

An overview of the Research on Agribusiness in Sao Paulo



Silvio Crestana
Instrumentation



Workshop FAPESP - CONICYT
Sao Paulo, SP, December 07th, 2016

Overview of the agribusiness and research in SP State

http://agencia.fapesp.br/agronegocio_paulista_apresenta_padrao_de_crescimento_balanceado/24424/

<http://www.bv.fapesp.br/pt/assunto/2443/tecnologia-agricola/>

http://agencia.fapesp.br/investimentos_em_capital_humano_e_em_pesquisa_aumentam_a_produtividade_da_agricultura/23878/

PIB R\$195,7 bi em 2008, R\$213,1 bi em 2013, crescimento 8,86%

Apta balanço social 2014-2015 http://www.apta.sp.gov.br/revista_apta/APTA_BalancoSocial_2016.pdf

Indicadores Fapesp

<http://www.fapesp.br/indicadores/> e <http://www.fapesp.br/indicadores/2010/volume1/cap3-Parte-A.pdf>

e

Sistema Paulista de Ciência, Tecnologia e Inovação Agrícola - SPInA

<http://www.fapesp.br/indicadores/2010/volume2/cap10.pdf>

Informações Setoriais

<http://www.saopauloglobal.sp.gov.br/frameSetores.aspx?gp=21&IdIdioma=1&IdTrad=40>

Estimates are search results ["FAPESP's contribution to the development of agriculture in the State of São Paulo"](#) supported by the Foundation.    

"Public investments in research, education and extension in agriculture must be included in the priorities of the State of São Paulo because of its high return to the economy and contribution to the GDP of São Paulo", said Paulo Fernando Cidade de Araújo, a professor at the School Superior de Agricultura "Luiz de Queiroz" of the University of São Paulo (ESALQ-USP) and coordinator of the study, the **Agency FAPESP**.

"The agribusiness GDP of the State of São Paulo - which includes agriculture, production of inputs, agribusiness and services - was R \$ 213 billion in 2013, an amount that corresponds to 15% of the state's gross domestic product. About 17% of the jobs with a formal contract that year, "Araújo said.

The researcher, in collaboration with colleagues from the Faculty of Economics, Administration and Accounting (FEA) of USP in Ribeirão Preto, from the Institute of Agricultural Economics (IEA) of the Secretariat of Agriculture and Supply of the State of São Paulo, Esalq, Federal University Of the State of Paraná (Unioeste) and of Brasília (UnB), in addition to the Institute of Applied Economic Research (Ipea) and the consulting companies MB Associados and MB Agro, carried out, in the last three years, An extensive study on the evolution of the agricultural sector in the State of São Paulo between 1970 and 2014.

Some of the issues analyzed were the contribution of agriculture to economic development in São Paulo, the economic transformations that accompanied the growth of the sector in the State in recent years and the technical efficiency in the production of sugarcane.

because of a combination of factors, such as public investments in research, higher education and rural extension," said Araújo.



Contribution

In order to estimate the specific participation of public investments in research, higher education and rural extension in the productivity gains obtained by the agriculture of São Paulo from 1981 to 2013, the researchers first made a survey of the expenditures made for these purposes by the related institutions in that period.

The survey indicated that, between 1981 and 2013, the average annual investments in agricultural research carried out by institutions such as FAPESP, the Agribusiness Technology Agency (Apta) and the Brazilian Agricultural Research Corporation (Embrapa) totaled R \$ 417.81 million.

Specifically, public investments in higher education - aimed at training professionals and researchers in the area - carried out in the same period by universities such as USP, State of Campinas (Unicamp) and State of São Paulo (Unesp) were, on average, R \$ 415.36 million per year.

And the investments in rural extension of institutions such as the Coordination of Integral Technical Assistance (Cati) were approximately R \$ 302.1 million per year.

Based on these values, the researchers elaborated statistical models to estimate the effects of a percentage increase in investments in human capital on the total productivity of agriculture in São Paulo and the economic return of each additional R \$ 1 invested for this purpose in the sector.

Zimbra: Entrada (383) x Investments in human ca x

← → ↻ ⓘ agencia.fapesp.br/investimentos_em_capital_humano_e_em_pesquisa_aumentam_a_produtividade_da_agricultura/23878/

Agência **FAPESP** NEWS APPOINTMENT BOOK VIDEOS SIGN IT

Public higher education institutions in the State of São Paulo - such as USP, Unicamp, Unesp and the Federal University of São Carlos (UFSCar) - have trained good professionals and invested consistently in research and development in São Paulo agriculture.

In addition, private higher education institutions are growing rapidly, forming human resources in Agrarian Sciences and related areas, the researchers point out.

"Today there are 51 undergraduate courses in Agricultural Sciences offered by private higher education institutions in the State of São Paulo, which have already trained 1,646 professionals in Veterinary Medicine and Agronomy in recent years, but have invested little in research," said Araújo. "Some, however, began to do research with support from development agencies such as FAPESP," he said.

Between 1981 and 2013, the Foundation invested R \$ 3.4 billion in research in the area of Agrarian Sciences and related fields.

Among the most researched themes in the projects supported by FAPESP in this period are cattle (milk and sugarcane) and sugarcane, which had, respectively, 12.8% and 4.9% of the total resources allocated to research in Agrarian Sciences And related areas by the institution between 1981 and 2013.

"The investments in agricultural research made by FAPESP are extremely important for the sector," he said.

COME

Investments in hu...html ^ Show all x

Search the web and Windows

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Science Map of Sao Paulo - ACIESP



Science Map of Sao Paulo – ACIESP

5062 researchers in Agrarian Sciences

Ciências Agrárias

Ciências Biológicas



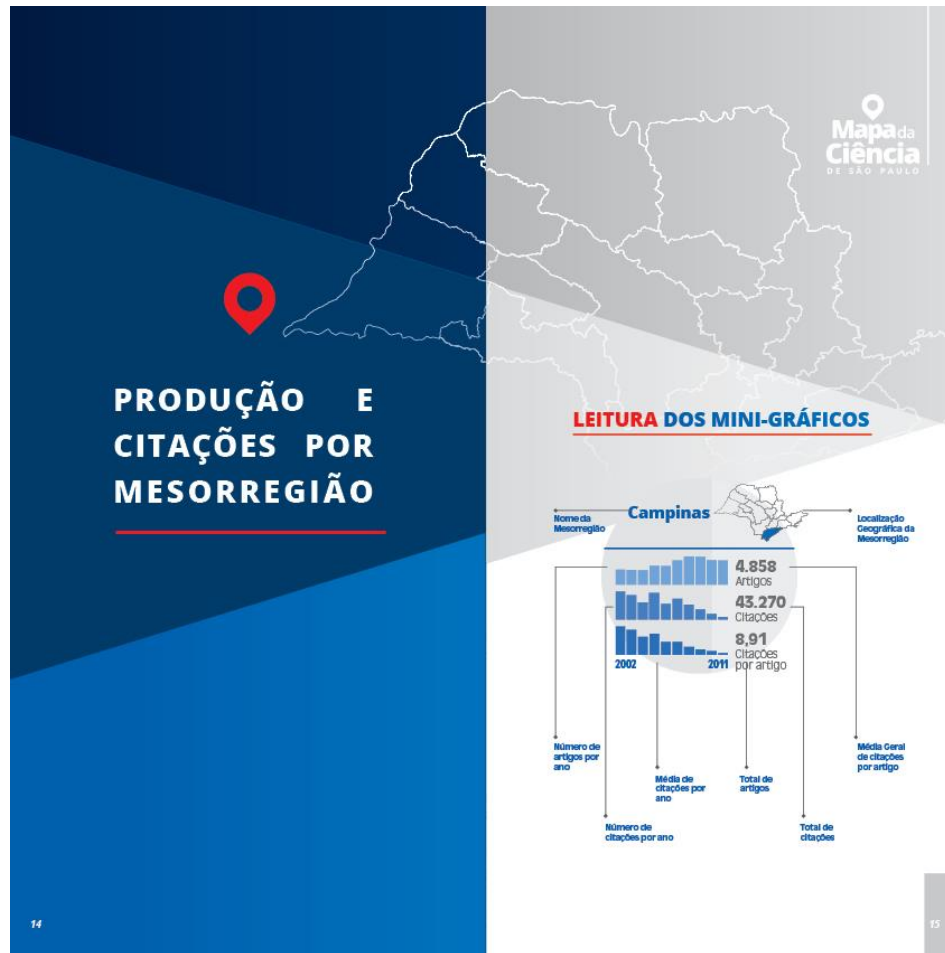
Quantidade de Pesquisadores com Índice h3 (2009 a 2011) ou h10 (2002 a 2011)

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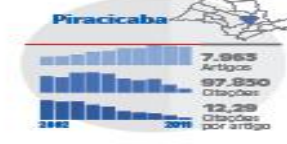
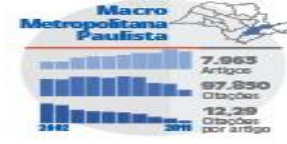
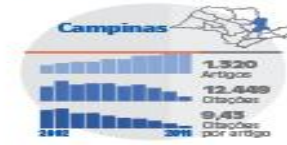
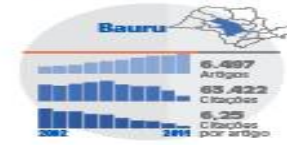
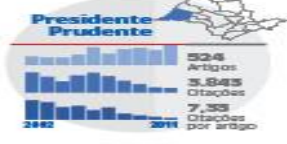
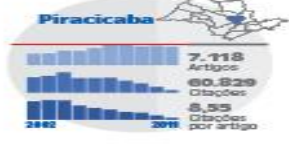
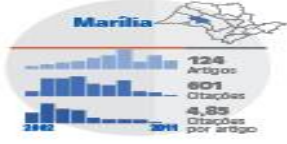
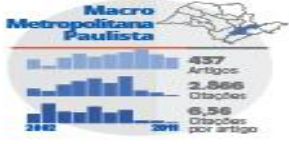
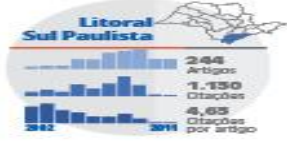
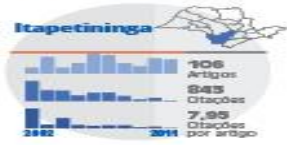
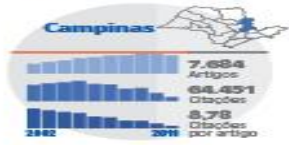
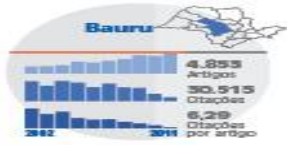
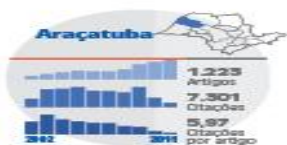
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Science Map of Sao Paulo - ACIESP



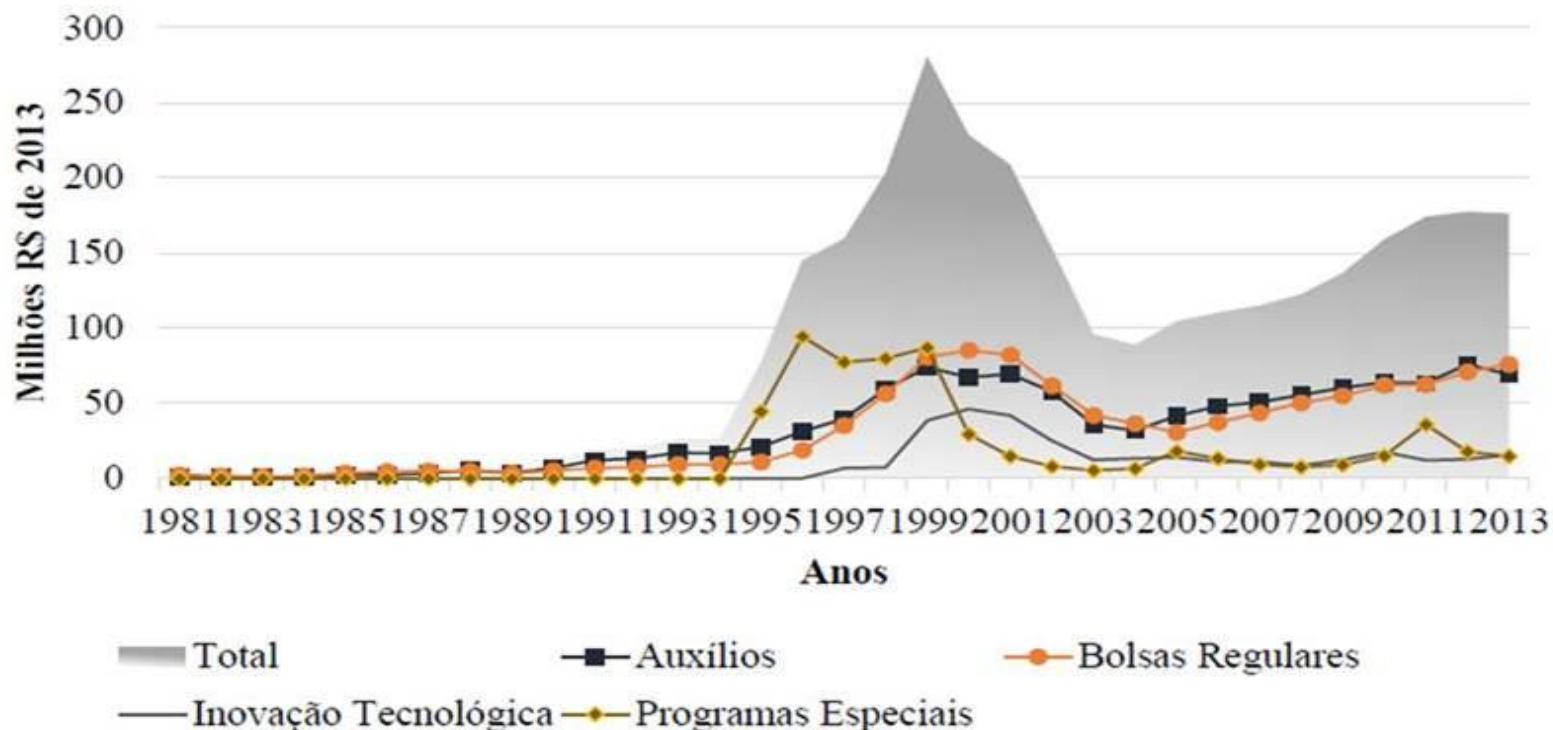
Science Map of Sao Paulo - ACIESP



Investment of FAPESP related to agriculture 1981 - 2013

O Gráfico 8 apresenta os Valores Desembolsados pela FAPESP desde 1981 para os projetos relacionados à agricultura.

Gráfico 8 – Valores Desembolsados pela FAPESP na área de agricultura, por tipo de financiamento, entre 1981 e 2013, em R\$ de 2013.



Fonte: Elaboração própria. Microdados da FAPESP.



Investments in research, expansion of mechanization and focus on producing commodities supported the growth increase of SP in agricultural production



Every R\$1 invested with public funds in research, higher education and extension in agriculture results in a return of R\$10 to R\$12 for the Sao Paulo State economy!

Embrapa Instrumentation

São Carlos – São Paulo State- Brazil



Embrapa Instrumentation's National Leadership

Embrapa Instrumentation is in charge and leads 3 national research labs and networks:

- 1) Precision Farming
- 2) Nanotechnology applied to agribusiness and
- 3) Automation and Computation applied to sustainable agriculture

Smart Agriculture

The concept considers the use of electronics, sensors, machines and informatics to take more precise, efficient and sustainable decisions for the management of agricultural production systems.

Advanced Technologies Are Making Smart Agriculture Real!

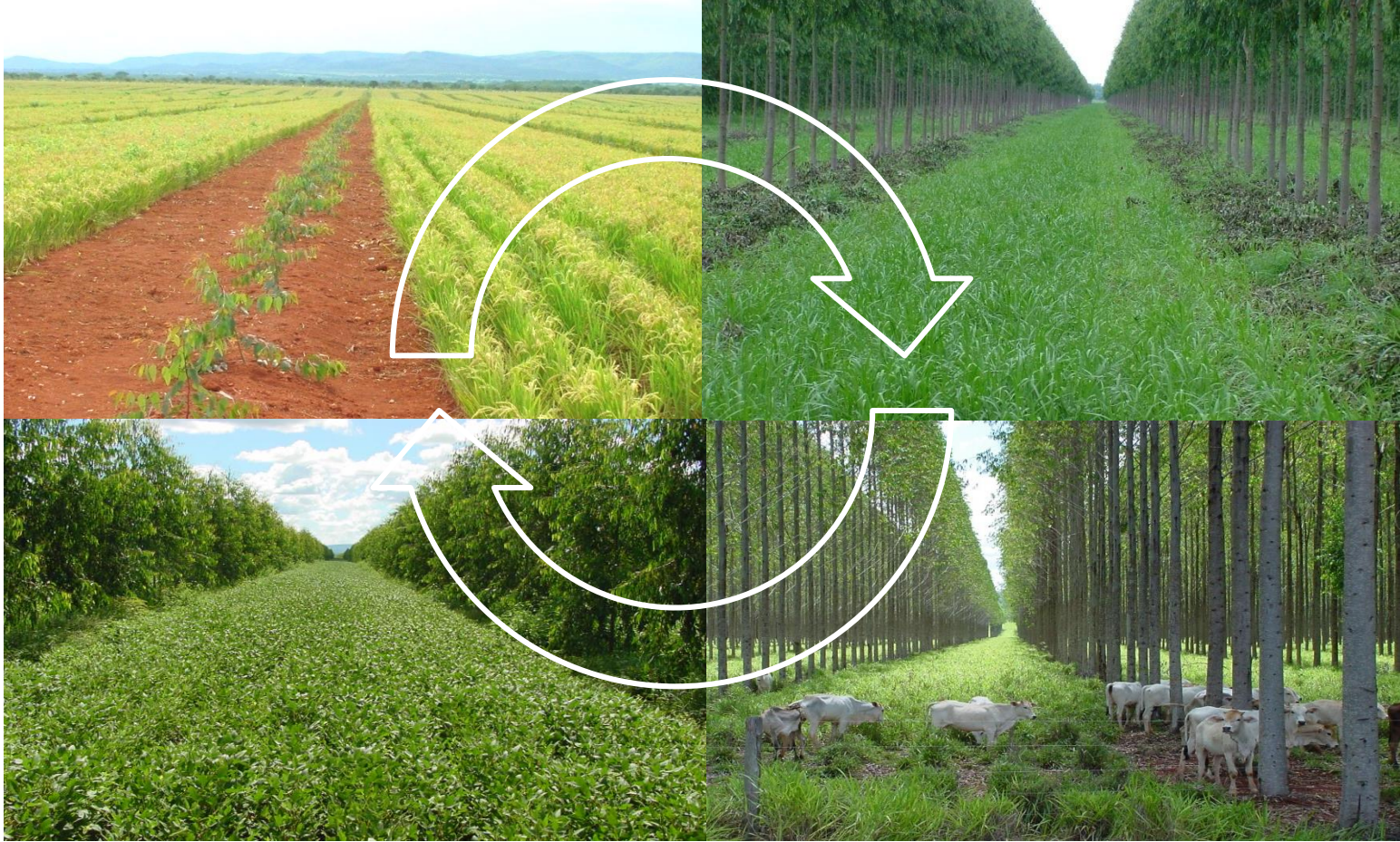
- Internet of Things(IoT)/Sensors
- Big Data Analytics(ICT)-Agrimetrics
- Cloud Computing-Agrimetrics
- Artificial Intelligence
- Robotics and 3D Printing
- Autonomous Vehicles(tractors, robots and drones)
- Automation and Precision Agriculture
- Bio-Nanotechnology and Phenotyping

AGRIMETRICS AND SMART AGRICULTURE

ICTs in agriculture



Integrated Crop-Livestock-Forest-Systems



Farm of the Future

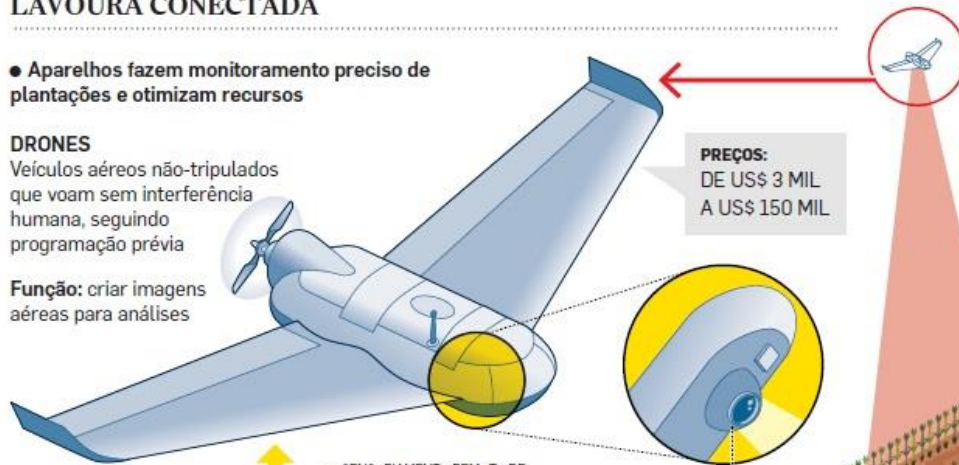
LAVOURA CONECTADA

● Aparelhos fazem monitoramento preciso de plantações e otimizam recursos

DRONES

Veículos aéreos não-tripulados que voam sem interferência humana, seguindo programação prévia

Função: criar imagens aéreas para análises



Usos na agricultura:

- Mapeamento de solo / zonas de erosão
- Monitoramento de rebanhos
- Monitoramento de florescimento e falhas no plantio
- Identificação de variedades plantadas
- Monitoramento do estado nutricional da planta, bem como detecção de estresse hídrico e de pragas (câmera com infravermelho)

O SENSORIAMENTO REMOTO DE ALTO NÍVEL TÉCNICO REQUER IMAGENS CAPTADAS COM CÂMERAS DIGITAIS MAIS SOFISTICADAS, COMO AS DE INFRAVERMELHO, QUE REGISTRAM O INTERIOR DA PLANTA

ALÉM DISSO, É NECESSÁRIO O USO DE UM SOFTWARE PARA JUNTAR E PROCESSAR AS IMAGENS GEORREFERENCIADAS DO DRONE



CONTROLE
TANTO OS DRONES COMO O JIPE-ROBÔ PODEM SER CONTROLADOS A DISTÂNCIA OU OPERAR AUTOMATICAMENTE, SEGUNDO UMA PROGRAMAÇÃO PRÉ-DEFINIDA

JIPE-ROBÔ

Similar ao robô Curiosity, utilizado em Marte pela Nasa

Função: faz análise de solo ou de cultura, determinando todos os elementos químicos que compõem a amostra

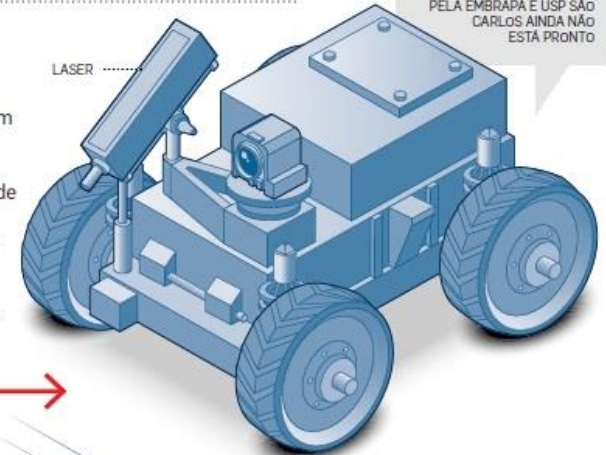


IMAGEM ILUSTRATIVA. O PROTÓTIPO DESENVOLVIDO PELA EMBRAPA E USP SÃO CARLOS AINDA NÃO ESTÁ PRONTO

COMO FUNCIONA:

O LASER INCIDE NA AMOSTRA E VAPOORIZA PARTE DELA, FORMANDO UM PLASMA

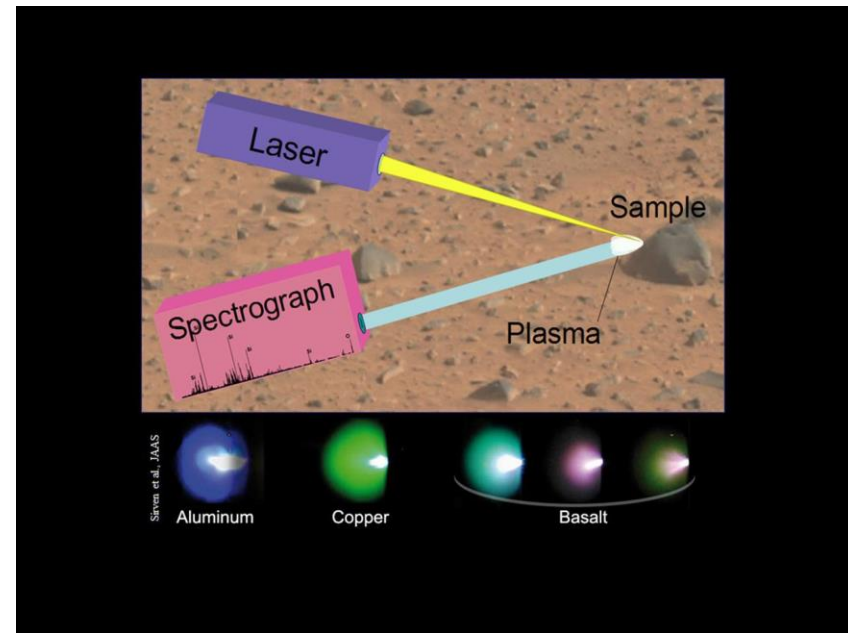
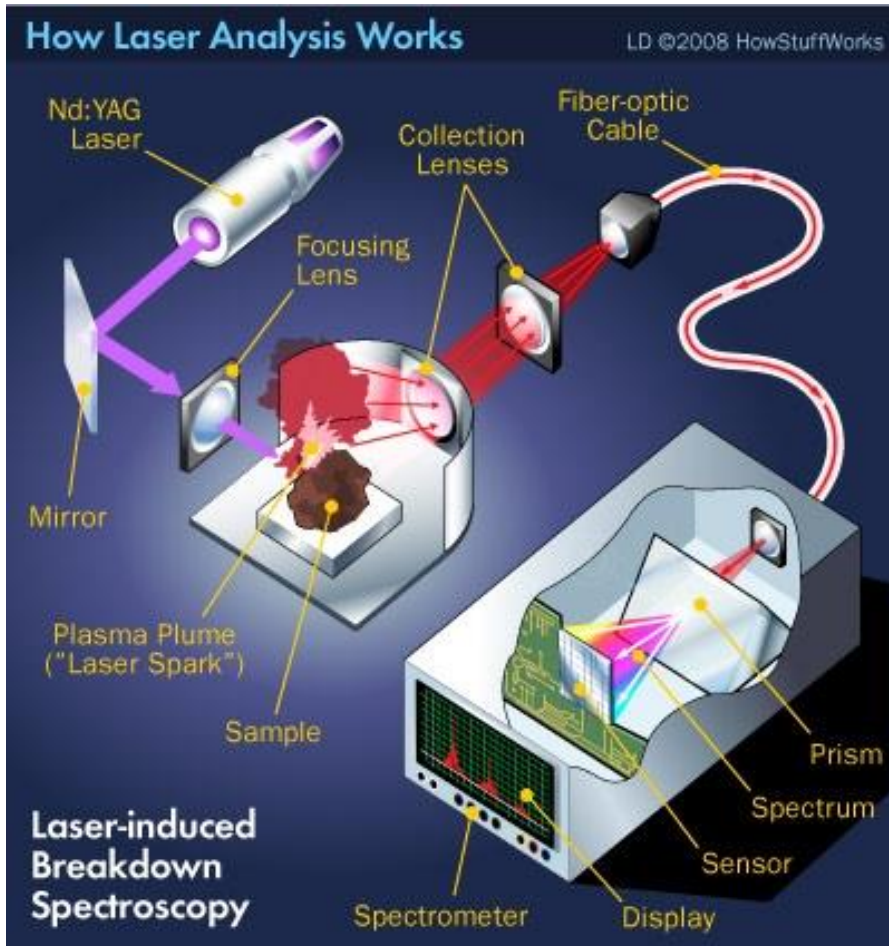
O PLASMA RESFRIA E EMITE LUZ EM DIVERSAS FREQUÊNCIAS

SOLO

PLANTAÇÃO

Com a análise da luz emitida, o aparelho identifica com precisão quais elementos químicos compõem a amostra, o que permite aos agricultores fazer correções ainda na mesma safra

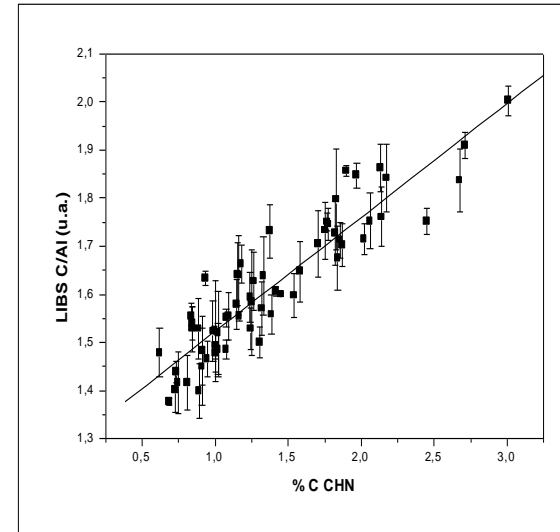
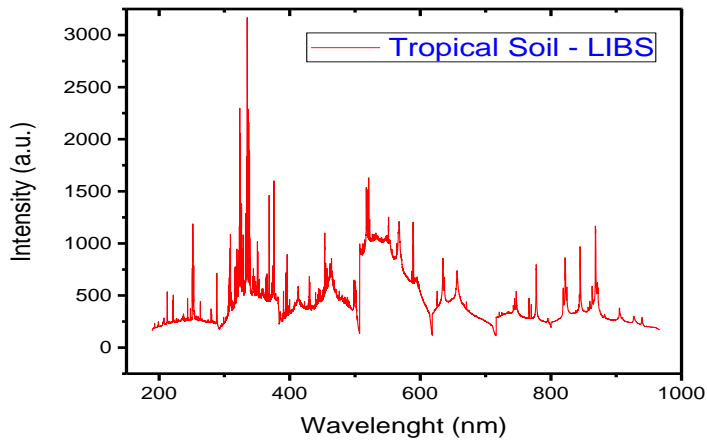
Laser Induced Breakdown Spectroscopy – LIBS



http://www.nasa.gov/mission_pages/msl/multimedia/pia15103.html

Quantification of Carbon in Soil

Applying LIBS to Soils....



R= 0,93
EMAR= 14%
LOD= 0,27%



C reference concentration (%)	C predicted concentration (%)	Absolute Error
0.51	0.43 (± 0.04)	-0.08
0.79	0.94 (± 0.08)	0.15
0.62	0.78 (± 0.15)	0.16
0.48	0.56 (± 0.09)	0.08
0.65	0.76 (± 0.10)	0.11
0.36	0.44 (± 0.07)	0.08
0.45	0.51 (± 0.07)	0.06
0.72	0.76 (± 0.07)	0.04

Smart Agriculture

[smartagri.mp4](#)



Curiosity – Mars

[nasa_final.mp4](#)



Mirã – Brazilian “rover–drone” for Agriculture [mira final.mp4](#)

 ESTADÃO



**If you desire peace,
cultivate justice,
but at the same time
cultivate the fields
to produce more
bread... N. Borlaug**

**Agronomist, Nobel Laureate and Father of
“Green Revolution”**

Thank you!

silvio.crestana@embrapa.br