Perceptions of genome editing in farm animals by livestock stakeholders

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E. Delanoue, **R. Duclos**, L. Journaux, D. Guéméné, M. Sourdioux, A.C. Dockès, R. Baumont, J.P. Bidanel,

Objective

❖ The application of Genome editing (GE) in agriculture is controversial

❖ Sociotechnical controversy :

- *Unstabilized knowledge about a scientific or technical object*
- *Goes beyond the scientific field*
- *Broader uncertainties (ethical, social, legal, etc.)*

❖ GE : a topic that straddles two controversies

- *On GMOs*
- *On livestock*

❖ Objective of the study : better understand the position of the actors of the livestock sector regarding the use of GE

Material & methods

❖ Qualitative survey among different livestock stakeholders

- 48 semi-structured interviews (1h25 on average) conducted by Raphaëlle Duclos

- Open-ended questions, complemented by cards presenting typical cases of GE applications (for people who did not know applications of GE)

- The interviews were registered and analysed a posteriori used a common framework

Table – Distribution by activity sector of the interviews

Activity sector	# interviews
Research	12
Public authorities	4
Breeding sector	8
Agriculture (except breeding)	7
Retailing sector	3
Civil society (NGO…)	14

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Results

- What are the uncertainties put forward by the interviewees

- An attempt at a stakeholder typology

- Additional arguments

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Results - What are the uncertainties ?

Main				Secondary
Technological uncertainties	**Environmental & (bio)diversity impacts**	**Impacts on animals**	**Socio-political uncertainties**	**Sanitary impacts**
• "Off-target" effects • Collateral effects • Ability to identify genes of interest	• Gene transfer and escape prevention capabilities • disruption of ecosystems • Impacts on wild and domestic biodiversity	• Effects of genome modifications • Impacts of possible related techniques	• Traceability and segregation of supply chains • Legal framework • Patents and privatization of life • Acceptability to society	• Human health risk assessment

Agricultural model

Irreversibility   **Irreversibility**
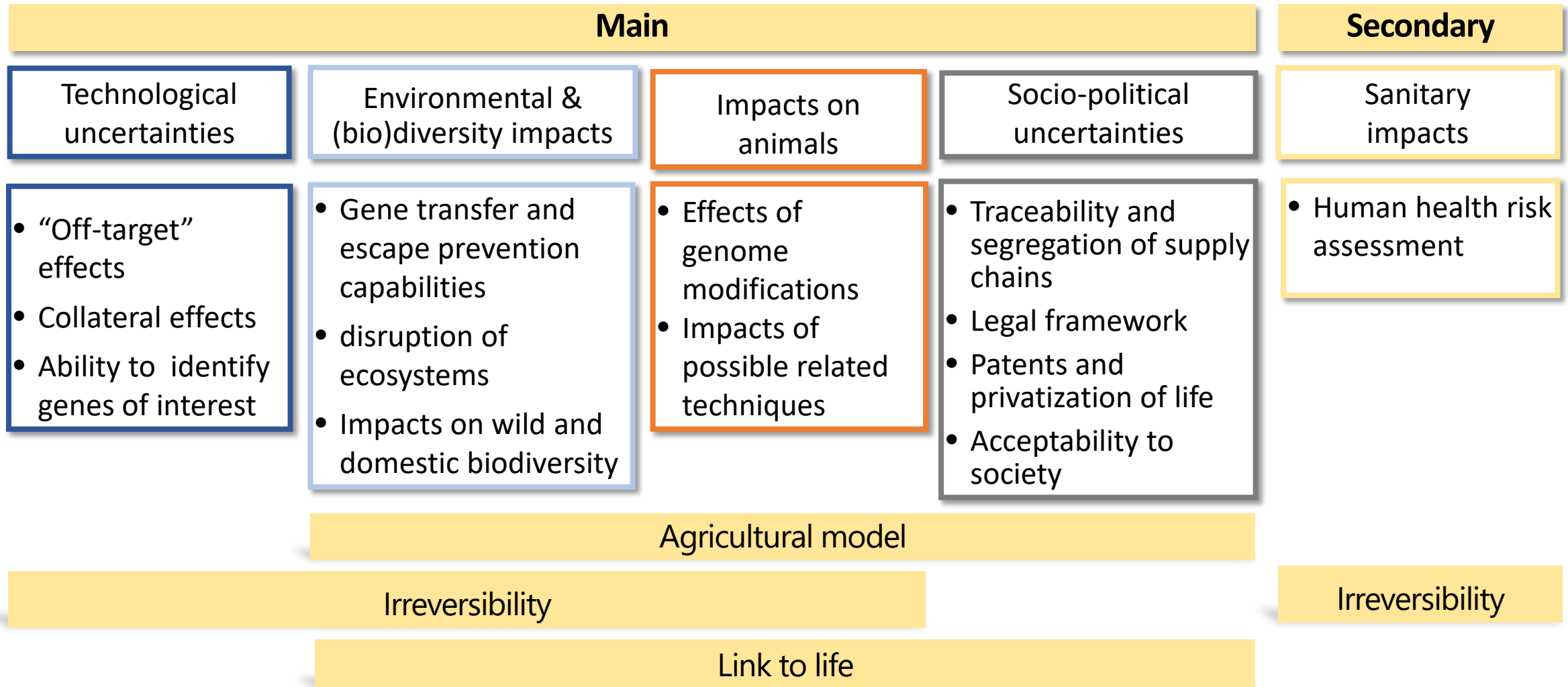
Link to life

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Results - What are the uncertainties ?

ETHICAL
Status of living organisms

- Artificialization of life
- Interventionism

- Modification of the essence of animals and species

TECHNICAL

Level of expertise of the tool
- Off-target effects
- Unexpected effects

What are collateral effects ?
- Animal welfare uncertainties
- Environmental uncertainties
- Human health uncertainties (secondary)

Are the changes irreversible?

FINALITY

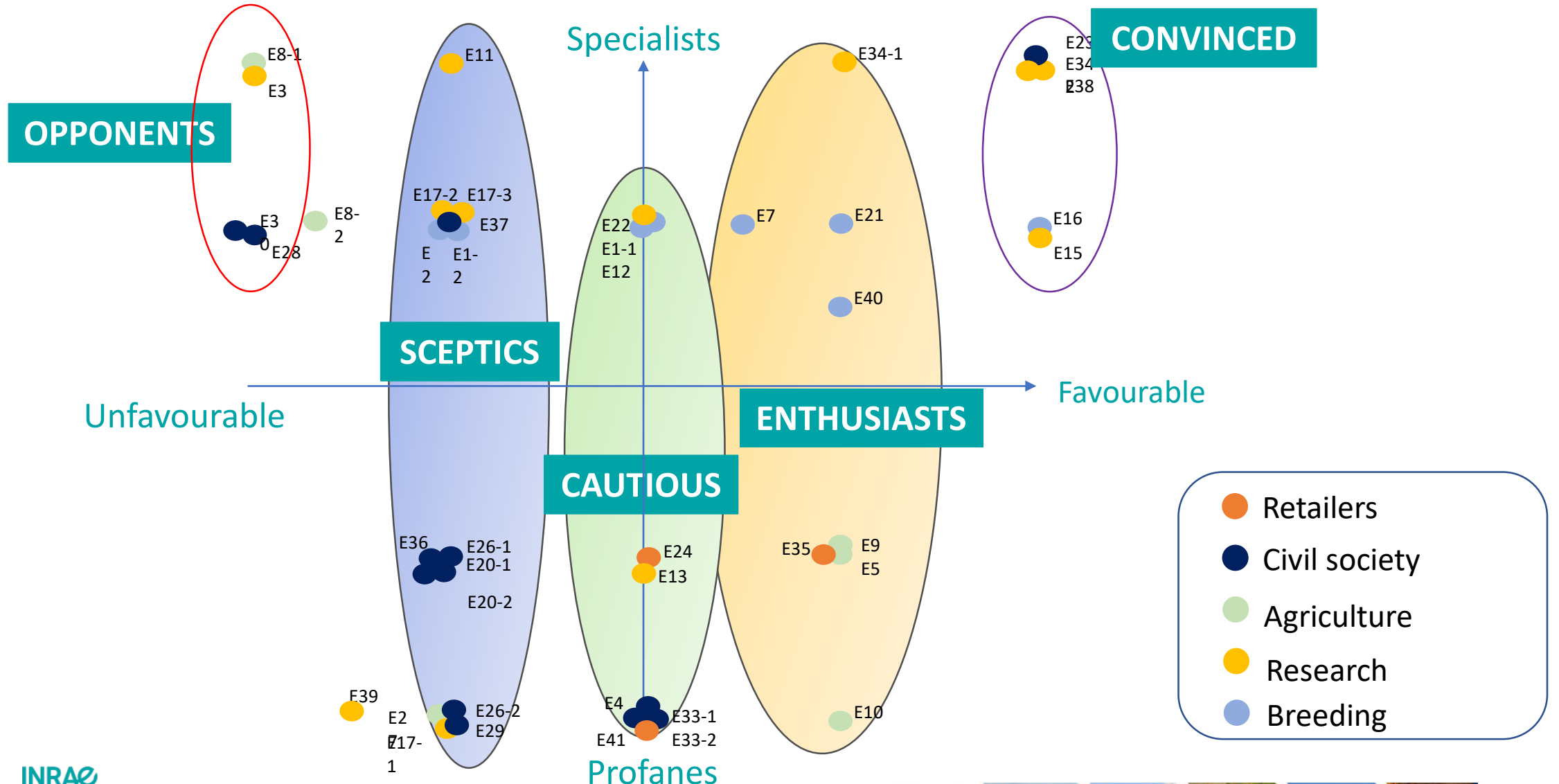Is the level of knowledge sufficient to propose interesting applications?

In which farming system(s) will these techniques fit?
- Socio-Economic uncertainties
- Animal welfare uncertainties
- Environmental uncertainties

Are there any alternatives?

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Typology of stakeholders

OPPONENTS

CONVINCED

SCEPTICS

CAUTIOUS

ENTHUSIASTS

Specialists

Favourable

Unfavourable

Profanes

E8-1
E3
E3
E28
E8-2
E11
E17-2 E17-3
E37
E2
E1-2
E22
E1-1
E12
E7
E21
E40
E34-1
E2
E34
E38
E16
E15
E36
E26-1
E20-1
E20-2
E39
E2
E17-1
E26-2
E29
E24
E13
E4
E41
E33-1
E33-2
E35
E9
E5
E10

Legend:
- Retailers
- Civil society
- Agriculture
- Research
- Breeding

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Typology of stakeholders

OPPONENTS

"We have exactly the same claims and promises with GE as with GMOs 30 years ago"

CONVINCED

"A necessary tool to feed the world in the future"

Specialists

SCEPTICS

"It's more the interest for the sector itself that is being questioned"

CAUTIOUS

ENTHUSIASTS

"I foresee a lot of possible outcomes for the listock sector.""

"As long as it is a matter that is validated by the society as a whole, whether from a legal, consumer or NGO perspective, we have no issue with it"

Layman

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› Additional arguments

- An additional tool in the geneticist toolbox

- "Could be used for traits that are difficult to improve with other techniques"

- Could be useful to break down unfavourable associations between antagonistic traits"

- Particularly promising to improve animal health related traits or animal welfare
  - *when an animal suffers, we are ready to do anything, or at least to increase our range of action, because we have the feeling that morally we are doing the right thing.*

- But there is no consensus even for these traits
  - *"animal welfare washing"*
  - *"should not be a solution for maintaining untenable livestock practices"*

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Conclusion

- Even if it is limited to France, this study has made it possible to identify the main uncertainties related to the potential use of GE in farm animals and the range of positions and arguments regarding these technologies The controversy on GE is still confined to specialised spheres and current positions are subject to change

- it also highlighted some rather profound discrepancies that reflect divergent visions on future agricultural systems and the on the role on science in society, at least in France and, to some extent, in Europe

- The controversy about GE is partly related to the controversy about livestock farming systems. Its use is often associated with an industrial agricultural model criticized or rejected by some actors

- Scientific, legal, societal … aspects regarding GE are rapidly changing, so that the controversy about GE might soon leave the sphere of the specialists.

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Thank you for your attention

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