Cover photo: ifz Göttingen

Model region of the bioeconomy for the digitalization of plant value chains in the Central German mining area in Saxony-Anhalt (DiP)

Cutting-edge research in the digitalization of the plant-based bioeconomy as a driver of regional structural change – the DiP model region in Saxony-Anhalt

Prof. Dr. Klaus Pillen

Speaker of DiP-Consortium

Martin-Luther-University Halle-Wittenberg

International Bioeconomy Conference, 2025-06-19, Halle (Saale)

With funding from the:

Federal Ministry of Research, Technology and Space

UNTERSTÜTZT VON

SACHSEN-ANHALT
Staatskanzlei und Ministerium für Kultur

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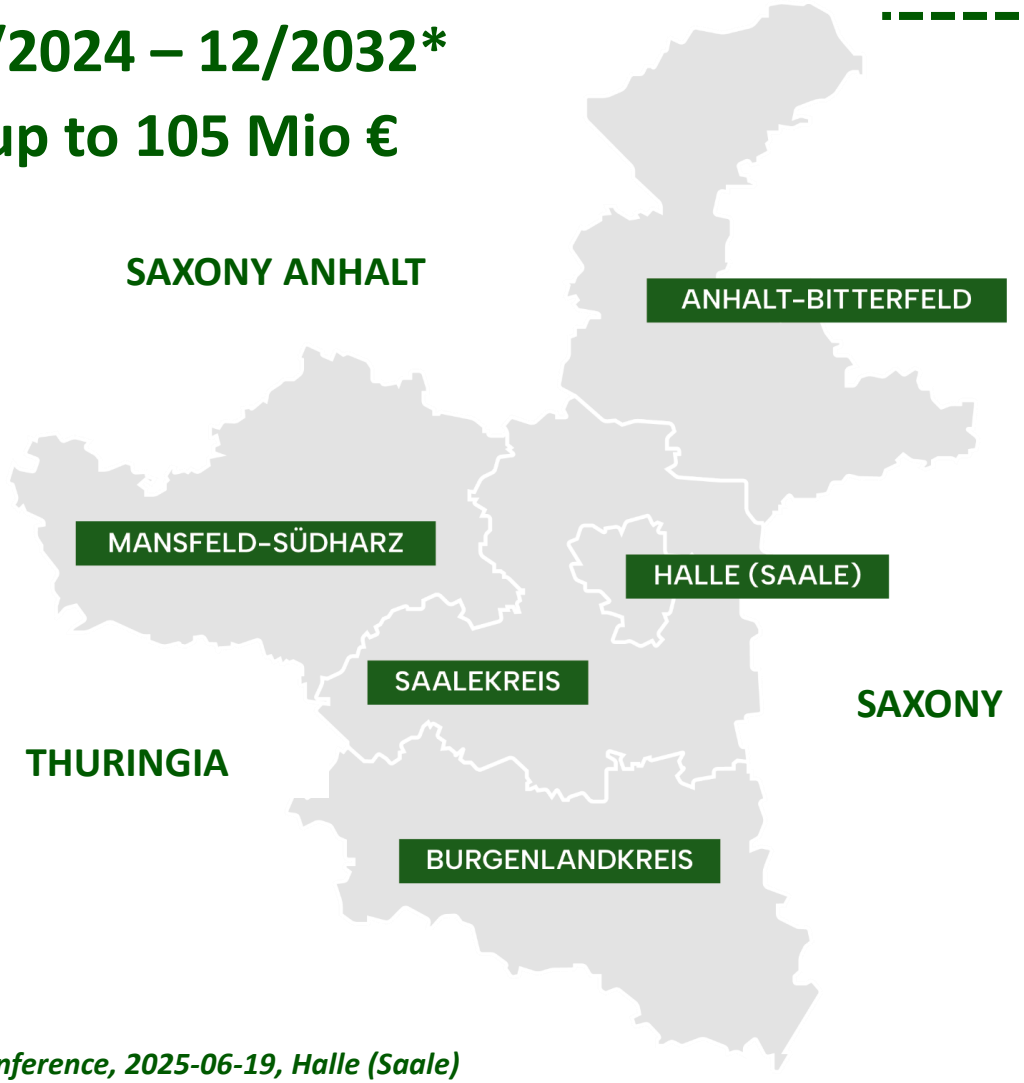
STRUKTURWANDEL MITTELDEUTSCHES REVIER SACHSEN-ANHALT

DiP:

- **50 partner institutions**
- **19 collaborative research projects**
- **Duration: 04/2024 – 12/2032***
- **Investment: up to 105 Mio €**

**Evaluation in 2028*



one vision:

The DiP consortium will establish a **model region of bioeconomy** in southern Saxony-Anhalt for the development of **sustainable, digitally-supported, plant-based value chains.**

Cutting-Edge Research Meets regional Added value

dip
Digitalization of plant-based value chains

Cutting-edge research with transfer to the industry:

- 21 scientific partners
- 28 business partners

Partners mainly located in Saxony-Anhalt

DiP Provides Impetus for Structural Change

Grafik: Staatskanzlei Sachsen-Anhalt

- Saxony-Anhalt is part of the **Central German coal mining area** and is phasing out coal-fired power generation by **2035**
- The federal and state governments are taking **exemplary measures** for a successful **economic transformation**
- The **bioeconomy and digitalization** are key future fields in the **structural development program** and are intended to provide decisive impetus for innovation

DiP: The Ideal Model Region for the Ramp-up of the Bioeconomy

dip
Digitalization of plant-based value chains

A center of the German plant science research with leading institutes and the EU's largest genbank

A hotspot of specialty crops, a TOP region to cultivate medicinal and aromatic crops with high added value

With large agricultural farms
Average of 280 ha/farm in LSA*
Efficient structures meet the best agricultural soils!
*Federal average: 65 ha/farm

Real-world laboratories for AI-based optimization of **data analysis and value chains**

Transformation of chemistry leading the way to **de-fossilization, scaling-up platforms** and with the first **industrial-scale biorefinery facilities**!

DiP: The Ideal Model Region for the Economic Ramp-up of the Bioeconomy

dip
Digitalization of plant-based value chains

Ideal model to **improve resilience against stress caused by climate change** as one of the most severely affected agricultural regions in Germany

Experience in the **socio-economic analysis and evaluation** of structural change through bioeconomy

The bioeconomy

- drives the de-fossilization of material value creation
- is the link between rural areas and energy-intensive industries
- stands for new, sustainable value creation and high-quality products

Core Objectives for the Development of the DiP Model Region

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Digitalization of plant-based value chains

1. Expansion of the digitalization of plant value chains in Saxony-Anhalt
2. Development of climate-resilient crop production systems
3. Promoting the sustainability of a bioeconomic circular economy
4. Promotion of the material and chemical utilization of plants
5. Creation of new products, markets and jobs
6. Strengthening a network between research, business and society

Structure of DiP Collaborative Research Projects

Light house 1
Value chains
of agricultural crops

Light house 2
Sustainable & climate-resilient cultivation systems for the production of bio-based raw materials

Light house 3
Value chains of specialty crops

\+

Begleit-DiP
Accompanying research for the digitalization of plant-based value chains in order to develop a participatory and self-learning sustainability monitoring

\+

DiP-Coordinating Office
- DiP Management and Networking
- Communication
- Research Data Management
- Transfer

Overview of 19 DiP Collaborative Projects

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Digitalization of plant-based value chains

Value chains of agricultural crops

DiP-Liglue
Adhesive made from lignin polymers

DiP-ZAZIkI
New sugar beet cultivation systems

DiP-LeFOS
Levans from sugar beet residues

DiP-DiPisum
Innovation center for pea breeding, cultivation and processing

DiP-MAGDI
Magnetic resonance for digitization of plants

NWG DiP-DIAMANT
Digital genome sequencing

Sustainable & climate-resilient cultivation

DiP-SMART Agroforst
Digitalization to promote agroforest systems

DiP-iQ-Hanf
Industrial hemp and digitization of quality management

DiP-SuSaKlim
Climate-adapted crop rotations in organic farming

NWG DiP-FaiReSyst
Sustainable use of field margins for climate-resilient agroecosystems

Value chains of specialty crops

DiP-BioCasNavi
AI platform for rapid creation of biocatalytic cascades in bioprocesses

DiP-Tres2Cera
Ceramides - from fruit residues to bio-based health products

DiP-NA-WIR
New medicinal plants and drug active ingredients

DiP-HyperSpace
Expansion value chains of the medicinal plant St. John's wort

DiP-DiPLanD
vegan vitamin D3 and cholesterol from *Nierembergia repens*

DiP-OptiLamia
Sustainable value chains for Lamiaceae

DiP-PhosFect
phospholipid-based transfection agents

NWG DiP-PhenoPren
prenylated natural substances

BegleitDiP (Accompanying research) Development of participatory and learning sustainability monitoring

Markets and sectors

Building Materials

Materials

Cosmetics

Green Chemistry

Pharmaceuticals

Nutrition

Healthcare

Environmental and climate protection

Agriculture

Soil health

The DiP Wheat Project LiGlue

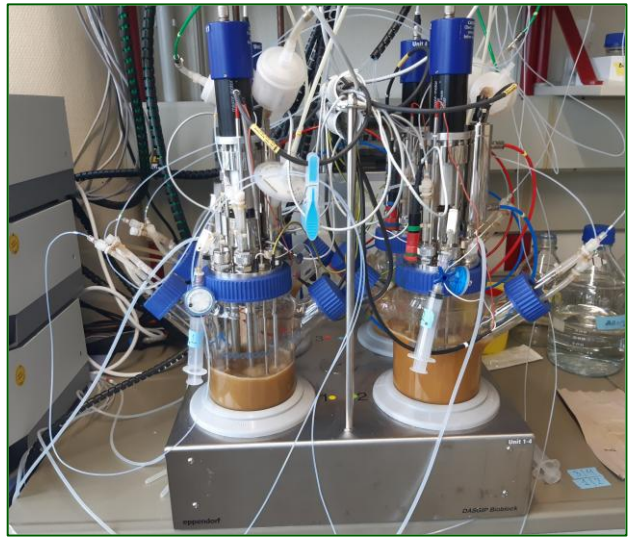
dip
Digitalization of plant-based value chains

- Participants: MLU, Inst. Holztechnologie Dresden, DBFZ, Fraunhofer CBP
- Coordinator: Prof. Markus Pietzsch (MLU)
- Start: 04/2024; End: 12/2028

IHD SCIENCE BY EXPERTS
DBFZ
Fraunhofer CBP

Goals:

- Develop natural binding glues based on wheat lignin
- AI-based optimization of enzymes and processes involved in glue formulation
- Utilizing lignin as a glue in wood industry



Lignin extraction

Production of wood composite material

Impressions of the DiP Kickoff Conference, Gatersleben, 4 March, 2025

dip
Digitalization of plant-based value chains

Impressions of the DiP Kickoff Conference, Gatersleben, 4 March, 2025

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Digitalization of plant-based value chains

DiP –
a strong consortium…

… for digitally supported plant-based value creation in the model region of Saxony-Anhalt

DiP Kick-off Conference, 03/2025

Join us in shaping the bioeconomy of the future!

Here in Saxony-Anhalt

dip
Digitalization of plant-based value chains

MARTIN-LUTHER-UNIVERSITÄT HALLE-WITTENBERG

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DiP is an initiative of the Federal Ministry of Research, Technology and Space and the State of Saxony-Anhalt based on the Structural Strengthening Act

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The DiP-associated Wheat Project

- Participants: MLU, JKI, Hochschule Anhalt, DLR, Compolytics
- Coordination: Dr. Andreas Maurer (MLU)
- Start: 01/2025; End: 12/2027

Goals:

- Study plant performance in controlled environments, field trials and wheat nurseries
- Develop UAV-bound senors to score plant growth, yield formation, pathogen resistance and drought
- Develop AI methods to model drought stress in wheat breeding nurseries
- Close the gap between research and wheat breeding

Trait	Method	relevant for
Plant development	BBCH scale	Prediction of plant development
Plant height	Ruler / laser	Growth curves, biomass
Stomatal conductance and photosystem II efficiency	Li-Cor LI-600PF	Drought stress response and photosynthetic activity
Yield components and grain yield	Counting, measuring, weighing	Grain yield and its structure
Biomass	Weighing	Harvest index
Diseases	Visual scoring (1-9 or % of leaf area)	Plant health status

DJI Mavic 3 M with:

- 5 MP Multispectral camera
- RGB camera

DJI Matrice 350 RTK with:

- VNIR hyperspectral sensor
- + LiDAR

DiPredict

1.

Controlled Atmosphere

for targeted application of drought stress scenarios

Plantarray (JKI)

- Capturing the transpiration reaction (H_20 efficacy)
- **AI modelling** of H_20 efficacy through hyperspectral sensors

Transferring the findings to the field

through UAV based sensor technology (RGB, hyper-/multispectral, thermal, LiDAR, FTIR)

2.

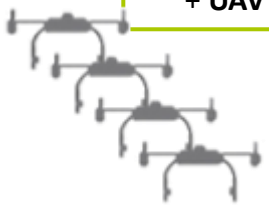
Natural environments (field trials)

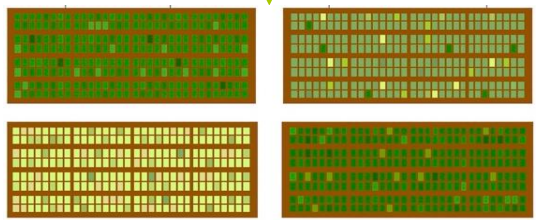
- Equipped with soil sensors and weather stations to estimate **drought stress**
- Evaluation of a wheat diversity panel of 50 cultivars

MLU | **JKI** | **HSA**

Flight mission network of different UAVs of **HSA, JKI & MLU**, supported by **DLR** + **UAV data processing**

Extrapolation to a multitude of further wheat genotypes





Wheat breeding nurseries in Silstedt (**RAGT**)

3.

UAV based prediction of the performance of up to **10.000** wheat genotypes

4.

- **Selection of superior wheat genotypes, adapted to drought stress**