

NEW



MEDIT

MEDITERRANEAN JOURNAL OF ECONOMICS, AGRICULTURE AND ENVIRONMENT

SPECIAL ISSUE / SEPTEMBER 2021

**SPECIAL
ISSUE**

Innovation and Sustainability
of Agri-Food System
in the Mediterranean Area

New Medit 2021 / Issue n. 3



CIHEAM
BARI

Editor-in-chief

MAURIZIO RAELI

Director CIHEAM Bari

Managing Editor

GIULIO MALORGIO

University of Bologna

Associate Editors

ABDELKADER AIT EL MEKKI, National School of Agriculture, Meknes, Morocco

JOSÉ MARIA G. ÁLVAREZ-COQUE, Universitat Politècnica de València, Spain

AHMED BENMIHOUB, Centre de Recherche en Économie Appliquée pour le Développement - CREAD, Alger, Algérie

FABIAN CAPITANO, University of Naples Federico II, Italy

ALI CHALAK, American University of Beirut, Lebanon

BOUBAKER DHEHIBI, ICARDA, Jordan

SALVATORE DI FALCO, University of Geneva, Switzerland

STEFANO FAROLFI, CIRAD, Montpellier, France

ABDELHAKIM HAMMOUDI, INRA-ALISS Paris, France

AHMET ALI KOC, Department of Economics, Akdeniz University, Turkey

KOSTAS MATTAS, University of Thessaloniki, Greece

SAMIR MILI, Centre for Human and Social Sciences CSIC Madrid, Spain

APOSTOLOS G. PAPADOPOULOS, Harokopio University, Greece

RACHA RAMADAN, Faculty of Economics and Political Science, Cairo University, Egypt

PAOLO SERTOLI, Italian Agency for Development Cooperation, Italy

CHOKRI THABET, Institut Supérieur Agronomique Chott Mériem, Tunisie

MURAT YERCAN, Ege University, Izmir, Turkey

Honorary Advisory Board

OULD AHMED ABDESSALAM, Assistant Director-General and Regional Representative, FAO Regional Office for Near East and North Africa, Cairo, Egypt

ALY ABOUSABAA, Director General, ICARDA, Jordan

GEORGE BAOURAKIS, Director, CIHEAM-Chania, Greece

PASCAL BERGERET, Director, CIHEAM-Montpellier, France

GIUSEPPE BLASI, Head of European and International Policies and Rural Development Department, Ministry of Agriculture, Food and Forestry, Rome, Italy

PAOLO DE CASTRO, University of Bologna, Italy

ABDELHAMID EL-ZOHEIRY, EMUNI University, Portoroz, Slovenia

FABIO FAVA, University of Bologna, Italy

MIGUEL GARCÍA-HERRAIZ, Deputy secretary-general, Union for the Mediterranean, Barcelona, Spain

LASSAAD LACHAAL, African Development Bank Group, Ivory Coast

PAOLO MAGRI, Director, Italian Institut for International Political Studies, Milan, Italy

STEFANO MANSERVIZI, Director, DEVCO, EU Commission, Bruxelles, Belgium

GRAMMENOS MASTROJENI, Coordinator for the Environment and Head of the Science-Policy Interface, MAECI, Rome, Italy

ÁRNI MATHIESEN, Assistant Director-General, Fisheries and Aquaculture Department, FAO, Rome, Italy

PLÁCIDO PLAZA, Secretary General, CIHEAM, Paris, France

ANGELO RICCABONI, Chair, Fundación PRIMA, Business Administration and Management Department, University of Siena, Italy

DOMINICK SALVATORE, Fordham University, New York, USA

RAÚL COMPÉS LÓPEZ, Director, CIHEAM-Zaragoza, Spain

ABDALLAH SROUR, Executive Secretary, GFCM, Rome, Italy

NEW MEDIT

MEDITERRANEAN JOURNAL OF ECONOMICS, AGRICULTURE AND ENVIRONMENT

SPECIAL ISSUE / SEPTEMBER 2021

Innovation and Sustainability
of Agri-Food System
in the Mediterranean Area

New Medit 2021 / Issue n. 3

Editor-in-chief
Maurizio Raeli

Managing Editor
Giulio Malorgio

Institutional Relations Manager
Debora Degl'Innocenti

Editorial office
Bologna University Press
Via U. Foscolo, 7
40123 Bologna (Italy)
tel.: +39 051 232882
fax: +39 051 221019
email: newmedit@iamb.it

Paper submission
<http://www.newmedit.iamb.it>

Copyright
© CIHEAM – Istituto Agronomico Mediterraneo di Bari

The contributed articles do not imply the expression of any opinion whatsoever on the part of CIHEAM – IAM of Bari. They report the author's opinion.

The editorial office reserves the right to revise the contributions, in view of adapting them for the publication.

Publisher
Bologna University Press
Via U. Foscolo, 7
40123 Bologna (Italy)
tel.: +39 051 232882
fax: +39 051 221019
email: comunicazione@buponline.com

Subscription rate
Print: Italy: € 40; Foreign: € 90.

Subscription office
ordini@buponline.com

Abstract and Index citation
NEW MEDIT is indexed in: SCOPUS, EBSCO, ISI Web Science, CAB Abstracts, EconLit, AGRIS/FAO database

Web page
<http://www.newmedit.iamb.it>

ISBN: 978-88-6923-859-8

ISSN: 1594-5685

ISSN online: 2611-1128

Graphic Layout
DoppioClickArt – San Lazzaro (BO)

Cover design
Debora Degl'Innocenti

Registrazione
Tribunale Ordinario di Bari, n. 1546 del 4/1/2002

Direttore Responsabile
Giulio Malorgio

NEW MEDIT è associato alla



Perceptions of the links between governance and food security: Case study of the pulses sector in Morocco

LARBI TOUMI*, MOHAMED EL AMRANI**, ABDELKADER AIT EL MEKKI**,
RACHID HARBOUZE*, AZIZ FADLAOUI***

DOI: 10.30682/nm2103e

JEL codes: O13, Q 13, Q18

Abstract

This research aims to examine the existence or not of a relationship between governance and pulse's food security in Morocco in terms of food availability, accessibility, utilization, and stability and to determine the governance indicators affecting food security. The methodological approach pursued combines ordinal logistic regression and qualitative analysis based on perceptions of thirty-four actors representing the value chain links of pulses. The results obtained show a relationship between governance and pulse's food security in terms of accessibility and stability rather than in terms of food availability and utilization. The most significant governance indicator affecting accessibility is the piloting and control of the sector. While none of the following indicators, affecting stability, are significant: the degree of information sharing on the distribution system, the degree of transparency, and the degree of trust between actors. However, the emergence of constraints relating to coordination, commitment, trust, and information sharing between actors are not favorable to a decisive role in food security governance.

Keywords: Governance, Food Security, Pulses.

1. Introduction

Food security is a global issue strongly linked to sustainability. Interruptions to any of the components of sustainability (environment, social and economic) will lead to food insecurity affecting food supply and market prices (Jeder *et al.*, 2020). Moreover, the exposure to food import becomes more and more crucial in measuring the multiple dimension of the concept of food security (Lacirignola *et al.*, 2015).

In recent years, food security is put on the

political agenda of both developing and developed countries, and is reflected in the action of public authorities, which consider food governance a lever to meet the multiple challenges of sustainability.

The latest HLPE (High Level Panel of Experts) report on food and nutrition security published in the midst of the global health crisis related to COVID-19 highlighted the urgent need to strengthen and consolidate conceptual thinking around food and nutrition security. The objective is to prioritize the right to food, to widen our understanding of food

* Agronomic and Veterinary Institute Hassan II, Rabat, Morocco.

** National School of Agriculture of Meknes, Meknes, Morocco.

*** Regional Center of Agronomic Research of Meknes, Meknes, Morocco.

Corresponding author: toumilar@gmail.com

security and to adopt a food systems analytical and policy framework (HLPE, 2020). Among the potential guidelines for agricultural policies, effective governance is one of the directions needed to support agricultural policies to better meet the Sustainable Development Goals, in particular SDG2 “Eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture”. Thus, Governance includes a renewed commitment to multilateral cooperation and coordination between sectors at different levels of government, and effective multi-stakeholder partnerships that support participation and representation, including the voices of marginalized and vulnerable groups (HLPE, 2020).

In the national context, the analysis of the role of governance in food security has not been the subject of academic research. The main research related to the field of this study has instead focused on the evaluation of public policies related to food security (Moussaoui *et al.*, 2003, pers. comm.; Akesbi, 2011; Rerhrhaye and Ait El Mekki, 2017). Other research has concentrated on analyzing the role of coordination of local actors in the global value chain of exported products and examining the relationship between the organization of the supply chain and the safety of exported products (Tozanli and El Haddad, 2007; Ait Hou *et al.*, 2015).

In order to explore more this topic, this research focused on the analysis of perceptions of actors in the pulses sector on the impact of governance on food security in terms of food availability, accessibility, utilization, and stability. The choice of the pulses sector was for the following reasons: first, the renewed international interest in pulses and their role in food security in terms of nutritional intake, the health benefits, economic and agro-environmental advantages, and secondly its strategic importance of the regular and sufficient supply in times of health crisis linked to the COVID-19 pandemic.

Pulses were among the foodstuffs concerned by the anti-COVID measures taken by the Government of Morocco by suspending the collection of import duty on lentils, chickpeas, beans and dried beans (MEFRA, 2020). Besides, they continue to be present in the Mo-

roccan consumer basket and in the Moroccan Nutrition Program as a source of micronutrient intakes according to the national nutrition strategy. They are particularly rich in protein and represent an alternative to the animal protein consumption. Over the past three decades, pulses have maintained their importance in the Moroccan basket despite the trend observed by the increase in consumption of dairy products (+95%), fish (+119%), and eggs (+110%) to the detriment of cereals (-0.1%) and sugar (-23.8%) (HCP, 2014).

During the two decades of the 1960s and 1970s, Morocco was one of the world’s leading exporters of pulses. However, it has become an importer because it cannot cover its consumption needs in pulses. The average rate of consumption coverage has been only 41% over the last two decades (1997-2017) (Toumi *et al.*, 2020). As for commercialization, it is mainly characterized by traditional circuits and only 3% of production is collected during the decade (2009-2019) (Driouach, 2020, pers. comm.).

In addition, the diagnosis of the pulses sector and its value chain showed multiple actors intervening in the value chain with organizational and governance constraints (Laamari, 2015) that are preventing its revival as a strategic sector for the food security of the country.

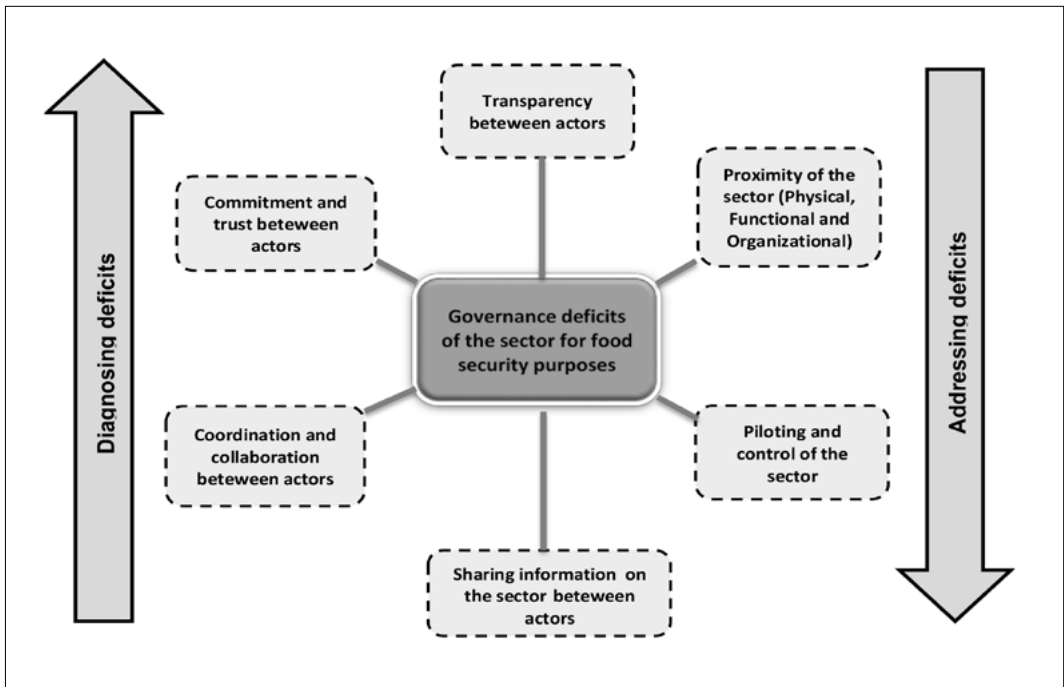
The objectives of this research are twofold: First, to examine the existence or not of a relationship between governance and pulse’s food security in Morocco in terms of food availability, accessibility, utilization, and stability and secondly to determine the governance indicators affecting strongly the food security of these vegetable commodities.

The remaining sections of the paper are organized as follows: Section 2 deals with a conceptual framework on the topic. In section 3, the data collected and source of data, and the empirical model were presented. Results are presented in section 4 and discussion of the main findings in section 5. Section 6 concludes.

2. Conceptual framework

There are several research studies dealing with governance analysis. This research refers to the

Figure 1 - Adapted analytical framework for the governance of the pulses sector.



Source: Our investigations.

framework of analysis on the governance of the value chain of the sector and the Organization for Economic Cooperation and Development (OECD) approach to governance analysis.

The OECD approach is a bottom-up and inclusive approach that offers a systemic analysis framework based on the diagnosis of governance in order to fill the gaps for more visibility to good governance practices. It uses indicators of commitment, transparency and trust, and resource sharing (OECD, 2011).

The analysis of governance via the concept of the value chain highlights a series of indicators such as the piloting and control of the sector, physical proximity, functional proximity and organizational proximity of the sector, coordination, and collaboration between actors in the value chain (Soullier, 2013). It provides an understanding of the relationships between actors in the sector, in particular collaboration and coordination considered crucial for the performance of the chain (Gereffi and Fernandez-Stark, 2016).

These approaches will allow identifying gov-

ernance indicators to analyze to meet the objectives of this research. The same, they are adapting to the case study where there are multiple actors whose coherence and coordination of interventions for food security purposes require a systemic and multi-actor approach.

Drawing on these approaches, a framework is elaborated for analyzing food security governance, according to the OECD's approach to diagnosing and addressing governance deficits of the pulses sector across the following dimensions of governance (Figure 1):

- Proximity of the sector (physical, functional and organizational);
- Piloting and control of the sector;
- Information sharing between actors in the sector in terms of inputs, production technology, quality, supply, price, and distribution system;
- Coordination and collaboration between actors;
- Commitment and trust between actors;
- Transparency between actors.

3. Data and Methodology

3.1. Data

Based on this analytical framework, a grid of variables made up of dependent and independent variables is used to examine the relationship between governance and food security. The dependent variable (Impact of governance on food security) was categorized into three modalities: no impact, low to medium impact, and high impact for the four dimensions of food security (food availability, accessibility, utilization, and stability). The independent variables concern 14 governance indicators relating to the governance dimensions indicated above and detailed in Appendix 1.

The data were collected from a questionnaire administered to 34 actors representing all the links of the pulses value chain from upstream to downstream, as well as the institutional support actors (public, private sectors, and NGOs). The questions are of two types:

- Closed questions where the actor is asked to express his/her qualification for the governance indicators studied according to an evaluation grid on a nominal and ordinal scale of scores from 1 to 5 (1 = very low, 2 = low, 3 = medium, 4 = strong, 5 = very strong). For the impact of governance indicators on pulse's food security in terms of food availability, accessibility, utilization, and stability, the actor expressed his/her qualification according to a scale of scores (1= no impact, 2= low to medium impact, 3= strong impact);
- Open-ended questions where the interviewed actor is invited to express his or her opinion and arguments on his or her qualification.

The selection of the actors to be interviewed was based on the criteria of representativeness of the different links of the value chain from upstream to downstream; decision-making and expertise within the institution to be investigated, inclusion of institutional actors from the public, private sectors, and NGOs and the intervention of actors at different scales (local, regional and national).

The survey took place between the beginning

of June and mid-November 2020. As our survey target is made up of actors with diverse profiles and coming from different institutions, the concepts of governance and food security were made more explicit and clear to the respondents so as not to bias their response and by pushing them to express their opinion more and argue their answers.

3.2. Data Analysis

Among the methodological tools, a combined approach is used between ordinal logistic regression and qualitative analysis through content analysis of the actors' speeches. The statistical software used is the SPSS.

3.2.1. Ordinal logit model

3.2.1.1. Description

Ordinal logistic regression is the modeling of the probability that an event will occur since the values of descriptive variables can be quantitative and/or qualitative. The aim is to understand or predict the effect of one or more variables on a qualitative variable with order modalities.

As the outcome variable is an ordered categorical variable and the research objective is to determine which governance indicators have a strong impact on food security in terms of food availability, accessibility, utilization, and stability, the ordinal generalized linear model is used. This model estimates the odds of being beyond a certain category relative to being at or below that category. A positive logit coefficient generally indicates that an individual is more likely to be in a higher category as opposed to a lower category of the outcome variable (Liu and Koira, 2012). There are four following ordinal logit models to examine:

- The ordinal logit model of availability where the dependent variable is the impact of governance on food availability;
- The ordinal logit model of accessibility where the dependent variable is the impact of governance on accessibility;

- The ordinal logit model of utilization where the dependent variable is the impact of governance on utilization;
- The ordinal logit model of stability where the dependent variable is the impact of governance on stability.

Also, this model facilitates data analysis by obtaining Odds Ratios (ORs) that reflect the multiplicative change in the probability of being on a higher level of the dependent variable for every one-unit increase in the independent variable while holding the other independent variables constant (Crowson, 2019, pers. comm.). In addition, this model tolerates the violation by a certain predictor of the assumption (parallelism of logistic functions) required by the proportional odds model. Moreover, this model uses the chi-square likelihood ratio test, which is more reliable than the cumulative model's Wald test when the sample size is small to moderate (Agresti, 2007).

The formula of this model is proposed by Fu (1998) and Williams (2006), cited in Liu and Koirala (2012) as follows:

$$\text{Logit} [\pi (Y > j | X_1, X_2, \dots, X_p)] = \ln \left(\frac{\pi (Y > j | X_1, X_2, \dots, X_p)}{\pi (Y \leq j | X_1, X_2, \dots, X_p)} \right) = \alpha_j + (\beta_{1j} X_1 + \beta_{2j} X_2 + \dots + \beta_{pj} X_p)$$

Where

$\pi (Y > j)$: probability that the answer is above category j

j : number of distinct categories of response

α_j : intercepts or cutpoints

$\beta_{1j}, \beta_{2j}, \dots, \beta_{pj}$: logit coefficients

X_1, X_2, \dots, X_p : predictor variables

3.2.1.2. Selection of variables

The independent variables that have a relationship of association with the dependent variable are selected, assuming that if a variable contributes to the overall regression model, then it is statically linked to the response variable (Legrand and Bories, 2007). They are tested significantly as explanatory variables of the outcome variable in the ordinal logit model.

The other non-significant independent variables are discarded to improve the quality of information processing and model fit. Indeed, the sample size of the case study (34 observa-

tions) must be adequate with the number of independent variables selected in logistic regression. A minimum of 10 observations per independent variable is suggested (Hosmer and Lemeshow, 2000).

Then, the Spearman's correlation is used to measure the relationship between:

- Dependent variable no. 1: "Impact of governance on food availability" and 14 independent governance variables (Appendix 1);
- Dependent variable no. 2: "Impact of governance on accessibility" and 14 independent governance variables;
- Dependent variable no. 3: "Impact of governance on utilization" and 14 independent governance variables;
- Dependent variable no. 4: "Impact of governance on stability" and 14 independent governance variables.

It measures the relationship between two qualitative variables (ordinal, discrete, or not following a normal distribution) and is based on the calculation of a Spearman correlation coefficient according to the following formula (Myers and Well, 2003):

$$rs = \frac{VOC (rgX, rgY)}{\sigma_{gx} \sigma_{gy}}$$

Where $VOC (rgX, rgY)$ is the covariance of rank variables and are the standard deviations of the rank variables. In order to confirm the existence of a correlation between two variables, a hypothesis test is carried out:

H0: No correlation between the two variables

HA: Correlation between the two variables

When this test is significant at a level $< 5\%$, the null hypothesis (H0) is rejected and it is concluded that there is a correlation relationship between the two variables.

Furthermore, to avoid a nuisance to the quality of the regression, the independent variables that are too highly correlated are discarded by considering as being too highly correlated those variables whose correlation coefficient was higher than the average correlation coefficient observed in the correlation matrix (Legrand and Bories, 2007).

In the analysis of the ordinal logit model, the mandatory tests are namely the Chi-square test

associated with the significant likelihood ratio at the inferior level of 5% for the final model fit and the Pearson Chi-square and Deviance (Crowson, 2019, pers. comm.). The last tests measure the quality of the model whose non-significant results are two indicators that indicate whether the model fits the data well (Petrucci, 2009).

3.2.2. Content analysis

The analysis of the content of the speeches of the actors in the pulses sector is used to highlight their opinions and comments on their perception of the impact of governance on food security. According to Moliner *et al.* (2002), content analysis is the most appropriate technique for identifying opinions, beliefs, positions, and points of view conveyed by speeches.

4. Results

4.1. Relationship between governance and pulse's food security

Spearman's correlation results show a relationship between governance and food security of pulses in terms of accessibility and stability rather than in terms of food availability and utilization. In fact, there is:

- a negative and significant correlation at a level $<$ to 5% between the dependent variable no. 2 "Impact of governance on accessibility" and the following governance indicators: the physical proximity of the sector, the piloting and control of the sector, and the degree of transparency between actors (Table 1);
- a positive and significant correlation at a level $<$ to 5% between the dependent variable no. 4 "Impact of governance on stability" and the following governance indicators: the degree of commitment, the degree of trust, the degree of transparency between actors, and the degree of information sharing between actors on inputs, prices, and distribution system (Table 1).

On the other hand, the correlation is insignificant between the governance indicators (Appendix 1) and the dependent variables no. 1 "Impact of governance on Availability" and no.

3 "Impact of governance on utilization". These variables are not analyzed for reasons of quality of information processing and adjustment of the ordinal logit model. Thus, the two following models are to analyze the ordinal logit model of accessibility and the ordinal logit model of stability.

4.2. Ordinal logit model of accessibility

For the quality regression in the ordinal logit model of accessibility, the independent variables selected, which are not strongly correlated with each other, are the physical proximity of the sector, the piloting and control of the sector, and the degree of transparency between actors (Appendix 2).

The Chi-square test associated with the likelihood ratio is significant at the inferior level of $<$ 5 % [Chi-square = 13.281, $P=0.004 <5\%$]. It indicates that there is a significant improvement in the fit of the final model compared to the initial model.

Concerning the quality of the final model, it is measured by Pearson's Chi-square and Deviance tests with non-significant results: [Pearson's Chi-square = 21.562, $P=0.547 > 5\%$ and Deviance's Chi-square = 19.570, $P=0.668 > 5\%$]. They indicate that the model fits the data well.

The Table 2 gives us the regression coefficients (B), their Odds ratios (Exp B) and significance tests for each independent variable in the model. These coefficients are interpreted instead by the Odds ratios, indicating that the independent variable affects the probability that the dependent variable is at the higher level. An Odds ratio $>$ 1 suggests a high probability of being at a higher level of the dependent variable as the values of an independent variable increase, while an Odds ratio $<$ 1 suggests a low probability with increasing values of an independent variable. An Odds ratio = 1 suggests no predicted change in the probability of being in a higher category as the values of an independent variable increase (Crowson, 2019, pers. comm.).

The governance indicators retained in the model, namely physical proximity of the sector and the piloting and control of the sector, have little

Table 1 - Dependency Relationships between variables.

Dependent Variables (DV)	Independent Variables (IV) tested significantly at the 5% level (Spearman's Test)		
	IV	rs	Prob.
Impact of governance on accessibility	Physical proximity of the sector	- 0.340	0.049*
	Piloting and control of the sector	- 0.395	0.021*
	Degree of transparency between actors	0.382	0.026*
Impact of governance on stability	Degree of commitment between actors	0.435	0.010*
	Degree of trust between actors	0.400	0.019*
	Degree of transparency between actors	0.502	0.002*
	Degree of information sharing on inputs between actors	0.459	0.06*
	Degree of information sharing on supply between actors	0.475	0.05*
	Degree of price information sharing between actors	0.422	0.013*
	Degree of information sharing on distribution system between actors	0.380	0.027*
Impact of governance on food availability	None of the 14 Independent variables (Appendix 1) has been tested significantly at the 5% level (Spearman's Test)	-	-
Impact of governance on utilization	None of the 14 Independent variables (Appendix 1) has been tested significantly at the 5% level (Spearman's Test)	-	-

Notes: IV: Independent Variables; rs: Spearman's Correlation Coefficient; * indicates significant at the 5% level; Source: non-parametric correlations, SPSS, 2020.

Table 2 - Parameters of the ordinal logit model of accessibility.

Estimation of parameters							
Parameters		B	Standard Residue	Hypothesis Test			Exp(B)
				Wald's Chi ²	df	approx.	
Threshold	[Impact on accessibility=1]	-2,341	1,7812	1,727	1	0,189	0,0096
	[Impact on accessibility=2]	1,065	1,7276	0,380	1	0,538	2,901
Physical Proximity of the sector		-0,822	0,7978	1,061	1	0,303	0,440
Piloting and control of the sector		-0,505	0,2362	4,564	1	0,033**	0,604
Degree of transparency between actors		0,586	0,4050	2,095	1	0,148	1,797
(Scale)		1 ^a					

Notes: B: Logit coefficients; df: degree of freedom; approx.: P-value of significance tests, Exp(B): Odds Ratios; *** indicates significant at the 1% level; ** indicates significant at the 5% level; a: Fixed displayed value; Source: Data Analysis SPSS, 2020.

effect on the probability that the impact on accessibility will be at a high level. Their odds ratios are respectively 0.440, 0.604, whereas the odds ratio of the degree of transparency between actors is 1.797, indicating an important probability. Among these indicators, the piloting and control of the sector are revealed as a significant indicator affecting accessibility the most (Table 2).

4.3. Ordinal logit model of stability

About the ordinal logit model of stability, the independent variables selected that are not strongly correlated are the degree of trust, the degree of transparency between actors, and the degree of information sharing between actors on the distribution system. They present a correlation coefficient lower than the average correlation coefficient observed in the correlation matrix (Appendix 3).

The Chi-square test associated with the likelihood ratio is significant at the inferior level of 5% [Chi-square=11,783, P=0.008< 5%], indicating that there is a significant improvement in the fit of the final model compared to the initial model. As for the quality of the final model, it is of good quality since the results of the Chi-square tests are insignificant [Pearson’s Chi-square = 8.393, P=0.817> 5% and Deviance’s Chi-square = 11.243, P=0.59> 5%].

The governance indicators that influence the probability that the impact on stability is in the high range are, in order of importance: the degree of information sharing on the distribution system (2,954 time’s chance), the degree of transparency between actors (2,465 time’s chance) and the degree of trust between actors (1,019 time’s chance). However, none of these indicators are revealed as a significant indicator that most affects stability (Table 3).

4.4. Actors’ perceptions on the impact of governance on food security

4.4.1. Position of actors

The actors of the sector (upstream, downstream, and support) do not share the same opinion on the overall impact of governance on food security in terms of food availability, accessibility, utilization, and stability. All actors in the sector share the dominant view of the strong impact of governance on food availability and utilization. Contrarily, opinions differ on the impact of governance on accessibility and stability both between actors in the sector and within the same category of actors (Figures 2, 3, 4, 5).

4.4.2. Perceptions of actors

The content analysis of the speeches of actors on the impact of governance on pulse’s

Table 3 - Parameters of the ordinal logit model of stability.

Estimation of parameters							
Parameters		B	Standard Residue	Hypothesis test			Exp(B)
				Wald’s Chi ²	df	approx.	
Threshold	[Impact on stability=1]	3,457	1,7502	3,903	1	0,048**	31,725
	[Impact on stability=2]	5,520	1,9197	8,270	1	0,004**	249,746
Degree of trust between actors		0,019	0,5762	0,001	1	0,974	1,019
Degree of transparency between actors		0,902	0,6403	1,985	1	0,159	2,465
Degree of sharing information on Distribution		1,083	0,8778	1,523	1	0,217	2,954
(Scale)		1 ^a					

Notes: B: Logit coefficients; df: degree of freedom; approx.: P-value of significance tests, Exp(B): Odds Ratios; *** indicates significant at the 1% level; ** indicates significant at the 5% level; a: Fixed displayed value; Source: Data Analysis SPSS, 2020.

Figure 2 - Perceptions of the pulses sector actors on the impact of governance on food availability

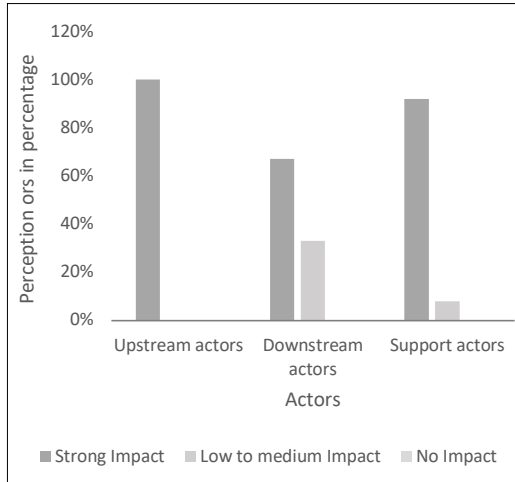


Figure 3 - Perceptions of the pulses sector actors on the impact of governance on accessibility.

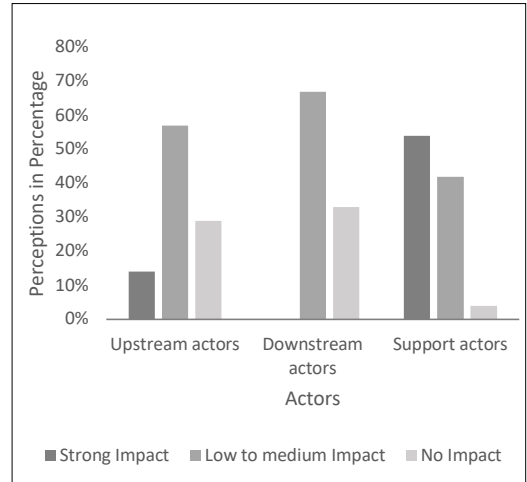


Figure 4 - Perceptions of the pulses sector actors on the impact of governance on utilization.

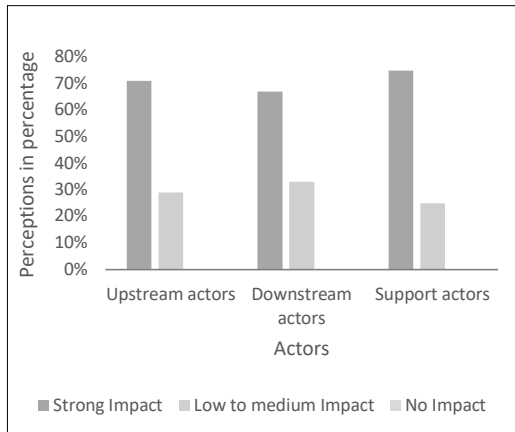
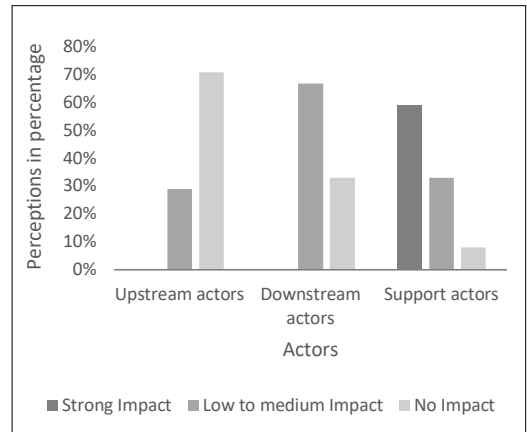


Figure 5 - Perceptions of the pulses sector actors on the impact of governance on stability.



food security has shown controversial perceptions and positions of different visions between certain actors in the sector, and even conflicts of interest. It is particularly among producers, importers, and buyers on the one hand and between the National Federation of Cereals and Legumes Traders (NFCL) and the National Inter-professional Office for Cereals and Legumes (NIOCL) on the other.

The producers argue that importers who control the sector in terms of price and do not buy national production by alibi that it is not of the quality and prefer to import even if the

quality of national production is good. While, importers point out that local production is not of good quality and insufficient to ensure the country's food security in pulses.

NFCL and NIOCL don't share the same vision of the development of the sector, particularly with regard to the following points:

- *The objectives pursued:* For the NIOCL's managers, the main concern remains a well-supplied market and price stability regardless of the origin of the imported or locally produced products. Whereas for the NFCL's officials, the main objective is to seek to maximize prof-

it and reduce commercial risks while actively contributing to the country's supply of pulses through the collection, storage, distribution of local production, and international trade.

- *The legal-regulatory framework:* NIOCL's officials emphasize that the NIOCL is not a development agency, but it has precise missions stipulated in Law no. 12-94 governing the activity of cereals and pulses and the status of the NIOCL. This status consists of monitoring supply, market regulation, imports, technical assistance, and quality promotion, encouraging the creation of Professional Agricultural Organizations, and providing information on the internal and external market. With regard to the mission of encouraging the creation of professional organizations, the officials consider that this mission is abandoned to avoid any overlap with development institutions such as the National Office of Agricultural Advice, the Agricultural Development Agency, and the Regional Directorates of Agriculture. In opposition, NFCL's officials consider the interventions of NIOCL under Law no. 12-94 to be a part of a "control/sanction" logic rather than a "regulation/development" logic. They ask that NIOCL plays the role of supporting and guiding professional actors.

- *The setting up of a security stock:* NFCL's officials believe that it is time to redefine the security stock by specifying the mechanisms for its constitution and regulation, and to see how to ensure it for pulses, given the current stakes and the risks of the market where Morocco is a net importer of pulses. They argue that law no. 009-71 governing the setting up of a security stock was a response to the era of the interventionist state and does not match with the policy of liberalization of cereals and pulses sectors, adopted by the state. Conversely, the NIOCL's officials advance that it is necessary to regulate the market through legislative and regulatory measures of the state in order to organize the pulses market via the management of customs duties. They add that stock levels are determined through the declaration system, which is corroborated by summary or exhaustive stock censuses of operators and by cross checking their declarations.

Moreover, the governance indicators that have raised constraints and divergences between actors, concern the piloting and control of the sector, coordination, commitment, trust, and information sharing between actors. For the piloting and control of the sector, the upstream actors (input producers and groups of economic interest) think that the buyers (importers and intermediaries) drive the pulses sector. They see that in the absence of a strategic vision of the state for the pulses sector, importers take advantage of the low national production and its low competitiveness vis-à-vis imported pulses. They add that intermediaries control prices and determine quality, leaving a small market for producers. On the other hand, downstream actors (processors, aggregators, and traders) think that the sector is so fragmented that there is no pilot. Each link seeks its own interests without any common vision or organization of the sector. Whereas the support actors have not issued a common opinion on the piloting and control of the sector.

Regarding the coordination between actors, upstream and downstream actors (input producers, groups of economic interest, aggregators, traders) see that coordination in the sector exists when there is a partnership agreement or there is a problem with pulses on the market, such as the case where chickpea prices have soared. They consider that "it is not a structured coordination in the relations between actors in the sector with a clear strategic vision". For the institutional support actors (National Company of Commercialization of Seeds, National Institute of Agronomic Research, and National Inter-professional Office for Cereals and Pulses), the officials confirm the lack of coordination, which is due, according to their opinion, to the two following reasons:

- Lack of a common strategic objective for pulses to guide the actions and programs of the different actors;
- Absence of an inter-professional federation that organizes the sector from upstream to downstream.

In addition, some actors have raised certain coordination deficits. This is the case of the:

- Overlap of the fields of action in terms of awareness-raising and support for farm-

ers between the two institutions in the Béni-Mellal-Khénifra region, namely the regional chamber of agriculture and the regional directorate of the National Office of Agricultural Advice.

- Duplication in terms of farmer representativeness by law no. 27-08 on the status of chambers of agriculture and law no. 03-12 on inter-professional federations, which may create a reluctance to collaborate between the chamber of agriculture and inter-professional federations and hampers coordination between these institutions.

Concerning commitment and trust between actors of the sector, all the actors (upstream, downstream, and support) agree on the importance of building trust between actors and respecting commitments as the key to a successful professional relationship. However, some actors have raised the following constraints for the strengthening of commitment and trust between actors in the sector:

- The level of representativeness below the aspirations of the institutional actors in the meeting committees that link these actors;
- The non-compliance of some importers with import regulations is a problem for the NIO-CL to monitor the supply operation and have visibility on the quantity actually imported.

About the information sharing between actors of the sector, upstream actors argue that there is no sharing because the sector is relegated to second place in the relationship between actors. They raised the case of research and development where a large part of the research is not implemented and transmitted to farmers, due to a lack of resources.

On the other side, downstream actors consider that a great effort should be done to share information between actors in the value chain. They mentioned the lack of an information and monitoring system on prices and global trends in research and innovation, as well as the lack of information sharing and dissemination through appropriate platforms and media.

For the institutional support actors, they consider that information sharing is not done at the same level between the different links of the value chain of the sector.

5. Discussion

Based on the results of the ordinal logistic model, there is a relationship between governance and pulse's food security in Morocco in terms of accessibility and stability rather than in terms of food availability and utilization. It highlighted the importance of governance indicators such as the physical proximity of the sector, the piloting and control of the sector, the degree of transparency, the degree of trust, and the degree of information sharing on the distribution system between actors. This result is in conformity with the literature review where proximity and exchange relations between actors contribute to reducing uncertainty about price, quantity, and quality and facilitate access to credit through trust, circulation of information, or dissemination of innovation (Soullier, 2013).

Nevertheless, the analysis of the speech of actors in the sector on the impact of governance indicators on food security has brought to light different visions and controversial perceptions between actors in the sector. It has raised constraints, particularly in terms of coordination, commitment, trust, and information sharing between actors. These divergences between actors are not able to meet the challenges facing the pulses sector in Morocco. This sector is subject to technical, organizational, and governance constraints that prevent its revival as a strategic sector for the agricultural development of Morocco and contribute to the country's food security.

These results provide an interesting orientation for public policy decision-makers to initiate a reflection on the role of governance and to understand how the actors of the sector (upstream, downstream, and support actors) work together, consult and articulate with a view to achieving food security for pulses in Morocco. This reflection is so necessary following the health crisis linked to the COVID 19 pandemic, which highlighted the importance for countries to design strategic food security action plans to manage the risks generated by COVID-19 and mitigate its impact on food security and its potentially destabilizing effect on the economy and society (FAO, 2020).

Indeed, the pulse's food security cannot be guaranteed on a sustainable basis if the different views on the development of the sector persist among the actors in the sector and the above-mentioned governance constraints are not lifted. Hence, the need to promote collective action between actors, particularly those upstream and downstream of the sector, to avoid any asymmetry of power and control of the sector by one actor to the detriment of the other, and to reduce market imperfections, particularly the constraints linked to information. In the same directive, Tozanli and El Hadad (2007) recommended that local actors should adopt collective strategies to maintain negotiation power in the face of key actors of the Global Value Chain.

Additionally, governance cannot fully and effectively play its role in food security if the cleavage of visions in relation to the legal and regulatory framework governing the pulses sector persists between two actors, namely the main state actor (NIOCL) and a professional actor (NFCL). Likewise, the overlap of responsibilities observed in the speeches of certain actors is not in favor of strengthening the governance of the sector.

In the view of the security issues imposed by the health crisis linked to the COVID pandemic, the state must make a political choice: should it be content with *resorting to imports to meet national pulses needs with customs duty arrangements in the event of a crisis while remaining dependent on food or developing and upgrading the pulses sector from a technical and agro-industrial level?*

In this perspective, the lessons drawn from the crisis caused by the pandemic linked to COVID 19 have led the Moroccan Government to adopt import substitution in the Moroccan Post-COVID 19 industrial strategy. This strategy has set up a new generation of support programs for the revival of industrial micro-enterprises (MICEVN, 2020). Thus, the Department of Agriculture should orientate and accompany the groups of economic interest and pulses cooperatives in seizing this opportunity to improve the quality of national production and the diversification of agro-food pulse products

(flour, semolina, shelled, frozen, preserved) via the development of new transformation processes. The new agricultural strategy "Green Generation" adopted by Morocco during the next decade (2020-2030) can be an opportunity and a framework for implementing good governance of the pulses sector for food security purposes through its second foundation "Sustainability of agricultural development".

This research focused on the qualitative aspect of governance food security by analyzing the perception of actors, but it opens up fields of research relating in particular to the role of legal regulation to lay out the basis for the good governance of food security. In addition, it is important to multiply this research to other organized sectors to examine what effect can have organization on the food security governance.

6. Conclusion and recommendations

In conclusion, the use of two modes of analysis via ordinal logistic regression and the qualitative analysis of actors' perceptions has been complementary and has enriched the overall analysis of the impact of governance on food security. This paper provides important information for government and policy makers to make governance effectively play its role in pulse's food security. It is highly recommended that the government should adopt a change in public policies by pushing the pulses sector towards reorganization within the framework of an inter-professional federation according to law no. 12-03.

This policy change leads to a rethinking of the market offer between national production and import through the encouragement and development of local production and its valorization by medium and long-term policies, instead of very short-term policies that focus on imports and balancing through fiscal and/or custom adjustments.

In addition, the legal reform of the texts governing the pulses sector should develop a system of governance that allows the sector to be pulled upwards by ensuring the revision of the actors' attributions and the definition of their roles and responsibilities for the secure

and optimized supply of pulses within a partnership framework between the State and the inter-professional federation. Furthermore, this legal reform should encourage operators to invest more in developing storage capacity and modernizing storage infrastructure for food security purposes.

In order to avoid the emergence of different visions or conflicts of interest between actors, it is primordial to develop, within this inter-professional federation, a strategic vision for the development of the sector shared by all the actors. Better piloting and control of the sector taking into account the interests of the actors upstream and downstream of the sector and strengthening of relations of proximity and exchange between actors contributes to reducing the uncertainty concerning the price, the distribution system, the quantities, and the quality linked to the sector.

Indeed, the strengthening of coordination, commitment, trust, transparency, and sharing of information on the pulses sector between actors (upstream, downstream, and support), are essential to ensure the pulse's food security and meet its challenges.

References

- Agresti A., 2007. *An introduction to categorical data analysis*, 2nd ed. Hoboken, NJ: John Wiley & Sons Inc., 357 pp.
- Driouach N., 2020. *Présentation de la filière des légumineuses alimentaires au Maroc*. Présentation Power Point. Rabat : Office National Interprofessionnel des Céréales et Légumineuses.
- HCP (Haut-Commissariat au Plan), 2014. *Présentation des résultats de l'Enquête Nationale sur la Consommation et les Dépenses des Ménages 2013/2014*. Rapport de synthèse, Rabat.
- HLPE (High Level Panel of Experts), 2020. *Food security and nutrition: building a global narrative towards 2030*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
- Hosmer D.W., Lemeshow S., 2000. *Applied Logistic Regression*, 2nd ed. Hoboken, NJ: John Wiley & Sons Inc., 369 pp.
- Jeder H., Hattab S., Frijia I., 2020. An econometric analysis for food security in Tunisia. *New Medit*, 19(4): 10-20.
- Lacirignola C., Adinolfi F., Capitanio F., 2015. Food security in the Mediterranean countries. *New Medit*, 14(4): 2-10.
- Laamari A., 2015. *Etude Données de base des Légumineuses alimentaires au Maroc : Analyse de l'offre, coûts de production et indicateurs de performance*. India-Morocco for the Development of Food Legumes, Initiative Rapport, 74 pp.
- Liu X., Koirala H., 2012. Ordinal Regression Analysis: Using Generalized Ordinal Logistic Regression Models to Estimate Educational Data. *Journal of Modern Applied Statistical Methods*, 11(1): 242-254.
- Moliner P., Rateau P., Cohen-Scali V., 2002. *Les représentations sociales : pratique des études de terrain*. Rennes : Presses universitaires de Rennes, pp. 202-230.
- Moussaoui A., Allali K., Bendaoud M., Doukkali R., Mahdi M., 2003. *Analyse socio-économique des rôles de l'agriculture et conséquences en matière de politiques : Etude du cas- Maroc*. Rapport de synthèse INRA. Projet FAO-ROA Maroc.
- Myers J.L., Well A.D., 2003. *Research Design and Statistical Analysis*, 2nd ed. Mahwah, NJ-London: Lawrence Erlbaum Associates Publishers, 508 pp.
- Petrucci C.J., 2009. A Primer for Social worker Researchers on How to conduct a Multinomial Logistic regression. *Journal of Social Service Research*, 35(2): 193-205.
- Rehrhaye K., Ait El Mekki A., 2017. Estimation de la vulnérabilité en sécurité alimentaire face aux objectifs visés par l'État à l'horizon 2020 (Cas du blé tendre). *Revue Marocaine des Sciences Agronomiques et Vétérinaires*, 5(2): 183-191.
- Toumi L., El Amrani M., Ait El Mekki A., Harbouze R., Fadlaoui A., 2020. The Structuring and Good Governance of the Pulses Sector in Morocco: Results from an e-Delphi Survey. *International Journal of the Science of Food and Agriculture*, 4(2): 191-202.

Web references

- Akesbi N., 2011. *La Nouvelle Stratégie Agricole du Maroc annonce-t-elle l'insécurité alimentaire du pays ?* <https://www.cairn.info/revue-confluences-mediterranee-2011-3-page-93.htm>.
- Ait Hou M., Grazia C., Malorgio G., 2015. *Food safety standards and international supply chain organization: A case study of the Moroccan fruit and vegetable exports*. <https://doi.org/10.1016/j.foodcont.2015.02.023> (accessed, 1 February 2021).
- Crowson M., 2019. *Ordinal logistic regression using SPSS*. The University of Oklahoma, <https://sites>.

- google.com/view/statistics-for-the-real-world/home (accessed, 1 February 2021).
- FAO (Food and Agriculture Organization), 2020. *La COVID-19 et l'impact sur la sécurité alimentaire dans la région du Proche-Orient et de l'Afrique du Nord : comment y répondre ?* Caire, <https://doi.org/10.4060/ca8430fr> (accessed, 15 February 2021).
- Gereffi G., Fernandez-Stark K., 2016. *Global Value Chain Analysis: A Primer*. <https://www.researchgate.net/publication/305719326> (accessed, 1 February 2021).
- Legrand P., Bories D., 2007. *Le choix des variables explicatives dans les modèles de régression logistique*. <https://www.researchgate.net/publication/281834969> (accessed, 1 February 2021).
- OECD (Organization for Economic Cooperation and Development), 2011. *Water governance in OECD countries: A Multilvel Approach*. OECD studies on water. Paris: Editions OCDE. <https://doi.org/10.1787/9789264119284-en> (accessed, 15 February 2021).
- MICEVN (Ministère de l'Industrie, du Commerce, de l'Economie Verte et Numérique), 2020. *Post COVID 19 : Nouvelle génération de programmes d'appui pour la relance des TPME industrielles*. <https://www.mcinet.gov.ma/fr/content/post-covid-19-nouvelle-génération-de-programmes-d'appui-pour-la-relance-des-tpme> (accessed, 23 February, 2021).
- MEFRA (Ministère de l'Economie, des Finances et de la Réforme de l'Administration), 2020. Circulaire n° 6029/211. <https://www.finances.gov.ma/Publication/adii/2020/adii-di-produits-covid19.pdf> (accessed, 23 February, 2021).
- Soullier G., 2013. *La gouvernance des chaînes de valeur en Afrique : permanence ou changement ?* <https://www.researchgate.net/publication/327115061> (accessed, 1 February 2021).
- Tozanli S., El Hadad F., 2007. *Gouvernance de la chaîne globale de valeur et coordination des acteurs locaux : la filière d'exportation des tomates fraîches au Maroc et en Turquie*. <https://hal.inrae.fr/hal-02660310> (accessed, 15 February, 2021).

Appendix 1

Grid of variables

<i>Dependent variables: Impact of governance on food security (Availability/Accessibility/Utilization/Stability) of pulses</i>					
<i>Dependent variables</i>	<i>Categories and codes</i>				
1. Impact of Governance on Food Availability	No impact: 1	Low to medium Impact: 2			Strong Impact: 3
2. Impact of Governance on Accessibility	No impact: 1	Low to medium Impact: 2			Strong Impact: 3
3. Impact of Governance on Utilization	No impact: 1	Low to medium Impact: 2			Strong Impact: 3
4. Impact of Governance on Stability	No impact: 1	Low to medium Impact: 2			Strong Impact: 3
<i>Independent variables: Indicators of governance of the pulses sector</i>					
<i>Independent variables</i>	<i>Categories and codes</i>				
1. Functional proximity of the sector	Yes: 1	No: 0			
2. Physical proximity of the sector	Yes: 1	No: 0			
3. Organizational proximity of the sector	Yes: 1	No: 0			
4. Piloting and control of the sector	No pilot: 1	Piloting by State: 2	Piloting by Producers: 3	Piloting by Industrials: 4	Piloting by Buyers: 5
5. Degree of coordination and collaboration between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
6. Degree of commitment between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
7. Degree of trust between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
8. Degree of transparency between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong :5
9. Degree of information sharing on inputs between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong:5
10. Degree of information sharing on production technology between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
11. Degree of information sharing on quality standards between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
12. Degree of information sharing on supply between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
13. Degree of price information sharing between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5
14. Degree of information sharing on distribution system between actors	Very low: 1	Low: 2	Medium: 3	Strong: 4	Very strong: 5

Appendix 2

Correlations between independent variables

Non-parametric correlations			Physical proximity of the sector	Piloting and control of the sector	Degree of transparency between actors
Rho Spearman (Rs)	Physical proximity of the sector	Correlation Coefficient	1,000	0,231	-0,445**
		Sig. (bilatéral)	.	0,188	0,008
		N	34	34	34
	Piloting and control of the sector	Corrélation Coefficient	0,231	1,000	-0,256
		Sig. (bilatéral)	0,188	.	0,144
		N	34	34	34
	Degree of transparency between actors	Correlation Coefficient	-0,445**	-0,256	1,000
		Sig. (bilatéral)	0,008	0,144	.
		N	34	34	34

Notes: ** indicates significant at the 1% level, Source: non-parametric correlations, SPSS, 2020.

Appendix 3

Average of correlation coefficients between variables

Independent Variables	Average correlation coefficient per variable	Average correlation coefficient observed in the correlation matrix
Degree of commitment between actors	0,602	Average of Rho Spearman (RsA)*: 0,598
Degree of trust between actors	0,590 <RsA*	
Degree of transparency between actors	0,536 <RsA*	
Degree of information sharing on inputs between actors	0,630	
Degree of information sharing on supply between actors	0,615	
Degree of price information sharing between actors	0,615	
Degree of information sharing on distribution system between actors	0,597 <RsA*	

Notes: * The average correlation coefficient RsA is calculated both for each variable and for the correlation matrix (non-parametric correlations, SPSS, 2020).