



SORGHUM,
A KEY TO BUILD
OUR FUTURE.

3RD EUROPEAN SORGHUM CONGRESS

CropBooster-P: A roadmap for future European plant research

NACRY Philippe *, PARRY Martin, RODRIGUES SALTENIS Vandasue Lily, BAEKELANDT Alexandra, PRIBIL Mathias, MALYSKA Aleksandra, TAYLOR Sam, YIN Xinyou, MURCHIE Erik, NANDA Amrit K., DAVIES Jessica, WILHELM Ralf, ROLLAND Norbert, HARBINSON Jeremy, INZÉ Dirk and KLEIN LANKHORST René

** B&PMP, Biochemistry and Plant Biology, Montpellier, France*

Dr. Philippe Nacry

12th October 2021



European
Commission

Horizon 2020
European Union funding
for Research & Innovation

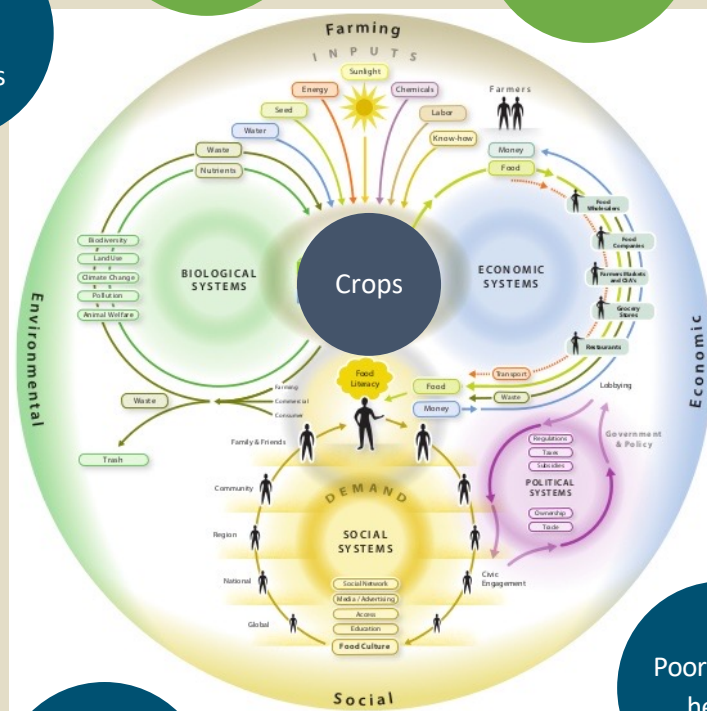


CAMPAIGN FINANCED
WITH AID FROM
THE EUROPEAN UNION

The content of this promotion campaign represents the views of the author only and is his/her sole responsibility. The European Research Executive Agency (REA) do not accept any responsibility for any use that may be made of the information it contains.



Crops in a food system under pressure



Climate change

Increasing demand

Decline in water resources

Declining land resource

Biodiversity loss

Environmental degradation

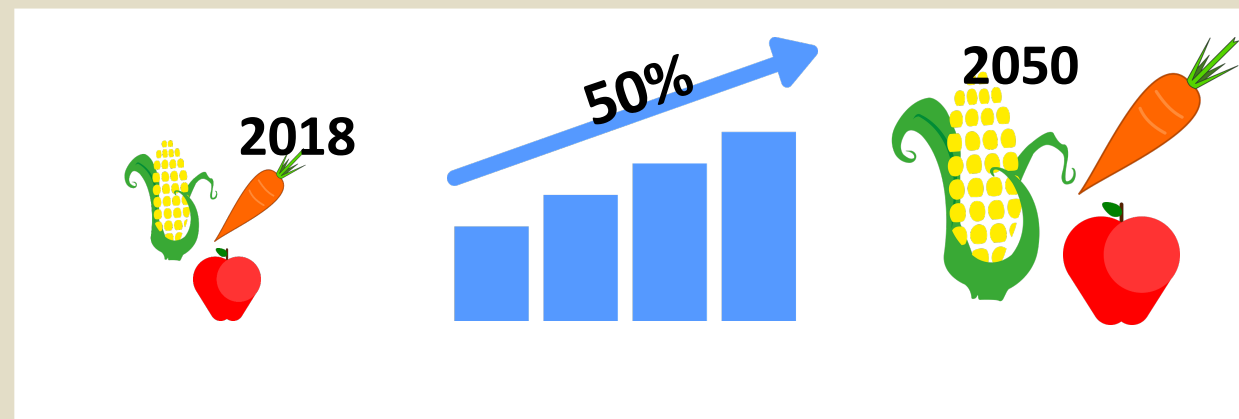
Food & health inequalities

Growing bioeconomy

Just transition

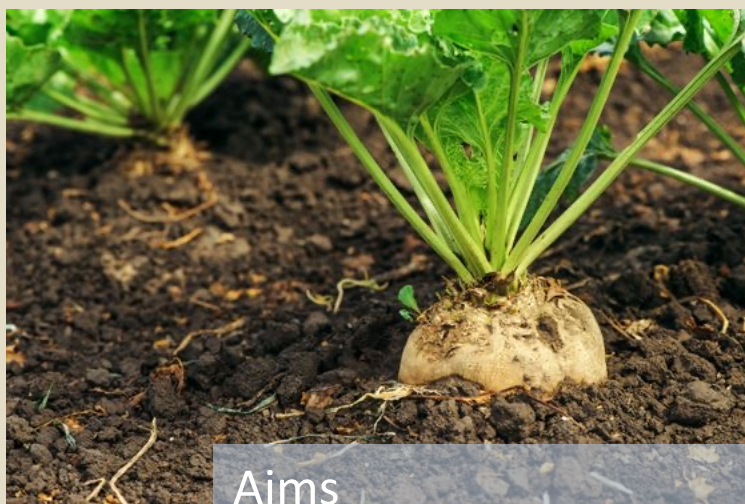
Poor dietary health

Image: Shift(2016)



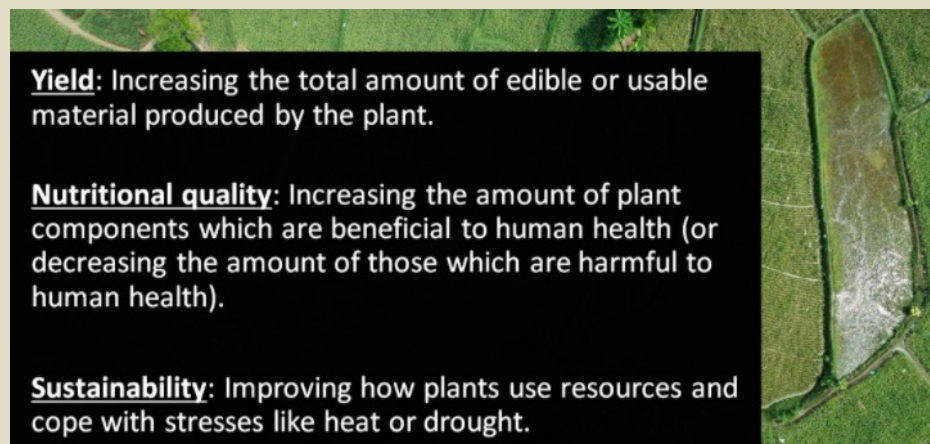
Crops yield will have to double by 2050

CropBooster-P - Future Proofing Crops



Aims

- Develop a roadmap for future proofing our food system and the European bioeconomy – **paves the way for future research and innovation.**
- Focusing on the potential for plant improvement to help enhance **yield**, enhance **nutritional quality**, and ensuring environmental **sustainability**.



We need to match future research programs to the values, needs and expectations of society



SORGHUM,
A KEY TO BUILD
OUR FUTURE.

3RD EUROPEAN SORGHUM CONGRESS

CropBooster-P Consortium



- Wageningen University & Research (Project Coordinator) <https://www.wur.nl>
- VIB <http://www.vib.be/en/Pages/default.aspx>
- CNR <http://www.disba.cnr.it>
- EPSO <https://epsoweb.org>
- Heinrich Heine University Düsseldorf <https://www.uni-duesseldorf.de/home/en/home.html>
- University of Nottingham <https://www.nottingham.ac.uk>
- Julius Kühn Institut <https://www.julius-kuehn.de/en/>
- Jonas Collén – CNRS <http://www.cnrs.fr/en>
- University of Copenhagen <https://www.ku.dk/english/>
- INRA <http://institut.inra.fr/en>
- ETP Plants for the Future <http://plantetp.org/>
- Lancaster University <https://www.lancaster.ac.uk/>
- Universitatea de Stiinta Agricola si Medicina Veterinara Cluj Napoca <http://www.usamvcluj.ro/eng/>
- Euroseeds <https://euroseeds.eu/>
- ACTA http://www.acta.asso.fr/en/the-network/access-by-institute/institute-details/i/detail/arvalis_institut_du_vegetal/presentation.html

Associate partners:

- Sorbonne Université <https://www.sorbonne-universite.fr/en>
- Arvalis <https://www.arvalis-infos.fr/index.html>



CAMPAIGN FINANCED
WITH AID FROM
THE EUROPEAN UNION

The content of this promotion campaign represents the views of the author only and is his/her sole responsibility.
The European Research Executive Agency (REA) do not accept any responsibility for any use that may be made of the information it contains.



Overview of how the Roadmap is developed

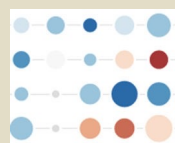
Setting the option space for Yield, Nutrition and Sustainability

CropBooster
"As is" 2019

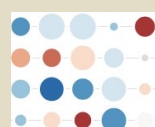
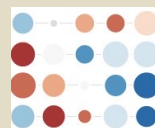
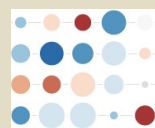
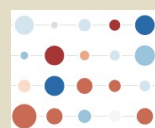
Future worlds
2050

Alternative
outcomes

technologies



EU crops



Multidimensional assessment of the option space

WP 2

Economic, Social and
Environmental Impact

WP 3

Societal Needs and
Expectations

WP 4

International
Cooperation

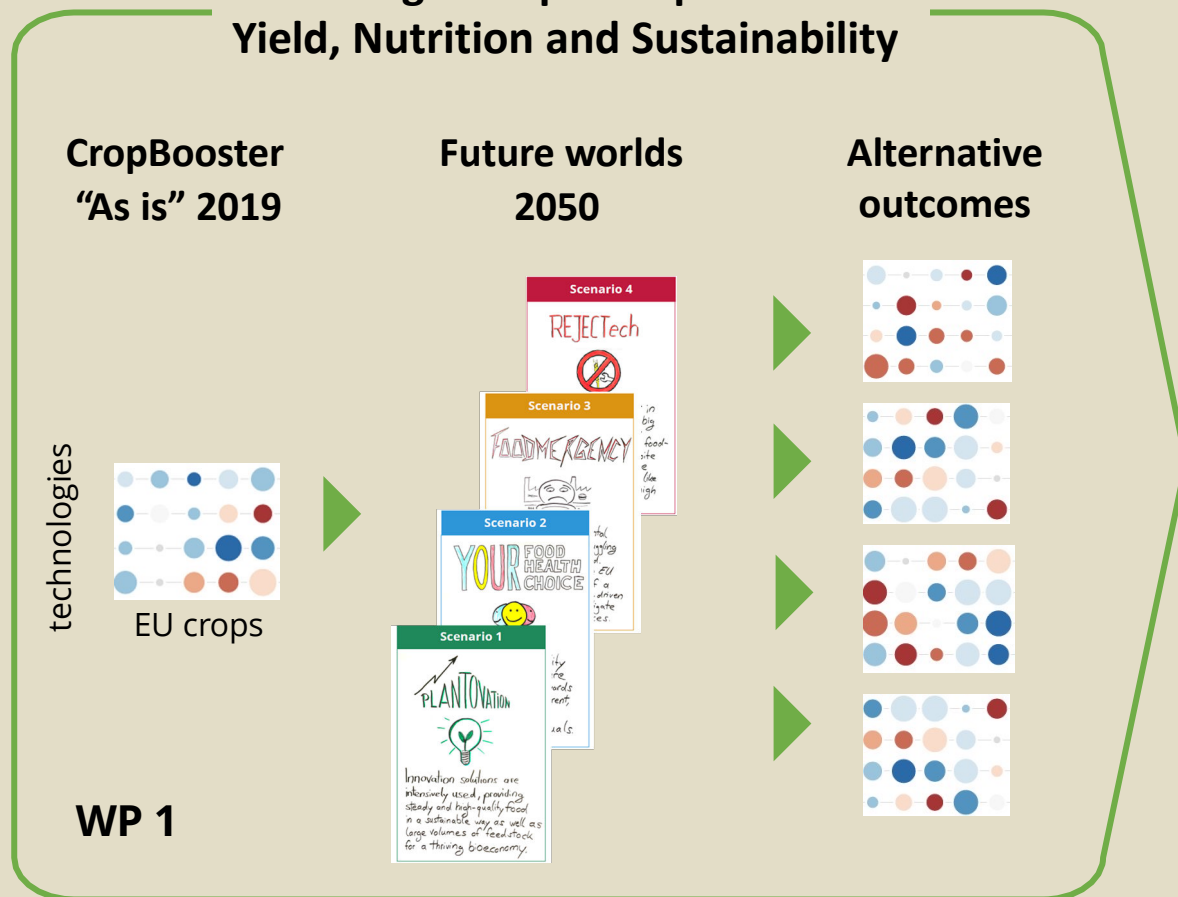
Strategy Development

WP 5

- Roadmap to future proof the EU crops
- Improved societal awareness and engagement
- In depth anticipation of economic, social and environmental impacts

Overview of how the Roadmap is developed

Setting the option space for Yield, Nutrition and Sustainability



3 stages:

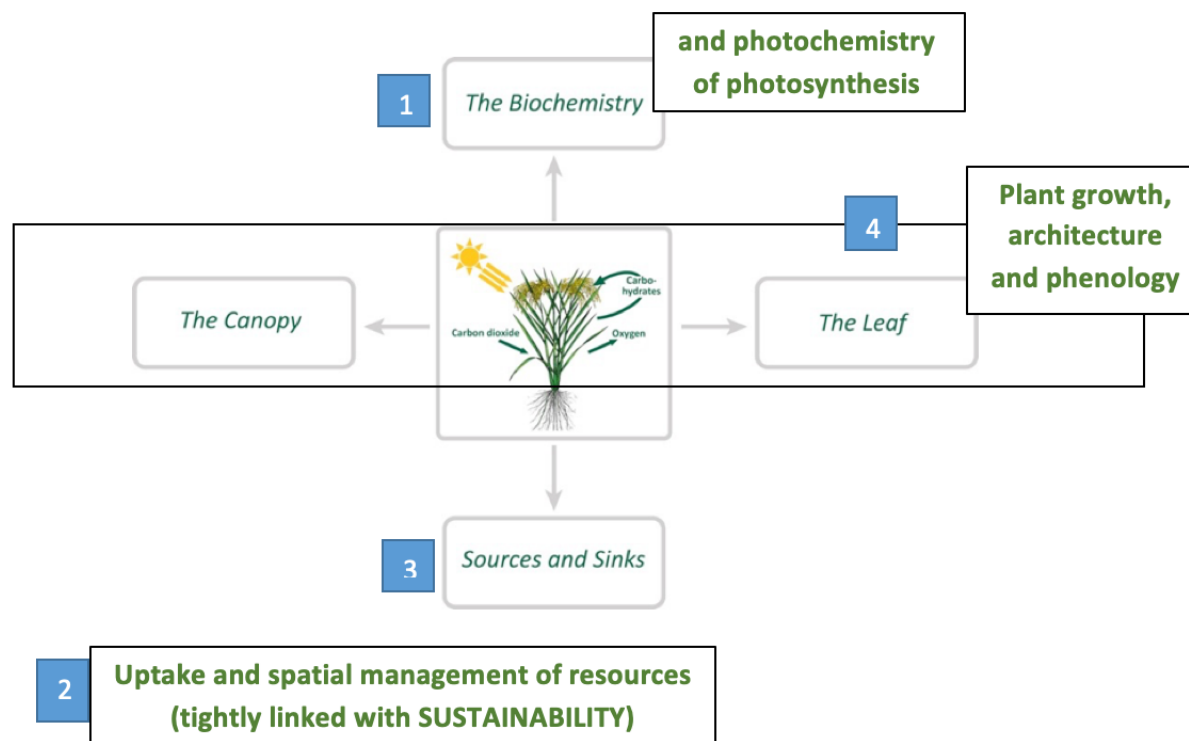
- (1) Setting the option space - **Generate matrices**
- (2) Run your plan against a range of possibilities - Create Future worlds - (**Scenario building analyses**)
- (3) How does this **affect the matrix** and what is the output?
 - Indicate for each scenario which crops and technologies show most potential
 - Based on that, provide guidance toward future plant research in Europe
 - Developbreeding strategies for (underdeveloped) crops
 - Direct funding to strategic areas
 - ...

WP1: Setting the option space – Generate matrices

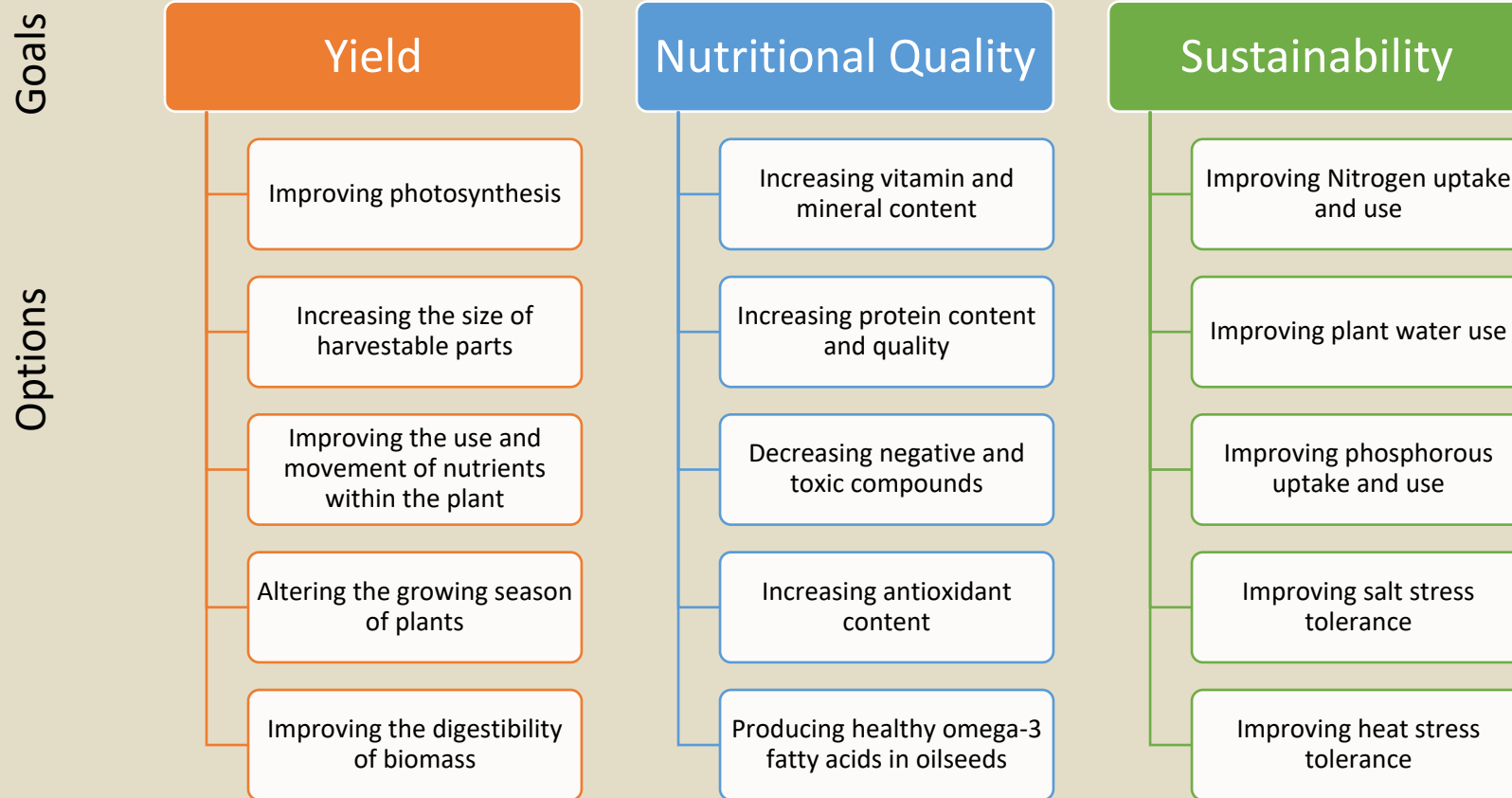
Define key options to improve ***Yield***,
Nutritional Quality
and Sustainability

What determines/affects YIELD POTENTIAL (genetic basis) – YIELD DETERMINANTS?
Which plant traits/functions are heritable/transferable and do we have to take into account in this project because they may determine plant YIELD POTENTIAL?

YIELD POTENTIAL <-> actual yield (YIELD POTENTIAL+ ENVIRONMENTAL CONSTRAINTS (e.g abiotic stresses - SUSTAINABILITY))

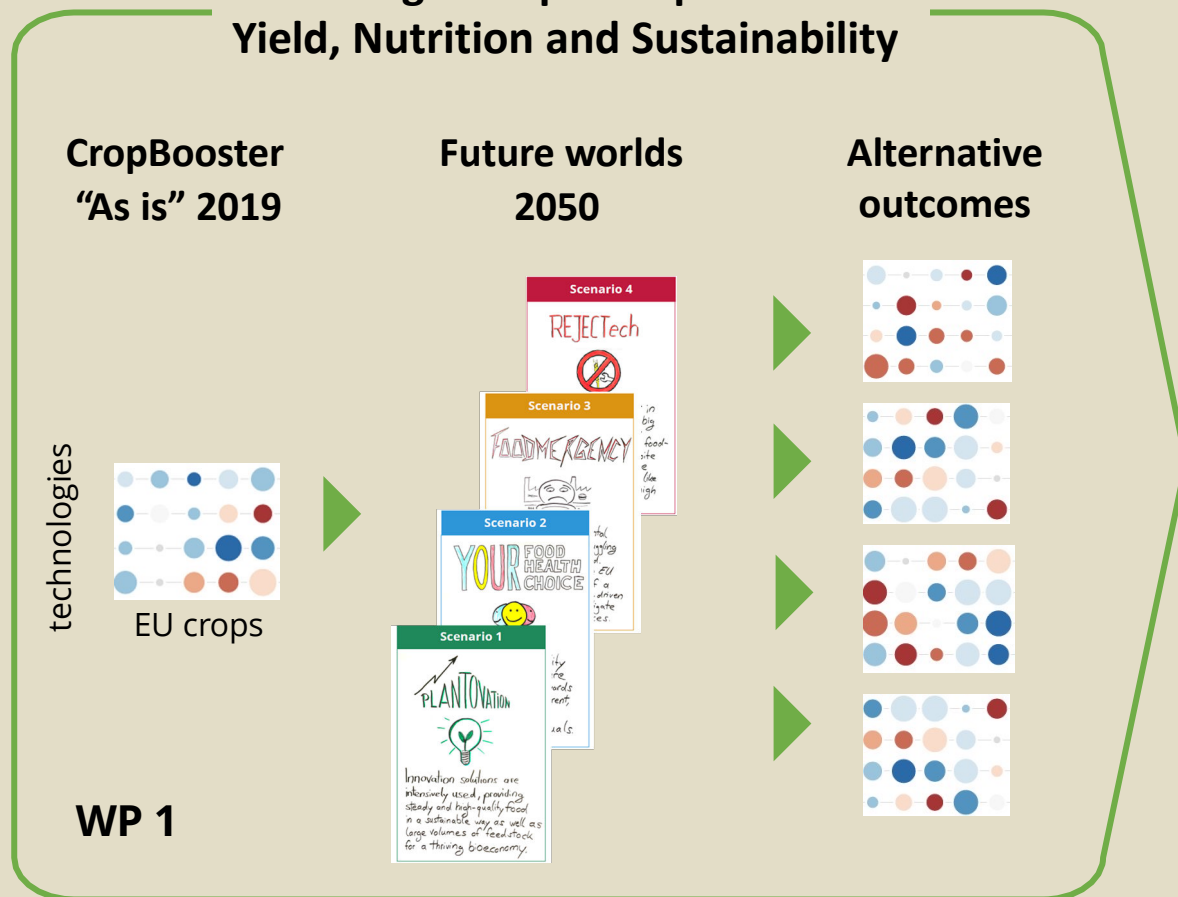


WP1: Setting the option space – The 15 cropboosting options



Overview of how the Roadmap is developed

Setting the option space for Yield, Nutrition and Sustainability

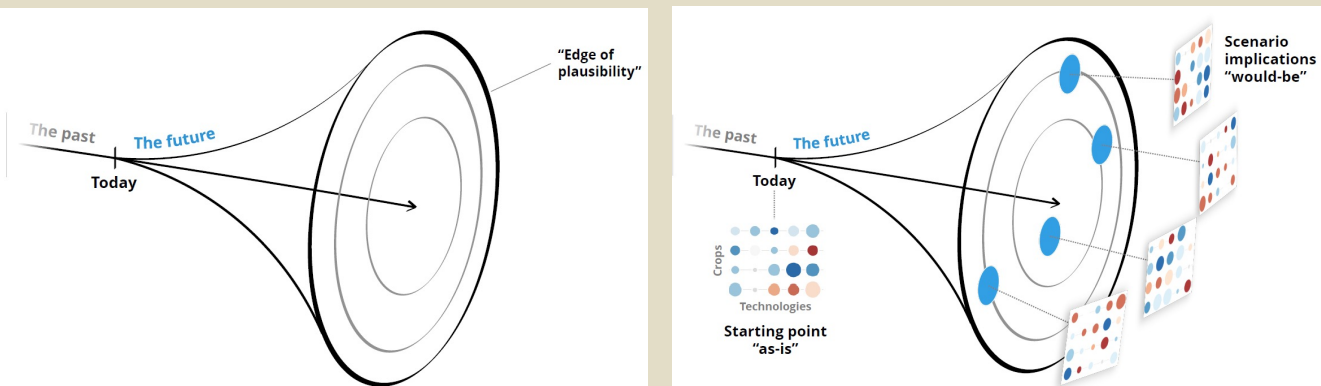


3 stages:

- (1) Setting the option space - **Generate matrices**
- (2) Run your plan against a range of possibilities - Create Future worlds - (**Scenario building analyses**)
- (3) How does this affect the matrix and what is the output?
 - Indicate for each scenario which crops and technologies show most potential
 - Based on that, provide guidance toward future plant research in Europe
 - Developbreeding strategies for (underdeveloped) crops
 - Direct funding to strategic areas
 - ...

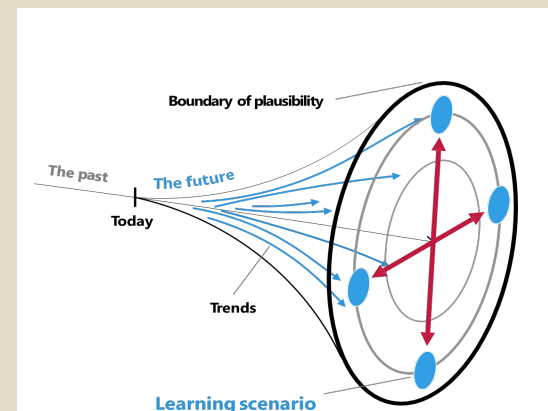
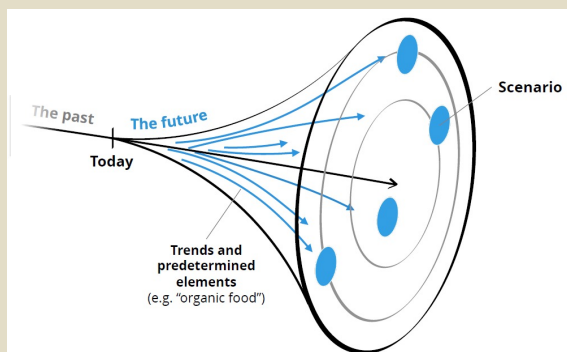
WP1: Scenario building analyses

The future can be imagined as a funnel of possibilities



Based on Trends and Key
Uncertainties, create
different scenarios

Once scenarios are created,
determine their implications
on the project



Learning scenarios serve as a general
framework for outlining future worlds

X	<p>Scenarios are not predictions: one can't predict complex (social) systems in the long- term</p> <p>Scenarios are never implausible e.g. based on inconsistent combination of outcomes or on extremely unlikely events</p>
✓	<p>Scenarios differ from each other to cover a wide range of possibilities; key uncertainties play out differently</p> <p>Scenarios are unlikely but plausible</p>

WP1: Scenario building analyses

Scenario 1



Innovation solutions are intensively used, providing steady and high-quality food in a sustainable way as well as large volumes of feedstock for a thriving bioeconomy.

When biotech innovation thrives

Scenario 2

YOUR FOOD
HEALTH
CHOICE



Health and sustainability concerns drive agriculture and food businesses towards being diverse and transparent, meeting the needs and preferences of individuals.

When consumers become king

Scenario 3

FOODMERGENCY



Due to severe environmental degradation, the EU is struggling to fulfill basic food demand. In response to the crisis, the EU has seen the introduction of a large-scale and technology-driven agricultural system to mitigate the most dire consequences.

When food runs out

Scenario 4

REJECTech



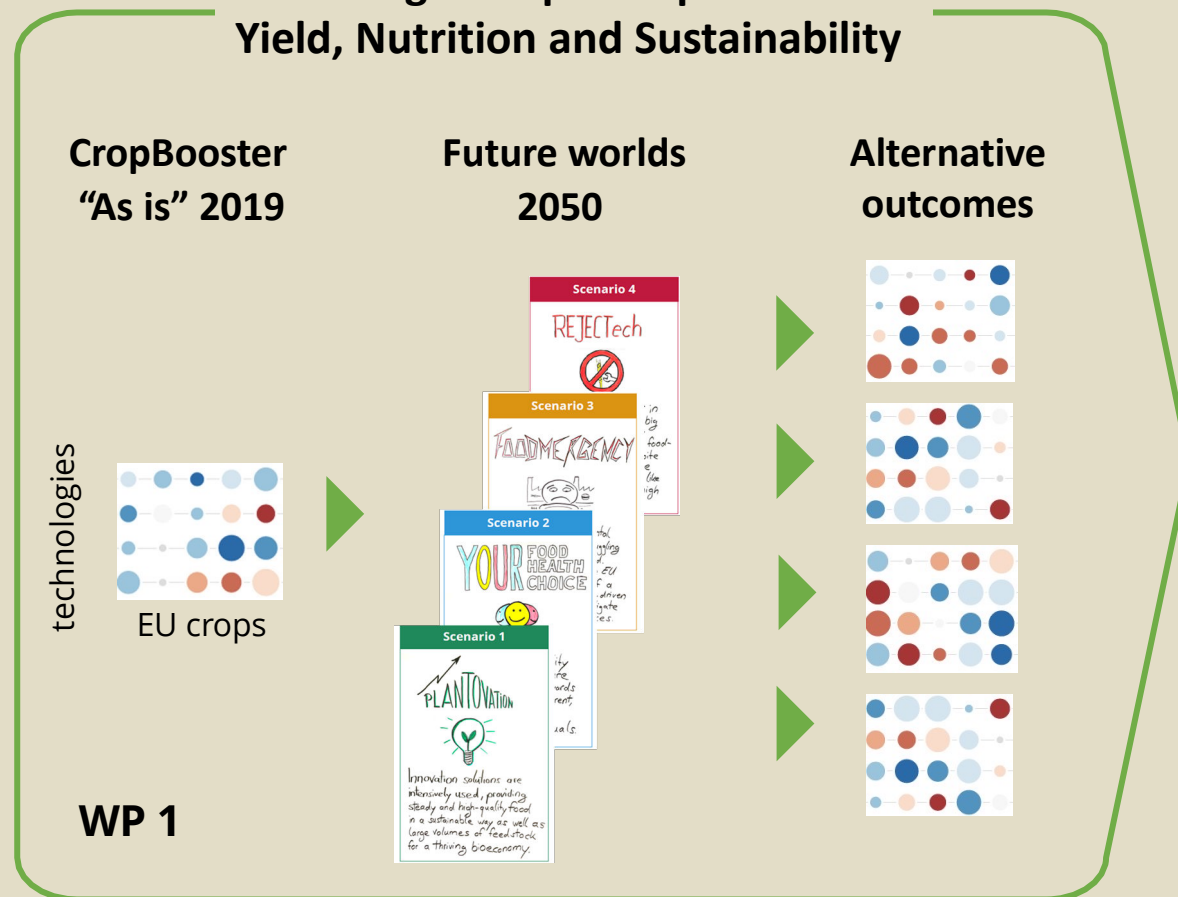
Consumers have little trust in politicians, scientists and big industry. Society is highly polarized and rejects new food-related technologies – despite the dissatisfaction with the current state of affairs like limited food choice and high prices.

When science loses society

Cornelissen et al., 2020

Overview of how the Roadmap is developed

Setting the option space for Yield, Nutrition and Sustainability



3 stages:

- (1) Setting the option space - **Generate matrices**
- (2) Run your plan against a range of possibilities - Create Future worlds - (Scenario building analyses)
- (3) **How does this affect the matrix and what is the output?**
 - Indicate for each scenario which crops and technologies show most potential
 - Based on that, provide guidance toward future plant research in Europe
 - Develop breeding strategies for (underdeveloped) crops
 - Direct funding to strategic areas
 - ...

Overview of how the Roadmap is developed

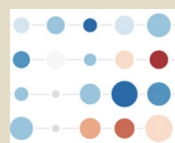
Setting the option space for Yield, Nutrition and Sustainability

CropBooster
"As is" 2019

Future worlds
2050

Alternative
outcomes

technologies



EU crops

WP 1

Multidimensional assessment of the option space

WP 2

Economic, Social and
Environmental Impact

WP 3

Societal Needs and
Expectations

WP 4

International
Cooperation

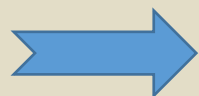
Strategy Development

WP 5

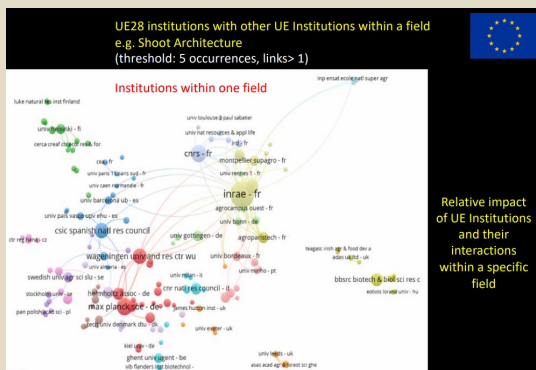
- Roadmap to future proof the EU crops
- Improved societal awareness and engagement
- In depth anticipation of economic, social and environmental impacts

WP4: International cooperation

- Aim: identify the main European institutions which publish in the fields corresponding to the traits identified in WP1 as being able to improve yield, sustainability and nutritional quality.
- Query the web of science (>10,000 publications for yield, sustainability and nutritional quality)



- Main actors in all fields and their interactions → **Focus group coordinators**
- Gathering a team of experts → Identification of key authors → **Focus groups**
- Networking activities with the different research communities and experts for sustainable improvement of crop yield, and nutritional quality (link with WP1)



- Status quo of research in the field
 - Current know-how
 - Most relevant latest research results
 - Trends in research, new technology applied or potentially applicable
- Future challenges in the field to be addressed with high priority
 - What are the most relevant unsolved questions (questions scientific questions, societal and economic challenges)
 - Aspects/opportunities for application of research results
- Action points for a future research program in the field
 - What needs to be done to solve the scientific questions and to meet the societal and economic challenges ?
 - Projects with application relevance
 - What needs to be done to support the translation of research results into societal and economic value?

Overview of how the Roadmap is developed

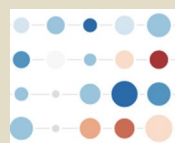
Setting the option space for Yield, Nutrition and Sustainability

CropBooster
"As is" 2019

Future worlds
2050

Alternative
outcomes

technologies



EU crops

WP 1

Multidimensional assessment of the option space

WP 2

Economic, Social and
Environmental Impact

WP 3

Societal Needs and
Expectations

WP 4

International
Cooperation

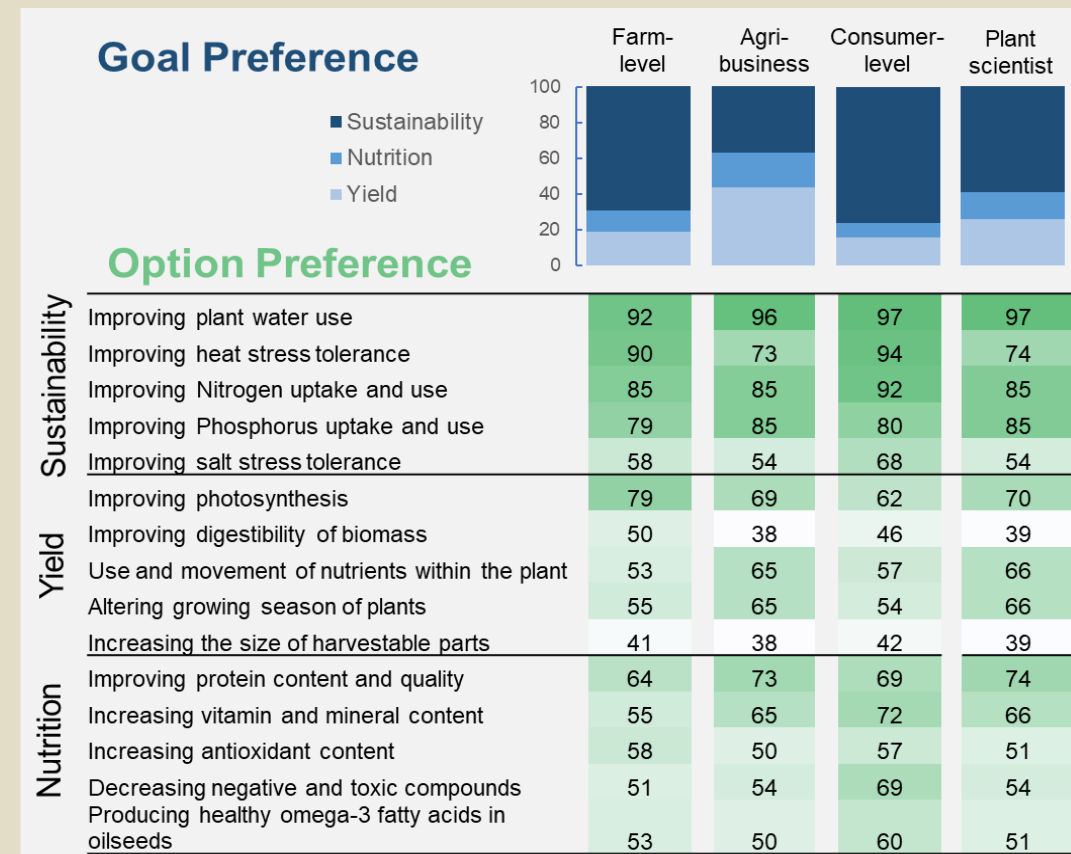
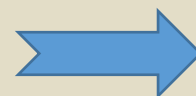
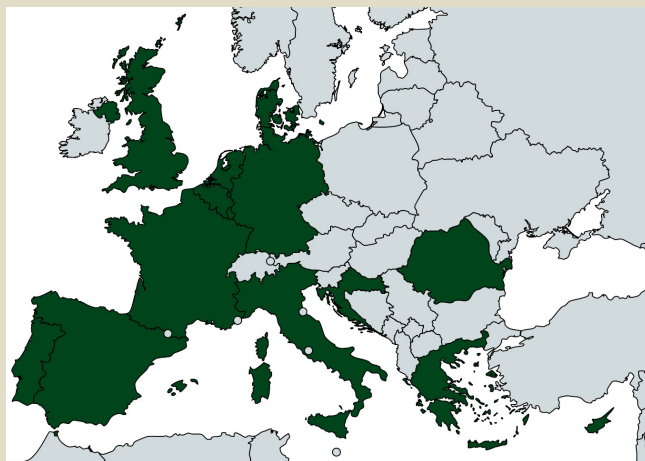
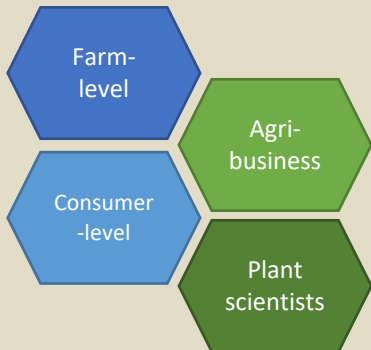
Strategy Development

WP 5

- Roadmap to future proof the EU crops
- Improved societal awareness and engagement
- In depth anticipation of economic, social and environmental impacts

WP2: Assessing socio-economic and environmental impacts

- Aim: Assess the **potential economic, social and environmental impact** of our toolbox of plant improvement options for improving yield, sustainability and nutritional quality.



Which goals – Yield, Nutrition, Sustainability – do people feel are most important?

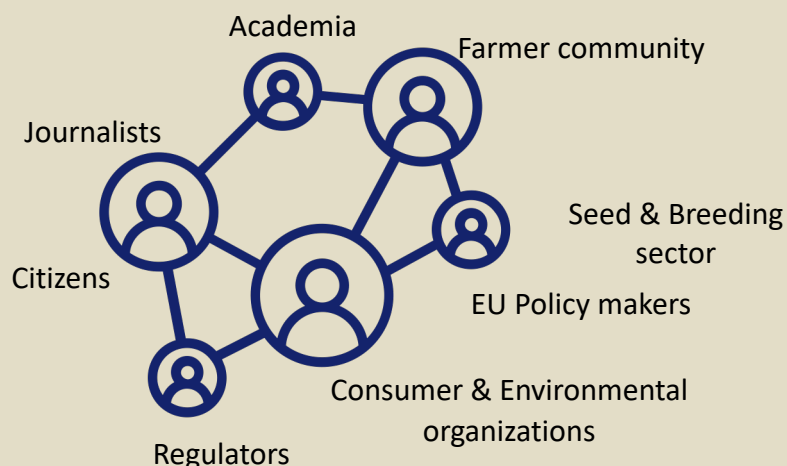
Which options are most important?

Do different stakeholder groups have different opinions?

WP3: Assessment of societal values, needs and expectations

- Aim: Improving the dialogue between science and society – **an outreach strategy**

Contribute to develop a strategy to improve **communication** with different target groups and promote/facilitate **adoption and acceptance of innovation relating to crop production and improvement**



Major questions (an excerpt):

- **How and with whom** do you communicate about plant breeding or genome editing in plants?
- Is there a **public discourse** in your country?
- **How** should genome editing be communicated?
- What is your **experience** with your communication?
- Could genome editing contribute to achieve the policy goals set by the EC?

External stakeholders and the project's SHG
Interviews, workshops, questionnaires...

Not influencing/manipulating somebody's opinion but to increase awareness and understanding for an issue under debate, to facilitate an differentiated and science based opinion forming process.

Overview of how the Roadmap is developed

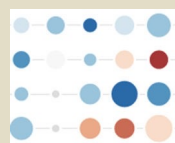
Setting the option space for Yield, Nutrition and Sustainability

CropBooster
"As is" 2019

Future worlds
2050

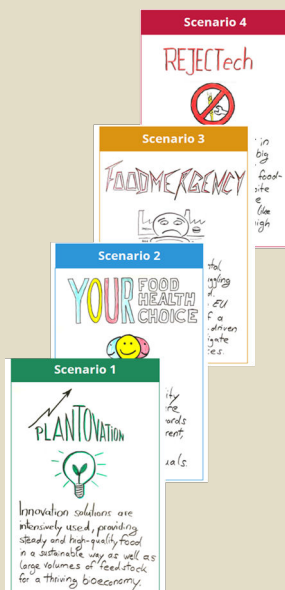
Alternative
outcomes

technologies



EU crops

WP 1



Multidimensional assessment of the option space

WP 2

Economic, Social and
Environmental Impact

WP 3

Societal Needs and
Expectations

WP 4

International
Cooperation

Strategy Development

WP 5

- Roadmap to future proof the EU crops
- Improved societal awareness and engagement
- In depth anticipation of economic, social and environmental impacts



SORGHUM,
A KEY TO BUILD
OUR FUTURE.

Acknowledgements

3RD EUROPEAN SORGHUM CONGRESS

WP1 team:

Aleksandra Malyska (PlantETP)

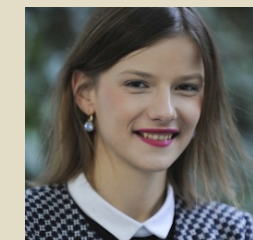
Vandasue Lily Rodrigues Saltenis (University of Copenhagen)

Mathias Pribil (University of Copenhagen)

Philippe Nacry (INRAE)

Martin Parry (Lancaster University)

Alexandra Baekelandt (UGent, VIB)

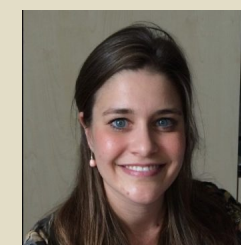


WP2: Jessica Davies (Lancaster University)

WP3: Ralf Wilhelm (Julius Kühn Institute)

WP4: Norbert Rolland (INRAE)

WP5: Jeremy Harbinson (Wageningen University)



Coordinator: René Klein Lankhorst (Wageningen University)



CAMPAIGN FINANCED
WITH AID FROM
THE EUROPEAN UNION

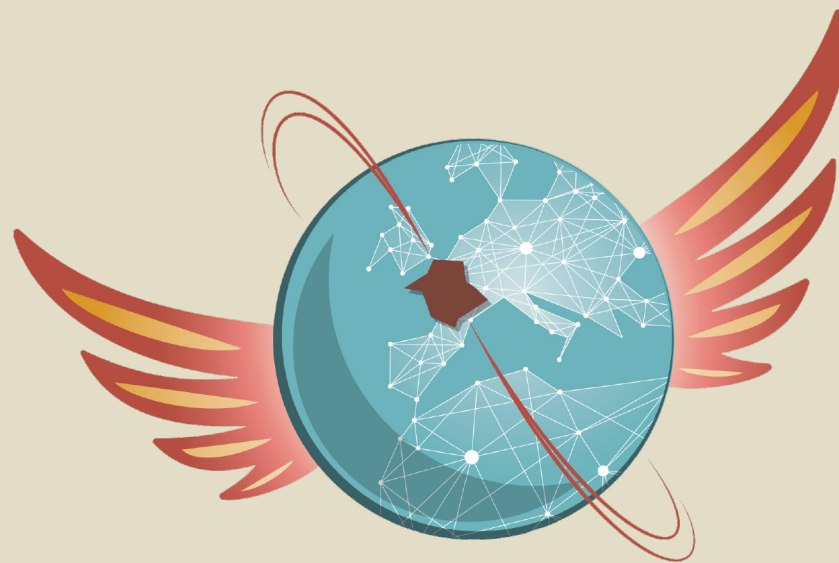
The content of this promotion campaign represents the views of the author only and is his/her sole responsibility.
The European Research Executive Agency (REA) do not accept any responsibility for any use that may be made of the information it contains.





SORGHUM,
A KEY TO BUILD
OUR FUTURE.

3RD EUROPEAN SORGHUM CONGRESS



Thank you

- Sign up for our newsletter:

www.cropbooster-p.eu/newsletter

- Get in touch:

info.cropbooster-p@wur.nl



@cropbooster

Partners



CAMPAIGN FINANCED
WITH AID FROM
THE EUROPEAN UNION

The content of this promotion campaign represents the views of the author only and is his/her sole responsibility.
The European Research Executive Agency (REA) do not accept any responsibility for any use that may be made of the information it contains.

