Julius Kühn-Institut
Bundesforschungsinstitut für Kulturpflanzen
Federal Research Centre for Cultivated Plants

Applied research in bioeconomy – status quo and future priorities –

Georg F. Backhaus
President of JKI

The German research landscape

Federal Government

Federal Research Institutions

BMEL: 6

Federal States

Universities

Univ. of Applied Sciences

State Research Institutes

Private Sector

Federal institutions of companies

Economically oriented R&D institutions

Federation of Industrial Research Associations (AiF)

Helmholtz Centres (90:10)

Leibniz Association (50:50)

Max Planck Society (50:50)

Fraunhofer Society (50:50)

German Research Foundation (50:50)

Total: 86, 6 of it partly funded by BMEL

Germany

BMEL's departmental research

Federal Research Institutes:

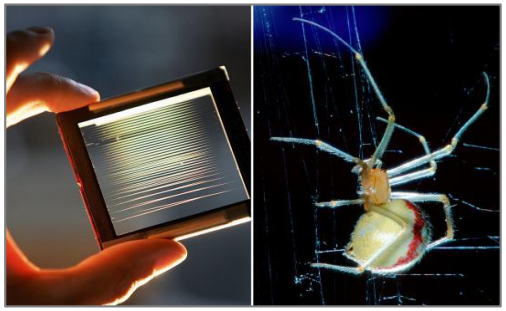
- Julius Kühn Institute – Federal Research Centre for Cultivated Plants (JKI)
- Friedrich Loeffler Institute – Federal Research Institute for Animal Health (FLI)
- Max Rubner Institute – Federal Research Institute for Nutrition and Food (MRI)
- Thünen Institute – Federal Research Institute for Rural Areas, Forestry and Fisheries (TI)
- German Biomass Research Centre (DBFZ)
- Federal Institute for Risk Assessment (BfR)

Institutes of the Leibniz Association (supported by BMEL):

- German Research Centre for Food Chemistry (DFA)
- Leibniz Institute for Agricultural Development in Transition Economies (IAMO)
- Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB)
- Leibniz Institute of Vegetable and Ornamental Crops (IGZ)
- Leibniz Institute for Farm Animal Biology (FBN)
- Leibniz Institute for Agricultural Landscape and Land Use Research (ZALF)

Pillars of bioeconomy

- **Biotechnology**
- **Recycling of waste and wastewater/sewage**
- **Agriculture / Horticulture / Forestry**



Source: www.welt.de

Source: Semalex/pixelio.de

Source: Backhaus

Source: JKI

Paths of use for biomass / 6F crops

Food

Feed

Fiber

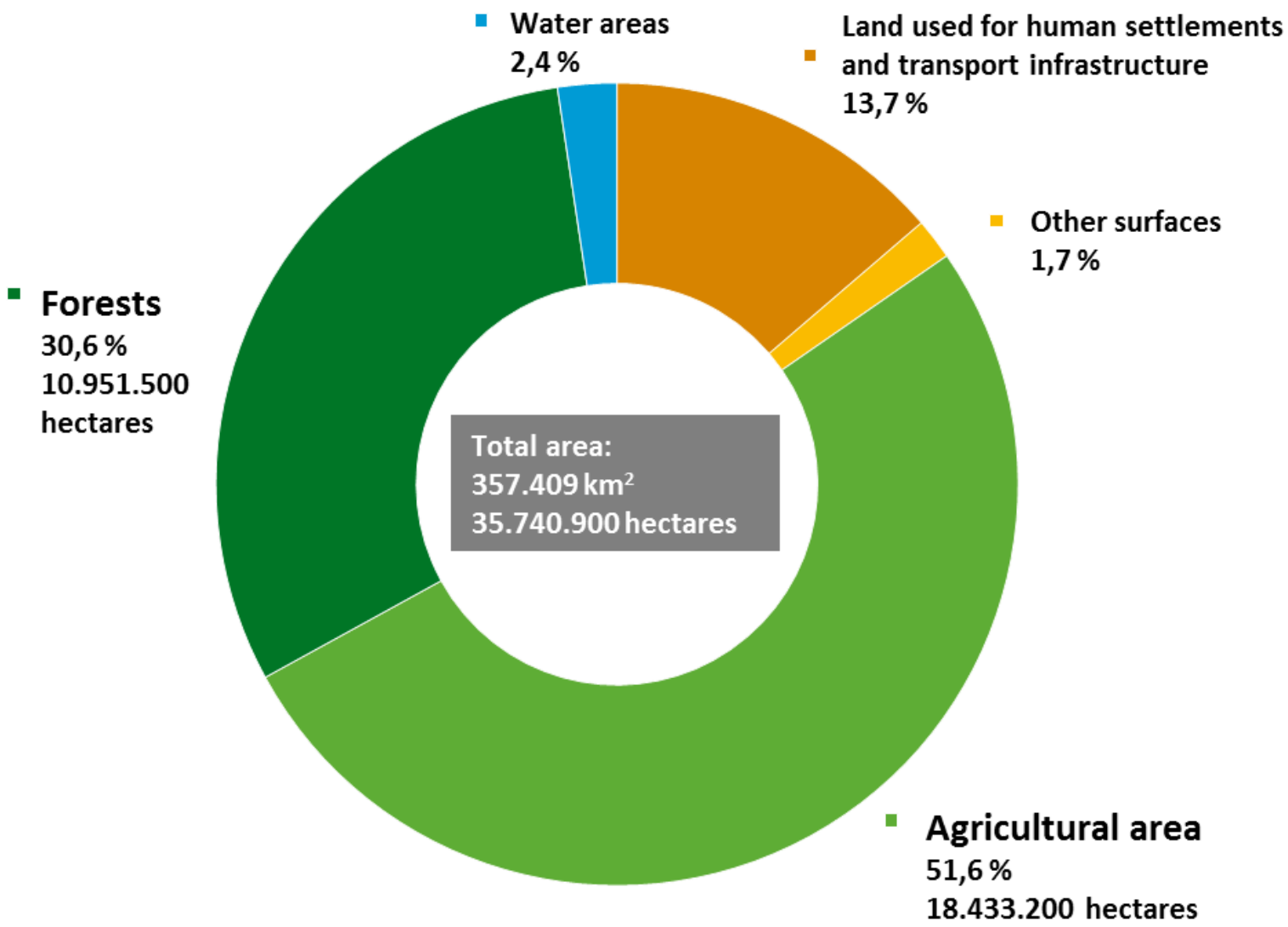
Fuel

Flowers

Fun




Land use in Germany (31.12.2015)



Source: Federal Statistical Office, 2016

Germany (2015)

Utilised agricultural area: 18.433.200 hectares

– Arable land: 12.062.700 hectares

Cultivation of renewable resources in Germany 2014 – 2016 (in hectares) without wood based products

Plants	Feedstock	2014	2015*	2016**
Industrial crops	Industrial starch	106,000	108,500	108,000
	Industrial sugar	12,500	15,000	16,000
	Technical rapeseed oil	115,500	129,000	122,500
	Technical sunflower oil	6,000	6,500	6,000
	Technical linseed oil	3,500	3,500	3,500
	Plant fibres	1,000	1,500	1,500
	Plant-based drugs and dyes	12,000	12,000	12,000
	Industrial crops total	**256,500**	**276,000**	**269,500**
Energy crops	Rapeseed oil for biodiesel/vegetable oil	798,500	800,000	760,000
	Crops for bioethanol	188,000	200,000	200,000
	Crops for biogas	1,353,500	1,400,000	1,450,000
	Crops for solid fuels (e.g. farmed wood, miscanthus)	10,500	11,000	11,000
	Energy crops total	**2,350,500**	**2,411,000**	**2,421,000**
Total acreage of renewable resources		**2,607,000**	**2,687,000**	**2,690,500**

Source: FNR (2017)

*preliminary values **estimated values

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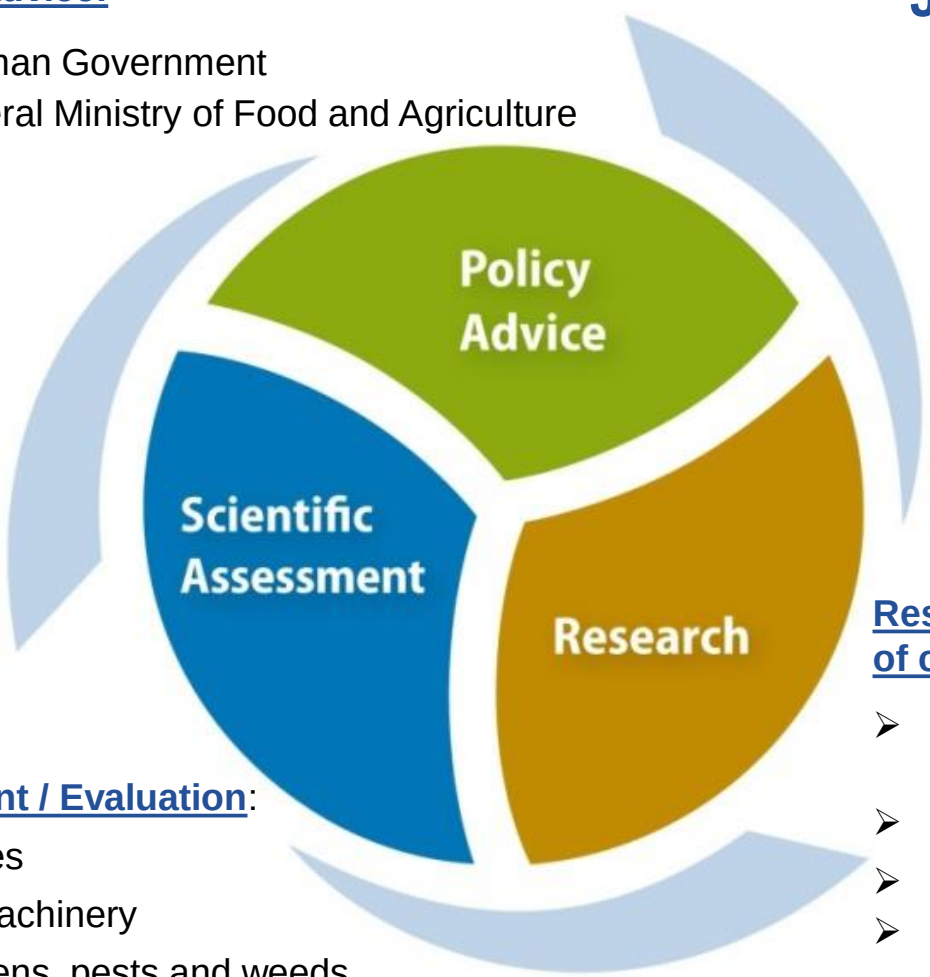
JKI's responsibilities

Policy Advice:

- German Government
- Federal Ministry of Food and Agriculture



Scientific Assessment / Evaluation:

- Pesticides, biocides
- Plant protection machinery
- Regulated pathogens, pests and weeds
- Genetically modified plants
- Fertilizers

Research in the major fields of competence:

- Plant genetics, breeding research, breeding
- Sustainable plant cultivation
- Plant nutrition, soil science
- Plant pathology, plant protection, plant health

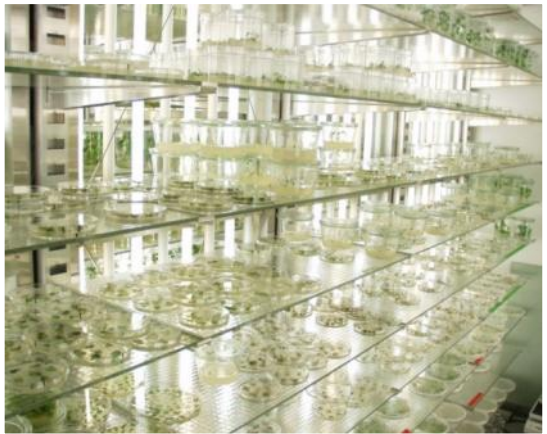
Applied research in bioeconomy:
Breeding research and plant breeding

Goals:

- Raising the productive potential of crops; stabilizing yields
- Improving resistance to pathogens
- Enhancing tolerance to biotic and abiotic stress factors (heat, drought, salinity)

Tools and need for research:

- Plant genetic resources
- Genotyping and phenotyping
- Modern biotechnological methods, e.g. Genome editing, CRISPR/Cas



Applied research in bioeconomy:
Plant cultivation

Goals:

- Sustainable plant production systems (agriculture, horticulture, forestry)
- Conservation of natural resources

Tools and need for research:

- Innovative plant production technologies using new varieties and new agricultural techniques

  Examples:

  - Precision farming with satellite-guided navigation and mapping systems for tractors
  - Spectral measurement techniques, e.g. near-infrared spectroscopy (NIRS); online sensor technology
  - Innovative irrigation techniques and water efficiency technologies

Applied research in bioeconomy:
Phytomedicine, plant health and plant protection

Goals:

- Reduction of yield losses and post-harvest losses
- Healthy plants as prerequisite for an efficient use of resources

Tools and need for research:

- Integrated plant protection methods and strategies
- New active substances and plant protection products
- Further development of plant protection machinery
- Biological and biotechnical plant protection measures
- Prevention of introduction and spread of harmful organisms (Quarantine management)

Topics of interest for cooperation between EMBRAPA and JKI

- **Breeding research**
  - Exchange and scientific evaluation of plant genetic resources
  - Genotyping and phenotyping (agricultural, horticultural and fruit crops, grapevine)
  - Modern biotechnological methods, e.g. Genome editing, CRISPR/Cas
- **Biological plant protection**
  - Molecular characterization of microbial antagonists of pest insects
  - Biological control of insect pests with entomopathogenic fungi and viruses
  - Biological control of soil-borne pathogens with bacterial and fungal antagonists
- **Adaptation to climate change**
  - Climate impact research (adaptation) in agriculture, horticulture, viticulture
  - Effects of climate change on invasive species (new plant diseases, pests and weeds)

Thank you for your attention!

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