VALORISATION SCENARIOS FOR INSECT REARING DESIGNED IN THE DESIRABLE PROJECT

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Insectinov2- Session 4:
Environmental, economic and societal approach in order to assess the relevance of each sector

Insectinov 2-Adebiotech/AgroParisTech

OUTLOOK

Introduction

1) Building framework- scenarios
    1) Organisation
    2) Getting the stake-variables
    3) Getting the framework- scenarios
2) Outputs: the generated scenarios
    1) 7 scenarios out of the DESIRABLE's scope
    2) 9 scenarios on artisanal scale
    3) 7 scénarios on an industrial scale
3) Conclusion

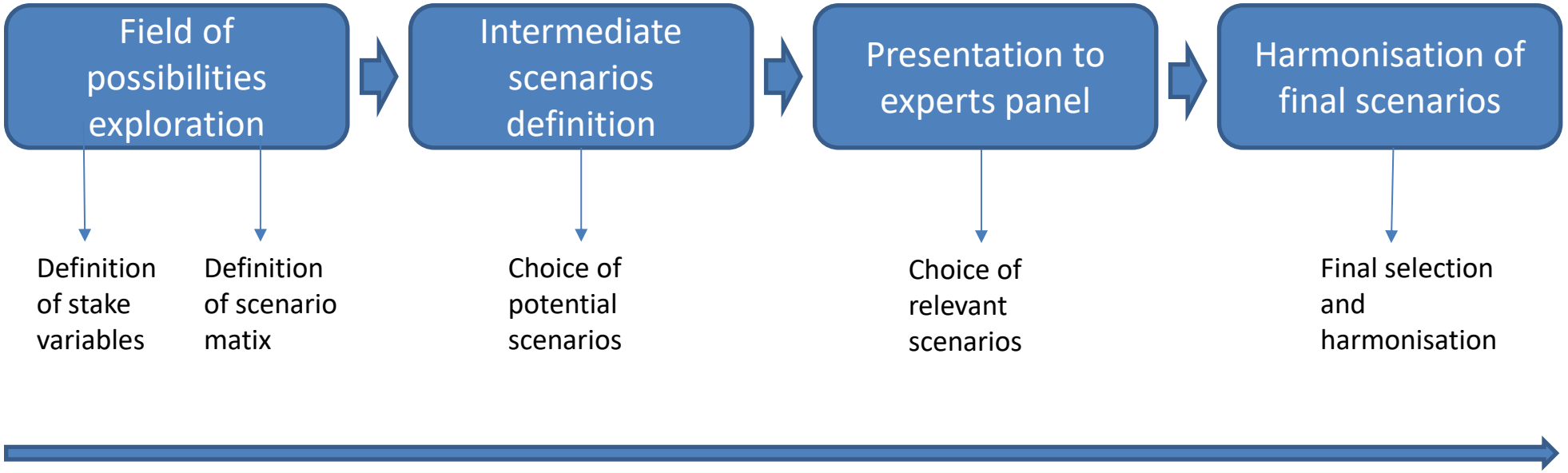
INTRODUCTION

- Great hopes in insects production development…
- Several questions remain:
  - What are the development models?
  - How to combine production constraints and market demand?
  - What about the relevance of the development models?

- Creation of bioraffineries scenarios in Desirable project

ORGANISATION

Participants : Ynsect, CNRS LEGS, INRA UMR SAS, IRSTEA UMR ITAP, Agroparistech-CNRS

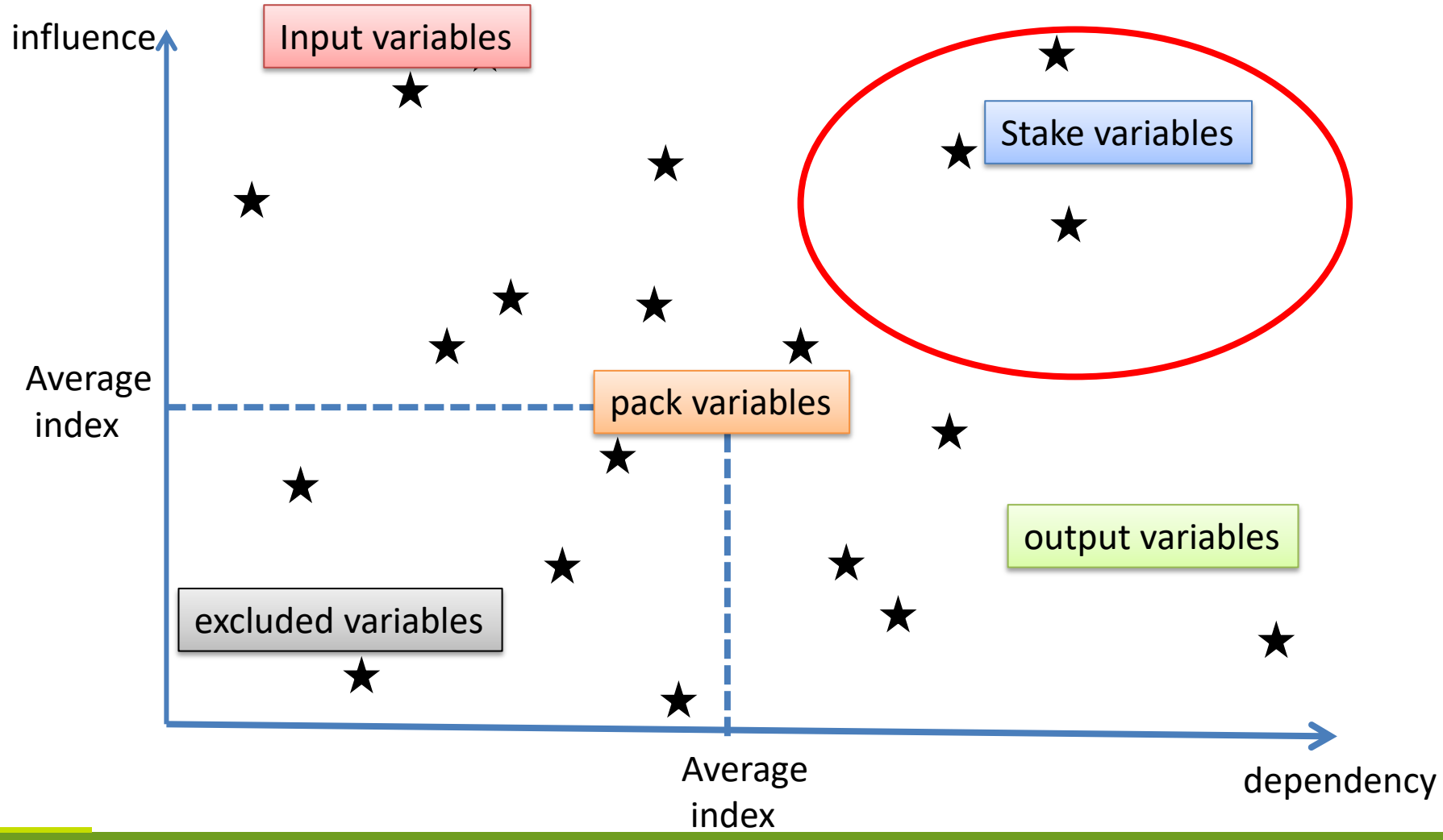


Implementation and adaptation of the methodology by M. Godet (CNAM)

SCREENED VARIABLES

	Variables
Insects nutrition	Nature de l'aliment (=substrat)
	Disponibilité de l'aliment
	Règlementation de l'aliment
	Profil nutritionel du produit sortant
Insects biology	Espece d'insecte élevé
	Acceptabilité du régime alimentaire par l'insecte
	Adaptabilité de l'insecte à la variabilité du régime ali
	Profil nutritionel du produit sortant
Insects rearing practices	Efficience d'élevage d'insectes
	Amelioration des perf d'élevage
	Sécurité des travailleurs
	Solutions techniques risque allergène
	Risque sanitaire consommateur (métaux lourds)
	Risque sanitaire de l'élevage
Economic integration level	Niveau d'intégration de l'élevage
	Niveau d'intégration de la filière
	Multiplicité des maillons filière
	Taille de la bioraffinerie
Location	Proximité de l'élevage gisement ou ferme
	Localisation geographique bioraf
Commercial outlet	Forme de valorisation insecte posttransfo
	Efficience de la transformation
Market tendancies	Consommation de viande poulet/truite
	Compétitivité du produit (farine)
	Compétition autres sources proteiques
	Reglementation environmentale élevage (ICPE, sps i
Coproducts	Espèces de destination
	Valorisation des coproduits

TYPES OF VIABLE IN STRUCTURAL ANALYSIS



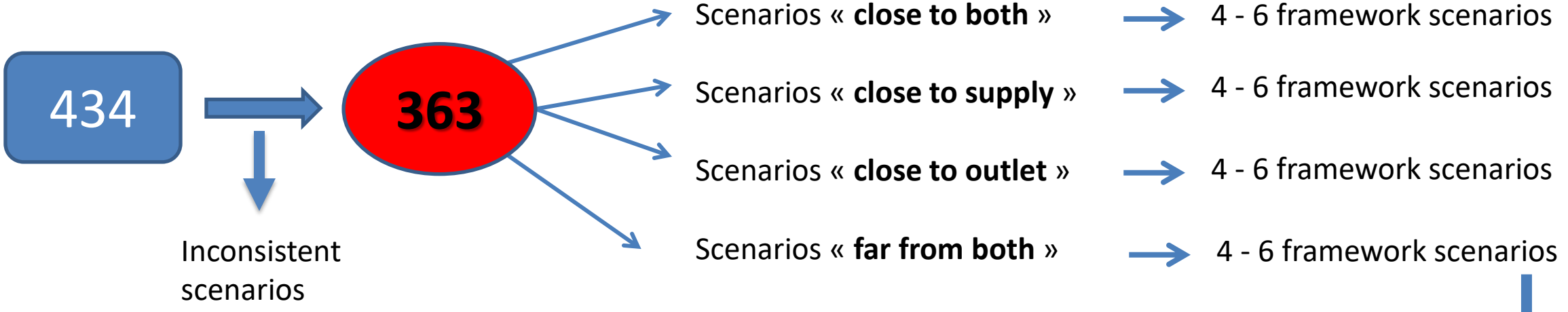
Adapted from Godet

DECLINATION OF THE 6 STAKE VARIABLES

Variables	Modality 1	Modality 2	Modality 3	Modality 4
Feed origin	Waste dominant	Coproduct dominant	Noble product dominant	
Biorafinery profile	Small farm/ small mill	Small farm/ large mill	Large farm/ large mill	
Location	Close to supply and market outlet	Close to supply	Close to market outlet	Far from supply and outlet
Products form	Alive/dried	Meal	Refined products	
Market for trout and poultry	Expansion	Decline		
Coproducts value	low	High		

434 framework scenarios

DISTRIBUTION OF SCENARIOS BETWEEN FOUR PAIRS WORKING GROUPS



Each pair of experts is in charge of screening the bunch of scenarios, while seeking for **typical** and **promising** ones.
Each pair of experts selects 4 to 6 scenarios, provides specification (fine-tuning), and performs a SWOT analysis, based on the **objective : « how the scenario is contributing to sustainable development? »**

23 SELECTED FRAMEWORK SCENARIOS

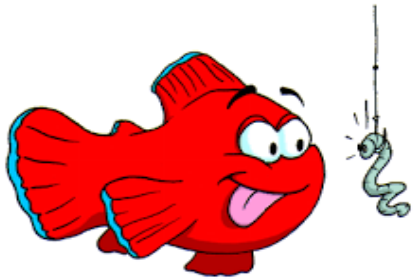
- 7 scenarios whose main (insect) function is « out of the DESIRABLE's scope »

- 16 scenarios aiming to « feed farm trout and poultry »
  - 9 at artisanal scale
  - 7 at industrial scale

THE 7 SCENARIOS OUT OF THE DESIRABLE'S SCOPE

- Purifying function (e.g. algae at river banks)
- Education-showcase function (educational farm)
- Selective **breeding**, zootechnical research, in sanitary isolation remote place
- Feeding game (e.g. in organic agriculture)
- Proteins hydrolysats for agro-food or health
- Feeding exotic pets and zoo animals, from waste valorisation
- « Brown chemistry » with several species, in industrial cluster

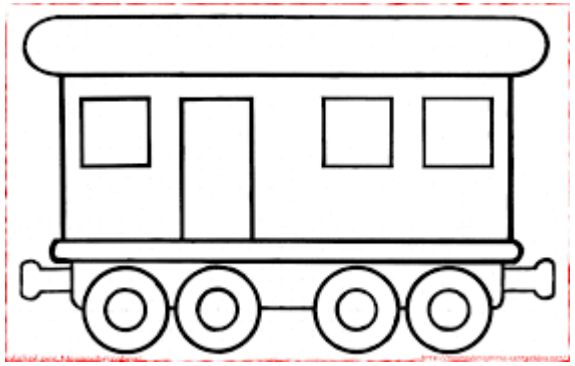
9 SCENARIOS AT ARTISANAL SCALE (1/2)



- **Live insects** for trout farms (with angling activity)
- CUMA for processing meal, outlets: **organic**

or « red label » meat (meat consumption + or -)

- Workshop linked to **school canteen with waste sorting**, used by two species.
- **Mobile workshop** linked to vegetable crops, regional processing



9 SCENARIOS AT ARTISANAL SCALE (2/2)

- Integrated husbandry of insects and **open-air runs poultry**

- Rearing insects on the **co-products of a large grain farm**
- **Insects box rearing** on the poultry farm, from supermarkets', schools' waste etc.
- Insects workshop **sized to provide all the proteins necessary** for the polyculture breeding farms, locally processed.

325 – Backyard workshop for feed complement

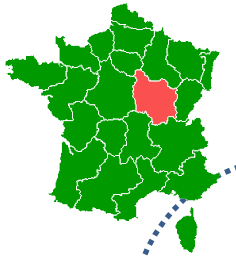
Organic wastes

Raw material
Insect feed
BSF larvae

Black soldier workshop integrated to fish/poultry farm

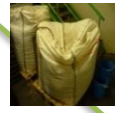
7 SCENARIOS AT INDUSTRIAL SCALE

- Territorial bio-refinery
- Centralisation in the processing plant, of several species of insects, raised in small farms, from various traceable waste
- Industrial farm, all on one site, near grain producing area
  - i) full insect meal;
  - ii) without chitin, defatted meal.
- From waste, integrated husbandry with poultry/trouts to replace GMO soya and/or fish meal, by insect meal.
- From co-products, integrated husbandry with poultry/trouts to replace GMO soya and/or fish meal, by insect meal.
- Insects rearing for both **feed** and health care.



125 - Territorial Bio-raffinery

Insect farms



Crop production

Industrial cooperative
Feed mill forinsects trout and poultry

Biodiesel rafiinery
Insect oil

Garden center
dropping

Trout farm

Poultry farm

Raw material
Insect feed
Meal worm meal
Products

CONCLUSION

- **Great number of goals and strategies** in insect value chain development
- **Different project scales** (from small workshops to national level)
- High influence of **resource supply** (nature, size of source, when?) and nature of outlets
- Two scenarios : territorial bio-reffinery and integrated industrial farm-mill, were used for environmental and social assessment
- Development of insect value chains in France requires adapted governance and more technological mastery

Desirable
insect biorefinery

THANK YOU FOR YOUR ATTENTION

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