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## Dealing with the variability and heterogeneity of raw materials: the governance of sustainable fruit-based supply chains

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**164th EAAE Seminar**  
**Preserving Ecosystem Services via Sustainable Agro-food Chains**

Dealing with the variability and heterogeneity  
of raw materials:  
the governance of sustainable fruit-based supply chains

Iciar Pavez – Zouhair Bouhsina

INRA, UMR MOISA, Interface Project, France

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Chania, Crete, Greece

Mediterranean Agronomic Institute of Chania (CIHEAM MAICh)

# Introduction

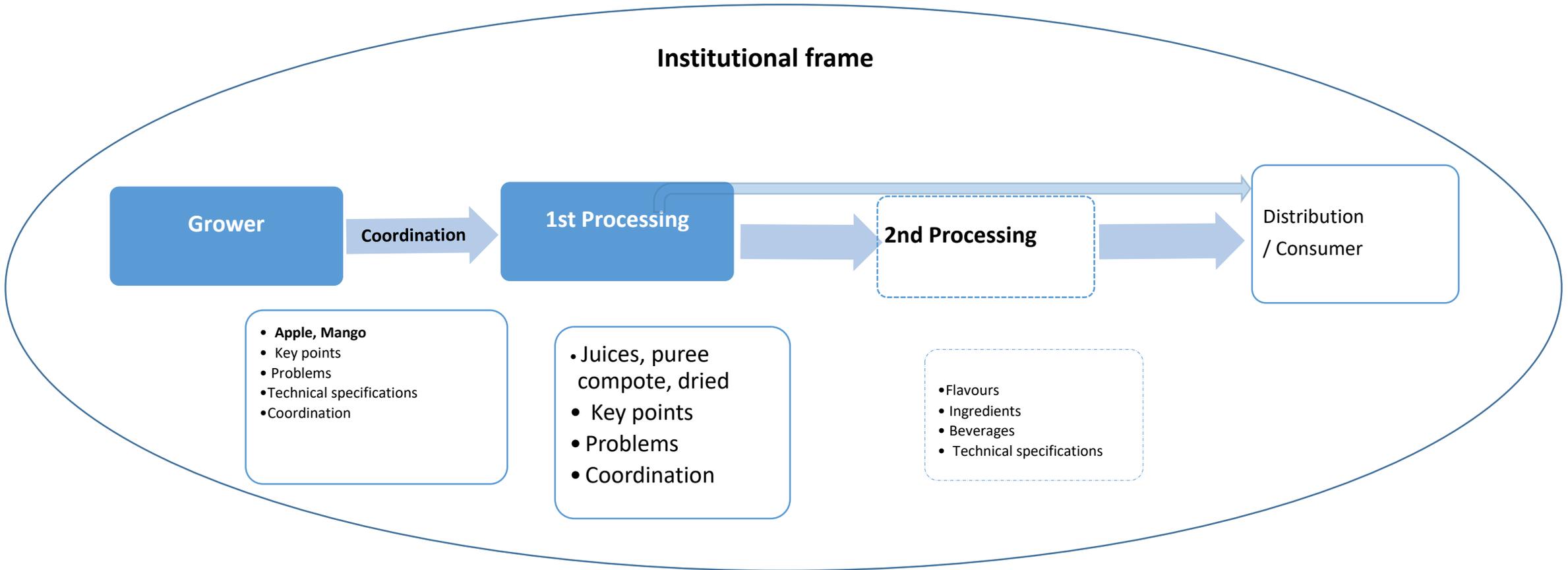
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- Agricultural products are living materials characterized by their variability and heterogeneity.
- This complexity makes difficult for growers and processors to control the food quality which is increasingly relevant and demanding.
- Quality has evolved towards a more comprehensive concept that beyond the organoleptic and nutritional attributes, involve the respect for sanitary, social and ecological considerations.

Our research question is:

- *How do firms manage the variability and the heterogeneity of fruits within the supply chains ?*
- Our main framework applied is New Institutional Economics: **Institutional analysis** by Menard (2017, 2018) and **Transaction Cost Economics** (Williamson 1996, 2008).

# Approach



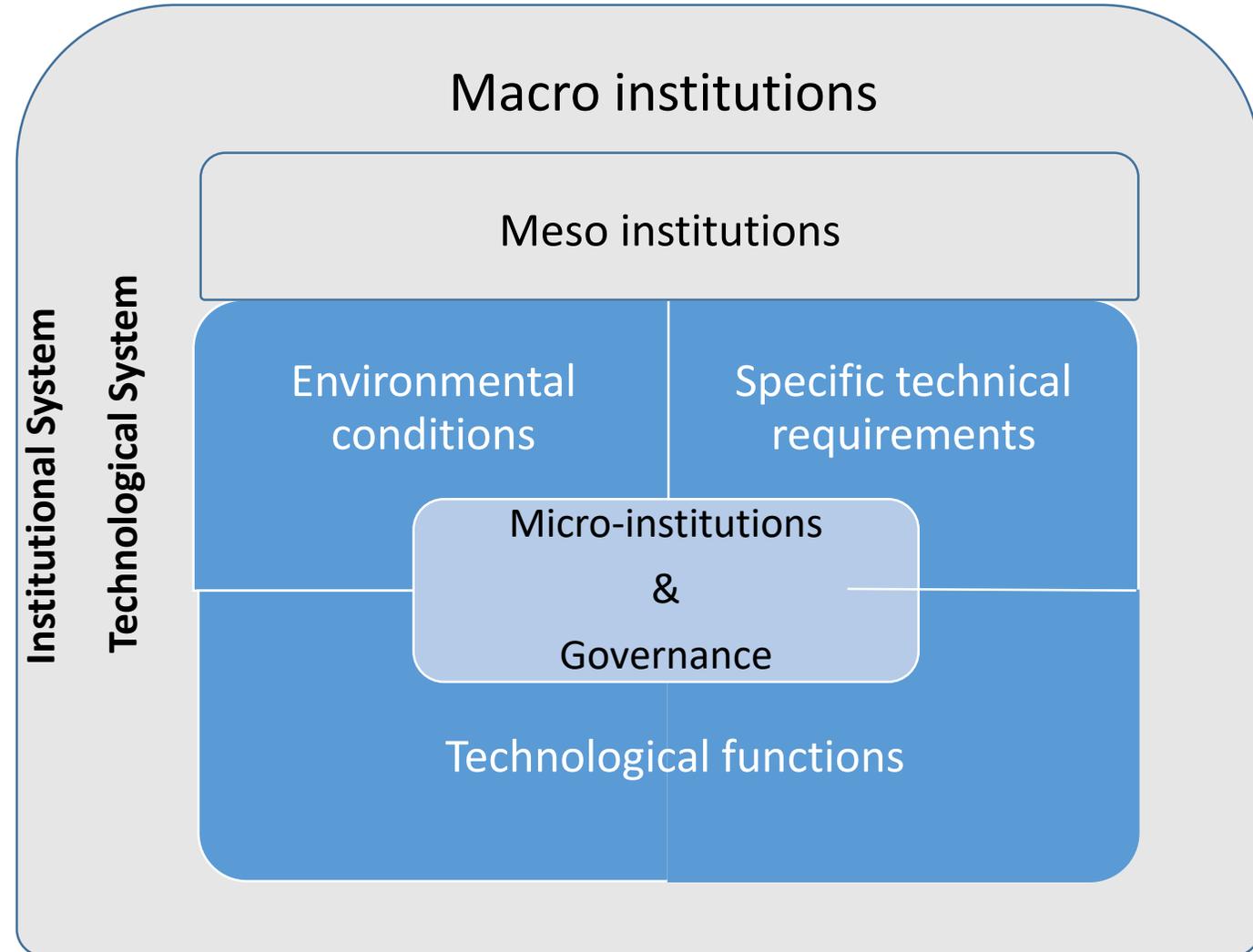
# Theoretical Framework:

- The agricultural supply chains are receivers and providers of ecosystem services.

They:

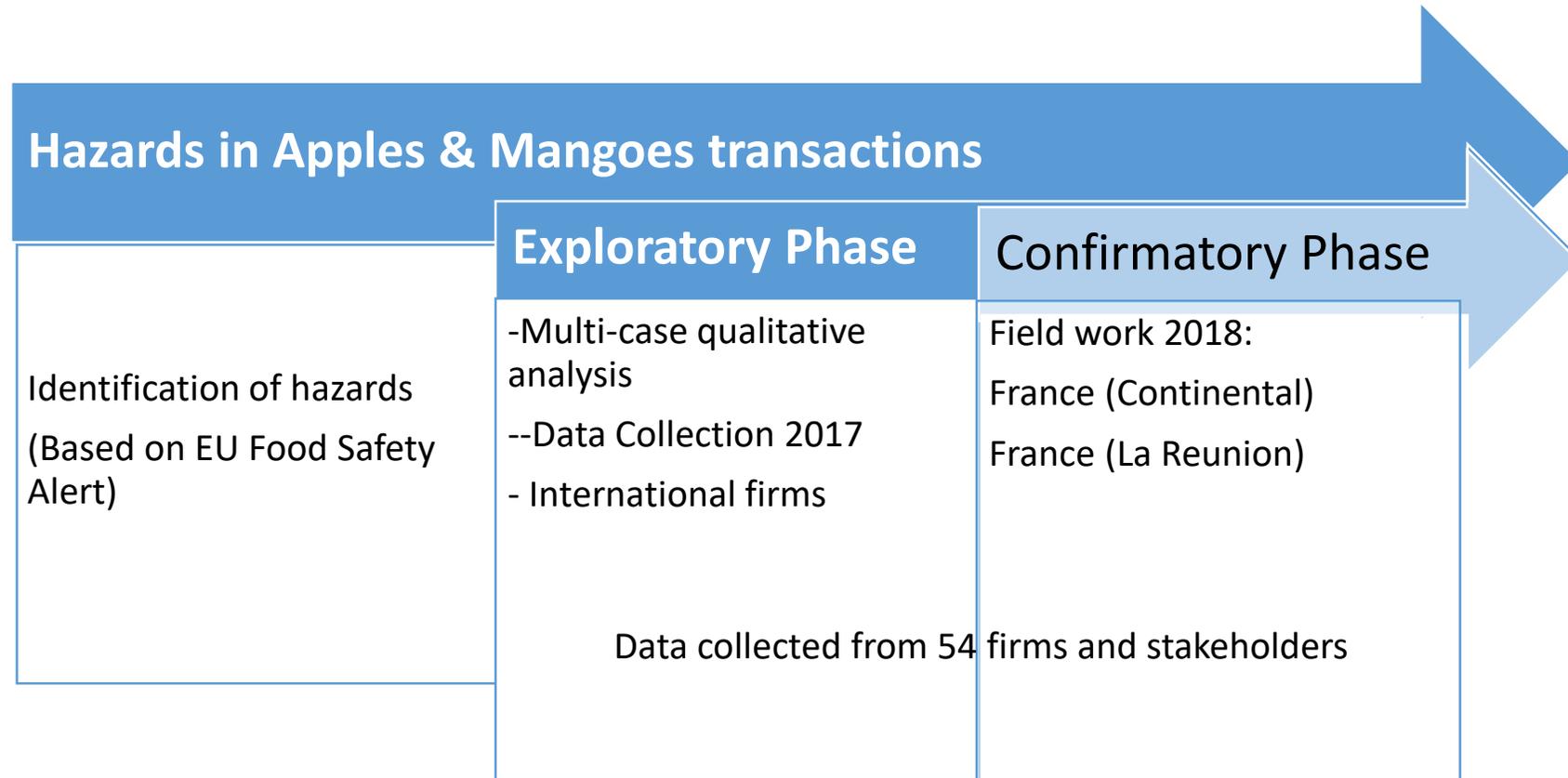
- Benefit from natural resources and,
- Supply food, non-food products and services (Le Roux et al., 2008).

- Agriculture supply chains are social-ecological systems interacting within natural, social, economic, institutional and technological dimensions (Moraine et al., 2015).



(Based on Menard, 2017)

# Methodological strategy:



# Findings:

To the question:

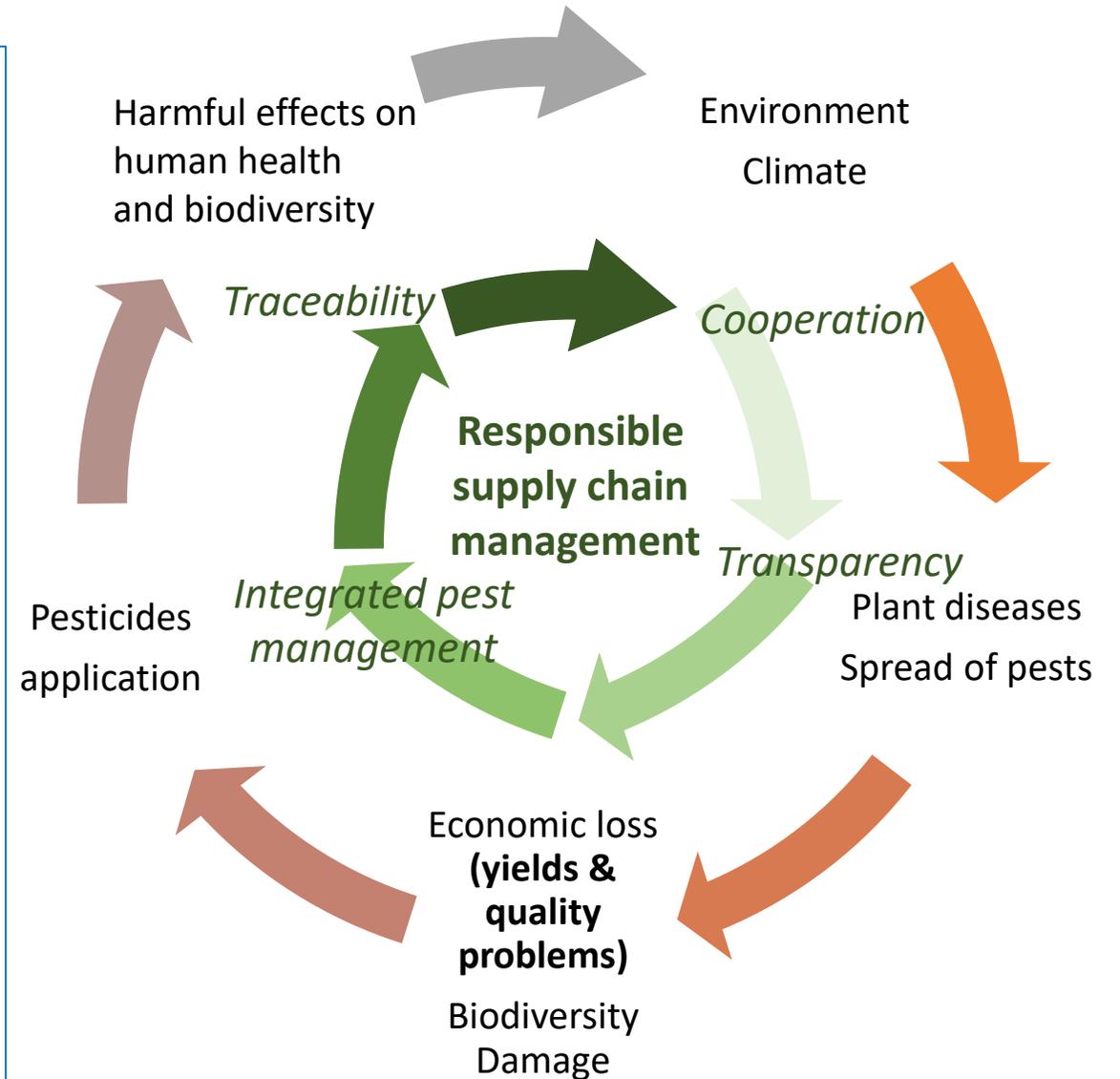
- What factors are source of variability and heterogeneity?

Interviewees answered:

Variability and heterogeneity mainly arise because of:

Climate, varieties, choice of crop management

Beside organoleptic aspects, sanitary hazards are also source of variability and heterogeneity



## ...Findings

- Managing of variability and heterogeneity

Grower - first processor stage,

- Official/private standards and private agreements:
  - To measure
    - Physical/chemical characteristics (e.g. size, brix)
    - Organoleptic characteristics (eg. color, texture)
  - To fix limits and tolerances:
    - Level of pathogens (toxins)
    - Contaminants (pesticide residues, heavy metals, radioactivity)
  - Other: varietal mix, origin of food materials
  - Parameters → from generic to customer-specific

First processor stage,

- The homogenization and standardization of the industrial product
- The valorization of the heterogeneity as means of differentiation

# Institutional linkages

## Macro-institutions

WTO rules

European Union  
Ministries (Agriculture, Economy and Health)

- Technical regulations, standards, testing and certification procedures.  
- SPS measures

Food law  
Marketing standards

## Meso-institutions

Departmental government  
Research organizations

Growers associations (e.g. Association Producteurs Pomme-Poire) → Collective Eco-friendly Label  
Industrial associations → Fruit Juice Association Code

## Micro-institutions

Consumer/customer demands translates into product specifications (Industrials, Distribution, Consumers)

Contracts: Commercial terms  
Quality provisions

Quality design

Quality control

Quality improvement

Technological functions (decisions on production)

Supply of Food materials

Processing

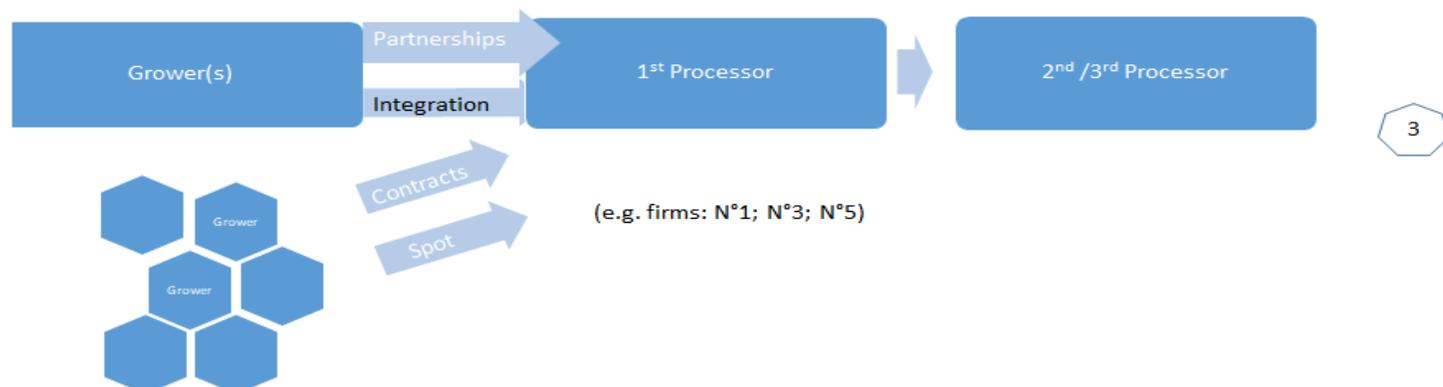
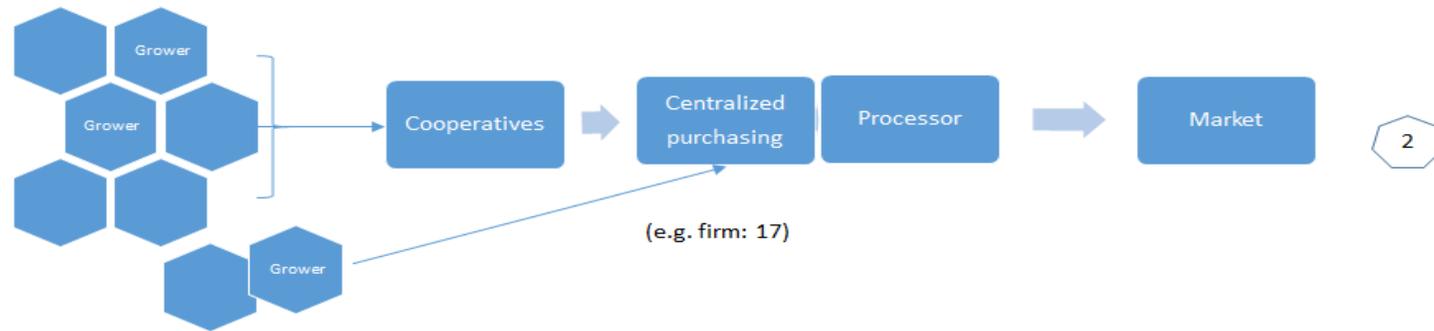
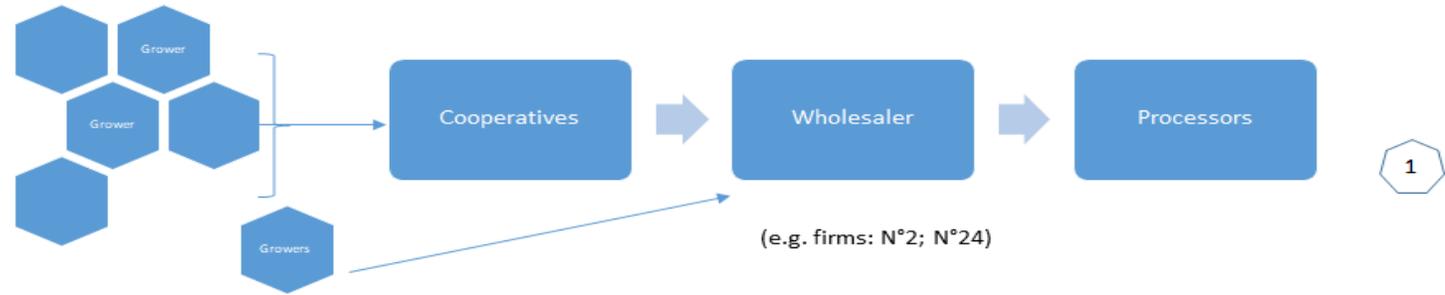
Product properties

## Enforcement

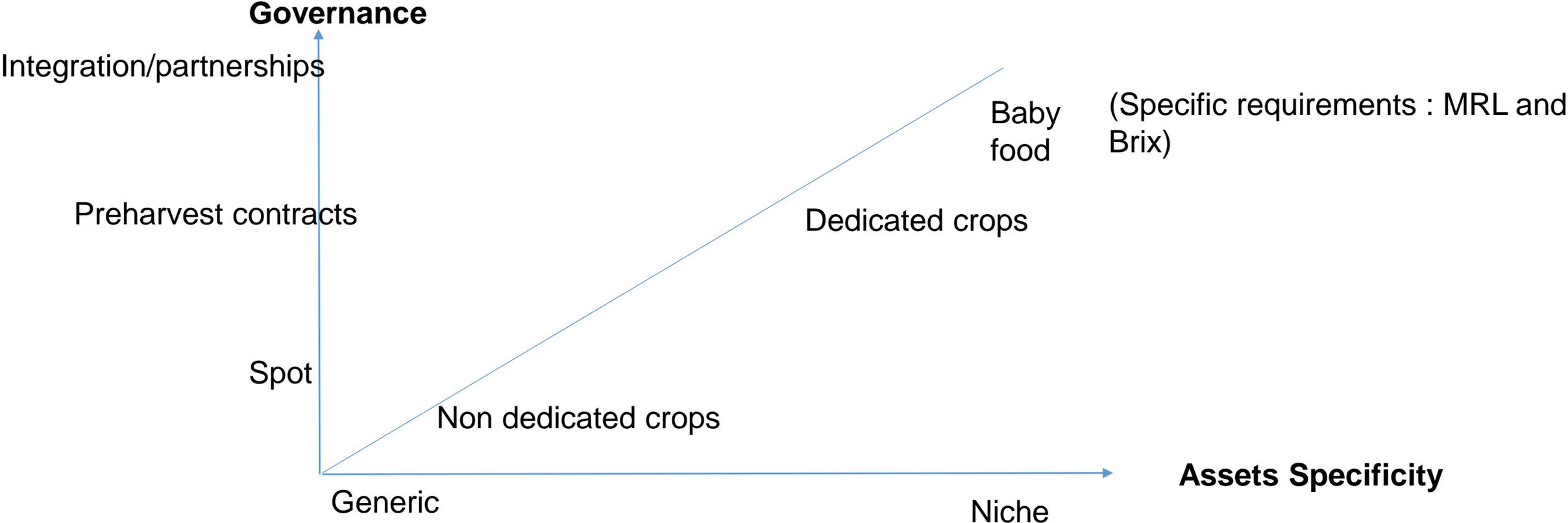
*Legal:*  
Inspections  
Courts  
Arbitration

*Informal:*  
Firm reputation

# Supply chain configurations



# Governance



- Supply chains of apples and mangoes are mostly oriented to the fresh market (mostly non processing dedicated crops)

# Conclusion:

## Variability and heterogeneity:

- Intrinsic characteristics of agricultural products and strongly linked with food quality.
- Increase in transaction costs (e.g. measurement).
- Coordination of actors within the supply chains through:
  - Multilayer institutions influencing technological decisions (e.g. Mesolevel: label for responsible supply chain management e.g. *Vergers écoresponsables*)
  - Homogeneization and standardization of the industrial product (predominant strategy)
  - Valorization of the heterogeneity as means of differentiation
- As specific investments increase transactions are governed by tighter forms of governance.

**Thank you for your attention**