



**A COMPREHENSIVE TURNKEY SERVICE
TO FIGHT INVASION OF THISLTE IN SUGAR
BEET.**

**HERBICIDE'S VOLUME REDUCTION ON
THISLTE IN SUGAR BEET WITH SNIPER
TECHNOLOGIES : A LESSON ON HOW
FARMERS WILL USE NEW TECHNOLOGIES**

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Who are we?



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Summary

1. Why « ease the fight on thistle in sugar beet » ?
2. 3 years of experiments : results and perspective
3. Guidelines on how to enhance technology acceptance by the farmers
4. Conclusions and Perspectives

01

**Why « ease the
fight on thistle in
sugar beet » ?**



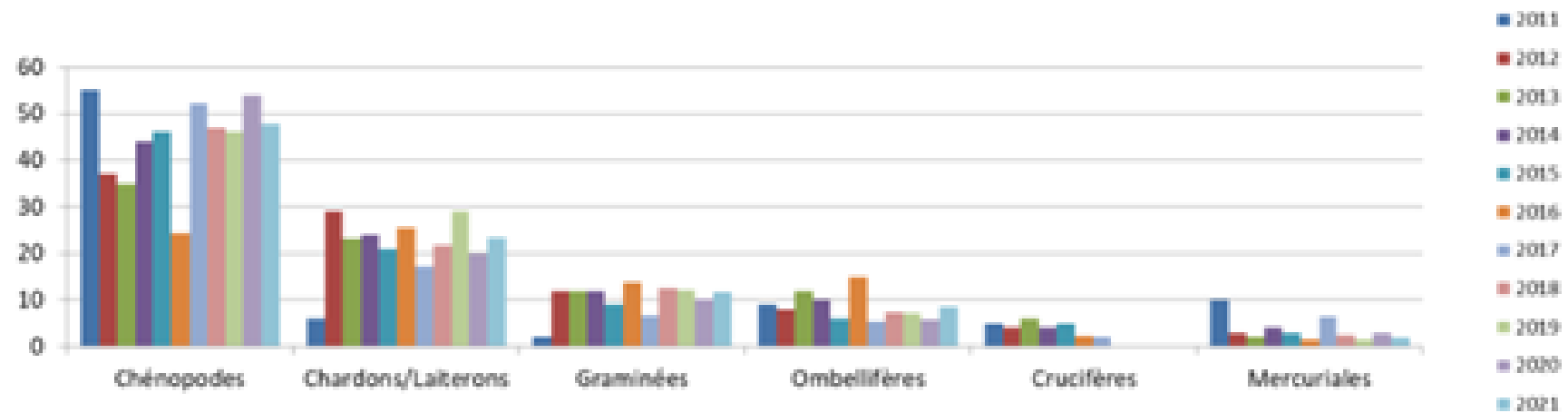
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Thistle in sugar beet



- ▶ Second least mastered adventice in sugar beet
- ▶ Presence of thistle has a direct impact on sugar beet yield and sugar content
- ▶ Berthoud and Corteva intuition : link precision Ag technology with active products know how can help

Evolution et répartition de la flore adventice non contrôlée en culture de betteraves en fin de désherbage (2011 à 2021)



Ease ? why ease ?

Reduction in TFI can be achieved through a combination of Precision Ag Techniques

- ▶ Spot Spraying is one of these technologies

These technologies require multiple cross-skills and time to be installed and mastered :

- ▶ An active product
- ▶ An application technology
- ▶ A human being to run the solution

Our hypothesis

Combining up-to-date techniques (such as SNIPER/LONTREL) will possibly be a solution only if farmers have an easy access to it.

Why do we (Berthoud and Corteva) want to address this issue

Berthoud

- ▶ As a specialist in sprayers, Berthoud started to explore spot Spraying in 2016.
- ▶ End 2019 : Nice perspectives but lot of practical questions raised by the farmers.
- ▶ We understand, we will not solve the problems alone

Corteva

- ▶ As a specialist in plant protection, Corteva sees Spot Spraying as an answer to societal pressure on PPP
- ▶ Prior partnering track record with OEM Manufacturers
- ▶ We understand, we will not solve the problems alone



- ▶ 2019 : discussions on first results : we understand the need to focus jointly on a single use case and integrate users into the loop
- ▶ Idea to focus on the fight of thistle in sugar beet : we decide to set up a joint experiment to find a way to enter the market
- ▶ This is the result of this program that we present today : Performance of the technique and acceptance by the users

02

**3 years of
experiments :
results and
perspectives**



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2020

Method

- ▶ Compare Sniper with usual application
- ▶ Pragmatic and quick test

Plot 1 : 46 ha - La Marnière – sowed 27th of March

Farmer's method	Control Plot	Spot Spraying Method
Lontrel SG 0,174 kg/ha + 1 liter Oil	Spraying width 36 m	Lontrel SG 0,174 kg/ha + 1 liter Oil

Plot 2 : 30ha – Les Fosses – sowed 23rd of March

Farmer's method	Control Plot	Spot Spraying Method
Lontrel SG 0,174 kg/ha + 1 liter Oil	Largeur Pulvé 36 m	Lontrel SG 0,174 kg/ha + 1 liter Oil

Results

- ▶ An average reduction of **85%** of TFI reduction
 - Estimated by SNIPER vs usual application process.

Question : can we comfortably « sell » 85% of TFI reduction ? Is it a robust result ?

Next step : we need to conduct a field trial with 3rd party control

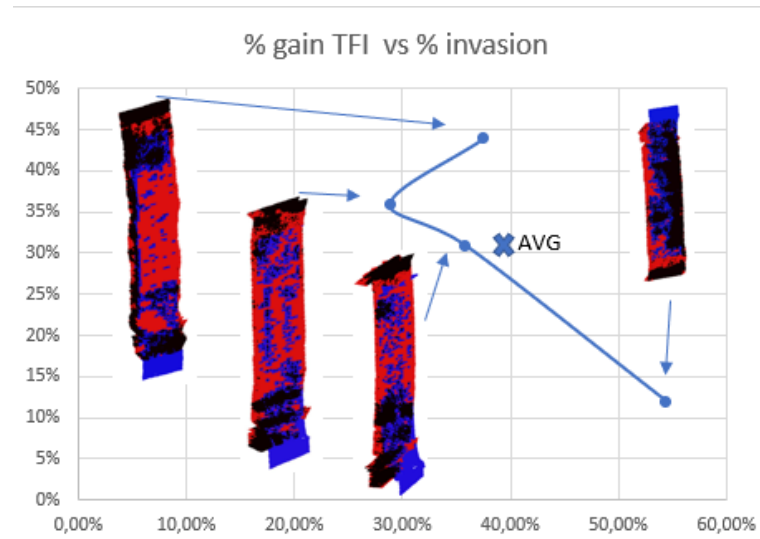
2021

Method

- 5 modalities comparing Bi-dose with and without Spot Spraying

Result

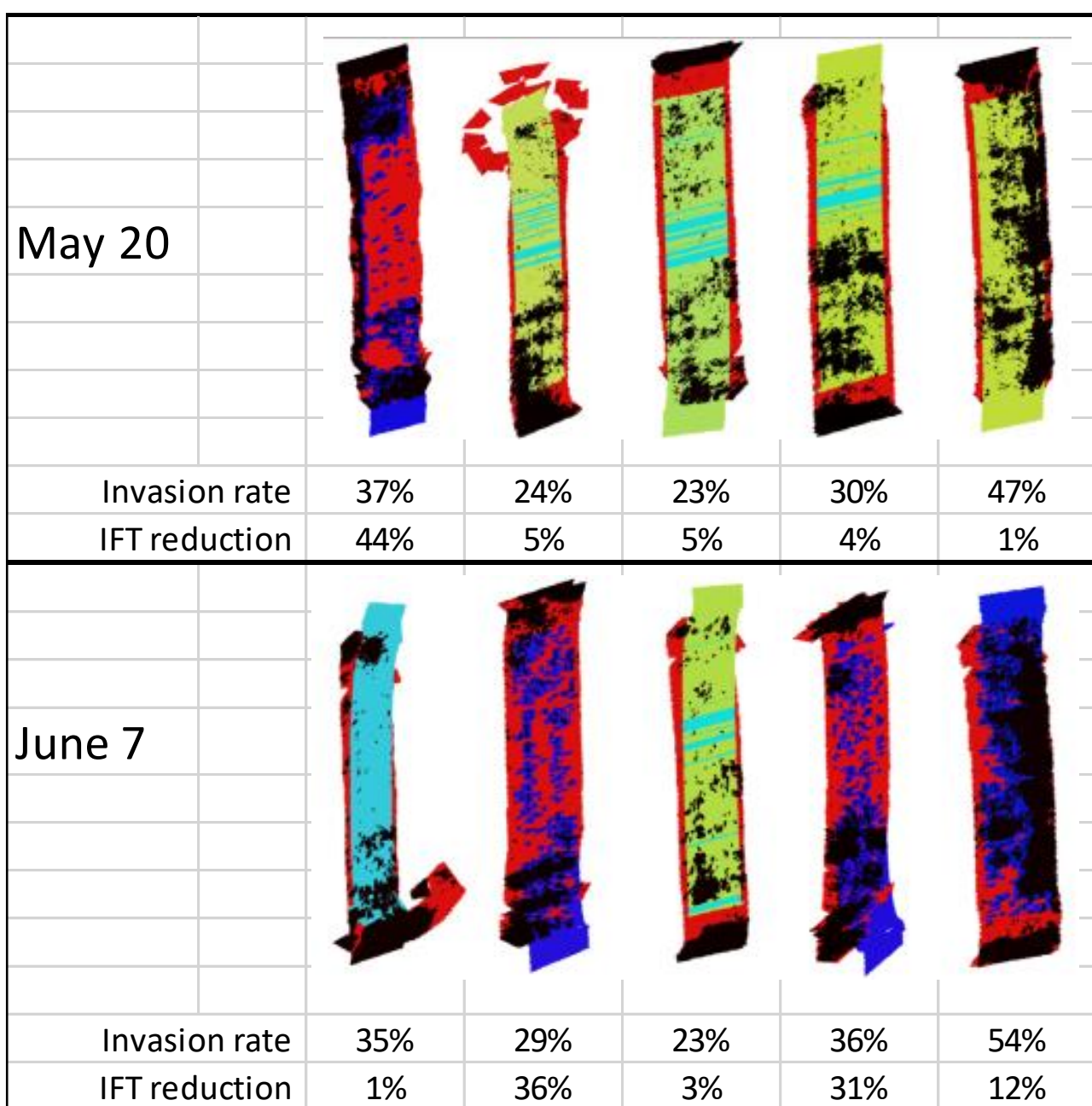
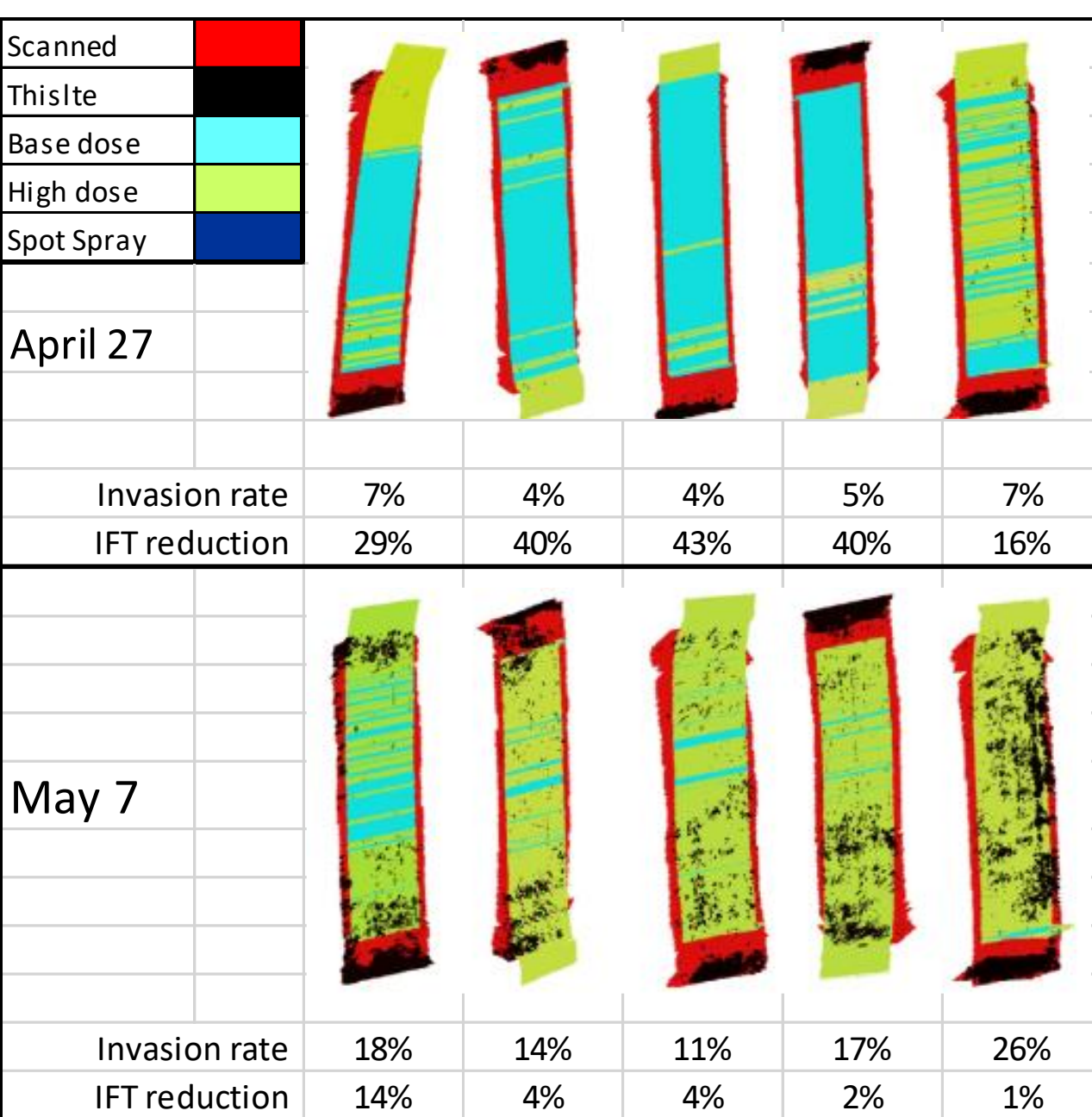
- Average gain of 31%
 - Varying with the presence of thistle



Scanned					
ThisIt					
Base dose					
High dose					
Spot Spray					
April 27					
Invasion rate	7%	4%	4%	5%	7%
IFT reduction	29%	40%	43%	40%	16%
May 7					
Invasion rate	18%	14%	11%	17%	26%
IFT reduction	14%	4%	4%	2%	1%
May 20					
Invasion rate	37%	24%	23%	30%	47%
IFT reduction	44%	5%	5%	4%	1%
June 7					
Invasion rate	35%	29%	23%	36%	54%
IFT reduction	1%	36%	3%	31%	12%

See detailed image
next slide

Learning : performance prevision is more robust
Next step : focus on user's acceptance.



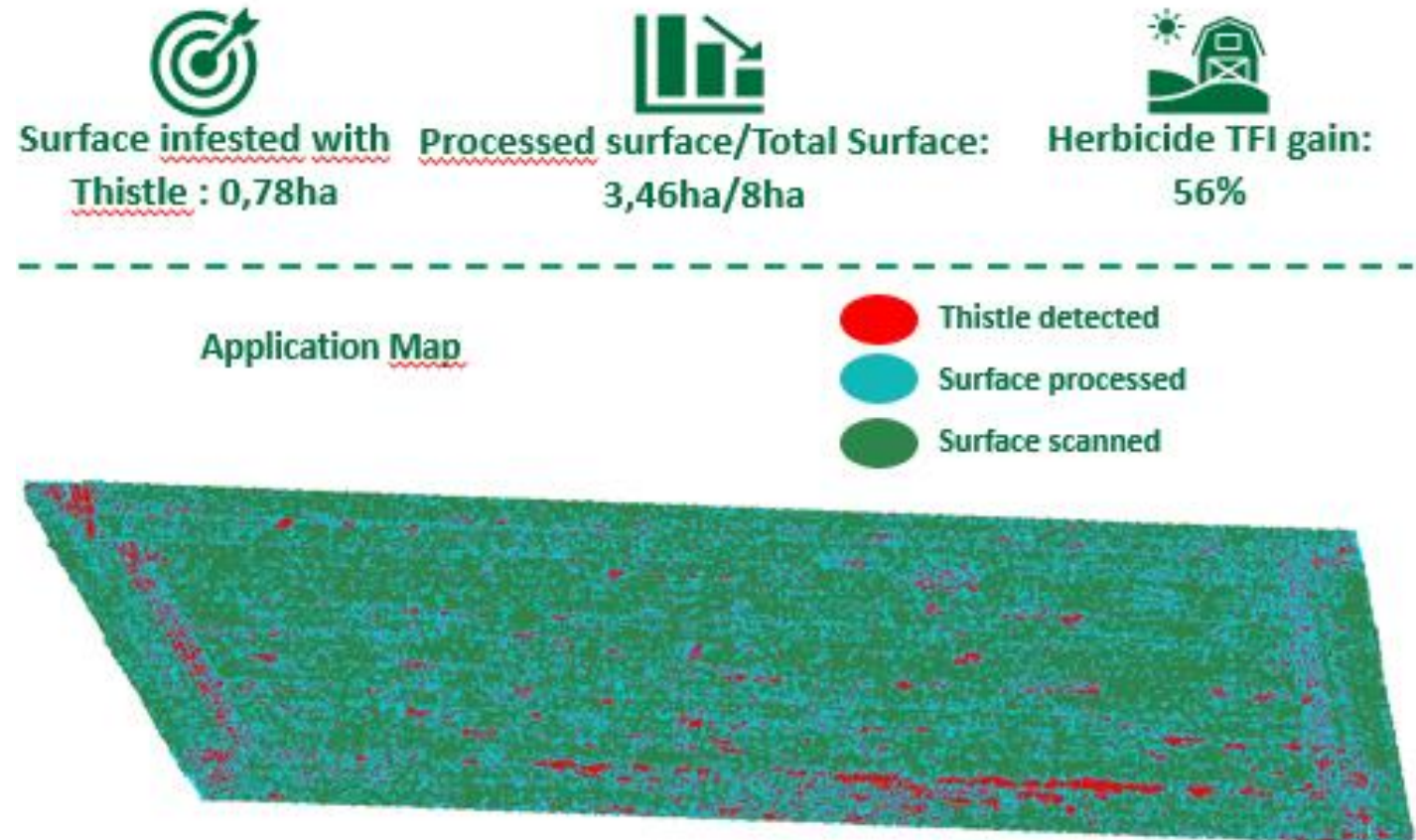
2022

Method

- ▶ Go live with service offering « LONTECH »
 - 15 farmers
 - 70 plots
- ▶ Berthoud and Corteva have played the role of service operator
 - The farmer orders the service on a web portal.
 - « We » operate the service.
 - Farmers are kept informed by text message sent by the portal.

Results

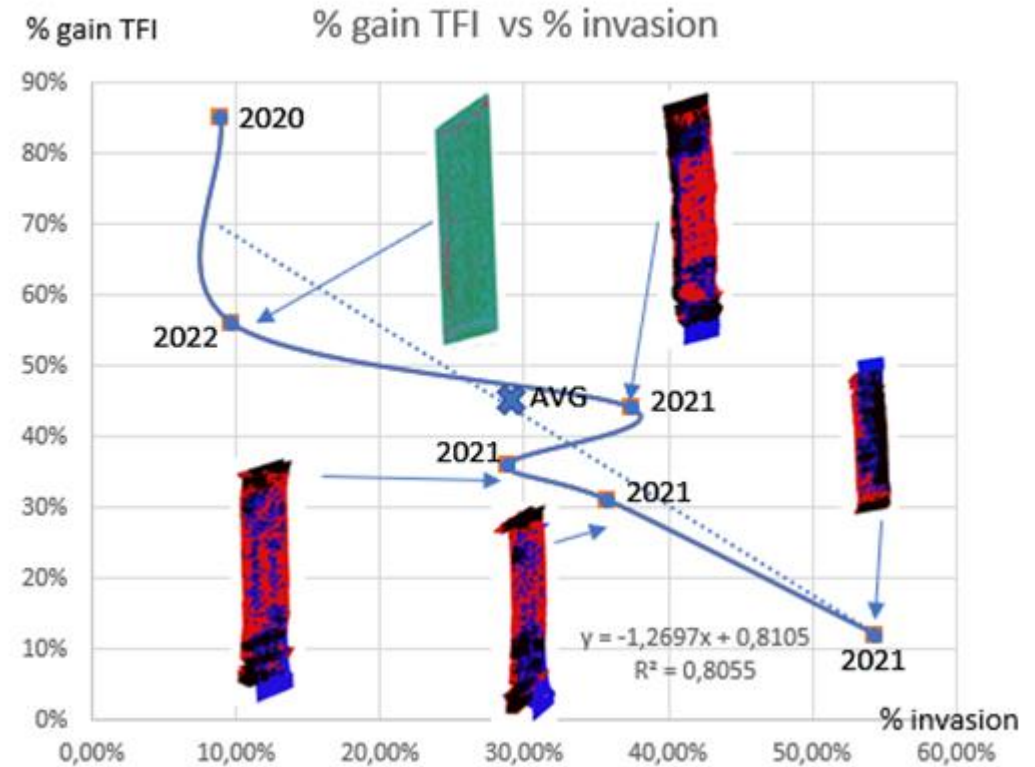
- ▶ Go live with service offering « LONTECH »
 - 500ha processed
 - Average 50% of reduction in TFI.
 - Farmers are satisfied : it is easy, efficient, secure.



Wrap up

A clear picture on the foreseeable performance of the technology

A methodology for assessing the benefit « seen from the farmer »



Next part : How does it lower the barriers of acceptance ?

03

**Guidelines on how
to enhance
technology
acceptance by the
farmer**



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Why is it difficult to use precision-ag technology ?

Method

- ▶ Survey in the Ag ecosystem
 - 2020-2021
 - 67 interviews
 - 14 barriers of acceptance were identified

- ▶ Trends have been confirmed in 2022 by a survey on 884 farmers

Barriers playing against the penetration of new spraying technologies (multiple replies)		
Difficult to find skilled and motivated drivers	34	51%
Legal and normative context is adverse to investment	31	46%
No technical system can replace completely the human know how	31	46%
Who take the risk on the yield if the technology doesn't work	30	45%
Mandatory declarations are complex, take time to fullfill	24	36%
The risk to invest in a hig-end tech is too high versus a versatile context	21	31%
Many software and mobile apps are not compatible with each other	19	28%
Not all workers on the farm can use all the systems, complexity remains in information sharing	18	27%
Access to Precision-Ag tool is too complicated	17	25%
Need to fill out many times the sames information in the diverse systems and softwares	16	24%
Relations with the neighbourhhod are always more complicated	15	22%
The dispatching of application task is moving every single minute	15	22%
Technologies are not accessible to anybody	10	15%
The technologies are not available to adress the challenges	3	4%

What are the issues addressed with this experiments

Out of the 14 barriers identified

- ▶ We addressed 9 out of the 14 with the service offering « Lontech »
 - 7 with a positive outcome
 - 2 still need to find a proper solution : yield insurance linked to the technology and reduce the administrative burden.

Barriers playing against the penetration of new spraying technologies (multiple replies)	Barrier lowered or to be managed in the future	Level of satisfaction of the farmer
Difficult to find skilled and motivated drivers	included in the service	+++
Legal and normative facte moving context is adverse to investment		Not addressed
No technical system can replace completely the human know how	IFT reduction managed completely by the system	+
Who take the risk on the yield if the technology doesn't work	still to be addressed	--
Mandatory declarations of spraying activites are complex and time consuming		Not addressed
The risk to invest in a high-end tech is too high versus a versatile context	Price of the service is competitive for all stakeholders	++
Many software and mobile apps are not compatible with each other		Not addressed
Not all workers on the farm can use all the systems, complexity remains in information sharing		Not addressed
Access to Precision-Ag tool is too complicated		++
Need to fill out many times the sames information in the diverse systems and softwares	still a wide ecosystem issue	---
Relations with the neighbourhood are always more complicated	Package into a service render the access very easy	+++
The dispatching of spraying tasks is moving constantly in a day.	Problem transfered to the service provider	+
Technologies are not accessible to anybody (Price, complexity)		+
The right technologies are not available to adress the challenges		Not addressed

What are the issues that were not addressed in this experiment

Legal and Normative environnement linked with increasing need of traceability and interoperability

► Seen from the farmers

- The form of a packaged service dedicated to the farmer will be a privileged way of scaling up technical solutions.
- Today, technology itself is not the limit, application of the technology is difficult if the farmer is « left alone »

Barriers playing against the penetration of new spraying technologies (multiple replies)	Barrier lowered or to be managed in the future	Level of satisfaction of the farmer
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Technologies are not accessible to anybody (Price, complexity)		+
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What is the innovation methodology, what are the results ?

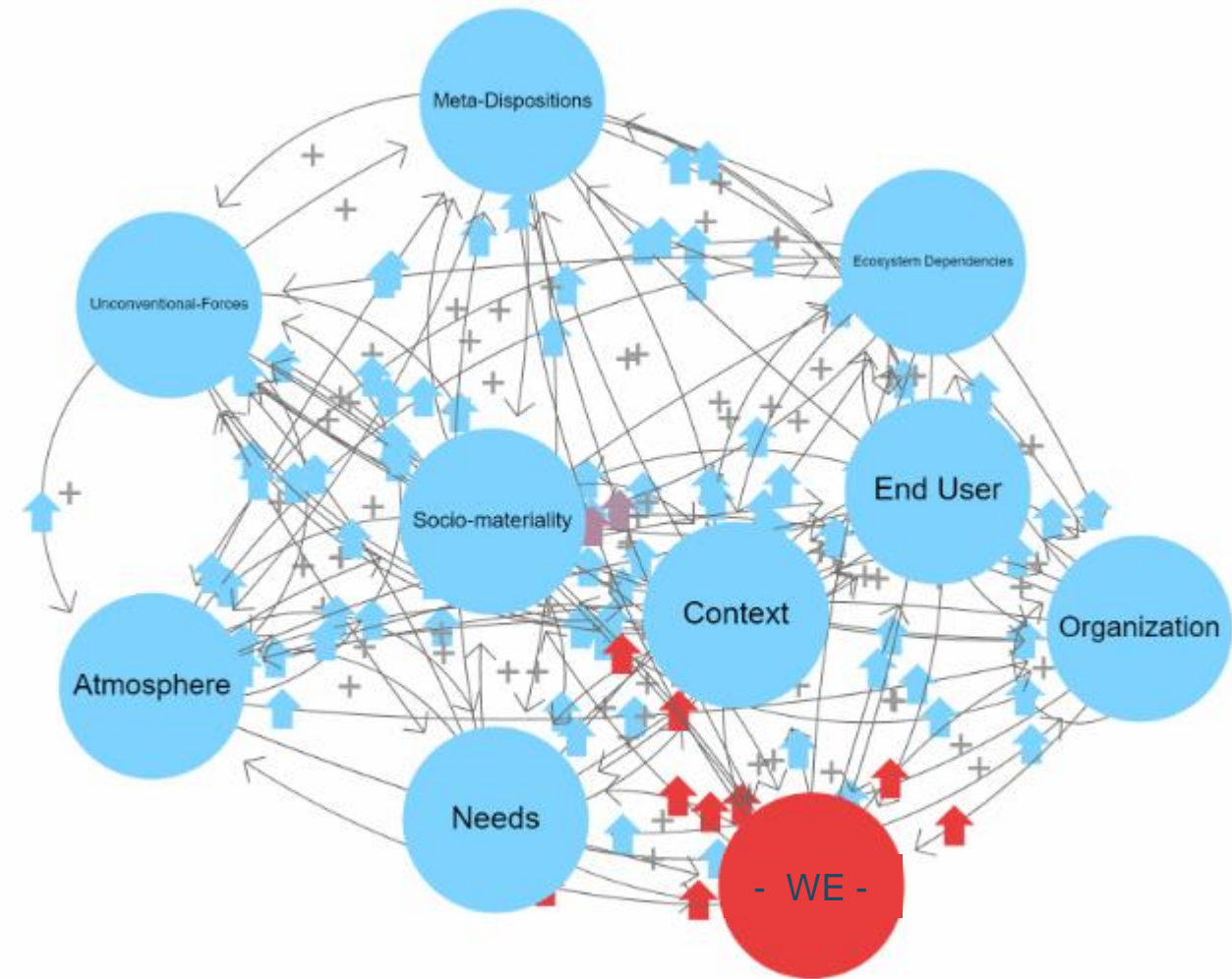
The innovation methodology

- ▶ Design thinking process
- ▶ Effectuation mindset
- ▶ Joint training of Berthoud and Corteva team at G-School

The results

- ▶ Mix technical development and stakeholder acceptance
- ▶ Testing potential partnership in real life

Opening ourselves to future new partners sharing our « vision of the world »



04

Conclusions and Perspectives



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On the technology

Conclusion

- ▶ More robust results on the performance of the solution : We can now comfortably take engagement on a performance level.

Perspective

- ▶ Combined techniques is the way : federate the efforts of Ag-equipment manufacturers, firms, service providers and farmers.

On the acceptance

Conclusion

- ▶ We lowered the main barriers of acceptance thanks to packaging into a single service

Perspective

- ▶ Still optimization in reducing the barriers of acceptance
 - We aim at testing digital solutions in 2023
 - Partnership and interoperability is key : welcome to those who would like to bring their added value and want to answer to the Agro-ecological objectives set by the society !

QUESTIONS & ANSWERS