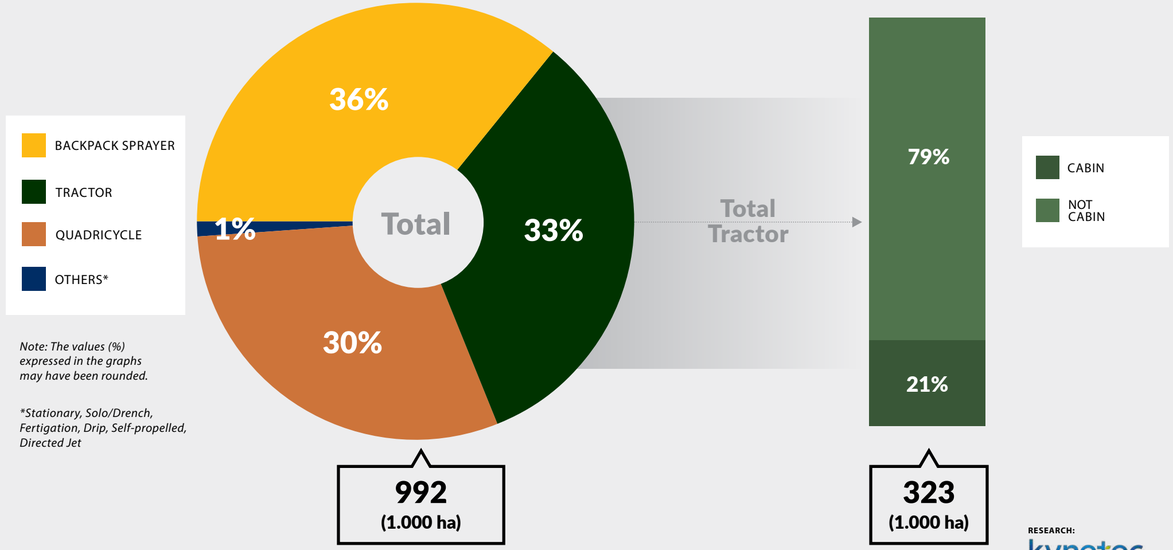
Note: The values (%) expressed in the graphs may have been rounded.

**Stationary, Solo/Drench, Fertigation, Drip, Self-propelled, Directed Jet*

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

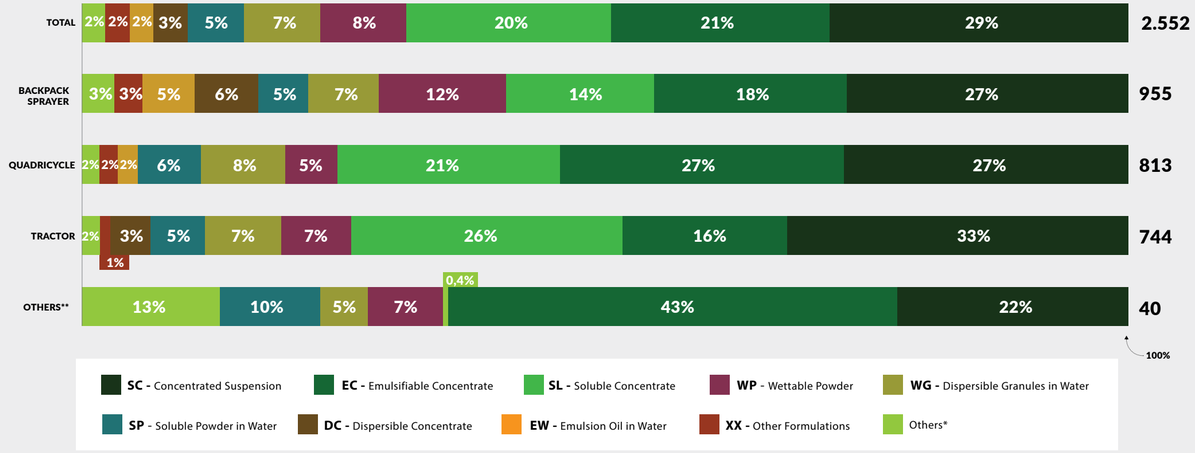
**Stationary, Solo/Drench, Fertigation, Drip, Self-propelled, Directed Jet*

RESEARCH: kynetec Incorporating Spark smarter decisions

PASSION FRUIT: 2022 | 2023
Bases by indicators.
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



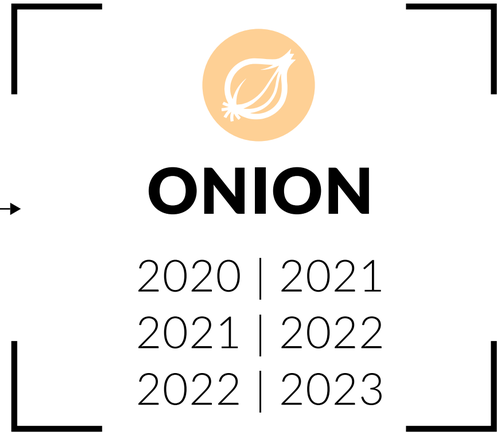
*** Stationary, Soil/Drench, Fertigation.*

**Adjuvants*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

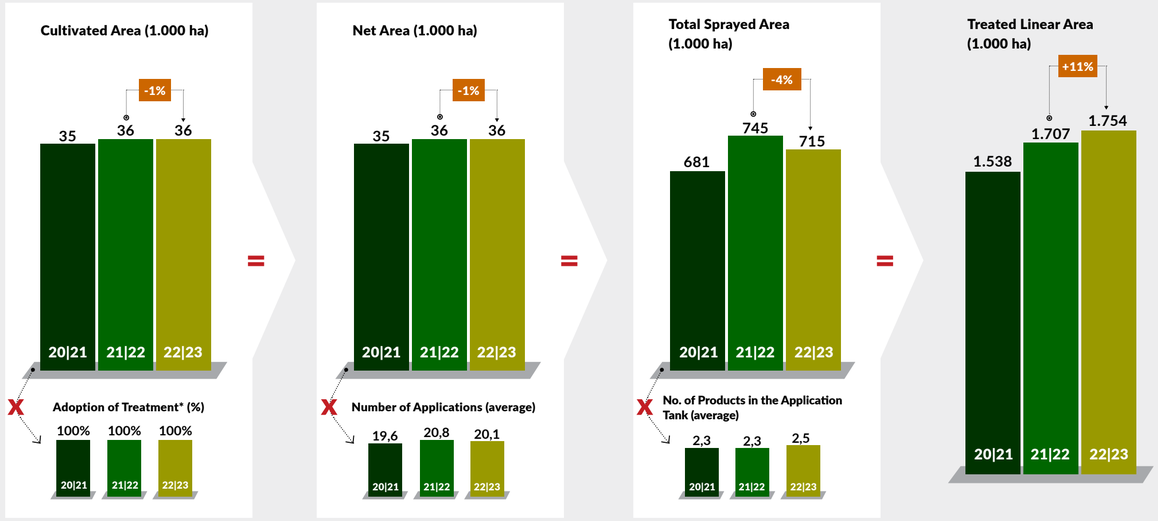
FarmTrak™



ONION: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

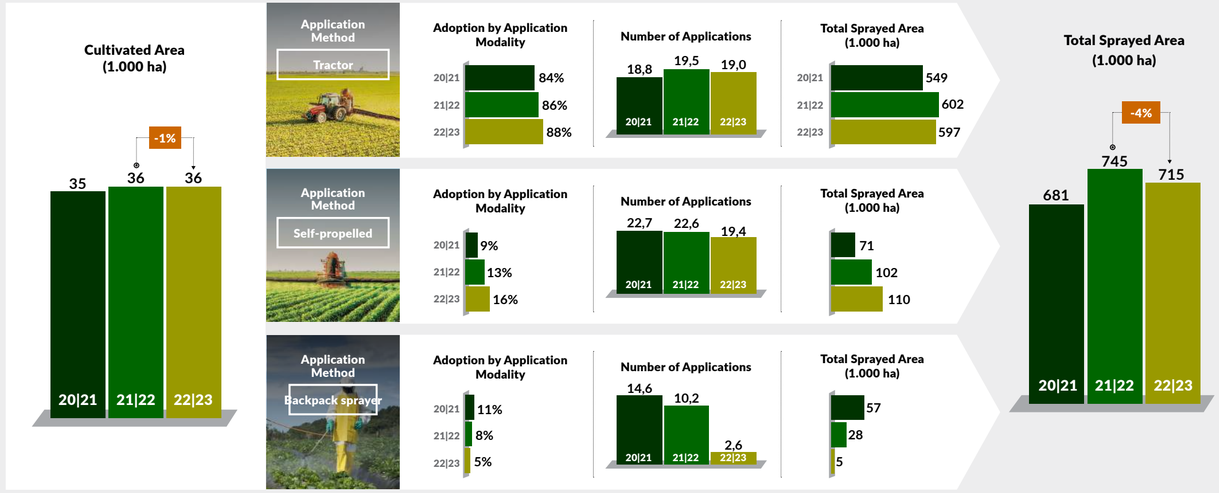
RESEARCH: kynetec Incorporating Spark smarter decisions

ONION: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



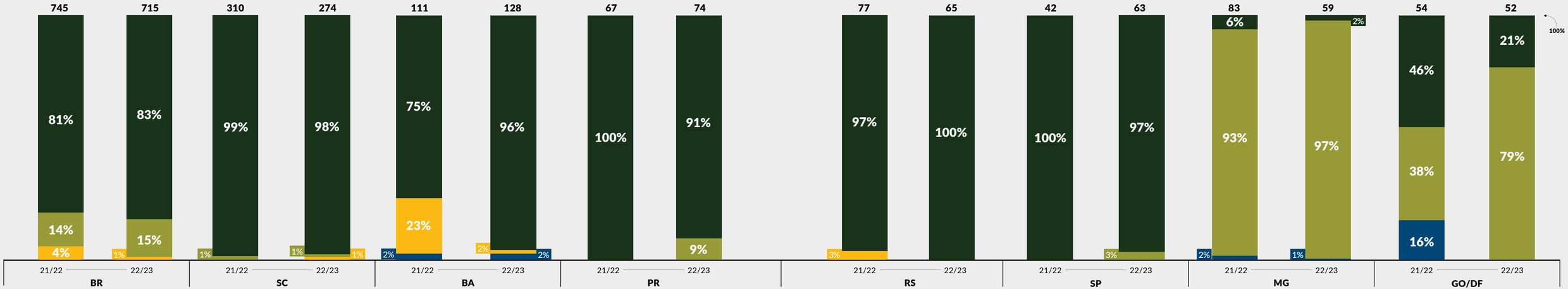
Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

ONION: 2021 | 2022
2022 | 2023
Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded. **Irrigation*

RESEARCH: kynetec Spark

ONION: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

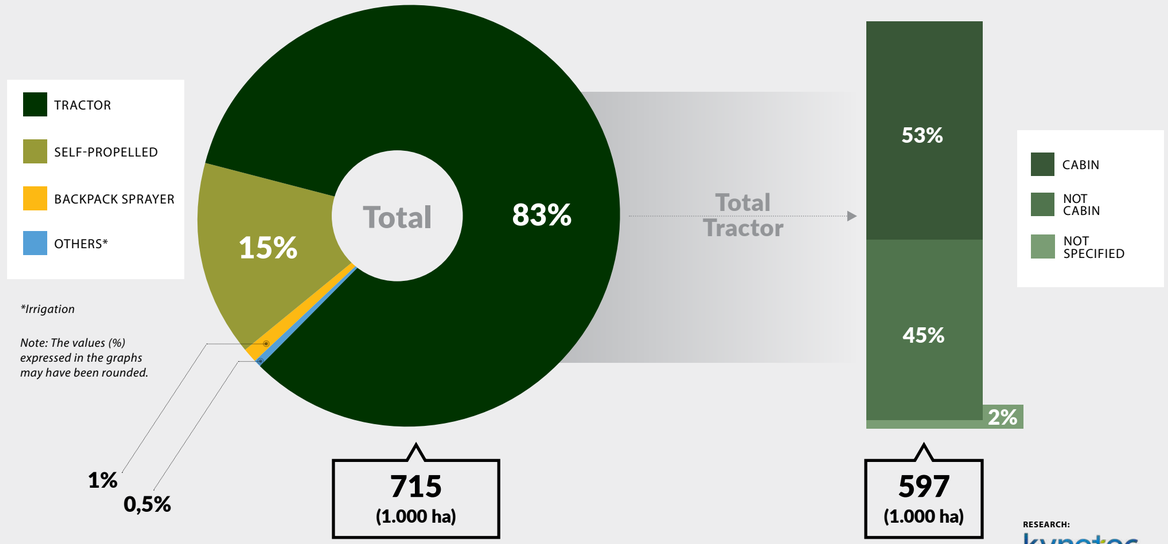
Indications in %: Total Sprayed Area Basis (1,000 ha)

Note: The values (%) expressed in the graphs may have been rounded. **Irrigation*

RESEARCH: kynetec Spark

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



**Irrigation*

Note: The values (%) expressed in the graphs may have been rounded.

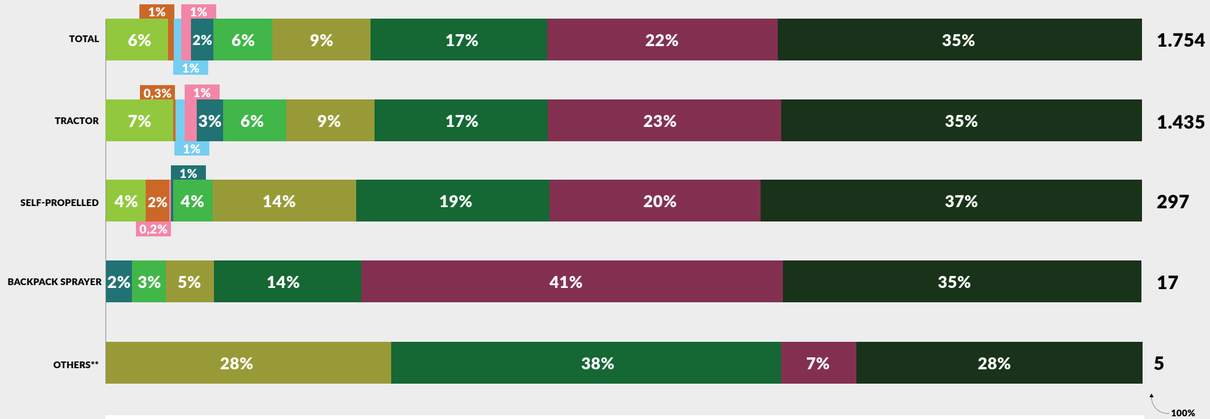
RESEARCH: kynetec Incorporating Spark smarter decisions

ONION: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



**Adjuvants.* ***Irrigation* *Note: The values (%) expressed in the graphs may have been rounded.*

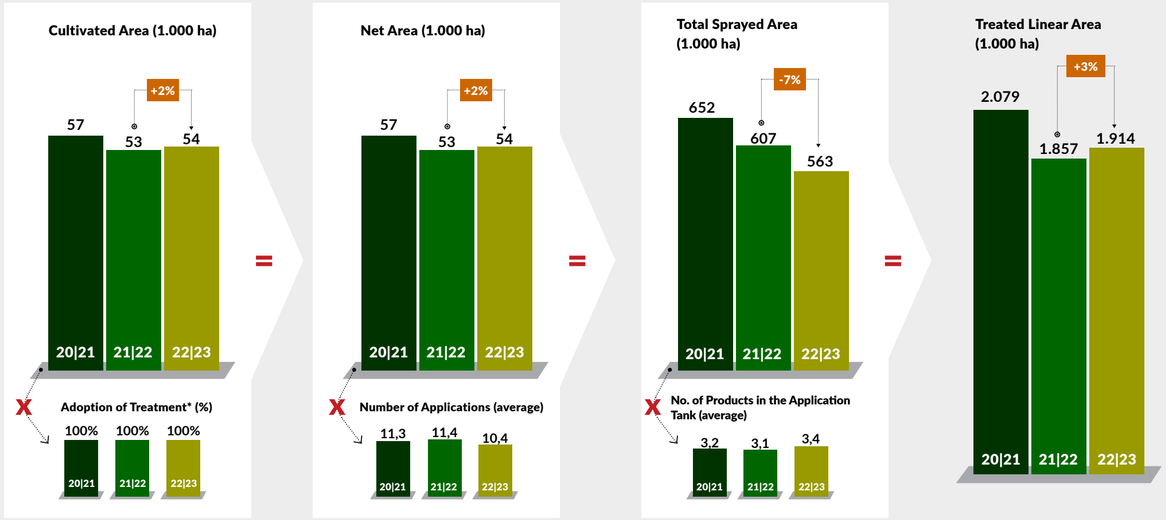
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

WATERMELON: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

WATERMELON: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

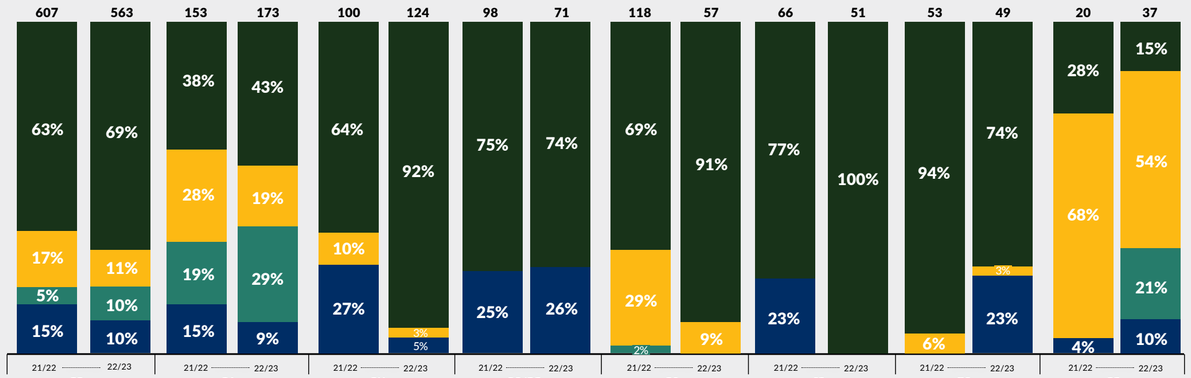
Main indicators

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



**Self-propelled, Irrigation*

Note: The values (%) expressed in the graphs may have been rounded.

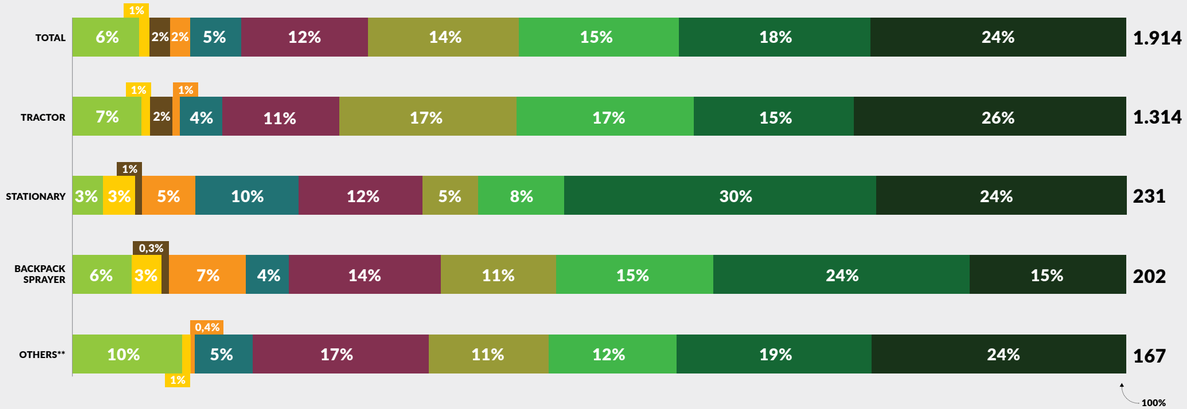
TRACTOR | BACKPACK SPRAYER | STATIONARY | OTHERS*

**Stationary, Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)

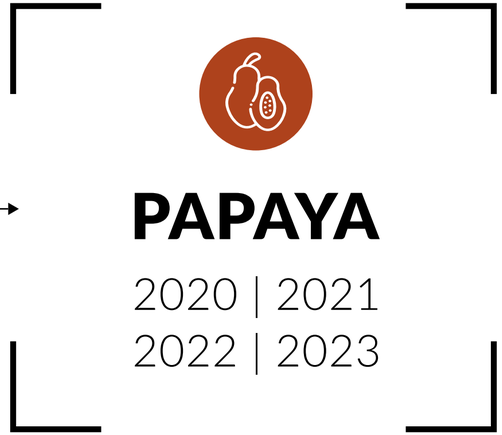


SC - Concentrated Suspension | **EC -** Emulsifiable Concentrate | **SL -** Soluble Concentrate | **WG -** Dispersible Granules in Water | **WP** - Wettable Powder
SP - Soluble Powder in Water | **FS -** Concentrated Suspension p/ Trat. Sementes | **DC -** Dispersible Concentrate | **OD** - Dispersion in Oil | Others*

Adjuvants.* * Self-propelled, Irrigation* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™



PAPAYA: 2020 | 2021
2022 | 2023
Bases by indicators.

Main indicators

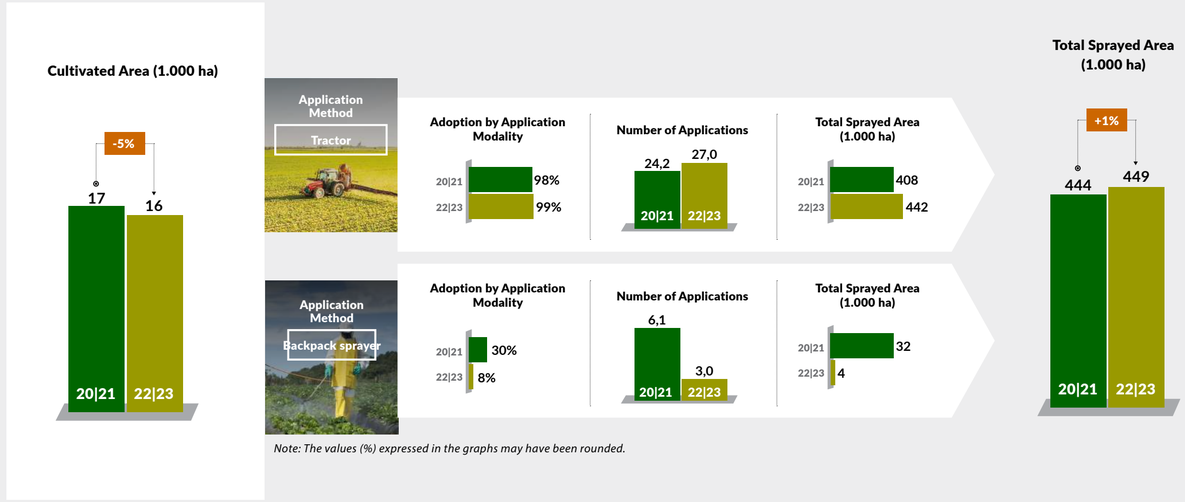
Note: The values (%) expressed in the graphs may have been rounded.
**Treatment may have been performed using chemicals or biologicals.*

RESEARCH: kynetec Incorporating Spark smarter decisions

PAPAYA: 2020 | 2021
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

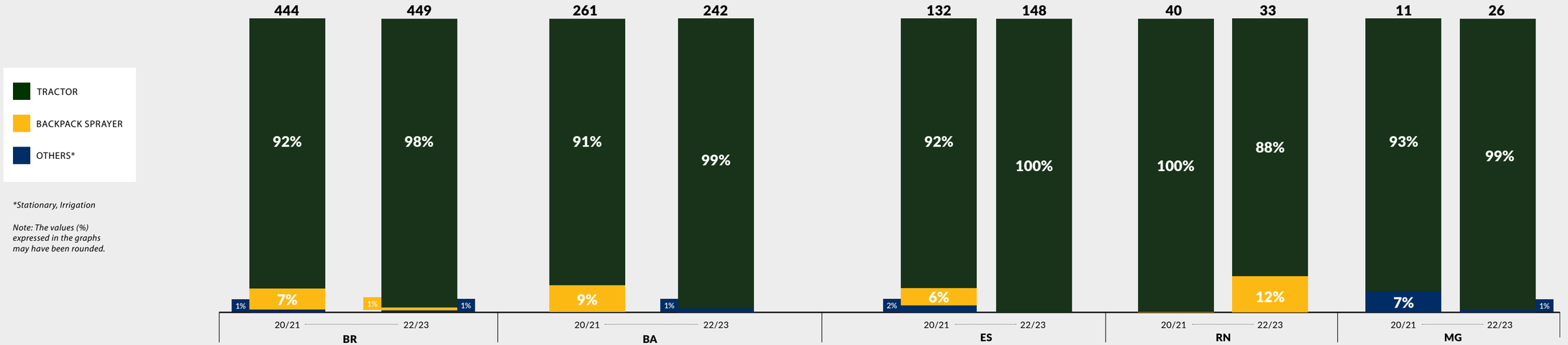


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



**Stationary, Irrigation*

Note: The values (%) expressed in the graphs may have been rounded.

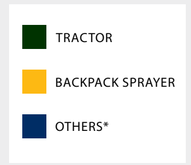
RESEARCH: kynetec Incorporating Spark smarter decisions

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

PAPAYA: 2020 | 2021 2022 | 2023
Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



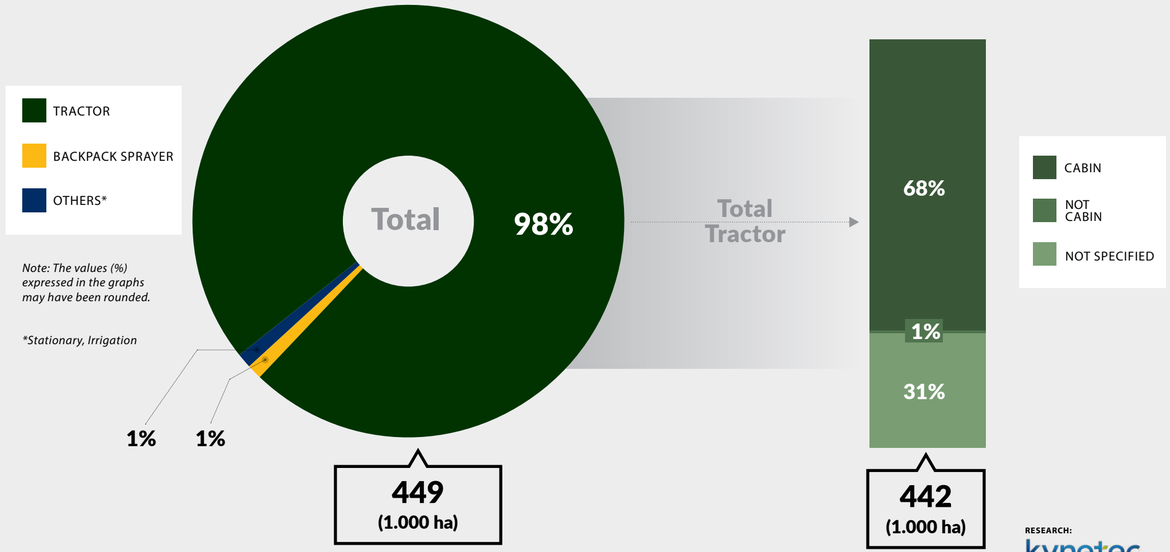
Note: The values (%) expressed in the graphs may have been rounded.

**Stationary, Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Stationary, Irrigation*

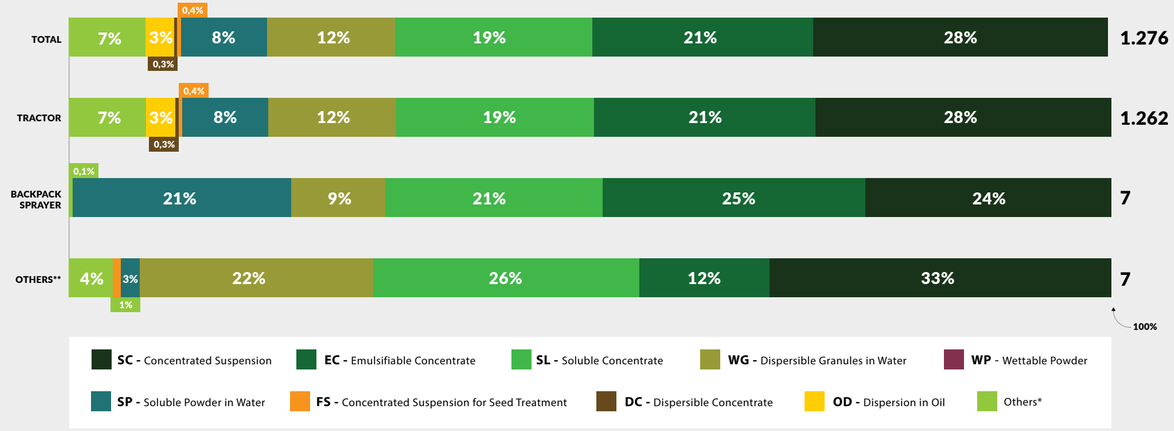
RESEARCH: kynetec Incorporating Spark smarter decisions

PAPAYA: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



**Adjuvants* ***Stationary, Irrigation* *Note: The values (%) expressed in the graphs may have been rounded.*

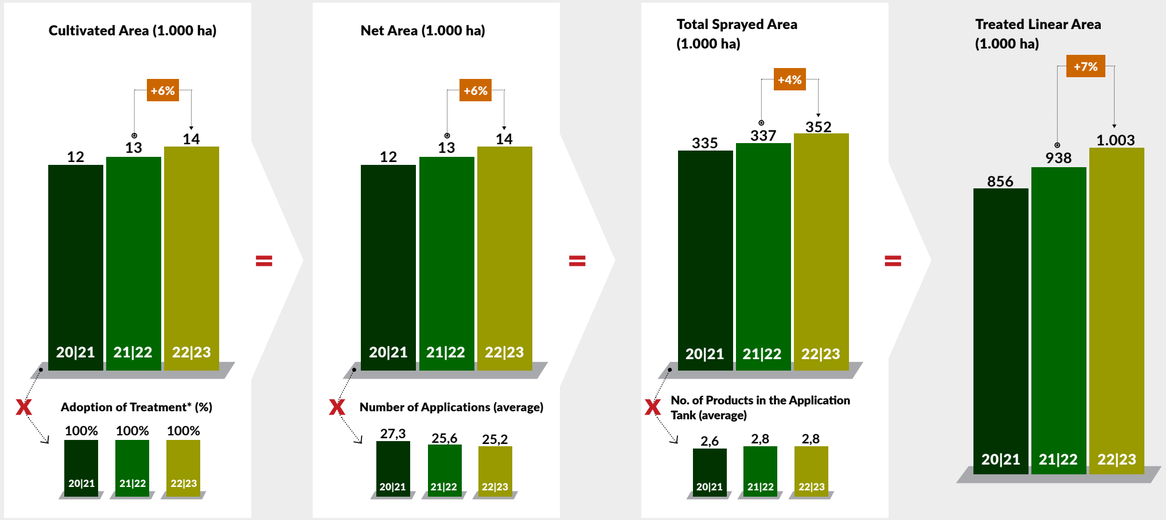
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

GARLIC: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

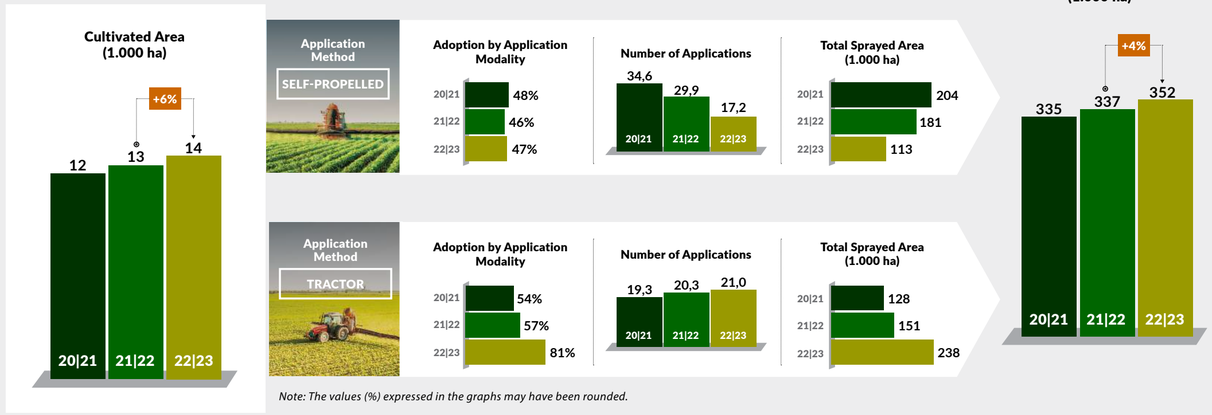
RESEARCH: kynetec Incorporating Spark smarter decisions

GARLIC: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

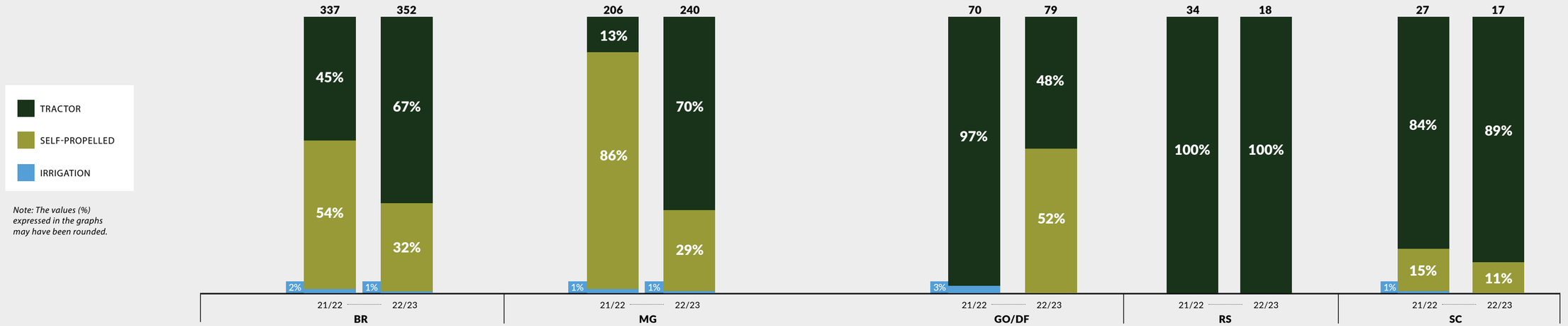


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

GARLIC: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

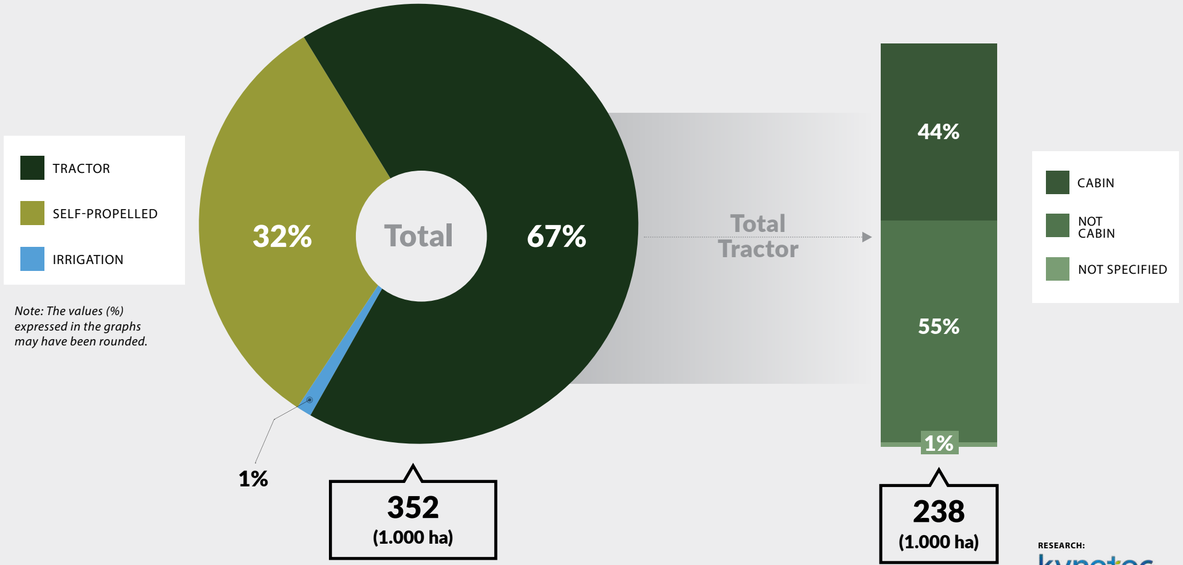
Indications in %: Total Sprayed Area Basis (1,000 ha)

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

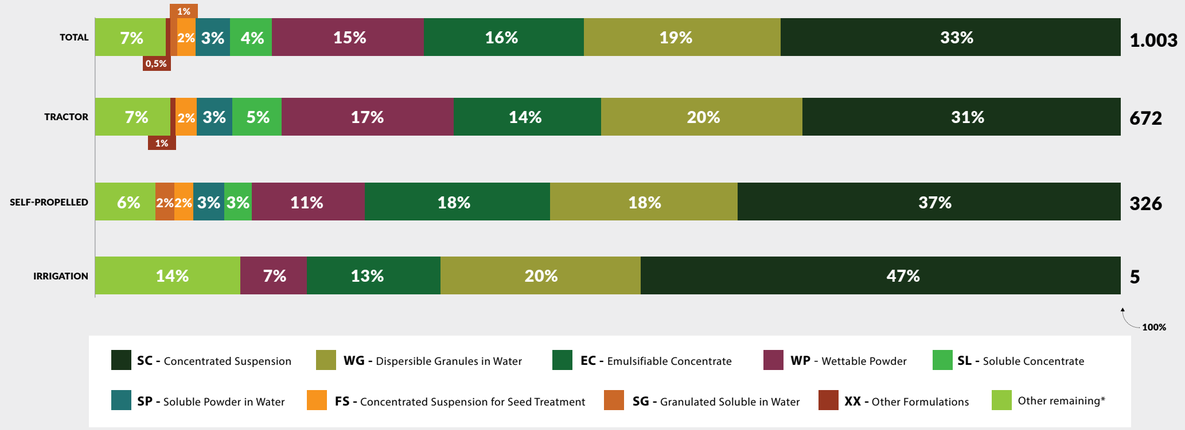
RESEARCH: kynetec Incorporating Spark smarter decisions

GARLIC: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)

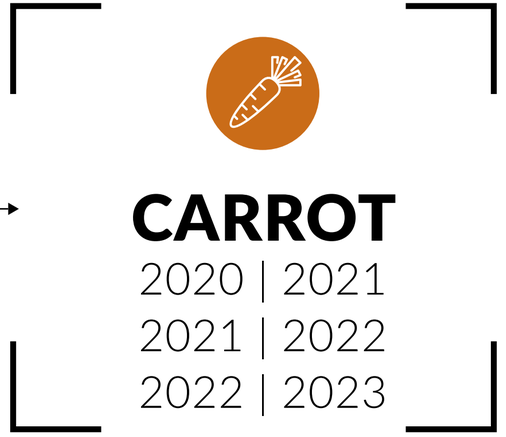


**Adjuvants*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

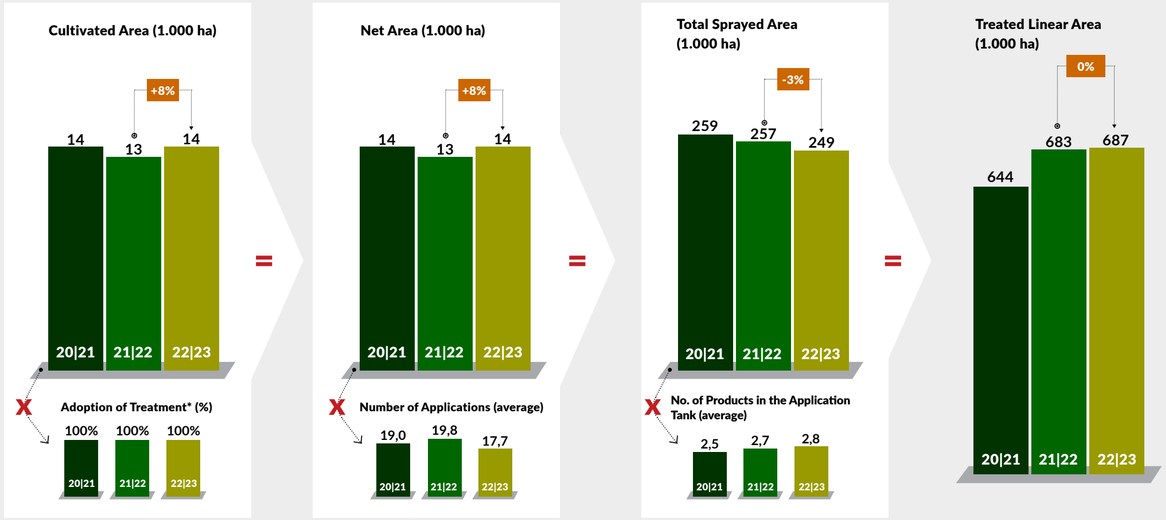
FarmTrak™



CARROT: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

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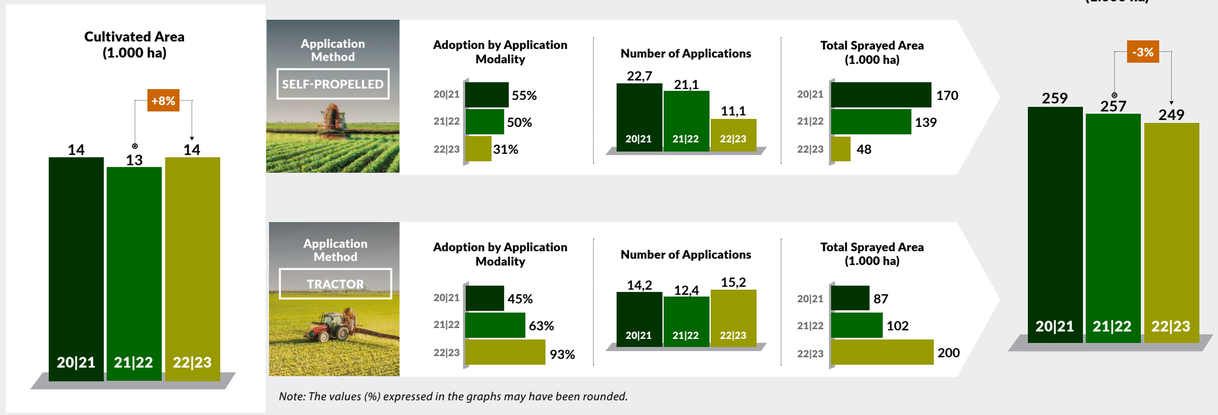
RESEARCH: kynetec Incorporating Spark smarter decisions

CARROT: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

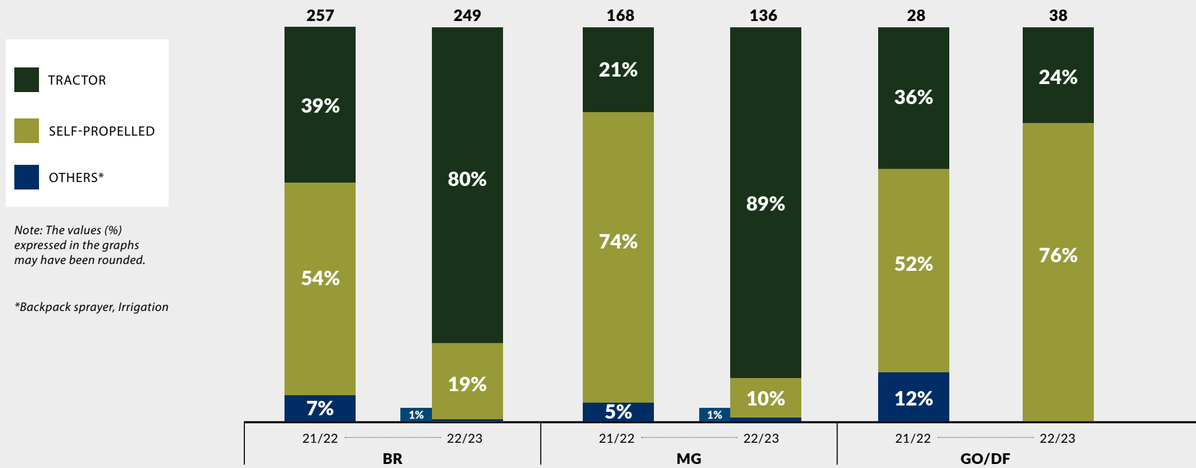
RESEARCH: kynetec Incorporating Spark smarter decisions

CARROT: 2021 | 2022
2022 | 2023

Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

**Backpack sprayer, Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

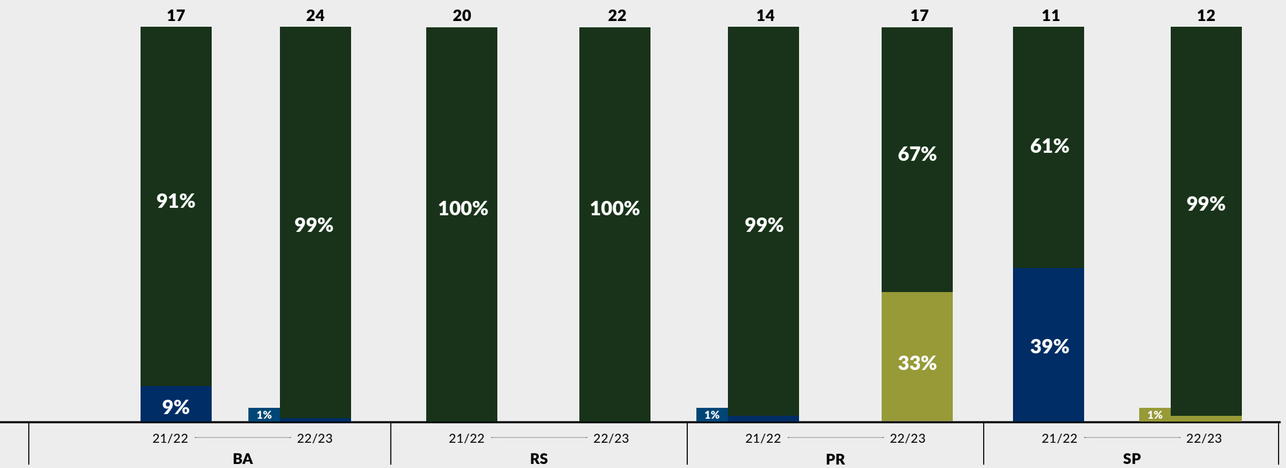
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

CARROT: 2020 | 2021
2022 | 2023

Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



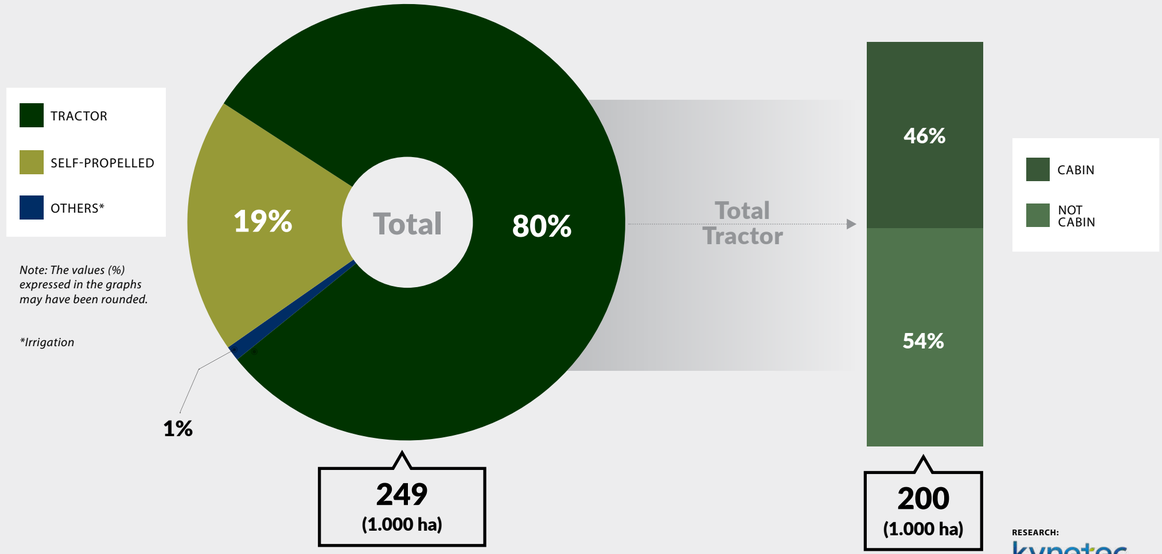
**Backpack sprayer, Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

Note: The values (%) expressed in the graphs may have been rounded.

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

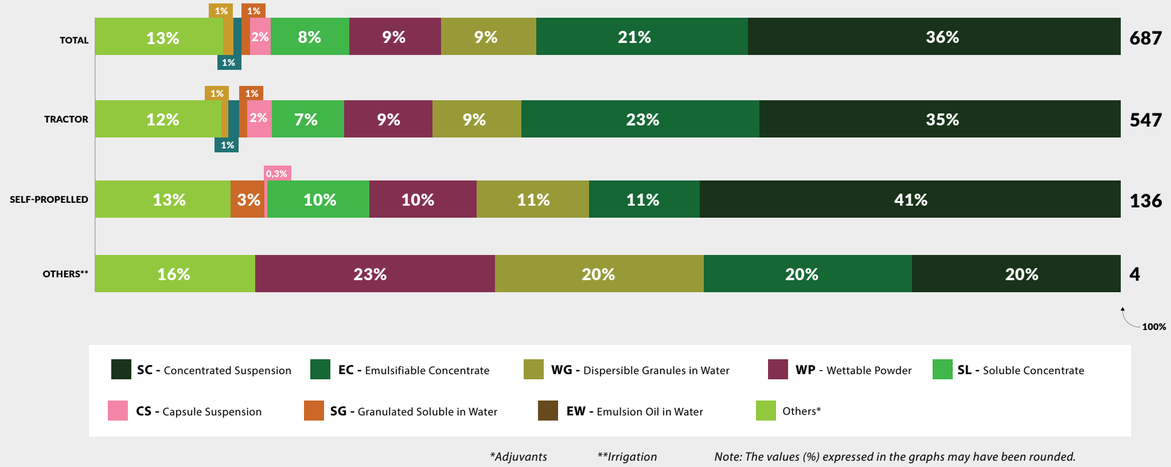
**Irrigation*

RESEARCH: kynetec Incorporating Spark smarter decisions

CARROT: 2022 | 2023
Bases by indicators.
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



**Adjuvants* ***Irrigation* *Note: The values (%) expressed in the graphs may have been rounded.*

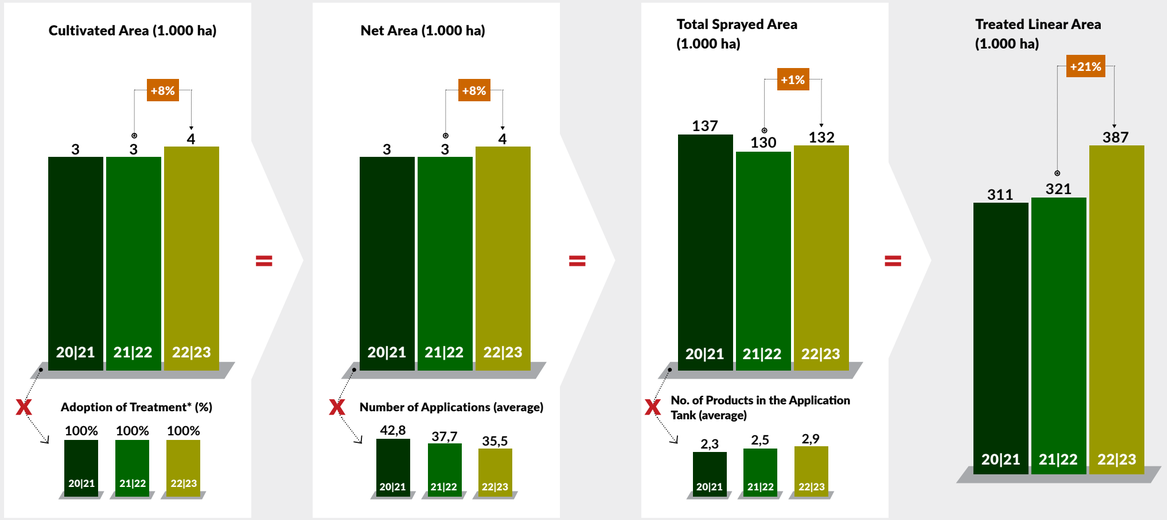
RESEARCH: kynetec Incorporating Spark smarter decisions

FarmTrak™

SWEET PEPPER: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

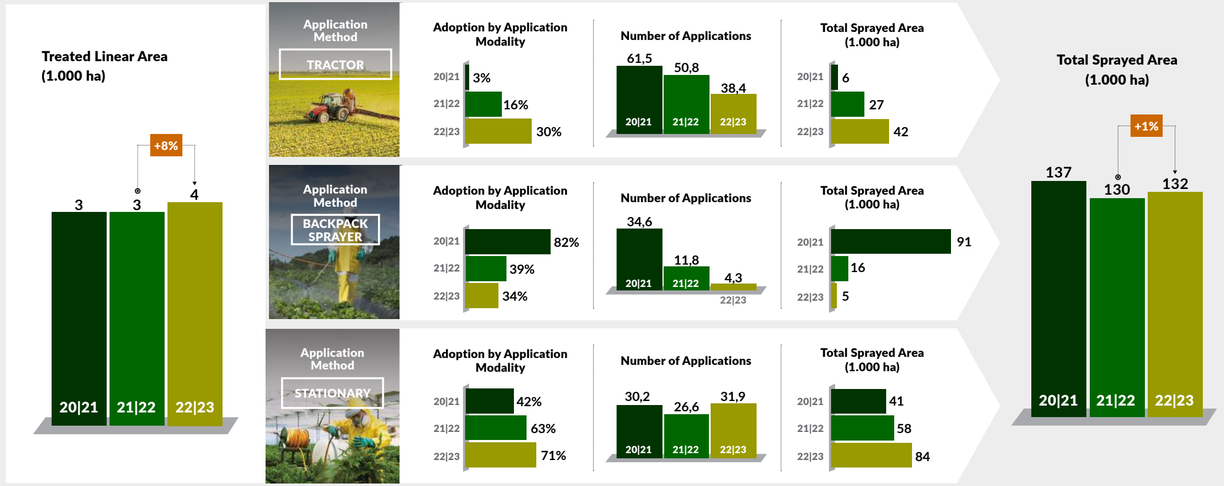
RESEARCH: kynetec Incorporating Spark smarter decisions

SWEET PEPPER: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

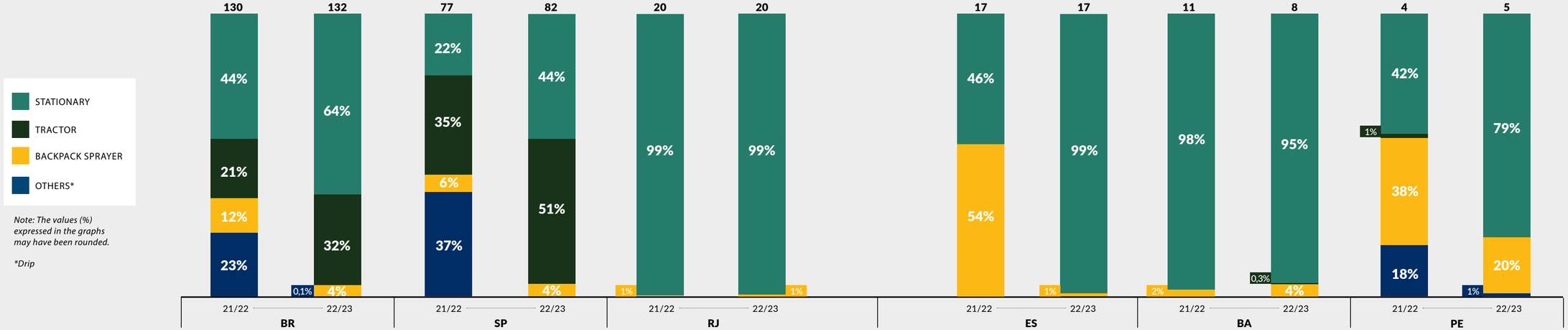


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

**Drip*

RESEARCH: kynetec Incorporating Spark smarter decisions

SWEET PEPPER: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)

STATIONARY
TRACTOR
BACKPACK SPRAYER
OTHERS*

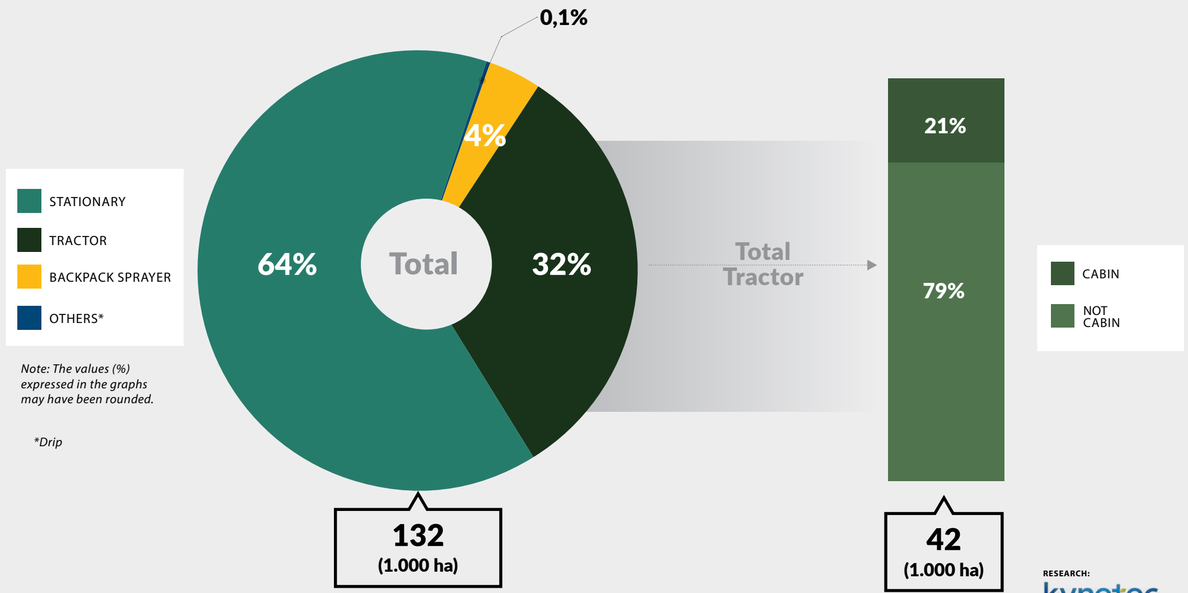
Note: The values (%) expressed in the graphs may have been rounded.

**Drip*

RESEARCH: kynetec Incorporating Spark smarter decisions

Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).



Note: The values (%) expressed in the graphs may have been rounded.

**Drip*

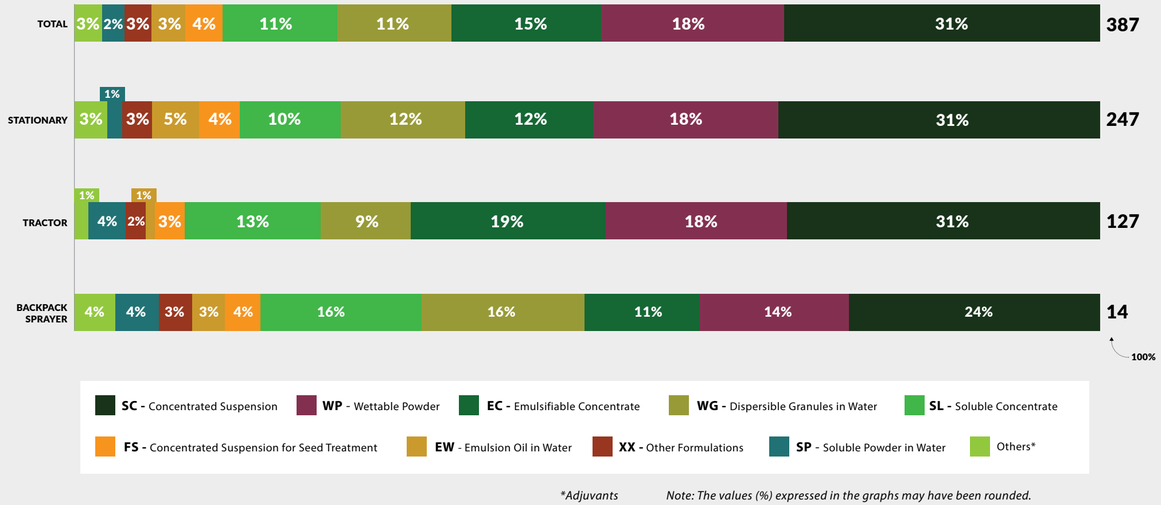
RESEARCH: kynetec Incorporating Spark smarter decisions

SWEET PEPPER: 2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)

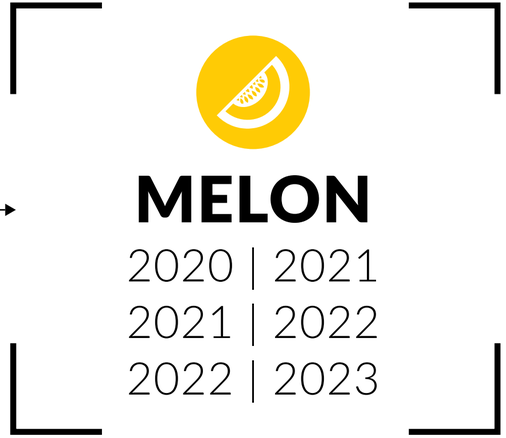


**Adjuvants*

Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

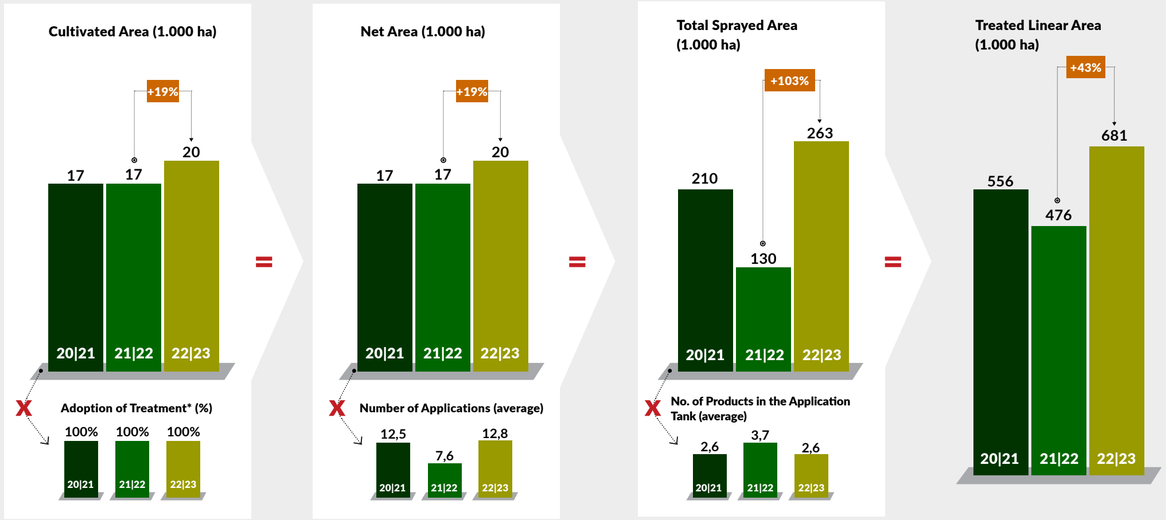
FarmTrak™



MELON: 2020 | 2021
2021| 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

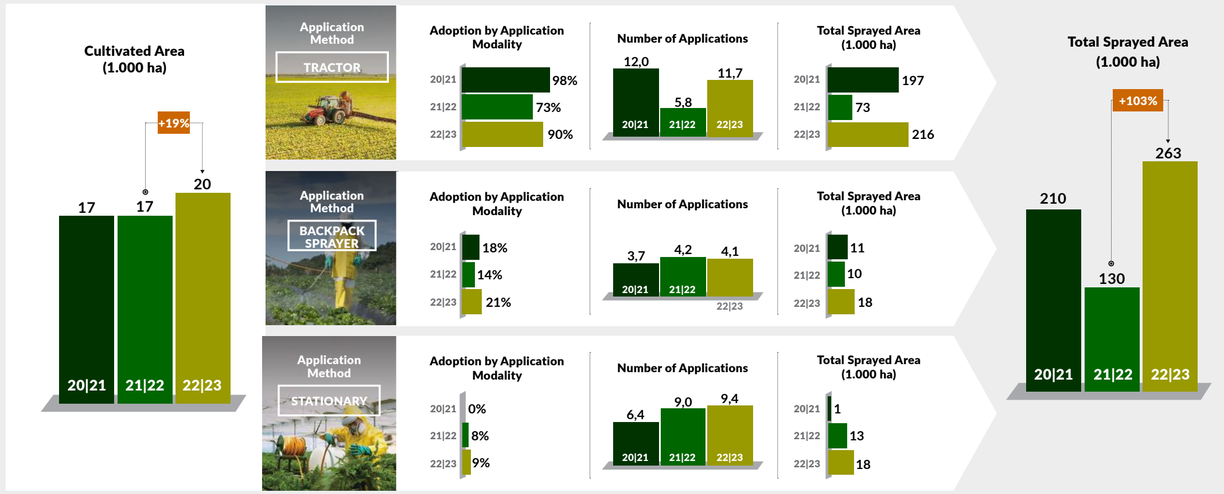
RESEARCH: kynetec Incorporating Spark smarter decisions

MELON: 2020 | 2021
2021| 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

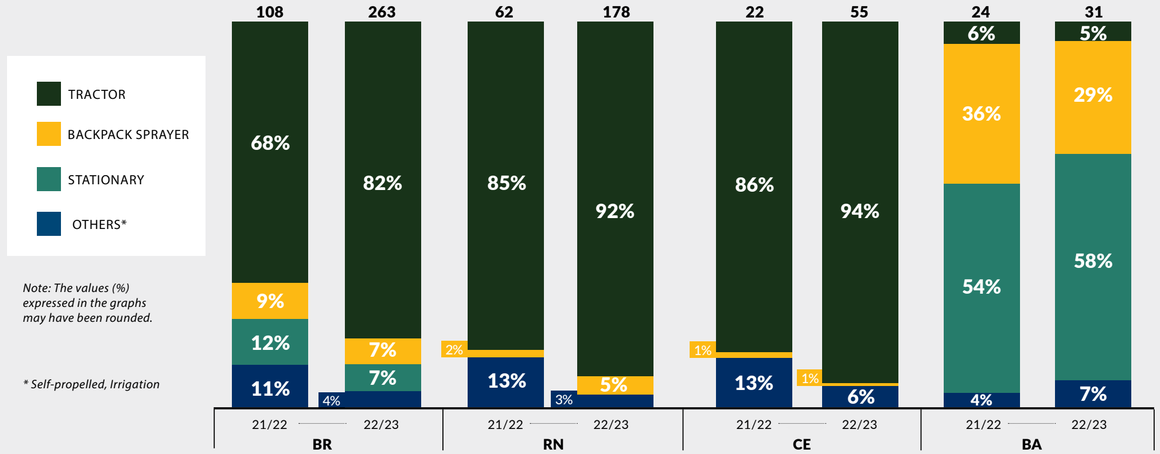


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

** Self-propelled, Irrigation*

Note: The values (%) expressed in the graphs may have been rounded.

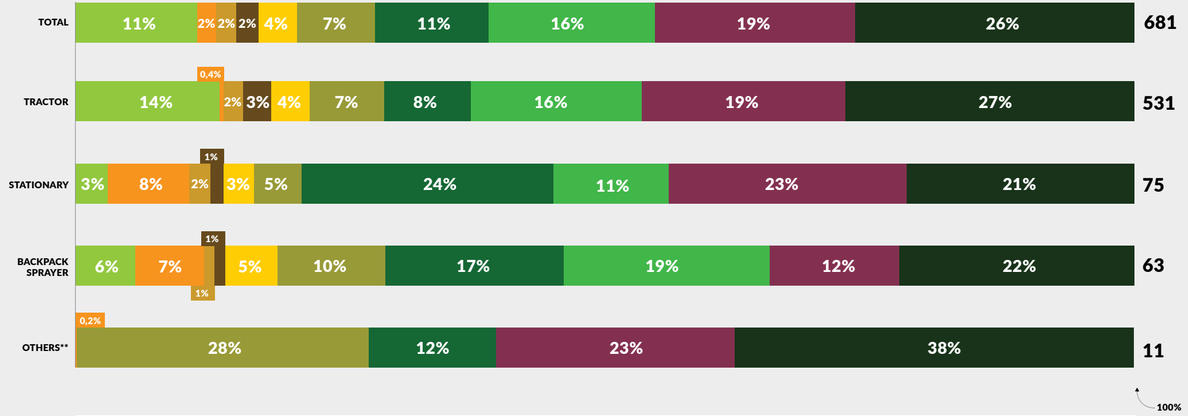
RESEARCH: kynetec Incorporating Spark smarter decisions

MELON: 2021 | 2022
2022 | 2023
Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



Adjuvants* * Self-propelled, Irrigation* *Note: The values (%) expressed in the graphs may have been rounded.*

RESEARCH: kynetec Incorporating Spark smarter decisions

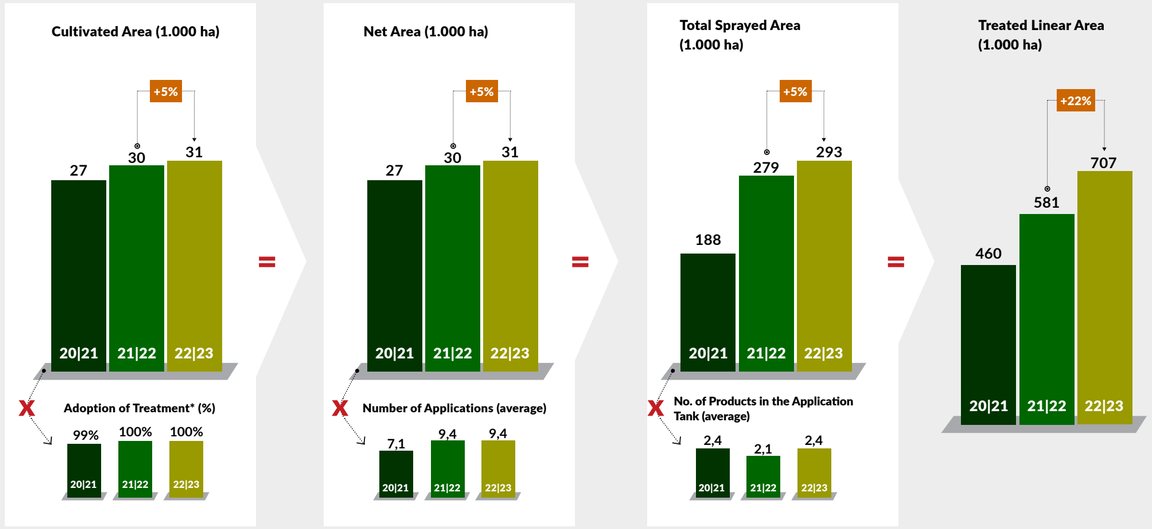
FarmTrak™

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

BRASSICAS: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

Main indicators



Note: The values (%) expressed in the graphs may have been rounded.

**Treatment may have been performed using chemicals or biologicals.*

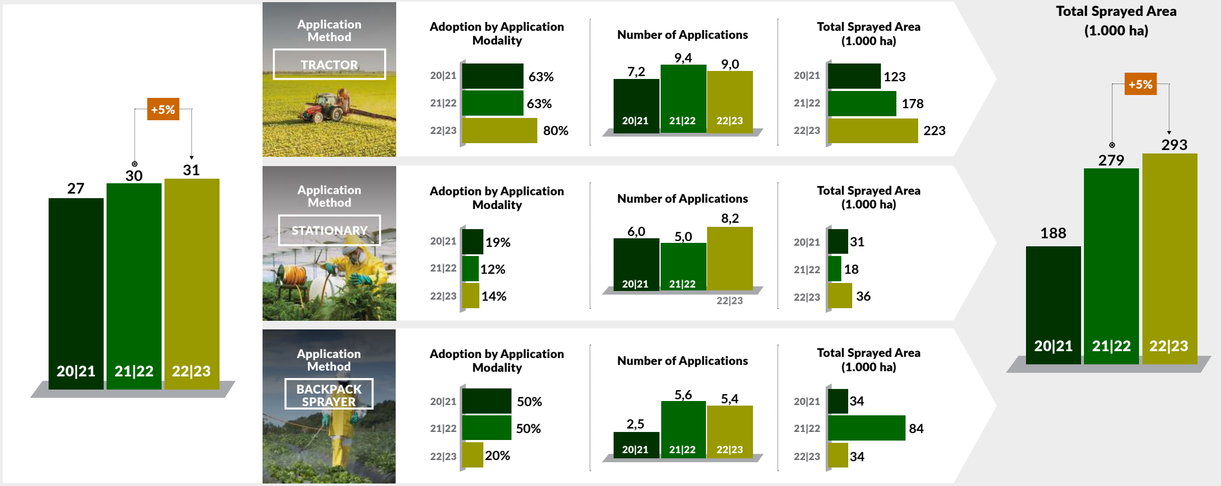
RESEARCH: kynetec Incorporating Spark smarter decisions

BRASSICAS: 2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators

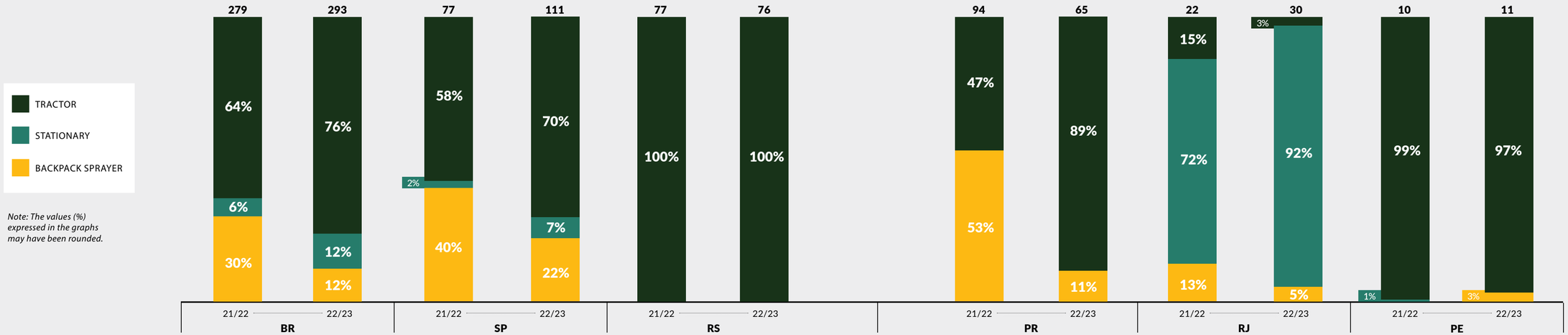


Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

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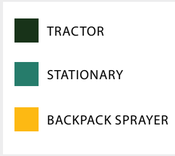
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

BRASSICAS: 2021 | 2022
2022 | 2023
Bases by indicators.

Application modalities by states

Indications in %: Total Sprayed Area Basis (1,000 ha)



Note: The values (%) expressed in the graphs may have been rounded.

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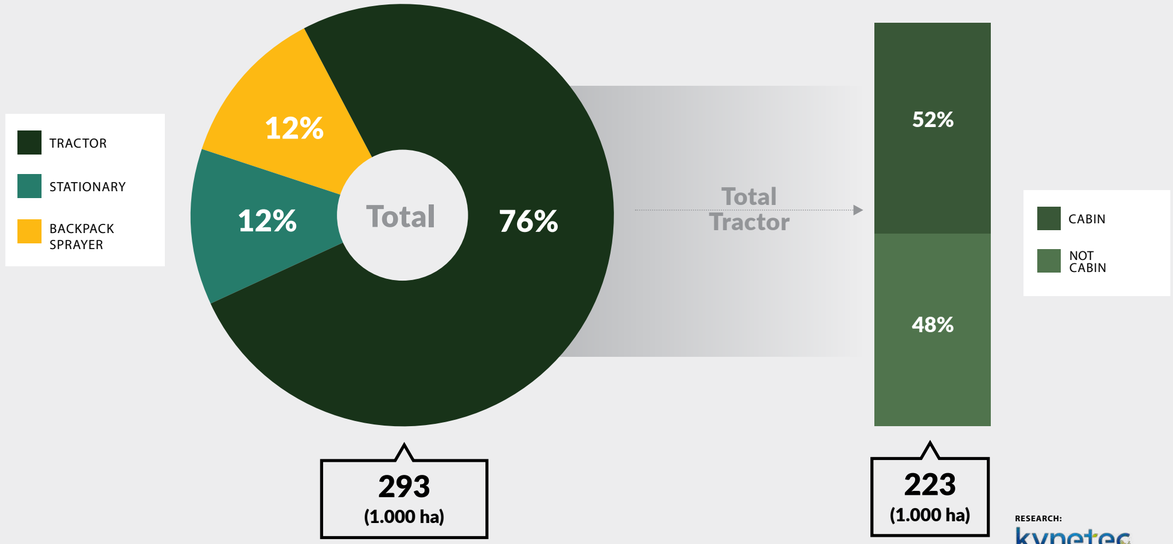
Modalities of application

Indications in %: Total Sprayed Area Basis (1,000 ha).

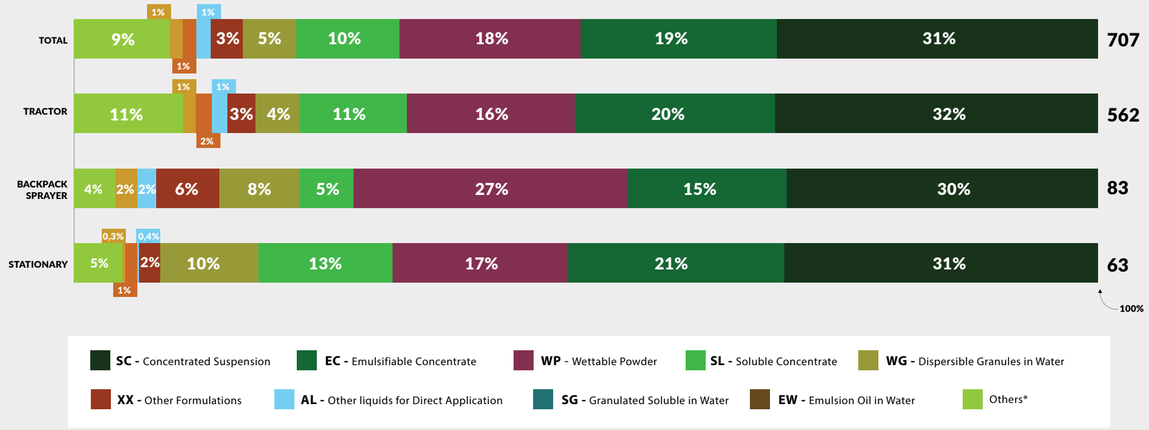


RESEARCH: kynetec Incorporating Spark smarter decisions

BRASSICAS: 2022 | 2023
Bases by indicators.
PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Formulations by application modalities

Indications %. Base in ALT (1,000 ha)



**Adjuvants*

Note: The values (%) expressed in the graphs may have been rounded.

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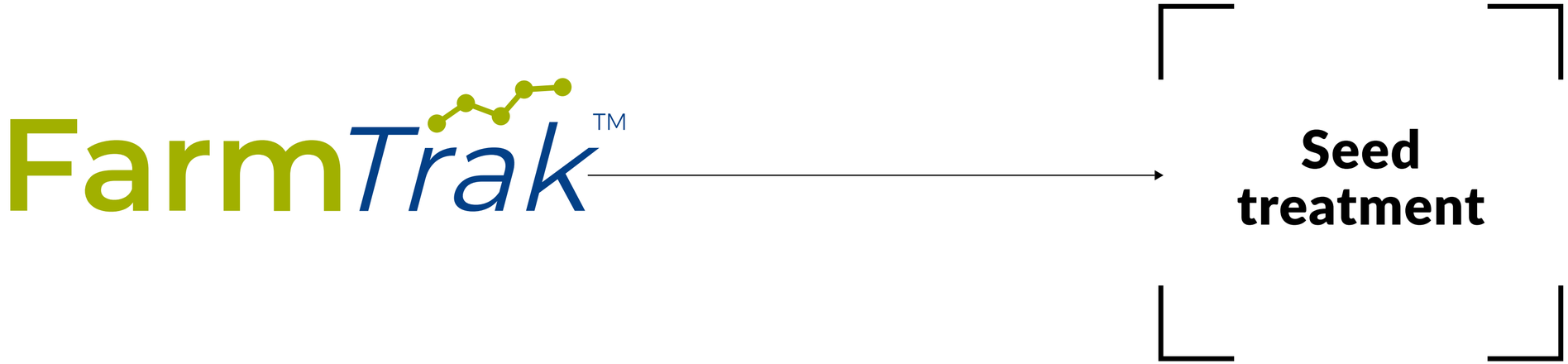

FarmTrak™
Seed treatment

Main indicators
Seed treatment*

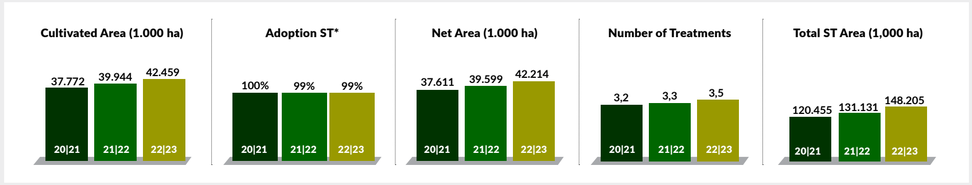
SOYBEAN:

2020 | 2021
2021 | 2022
2022 | 2023

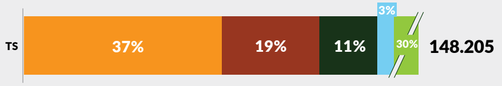
Bases by indicators.

**TS Inseticidas e TS Fungicidas e Inoculantes.*

***Wettable Powder, Other liquids for Direct Application*



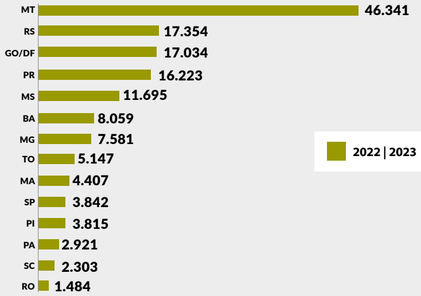
Main Formulations
Indications %. Base in ALT (1,000 ha)



FS - Concentrated Suspension for Seed Treatment
XX - Other Formulations
SC - Concentrated Suspension
CG - Baits
Others**

Note: The values (%) expressed in the graphs may have been rounded.

Total ST Area (1,000 ha) by state



RESEARCH: kynetec Incorporating Spark smarter decisions

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators
Seed treatment*

WINTER CORN:

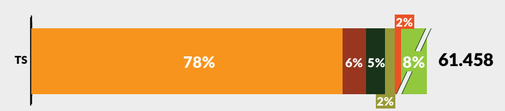
2021 | 2022 | 2023

Bases by indicators.

**ST Insecticides and ST Fungicides and Inoculants.*

***Wettable powder, Other Liquids for Direct Application*

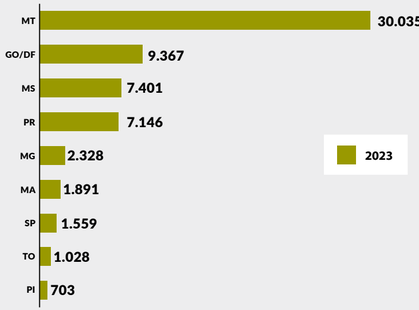
Main Formulations
Indications %. Base in ALT (1,000 ha)



FS - Concentrated Suspension for Seed Treatment
XX - Other Formulations
SC - Concentrated Suspension
WG - Dispersible Granules in Water
AL - Other liquids for Direct Application
Others**

Note: The values (%) expressed in the graphs may have been rounded.

Total ST Area (1,000 ha) by state



RESEARCH: kynetec Incorporating Spark smarter decisions

Main indicators Seed treatment*

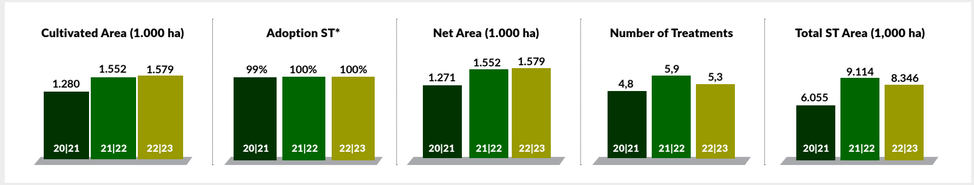
COTTON:

2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

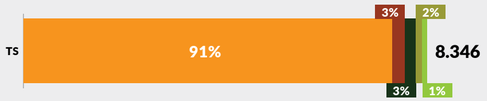
**ST Insecticides and ST Fungicides*

**Wettable Powder, Dispersible Powder for Seed Treatment*



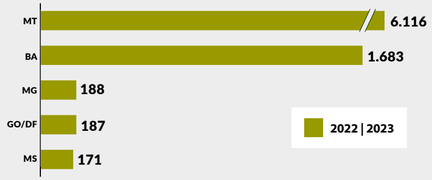
Main Formulations

Indications %. Base in ALT (1,000 ha)



FS - Concentrated Suspension for Seed Treatment
LS - Solution for Seed Treatment
SC - Concentrated Suspension
WG - Dispersible Granules in Water
XX - Other Formulations
Others**

Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

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PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Main indicators Seed treatment*

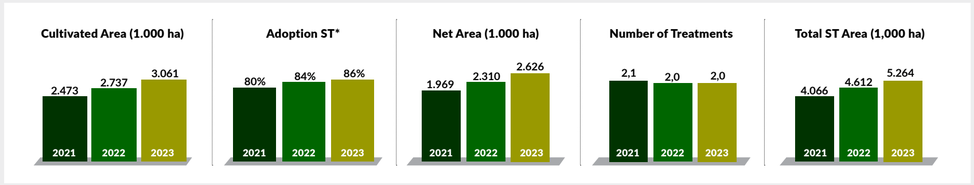
WHEAT:

2021
2022
2023

Bases by indicators.

**ST Insecticides and ST Fungicides*

***Dispersible Granules in Water, Other liquids for Direct Application*

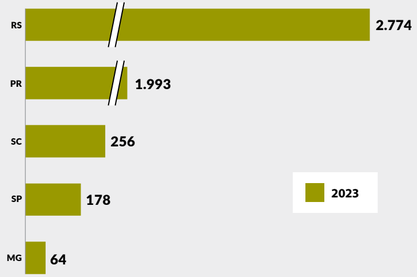


Main Formulations

Indications %. Base in ALT (1,000 ha)

FS - Concentrated Suspension for Seed Treatment
SC - Concentrated Suspension
XX - Other Formulations
WG - Dispersible Granules in Water
AL - Others* Líquidos p/ Aplicação
Others**

Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

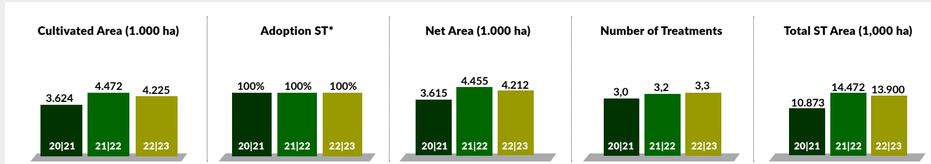
Main indicators
Seed treatment*

SUMMER CORN:
2020 | 2021
2021 | 2022
2022 | 2023

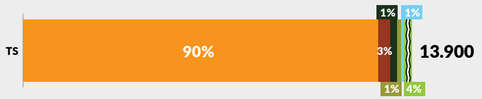
Bases by indicators.

**TS Inseticidas e TS Fungicidas e Inoculantes.*

**Wettable Powder, Dispersible Powder for Seed Treatment*

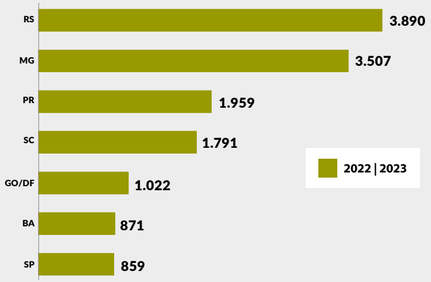


Main Formulations
Indications %. Base in ALT (1,000 ha)



FS - Concentrated Suspension for Seed Treatment
WG - Dispersible Granules in Water
XX - Other Formulations
AL - Other liquids for Direct Application
SC - Concentrated Suspension
Others**

Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

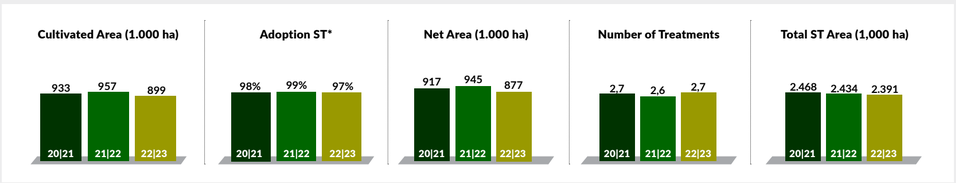
Main indicators
Seed treatment*

BEAN:
2020 | 2021
2021 | 2022
2022 | 2023

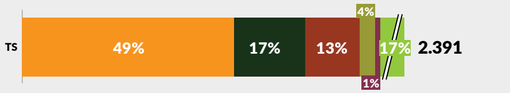
Bases by indicators.

**ST Insecticides and ST Fungicides and Inoculants.*

***Other liquids for Direct Application, Emulsifiable Concentrate*

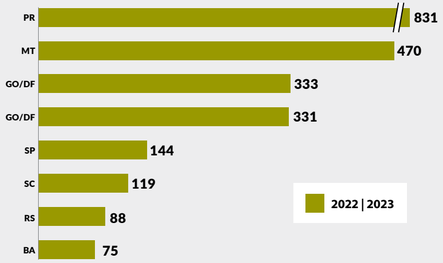


Main Formulations
Indications %. Base in ALT (1,000 ha)



FS - Concentrated Suspension for Seed Treatment
WG - Dispersible Granules in Water
SC - Concentrated Suspension
WP - Wettable Powder
XX - Other Formulations
Others**

Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

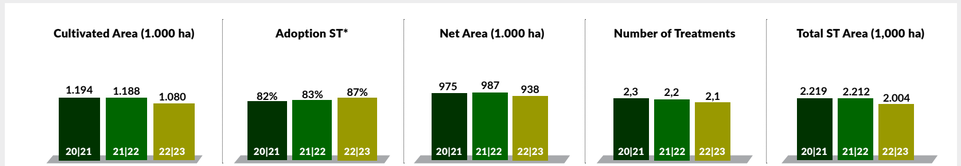
Main indicators
Seed treatment*

PADDY RICE

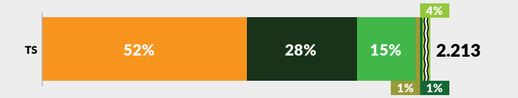
2020 | 2021
2021 | 2022
2022 | 2023

Bases by indicators.

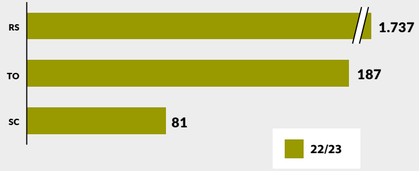
**ST Insecticides and ST Fungicides*
***Soluble Concentrate*



Main Formulations
Indications %. Base in ALT (1,000 ha)



Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

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PROHUMA
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Main indicators
Seed treatment*

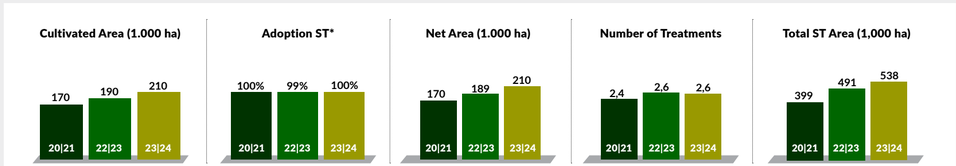
Peanuts:

2021 | 2022
2022 | 2023
2023 | 2024

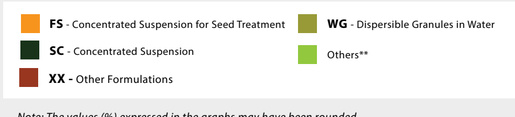
Bases by indicators.

**ST Insecticides and ST Fungicides and Inoculants.*

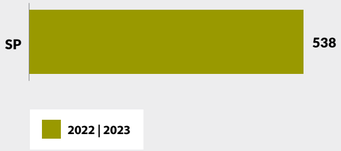
***Suspo-Emulsion*



Main Formulations
Indications %. Base in ALT (1,000 ha)



Total ST Area (1,000 ha) by state



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

05

Consolidation
Crop
Kynetec + Spark

Consolidated Data
TOTAL

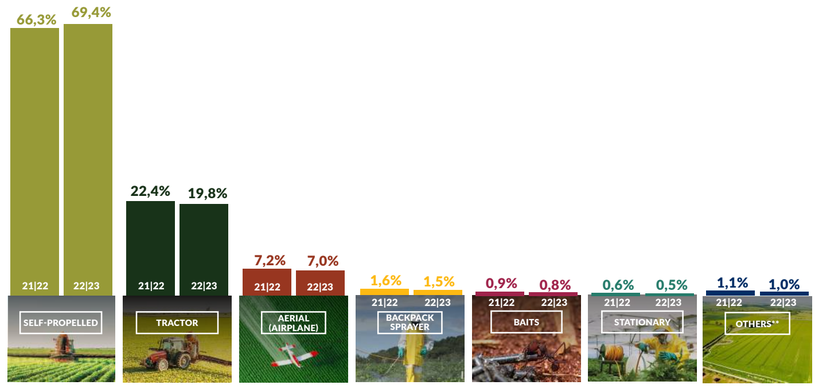
kynetec Incorporating Spark smarter decisions

Consolidated Total (22/23)

Grains, Special Crops, Fruits and HORTICULTURE

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
91.428.027 (21/22)	**532.801.766** (21/22)
94.796.668 (22/23)	**577.721.861** (22/23)

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

** Quadricycle; Drone; Irrigation*

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PROHUMA
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Application Modalities
GRAINS

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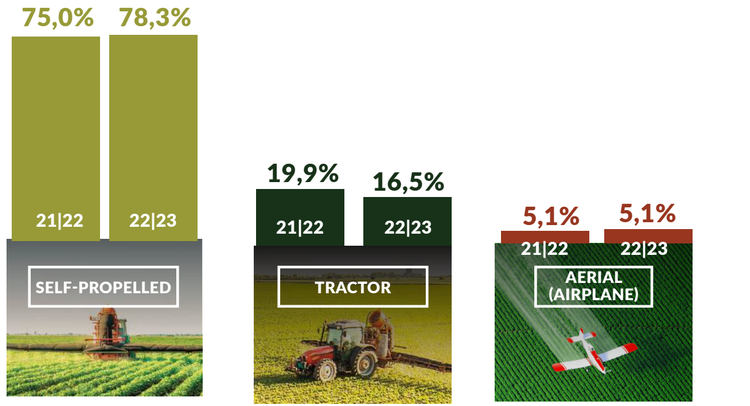
Consolidated Total (22/23)

Peanut, Paddy Rice, Oats, Barley, Beans, Sunflower, Summer Corn, Winter Corn, Soybean, Sorghum, Wheat, Triticale

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
66.949.108 (21/22)	**406.048.443** (21/22)
70.873.981 (22/23)	**451.133.929** (22/23)

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

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Application Modalities TROPICAL FRUITS

kynetec Incorporating Spark smarter decisions

Consolidated Total Tropical Fruits (22/23)

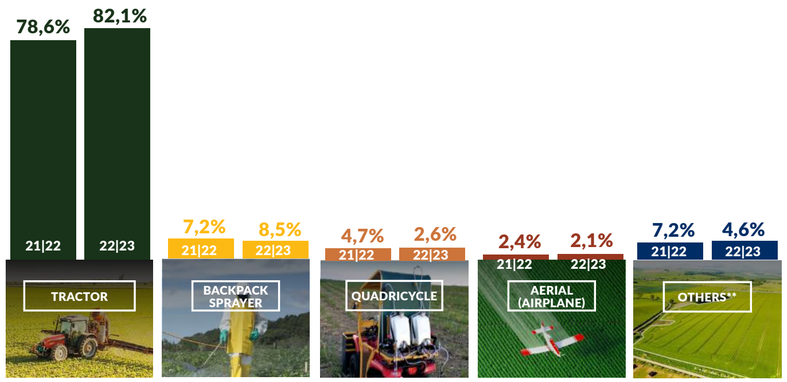
Avocado, Pineapple, Banana, Cashew,Coconut, Citrus*, Guava, Papaya, Mango,Passion Fruit, Watermelon, Melon

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
1.384.812 (21/22)	**11.068.296** (21/22
1.394.324 (21/22)	**11.314.183** (21/22)

*Citrus: tangerine, lemon and orange.

**Bait, Stationary, Irrigation.

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

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PROHUMA
INSTITUTO PROHUMA DE ESTUDOS CIENTÍFICOS

Application Modalities SEASONAL FRUITS

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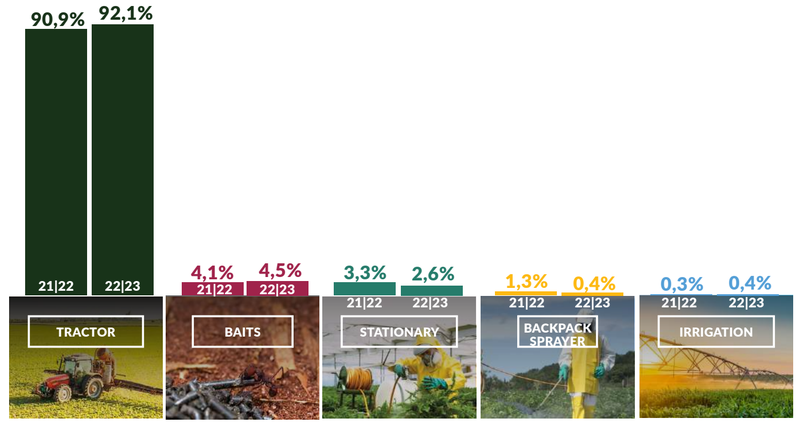
Consolidated SEASONAL FRUITS (22/23)

Persimmon, Fig, Apple, Pear, Peach/Plums/Nectarines, Grape

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
104.393 (21/22)	**3.179.616** (21/22)
104.499 (22/23)	**3.174.554** (22/23)

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

RESEARCH: kynetec Incorporating Spark smarter decisions

Application Modalities HORTICULTURE

kynetec Incorporating Spark smarter decisions

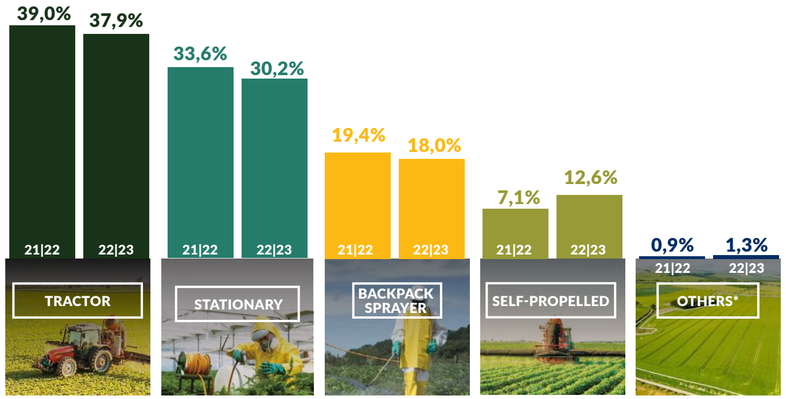
Consolidated HORTICULTURE (22/23)

Garlic, Potato, Onion, Carrot, Flowers/Ornamental Plants, Leafy Greens, Sweet Peppers/Scarlet Eggplant/Eggplant/Okra, Tomato

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
579.640 (21/22)	**9.411.117** (21/22)
492.236 (22/23)	**8.445.869** (22/23)

***Irrigation, Drip.**

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

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PROHUMA
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Application Modalities SPECIAL CROPS

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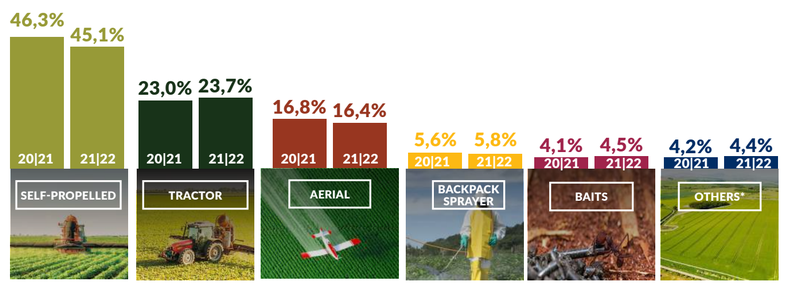
Consolidated Special Crops (22/23)

Cotton, Coffee, Cane, Forest, Mate Herb, Smoke, Cassava

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
22.410.074 (21/22)	**103.094.294** (21/22)
21.931.629 (22/23)	**103.653.326** (22/23)

***Quadricycle, Drone, Irrigation**

Base: Total Sprayed Area (ha) Indications in %.



Note: The values (%) expressed in the graphs may have been rounded.

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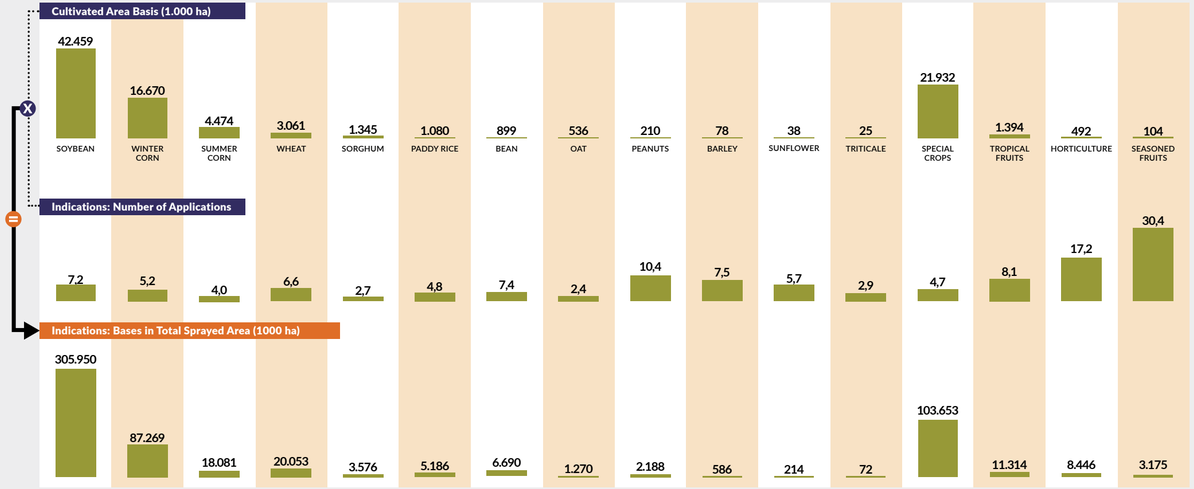
Net area, number of applications and total sprayed area per crop:

Consolidated Total
(Grains, Special Crops, Fruits and HORTICULTURE) - 22/23

The number of applications does not consider the Seed Treatment



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Application Modality TOTAL

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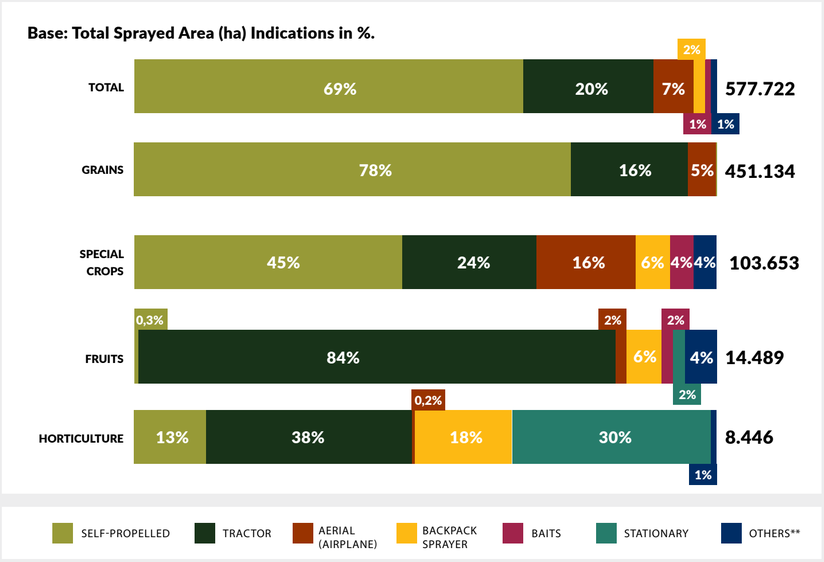
Consolidated Total

Grains, Special Crops, Fruits and Horticulture

Cultivated Area Brazil *(ha)*	Total Sprayed Area (ha)
94.796.668*	577.721.861

**Font: Kynetec*
*** Quadricycle, Drone, Irrigation*



Note: The values (%) expressed in the graphs may have been rounded.

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Total Area
SEED TREATMENT

Base: TOTAL Area ST (ha) Indications in %

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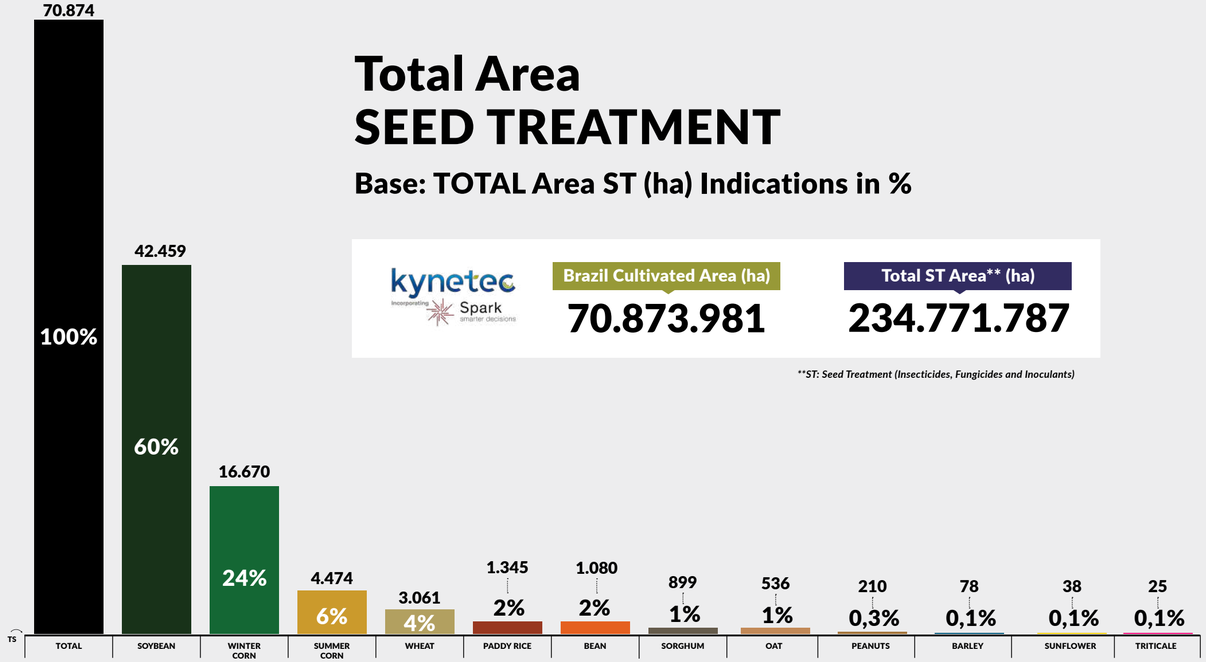
Brazil Cultivated Area (ha)	Total ST Area** (ha)
70.873.981	234.771.787

***ST: Seed Treatment (Insecticides, Fungicides and Inoculants)*



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Total Area
SEED TREATMENT

Base: TOTAL Area ST (ha) Indications in %

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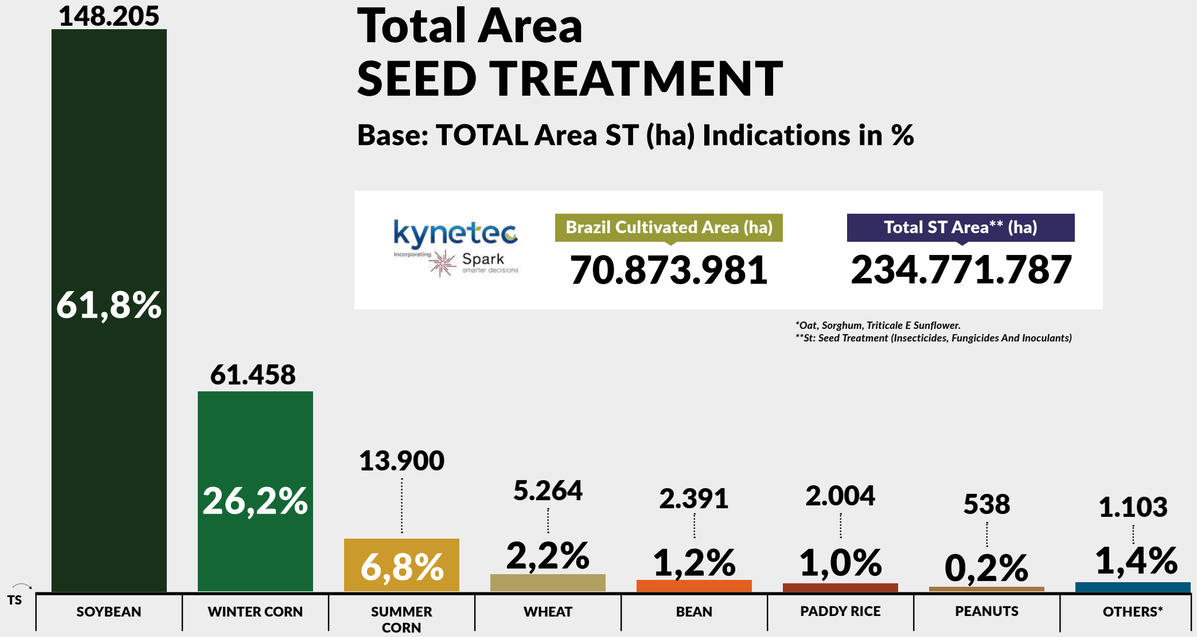
Brazil Cultivated Area (ha)	Total ST Area** (ha)
70.873.981	234.771.787

**Oat, Sorghum, Triticale E Sunflower.*
***St: Seed Treatment (Insecticides, Fungicides And Inoculants)*



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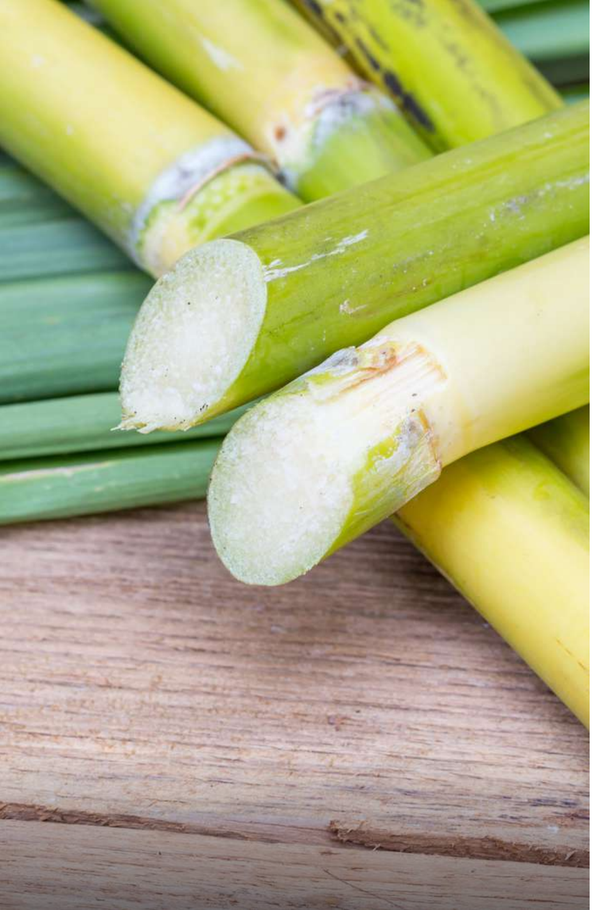
06 Conclusions

01

Brazil is among the world's leading grain producers. Despite the moderate intensity of applications, this group of crops is the most representative in relation to the total area sprayed with pesticides in the country (cultivated area x number of applications). This is due to the magnitude of the area planted with grains in Brazil, especially for soybean and corn (summer + corn).

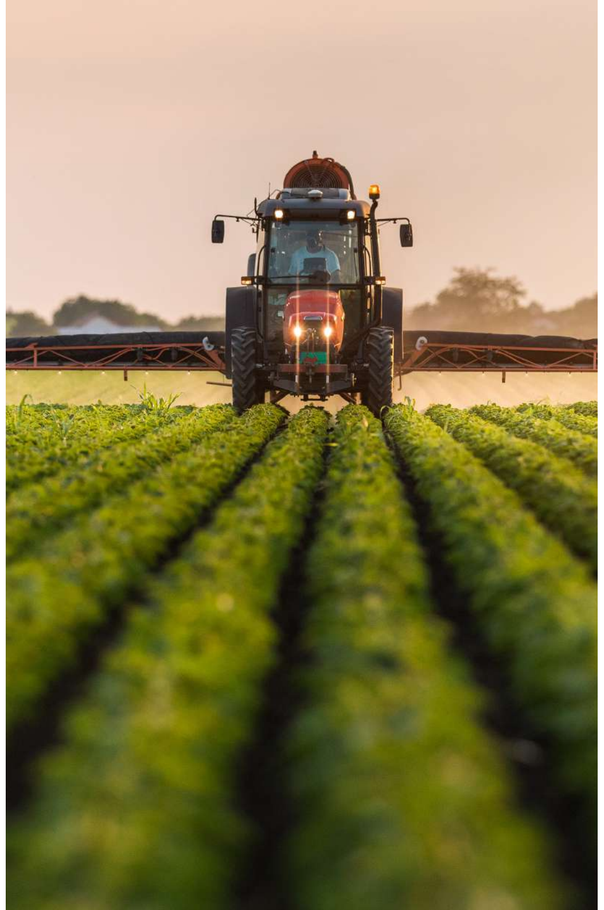
02

Despite the lower intensity of applications in relation to fruit and vegetable crops, due to the representativeness in area, the grain market accounts for **78%** of the total area sprayed in the country.



03

Special crops are also important in relation to the total area sprayed, corresponding to **18%.** Among these crops, cotton and sugarcane stand out.



04

In general, the self-propelled **application method** is the most employed in the country with **69.4%** of importance in relation to the total area applied. This is a very safe modality, as the applicator operates on protected equipment.

05

The second most used method is **tractor,** totaling **19.8%** of the sprayed area. Other applications are made by **air 7.0%** and **3.8%** with other modalities. Within this last group, the main method is **backpack sprayer application (1.5%).**

06

Seed treatment is a common practice in Brazil, especially for grains and cotton. The crops where this treatment method is used exceed **70 million hectares.**

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