



LEVANTAMENTO DO NÍVEL DE MECANIZAÇÃO NA **SILVICULTURA**

SILVICULTURE MECHANIZATION INDEX SURVEY

EDIÇÃO
EDITION
**2020
2021**

iPEF

 **FCA**
FACULDADE DE CIÊNCIAS AGRONÔMICAS
UNESP | BOTUCATU



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All data were collected directly from employed/collaborators of companies affiliated to PCMAF and PPPIB/IPEF or associated with IPEF.

All data compiled reflect the reality of participating companies only.

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ABOUT THE PROJECT

- ◆ Conducted by the **Cooperative Program of Forestry Mechanization and Automation (PCMAF)**, belonging to IPEF.
- ◆ Compared to the last edition, there was an **increase of 153%** in the representativeness of the survey in relation to the eucalypt planted area.
- ◆ For the first time, the publication is available in **Portuguese and English**.
- ◆ **New chapter** dedicated to the mechanization of commercial Pinus plantation, in partnership with the **Cooperative Program on Pinus Research in Brazil (PPPIB)**.
- ◆ The survey of information and publication will take place every two years, allowing the monitorins of the level of mechanization of forest companies.

DATA FLOW



FIVE MAIN ITEMS

1 **Identification** (forest companies)

2 **Human resources** (forest companies and service providers)

3 **Mechanized resources** (forest companies and service providers)

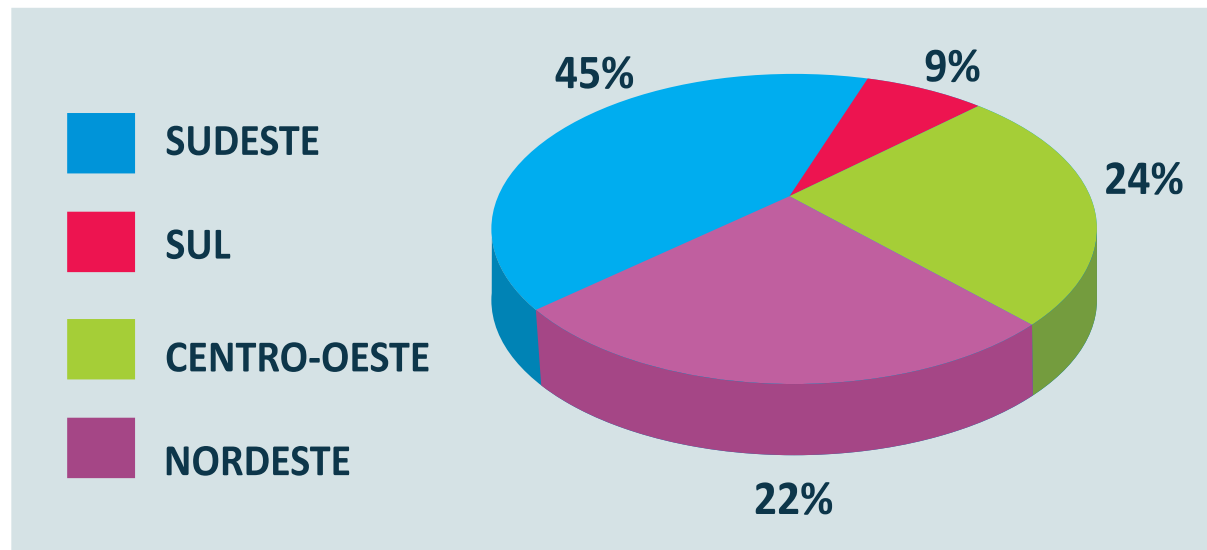
4 **Implements** (forest companies and service providers)

5 **Mechanization level** (forest companies and service providers)

1

GENERAL RESULTS

UNIDADES FLORESTAIS DE *EUCALYPTUS*



- ◆ The area of effective forest planting represents 42.5% and 8.0% of the total planted area of *Eucalyptus* and *Pinus*, respectively (Ibá, 2020)
- ◆ Most of the forestry units are located in the southeast region, and the *Pinus* plantation are 100% in the south region.

2

HUMAN RESOURCES

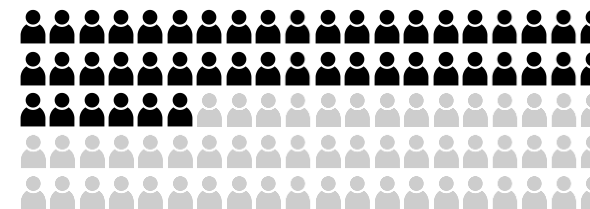
Silviculture accounts

14,933
employees

Coordinators, supervisors, leaders,
operators, assistants, etc.

Of this total,

46%



with formal direct links to the forest companies.

Percentage of machine operators among total silviculture staff, by company

| A | B | C | D | E | F | G | H | I | J | |
|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|------------------|
| 33,6% | 39,7% | 18,8% | 22,7% | 13,8% | 19,4% | 4,9% | 35,3% | 14,1% | 31,3% | |
| K | L | M | N | O | P | Q | R | S | T | Média Average |
| 15,8% | 58,8% | 17,0% | 81,3% | 46,5% | 21,3% | 5,4% | 8,8% | 25,8% | 14,3% | 26,4% |

3

MECHANIZED RESOURCES

Tractor fleet

Only 2,449 tractors
33% belong to the forest companies

Only **3** forest companies have their own fleet

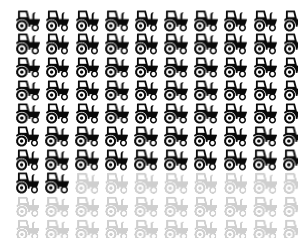
The remaining 17 companies utilize

50 S.P.

Market share of tractor manufactures

Spanning a total of
32 manufactures & **189** models

72% of the entire fleet belong to only 3 manufactures



3

MECHANIZED RESOURCES

| Ranking | Manufacturer | Total share (%) | Ranking | Manufacturer | Total share (%) |
|---------|-----------------|-----------------|---------|--|-----------------|
| 1º | John Deere | 28,80 | 13º | Valmet Tigercat | 0,20 |
| 2º | Valtra | 22,78 | 14º | Hyundai Lonking | 0,16 |
| 3º | New Holland | 20,55 | 15º | Shantui Iveco Ford | 0,12 |
| 4º | Massey Ferguson | 10,56 | 16º | Bobcat Doosan JCB Timberjack | 0,08 |
| 5º | Komatsu | 5,46 | 17º | Antonio Carraro Energreen Michigan | 0,04 |
| 6º | LS | 2,99 | | | |
| 7º | Caterpillar | 1,94 | | | |
| 8º | Case | 1,78 | | | |
| 9º | Fiat Allis | 1,46 | | | |
| 10º | Agrale | 0,44 | | | |
| 11º | SDLG | 0,36 | | | |
| 12º | Volvo | 0,32 | | | |

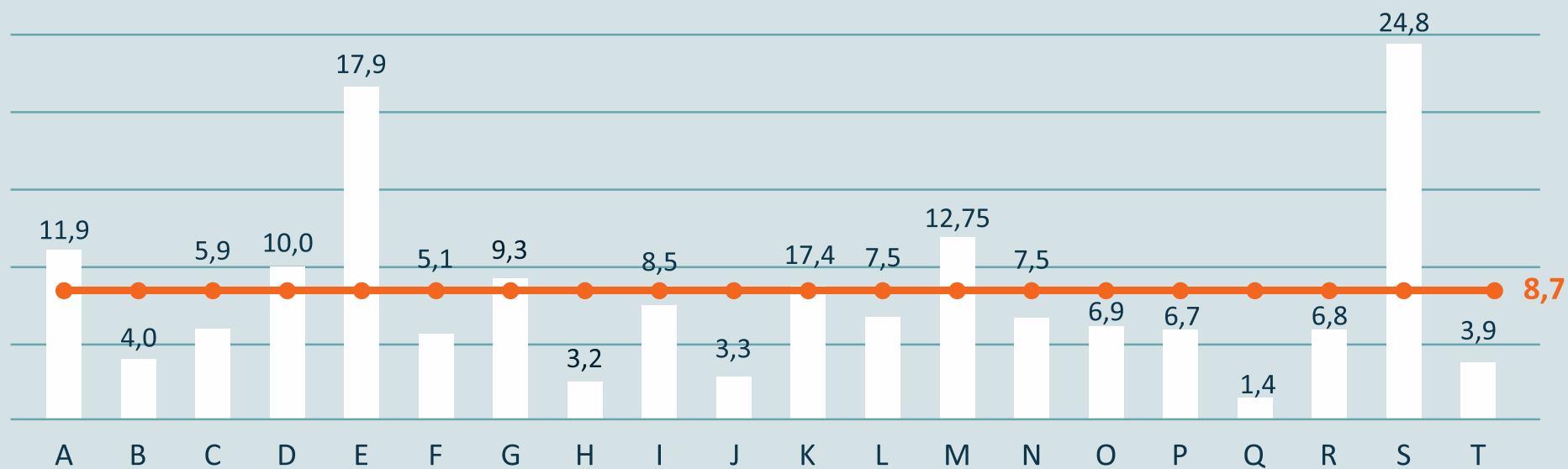
3

MECHANIZED RESOURCES

Rate of tractor use

Quantidade de Implementos/10.000 ha

Tractors/10,000 ha



Índice Rate

Média Average

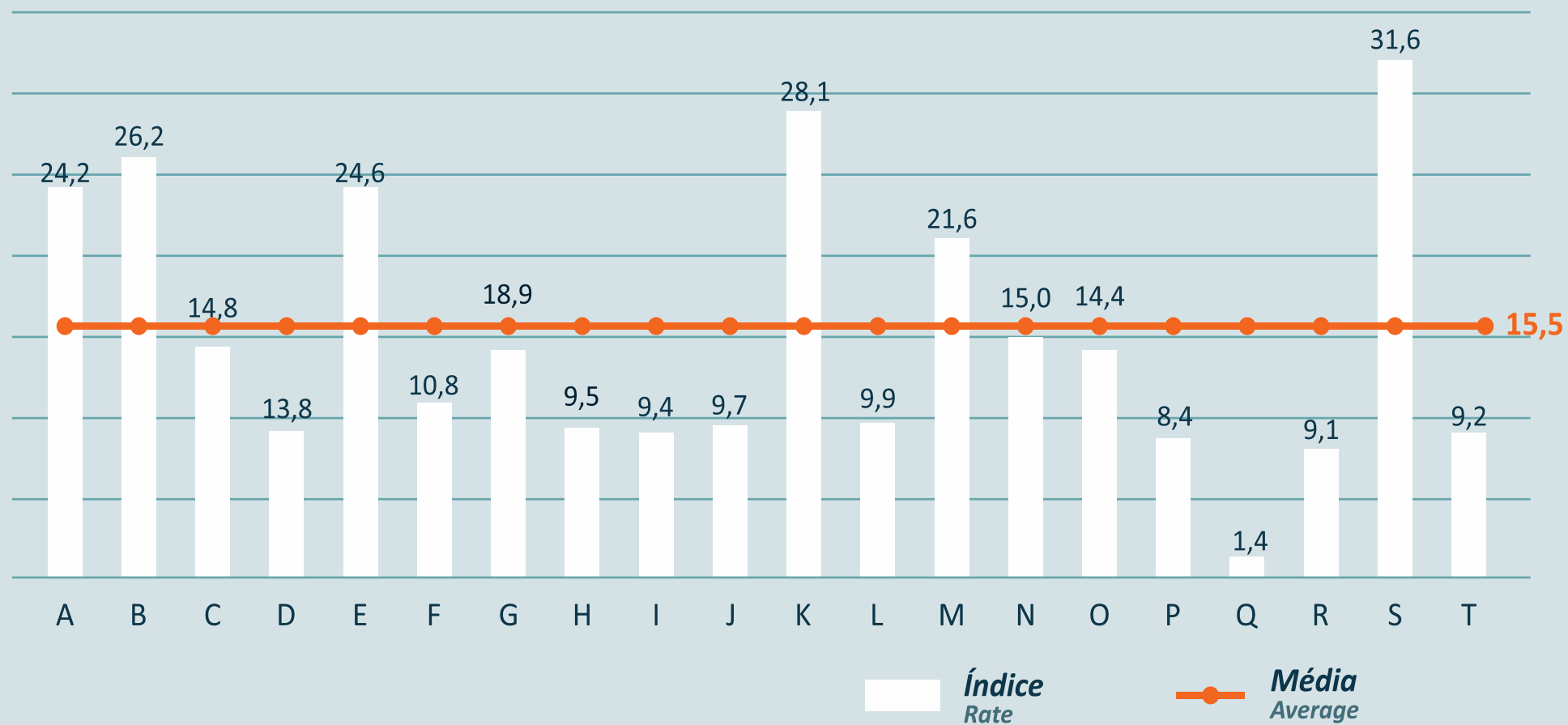
4

IMPLEMENTS

Implement rate

Quantidade de Implementos/10.000 ha

Implementos/10,000 ha





4 IMPLEMENTS

The forest companies have:

4.367 of **137**
implements manufactures

Of the 20
participating
forest
companies

9

utilize implements
that exclusively
belong to S.P.

7

Utilize their own
implements

5

ABOUT THE MECHANIZATION LEVEL



- ◆ The level of mechanization (overall and for the main operations) are presented separately for *Eucalyptus* e *Pinus*;
- ◆ The percentages for the quantities of areas worked area calculated using the mechanical implements/assemblies and then classified according to the following definitions:

MANUAL OPERATION

Any activity using tools that are exclusively human-powered.

LEVEL 1

Tools without mechanical actuation.
Ex.: hoe, ax.



LEVEL 2

Tools with mechanical actuation.
Ex.: seedling transplanter and ant bait applicator.



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ABOUT THE MECHANIZATION LEVEL

SEMI-MECHANIZED

Any activity using tools, mechanical assemblies, or implements that are human and mechanically powered.



LEVEL 3

Tools driven by a motor.
Ex.: chainsaw and tiller.

LEVEL 4

Mechanical assemblies and implements that require an operator and at least one other external person.
Ex.: continuous planter and conventional irrigator.



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ABOUT THE MECHANIZATION LEVEL



MECHANIZED OPERATION

Any activity using mechanical assemblies or implements that are exclusively mechanically powered.

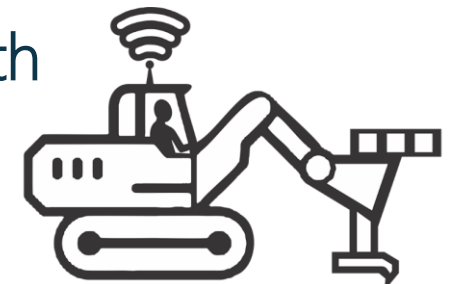
LEVEL 5

Mechanical assemblies and implements that require only an operator, **without** the use of an auto-pilot function.
Ex.: tractor-drawn subsoiler.



LEVEL 6

Mechanical assemblies and implements that require only an operator, **with** the use of an auto-pilot function.
Ex.: specialized subsoiler drawn by a track-drive tractor with geotechnology systems.



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ABOUT THE MECHANIZATION LEVEL

AUTOMATIC OPERATION

Any activity using tools controlled by various artificial systems, with a high degree of technology and low levels of human intervention.

LEVEL 7

Automated

Mechanical assemblies which are remotely controlled by an operator in the field.
Ex.: Unmanned aerial vehicle (drone).



LEVEL 8

Autonomous

Mechanical assemblies which do not require an operator in the field.
Ex.: autonomous tractor and autonomous planter.



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MECHANIZATION LEVEL IN SILVICULTURE

Involving *Eucalyptus*

% area worked for each level

| | Average | MANUAL | | SEMIMECANIZADA | | MECANIZADA | | AUTOMÁTICA | |
|--|-------------|---------|---------|----------------|---------|------------|---------|------------|---------|
| | | Nível 1 | Nível 2 | Nível 3 | Nível 4 | Nível 5 | Nível 6 | Nível 7 | Nível 8 |
| SOIL PREPARATION | 2020 | 1,31 | 0,00 | 0,01 | 0,04 | 85,12 | 13,48 | 0,03 | 0,00 |
| | 2018 | 9,40 | 0,00 | 2,20 | 8,70 | 74,90 | 4,80 | 0,00 | 0,00 |
| PLANTING | 2020 | 14,28 | 56,88 | 0,49 | 18,80 | 9,55 | 0,00 | 0,00 | 0,00 |
| | 2018 | 0,00 | 65,00 | 1,30 | 33,30 | 0,30 | 0,10 | 0,00 | 0,00 |
| IRRIGATION | 2020 | 0,84 | 11,37 | 6,68 | 73,40 | 7,04 | 0,67 | 0,00 | 0,00 |
| | 2018 | 8,80 | 16,80 | 3,50 | 59,90 | 11,00 | 0,00 | 0,00 | 0,00 |
| General mechanization level (<i>Eucalyptus</i>) | 2020 | 12,09 | 33,00 | 2,16 | 4,18 | 42,08 | 6,25 | 0,14 | 0,00 |
| | 2018 | 9,70 | 30,90 | 2,70 | 4,50 | 51,10 | 1,10 | 0,00 | 0,00 |

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MECHANIZATION LEVEL IN SILVICULTURE

Involving *Pinus*

% area worked for each level

| | MANUAL | | SEMIMECANIZADA | | MECANIZADA | | AUTOMÁTICA | |
|---|---------|---------|----------------|---------|------------|---------|------------|---------|
| | Nível 1 | Nível 2 | Nível 3 | Nível 4 | Nível 5 | Nível 6 | Nível 7 | Nível 8 |
| Average | | | | | | | | |
| SOIL PREPARATION | | | | | | | | |
| 2020 | 0,00 | 0,00 | 0,01 | 0,04 | 85,00 | 15,00 | 0,03 | 0,00 |
| PLANTING | | | | | | | | |
| 2020 | 46,09 | 53,92 | 0,00 | 0,00 | 0,00 | 0,00 | 0,03 | 0,00 |
| WEED CONTROL | | | | | | | | |
| 2020 | 25,00 | 26,24 | 35,80 | 0,00 | 8,83 | 3,46 | 0,03 | 0,67 |
| General mechanization level (<i>Pinus</i>) | | | | | | | | |
| 2020 | 26,77 | 42,91 | 10,87 | 0,00 | 16,18 | 3,03 | 0,00 | 0,24 |

The *Eucalyptus*
forest companies



The *Pinus*
forest companies



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