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FINANCIAL CONSTRAINTS RISK AVERSION AND SHARECROPPING IN RAINFED AGRICULTURE: APPLICATION TO NORTH WEST TUNISIA

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Abstract

Laffont and Matoussi (1995) have developed a theory of sharecropping which emphasizes the dual role of moral hazard in the provision of effort and financial constraints. Their Empirical Investigation was based on irrigated agriculture. Our contribution is then a generalization of this work to the context of rainfed agriculture, which provides the essential of food production in semi-arid countries like Tunisia. Two innovations will be introduced: a sequential choice of the landlord behavior in the selection of the optimal contract and the test of the role of financial constraint and risk aversion in the contract determination in the context of non-irrigated agriculture.

JEL Classifications: Q1

Keywords: Risk Aversion, Sharecropping, Rainfed Agriculture, Tunisia

ملخص

وضع كل من لافون وماتوسى (1995) نظرية المزارعة التي تؤكد على الدور المزدوج للخطر الأخلاقي في توفير الجهد والقيود المالية. واستندا على التحقيق التجريبي عن الزراعة المروية مساهمتنا من ثم هي تعميم هذا العمل إلى سياق الزراعة البعلية، والذي يوفر ضرورة الإنتاج الغذائى في البلدان شبه الجافة مثل تونس. وسيتم عرض اثنين من الابتكارات: اختيار متتابعة من سلوك المالك في اختيار العقد الأمثل والاختبار للدور القيد المالي ومعدلات كره المخاطرة في تحديد العقد في سياق الزراعة غير المروية.

1. Introduction

Appropriate institutions represent an efficient response to the market failures. A good example of such institutions is sharecropping. Economists, from the founder of this science Adam Smith, until the work of Gale Johnson (1950), has considered such institutions as inefficient and must be discouraged by adapted means. The probem that emerged and has became a paradox which has challenged many economists for generations could be briefly summarized in a few words: in spite of this large condemnation by eminent theoretical economists, sharecroping has known a large extention in space as well as in time; indeed in several regións in the World such India, Pakistan Bangladesh, Tunisia, etc., sharecropping is even now very active in agriculture.

Thanks to the huge development of contract theory and more generaly "Information theory", the analysis of the this important question of agrary economics, is now clarified. The modern litterature (Stiglitz 1974; Braverman and Stiglitz 1986; Shaban 1987; Laffont-Matoussi 1995; Jacoby and al. 2004) now considers sharecropping as a rational response to the missing appropriate markets for insurance and credit.

The main objective of this paper is to investigate the contractual choice in a semi arid climate and mainly in rainfed agriculture. This paper is then an extension of the work done by Laffont and Matoussi (1995). Those authors have developed a theory of sharecropping which emphasizes the dual role of moral hazard in the provision of effort and financial constraints. Their empirical investigation was based on irrigated agriculture. Two innovations will be introduced in this paper, which focuses on rainfed agriculture:

- We assume that the final contract is essentially determined by the landlord's preferences since his bargaining power is largely superior to the tenant's. The first innovations will be then the introduction of a sequential behavior in the choice of an agricultural contact. We assume that the landlord decides the choice of a contract in two steps: His first decision will be to make the choice between self-cultivation and a share contract. The second decision will be to choice the type of the association (Rent or Share contract).
- The second innovation is to focus on rainfed agriculture. In semi arid countries like Tunisia, non-irrigated agriculture is closely dependent on precipitations, which is highly variable. In those countries irrigated agriculture, when it is possible, reduces significantly the variability of production and diminishes the risk incurred by the farmer. We think that an empirical investigation focused on rain fed agriculture will show the importance of the dual role of financial constraints and risk aversion in the selection of contracts, and complete the work of Laffont and Matoussi.

We would like to argue in this paper that the financial constraint, which has been demonstrated by Laffont and Matoussi, as the main explanation of sharecropping in irrigation agriculture is still valid in a risky environment such as rainfed agriculture characterized by production volatility.

Section 2 provides some theoretical foundations to our work. Section 3 is dedicated to our empirical investigation. We will begin with a description of our original data. We will then present the analysis and the estimation of the determinants of the landlord's choice and finally we will go the tenant selection of the optimal contracts. We will try to explain the determinants of the difference between the tenant's obtained contract and his real preferences in the fourth section. Finally we will propose some policy implications of our results and then conclude.

2. Methodology

We assume that the selection of an agricultural contract is a function of the real behavior of the landlord, which is sequential by nature. In fact the landlord makes his choice of the appropriate contract in two stages:

- In the first step, given his endowments (Working capital, family labor, water resources availability, plot fertility, climate variability, etc.), the landlord decides to choose between self- cultivation and a contract.
- Then in the second step, if an enforce-indirect contract is retained, the landlord tries to select the best association contract.

2.1. First stage: Status choice

At the beginning of each growing season, the landlord has the choice between operating his plot himself or opting for a rent or sharecropping contract.

Let Z be the dummy function, which describes the tenure[1]. We argue that this function is governed by a decision rule z_i^* which is a linear combination of explanatory variables (X_i) giving the event $Z = 1$ if z_i^* is above 0. Thus, we have:

$$Z_i = \begin{cases} 1 \; si \; z_i^* > 0 \\ 0 \; si \; z_i^* \le 0 \end{cases}, \qquad (1)$$

Here $z_i^* = X_i.\beta + \varepsilon_i$

This latent variable describes the characteristics of the individual *i* (socio-demographic and economic characteristics). We postulate that this variable is a function of the wealth of the owner, the family labor and other control variables. Correlations between these variables are relatively low[2].

If P_i is the probability of auto cultivation, then, we have:

$$P_i = \Pr ob(z_i^* > 0)$$
$$= \Pr ob(\varepsilon_i > - X_i.\beta) \qquad (2)$$

If we choose the probit[3] model where density of the error term ε_i is symmetric, we obtain:

$$P_i = \Pr ob(\varepsilon_i < X_i.\beta) . \qquad (3)$$

The coefficients β_i are not elasticities like in the OLS regressions, but they indicate whether the variables have a positive impact or not on the probability P_i.

2.2. Second stage: selection of the best contract

The previous section has shown the determinant of the landlord's choice. In this section we will test the role of financial constraints and risk aversion in the selection of the best share contract.

The structural form is summarized as an ordered probit model where the dependent variable CT_i is the ordered categories. There is a latent variable CT_i^* that is observed transformed CT_i[4] as:

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[1] The function Z is 1 if the landlord cultivates his plot, 0 else.

[2] See annex 2

[3] We can also use a logit model or logistic. But in the large sample, we obtain comparative results (Amemiya 1981)

$$CT_i = \begin{cases} 0 & \text{if } CT_i^* \le c_1 \\ 1 & \text{if } c_1 \le CT_i^* \le c_2 \\ 2 & \text{if } c_2 \le CT_i^* \le c_3 \\ 3 & \text{if } c_3 \le CT_i^* \le c_4 \\ 4 & \text{if } CT_i^* \ge c_4 . \end{cases}$$

To explain the choice of contracts we selected the following regression:

$$CT_i^* = \alpha_0 + \alpha_1 HS + \alpha_2 WC^T + \alpha_3 credit + \alpha_4 dist^T + \alpha_5 DW + \alpha_6 ACT + \alpha_7 age + \alpha_8 EQ + \varepsilon_i$$

The maximum likelihood estimators of this model are obtained by the Davidson (1959), Fletcher and Powell (1963) algorithm and the variance covariance matrix for the estimates is the Berndt ***et al.*** (1974) estimator using the first derivatives.

3. Empirical Investigation

Our empirical investigation will be conducted in three steps:

- We will begin by the presentation of our original data,
- We then proceed to estimate the determinants of the landlord choice between operating his plot himself and looking for a partner to establish the best share contract.
- Finally we estimate the real determinant of the choice of the best share contract by the tenant.

3.1 The data

We have collected by survey, original data on farms in a semi-arid zone in the western north of Tunisia, namely the Kef region and especially the delegation of Tajerouine. Six villages are selected in the district center. Data were collected on grain crops during the growing season of 2004-2005. These data are related to socioeconomic characteristics of the farmers (age, experience, household size, and capital stock), modes of tenure and the economic environment of the study area.

The number of farmers in selected survey is 149. The number of plots planted is 465 including 145 which are operated under rent contracts (RC) or sharing of harvest (SC).

A survey was conducted during the growing season 2004-2005 in the rural area of Tajerouine district situated in the governorate of El Kef, 120 miles west of Tunis. The main production in this region is grain crops. The agriculture in this semi arid region is mainly of the rainfed type. The main characteristic of this production is the high volatility of yield due to the variability of the rain frequency. So the risk induced by this characteristic will certainly have a significant impact on the contractual choice.

The information collected by this survey, which is based on the plot dimension, can be classified in two main categories:

- The first concerns information about the families (sociodemograghic characteristics, wealth and income data for each family).
- Information about each plot of land. Data include size of plot, type of crop, type of labor contract used (wage contract, rent contract or sharecropping contract), production levels, amounts of labor inputs as well as amounts of other inputs.

[4] See Greene, Econometry, fifth edition

We want to insist that our study is conducted on the basis of the plot concept. A plot is a piece of land where only one type of crop is carried out each season.

3.2 The determinant of the Landlord Choice

We will begin by the estimation of the landlord's choice because his bargaining power dominates the one of the tenant and plays an important role in the final contract choice.

Table 1 gives us the results of the estimations of the landlord choice. This estimation, based on a probit model, is performed by the STATA software.

The main results which can be derived from the analysis of Table 1 are:

- ***The Wealth Variable (WV) is here highly significant and has the right sign***, suggesting that the financial constraints play a key role in the explanation of the contract selection. Indeed, this result confirms those of Laffont and Matoussi, which stipulate that wealthy landlords prefer to operate their plots themselves.
- ***The Hail-storm*** frequency during the last decade (HS) has also the right sign and is highly significant. This variable is very important since it reflects the riskiness of this rainfed activity which depends essentially on weather impacts (rain and hail storm). Indeed this variable shows us that when the frequency of hail storm increases, the landlord prefers to choose a share contract.
- ***The plot remoteness (PR) and area are also highly significant but with negative*** signs suggesting that when the plot is very far from the landlord's residence and its area is very large the landlord prefers to look for a share contract.
- ***When the number of plots (NP) increases*** the landlord will opt also for share contracts.

These estimates allow us to claim that the landlord looks for a partner when the hail storm frequency and/or the plot number and size increase.

3.3 Contracting with financial constraints and risk aversion (the tenant choice)

To explain the tenant choice of contracts, we select the following regression:

$$CT_i^* = \alpha_0 + \alpha_1 HS + \alpha_2 WC^T + \alpha_3 Cred + \alpha_4 PR + \alpha_5 DW + \alpha_6 ACT$$

$$+ \alpha_7 Age + \alpha_8 EQ + \varepsilon_i$$

Where:

- WC^T: Tenant Working Capital (available monetary liquidities, rented value of various owned equipments).
- Cred: credit obtained by the tenant.
- PR: proximity from Plots
- ACT: Number of tenant family workers in agriculture.
- EQ : Tenant equipment rented value of various owned equipments.
- DW: Day Work is the full occupation of the tenant in the agriculture work.
- Age : Tenant age.

The estimation of this specification will be performed according to three modalities:

- Multiple Choices of contracts[5]: This estimation will be done by the instruction Ordered Probit. Table 2 presents the obtained results.
- The same estimation as before, with the combination the two variables (Credit and WC) in one variable. Table 3 shows the results, and finally the
- Binary Choice (Rent or share contract), the results are illustrated by Table 4.

[5] Different contracts are described in annex 4

This table shows us that all the variables retained are significant and have the right sign. The WC, the Credit and the EQ variables, indicating the importance of the tenant financial constraints in the determination of the contract selection, are significant with the positive signs. This result suggests that when the tenant has a sufficient WC, an easy access to Credit and an important endowment in agriculture equipment, he will opt for a Rent or a share contract with a large part of the plot output. Table 3 and table 4 confirm the above results even when combining the credit, equipment and liquidity of the tenant in an aggregate variable named now Working Capital (WC) or simplifying the choice of the tenant only between share and rent contract (Table 4). Those results obtained in rainfed agriculture reinforce the LM results obtained from irrigated agriculture.

The HS variable, which is significantly negative, suggests that when hailstorm frequency is high, the tenant prefers a sharecropping contract. This result is really important in our work since it shows that the risk induced by this event will push the tenant to be prudent and try to share this risk with the landlord. Based on this result, we can claim that risk aversion plays an important role, like financial constraint, in the determination of the appropriate choice made by the tenant. Knowing that risk aversion plays a secondary role in the choice of contract by the tenant in the case of irrigated agriculture[6], when we move to rainfed agriculture things changes radically and this variable became as important as the financial constraint.

The variable ACT, which indicates the number of working members in the tenant's family, has a positive effect and is significant showing that when the tenant has an important working force (measured by the active family member in agriculture) he will also choose a rent or a share contract with a large part of the plot output.

Tenants who are essentially active in the agriculture sector, mostly as a worker, are pushed to share contracts since they are obliged to work for low salary to assure their subsistence.

Finally when the tenant is old (AGE), or the plot is far from his residence (PR), he will opt for a share contract.

4. Tenants Preferences

A contract is in reality the result of bargaining between at least two parties. In our case it is the result of a negotiation between the landlord and the tenant. This is why we assume that the contract obtained by the tenant is not necessarily his first best choice, because the bargaining power of the owners is higher. Several authors have drawn attention to the importance of this aspect, however very few empirical studies have been devoted to this issue.

We will explore in this study the determinants of the tenant's deep preferences, the determinants of the real choices and especially the difference between them and finally we try to explain the underlying reasons for those differences.

To estimate the determinants of real choice and ideal choice, we define a dummy variable which takes 0 for the choice of share contract and 1 for a rent contract. In our survey data we have collected for the tenant, in the real case, a multiple choice (rent contract and several types of contract share), while for the ideal case we have collected for tenant deep preferences only two binary situations (rent and share).

4.1. Tenant real choice in the multiple and binary case

Table 5 presents the estimation of the tenant real choice in the multiple and binary choice and Table 6 will present the comparison of the real and ideal choice of the tenant for the binary case.

[6] See the results shown by Laffont-Matoussi (1995).

The estimation, of the real choice (multiple and binary choices) illustrated by Colum 2 and Colum 3 of Table 5, gives us almost the same results for the main determinants, which are HS, WC, Credit, and EQ. As shown before the main variables explaining the tenant contractual choice are the financial constraints (Working Capital and Credit) and risk, which is approximated by Hailstorm. The other Variables (Distance, DW, ACT and AGE) are less important in the case of rainfed agriculture. Those variables indicating the workforce of the tenant (ACT), the distance from the cultivated plot (Dist), the full occupation of the tenant in the agriculture work (DW) and the Age of tenant are very important in the irrigated agriculture which needs an intensive care. While rainfed agriculture needs essentially an important endowment to buy the main inputs (seeds, fertilizer and harvesting) and it is less greedy in inputs involving labor force. Indeed cereal crops, which are the dominating occupation in those semi arid regions, are more dependent on financial constraints and risky weather than on intensive labor.

4.2 estimation of the tenant real and ideal choice in the binary case

The main difference between the real and the ideal choice obtained in our estimate (Colum 2 and Colum 3 of Table 6) is the effect of the variable storm hail. Indeed this variable is highly significant and has the right sign in the real choice case but is not significant in the ideal choice. The best explanation for this result could be presented as follows: Indeed, the tenant may ignore, before the start of the negotiations with the landlord, the actual value of the hailstorm probability, so he does not explicitly include it in his evaluation. While the landlord knows very well this probability which why he will incorporate it explicitly in his choice.

The final results showing the tenant's real choice, which indicates that the Hailstorm variable became highly significant, is in fact induced by the landlord's bargaining power pushing the tenant to accept a share contract in plots having high probability to be damaged by hail.

5. Policy Implications

Sharecropping was until very recently considered as detrimental to the entire society and should be discouraged by all means. A failure of the invisible hand that should be reduced by high taxation, as was suggested by Adam Smith the founding father of economics, or significantly improved by an appropriate sharing of variable factors (Schickele 1941). We have seen that modern economic theory has succeeded to demonstrate that this type of contract is appropriate in several specific situations of moral hazard and where credit is lacking.

This modest contribution to the intensive research initiated by Gale Johson in 1950, which explains the existence and even the extension of this type of productive organization by certain market failures, attempts to apply the theoretical arsenal developed over recent decades to the context of semi arid regions where agricultural production is dominated by rainfed crops.

Our work confirms empirically the main results obtained by Laffont and Matoussi, in the context of rainfed agriculture, which stipulates that the availability of credit and lack of financial constraint allows the tenant to choose the optimum contract i.e. the rent contract.

A very brief summary of the essential results obtained: If risk aversion plays a secondary role in the choice of contract by the tenant in the case of irrigated agriculture, when we move to rainfed agriculture, situations changes radically and this variable became as important as the financial constraint.

The two major recommendations to provide to decisions makers in the field, derived from our main result are:

- ***Improve credit conditions***: Indeed it is imperative in these rather poor regions to promote an appropriate credit system, and
- ***Implement an insurance scheme*** adapted to this highly risky context.

As demonstrated theoretically by Laffont and Matoussi and confirmed here empirically, it is imperative to ensure these two conditions ***permit the tenant to realize a rent contract*** which give him the incentive to provide a maximum effort.

We wish to emphasize that all the MENA countries, which suffer from an alarming lack of water resources and chronic food deficits, must consider all the alternatives capable of improving agricultural production. The choice of optimal contract is one of those alternatives.

References

Ackerberg, D.A. and Botticini M. 2002. "Endogenous Matching and the Empirical determinants of Contract Form." *Journal of Political Economy* 110 (3): 564-591.

Amamiya T. 1981. "Qualitative Response Models: A Survey." *Journal of Economic Literature* Vol. XIX: 1483-1536.

Banarjee, A., and Ghatak M. 2004. "Eviction Threats and Investment Incentives." *Journal of Development Economics* 74: 469-488.

Basu, K. 1992. "Limited Liability and the Existence of Share Tenancy." *Journal of Development Economics*38 (1): 203-220.

Bellemare, M. F. 2003. "A Limited Liability Model of Reverse Tenancy." Working Paper, Department of Applied Economics and Management, Cornell University.

Braido, L.H. 2008. "Evidence on Incentive Properties of Share Contracts", *Journal of Law and Economics*, 51:327-348.

Brasselle, A.S., Gaspart F., and Platteau J.P. 2002. "Land Tenure Security and Investment Incentives: Puzzling evidence from Burkina Faso", *Journal of Development Economics* 67: 373-418.

braverman & Stiglitz (1982):

Braverman, A., and Stiglitz J. 1986). "Landlords, Tenants and Technological Innovations." *Journal of Development Economics*, 23, 313-332.

Cheung, S.N.S. 1968. "Private Property Rights and Sharecropping." *Journal of Political Economy* (6): 1107-1122.

Cheung, S.N.S. 1969. *The Theory of Share Tenancy.* Chicago: The University of Chicago Press.

Dubois, P. 2002. "Moral hazard, Land Fertility and Sharecropping in a Rural Area of the Philippines", *Journal of Development Economics* 68(1): 35-64.

Hart, O., and Moore J. 1999. "Foundations of Incomplete Contracts." *Review of Economic Studies* 66:115-138.

Hayami, Y., and Otsuka K. 1988. *The Economics of Contract Choice: An Agrarian* Perspective. Oxford: Clarendon Press.

Jacoby, A., A.R. Murgai and S. Rehman. 2004. "Monopoly Power and Distribution in Fragmented Markets: the Case of Groundwater." *Review of Economics Studies* 71(3): 783-808

Johnson, D. G. 1950. "Resource Allocation under Share Contracts." *Journal of Political Economy* 58(2): 111-123.

Joskow, P. 1987. "Contract Duration and Relationship-Specific Investments: Empirical Evidence from Coal Markets." *American Economic Review* 77(1): 168-85.

Laffont, J.J., and Matoussi M.S. 1995. "Moral Hazard, Financial Constraints and Sharecropping in El Oulja." *Review of Economic Studies* 62: 381-99.

Laffont, J.J., and Mortimort D. 2002. *The Theory of Incentives: The Principal Agent Model*. Princeton, NJ: Princeton University Press.

Maddala, G.S. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge University Press, Cambridge.

Maskin, E., and Tirole J. 1999. "Two Remarks on the Property Rights Literature." *Review of Economic Studies* 66: 139-150.

Marshall, A. 1890. *Principles of Economics, 2nd ed*. London: Macmillan and Co.Ltd.

Ray, T., and Singh N.2001. "Limited Liability, Contractual Choice, and the Tenancy Ladder." *Journal of Development Economics* 66: 289-303.

Salanie, B. 1997. *The Economics of Contracts.* Cambridge, Mass: MIT Press.

Schickele, R.1941. "Effect of Tenure Systems on Agricultural Efficiency." *Journal of Farm Economics* 23:185-207.

Shaban, R. 1987. "Testing between Competing Models of Sharecropping." *Journal of Political Economy* 95(5): 893-920.

Shively, G.E. 2001. "Poverty, Consumption risk, and soil conservation." *Journal of development Economics* 65:267-290.

Stiglitz, J. 1974. "Incentives and Risk Sharing in Sharecropping." *Review of Economic Studies* 41:219-255.

Wooldridge, M.J. 2001. *Econometric Analysis of cross section and Panel Data.* Cambridge, Mass: MIT Press.

Table 1: Determinants of the Landlord Choice

Variable	Coefficient	Z-Statistic	P-value
1. HS	- 0.91	-7.80	(0.000)
2. WC^L	0.00008	3.74	(0.000)
3. PR^L	-0.145	-6.91	(0.000)
4. Area	-0.015	-1.99	(0.046)
5. NP	-0.08.	-2.69	(0.007)
6.Cte	2.74	9.9	(0.000)
N =	**465**		
LR chi2	**311.82**		
Pseudo R^2	**0.54**		

Where:
HS : Hail-storm frequency during the last decade.
WC^L : Landlord Working Capital.
Area : Surface of the plot (in hectares)
NP : Number of plots.
PR : Plot remoteness.

Table 2: Determinants of the Tenant Contract Selection (Multiple Choices)

Variable	Coefficient	Z-Statistic	P-value
1. HS	- 0.16	-2.41	(0.016)
2. WC^T	0.00003	2.01	(0.044)
3. Cred	0.0002	4.32	(0.000)
4. PR.	-0.1396	-5.64	(0.000)
5. DW	-0.00393	-3.5	(0.000)
6. ACT	0.238	2.06	(0.040)
7. Age	-0.0003	-3.23	(0.001)
8. EQ	0.0001	4.46	(0.000)
N	**145**		
LR chi2(8)	**79.66**		
Pseudo R2	**0.1983**		

Table 3: Determinants of the Tenant Contract Selection (Multiple Choices) With Combining the Two Variable Credit and WC

Variable	Coefficient	Z-Statistic	P-value
1. HS	- 0.13	-1.95	(0.051)
2. Working[7]	0.00006	4.66	(0.000)
3. PR.	-0.112	-4.93	(0.000)
4. DW	-0.0032	-3.08	(0.002)
5. ACT	0.082	0.82	(0.413)
6. Age	-0.168	-2.32	(0.02)
7. EQ	0.0001	4.77	(0.000)
N	**145**		
LR chi2(7)	**68.46**		
Pseudo R2	**0.1704**		

[7] Working= credit+ WC

Table 4: Determinants of the Tenant Contract Selection (Binary Choice)

Variable	Coefficient	Z-Statistic	P-value
1. HS	- 0.844	-4.61	(0.000)
2. WC	0.00005	2.63	(0.008)
3. PR.	-0.146	-2.41	(0.016)
4. DW	-0.0022	-1.21	(0.22)
5. ACT	0.034	0.19	(0.85)
6. Age	-0.0044	0.32	(0.75)
7. EQ	0.0002	3.51	(0.000)
8.Constante	0.97	1.38	0.16
N	**145**		
LR chi2(7)	**85.22**		
Pseudo R2	**0.4989**		

Table 5: Real and Ideal Choice

Variable	Real (multichoice)	Real (binary choice)
1. HS	- 0.16 ***	**-0.4** (4.74)***
2. WC	0.00003 **	**0.0003** (1.35)
3. Credit	0.0002 ***	**0.0002** (2.56)***
4. PR.	-0.14 ***	**-0.16** (2.66)***
5. DW	-0.004 ***	**-0.002** (1.0)
6. ACT	0.24 **	0.1 (0.6)
7. Age	-0.02 **	-0.00005 (0.4)
8. EQ	0.0001 *	0.0002 (3.3)***
N = 145	145	145
Pseudo R^2	0.20	0.52
LR chi^2	80.81	89.32

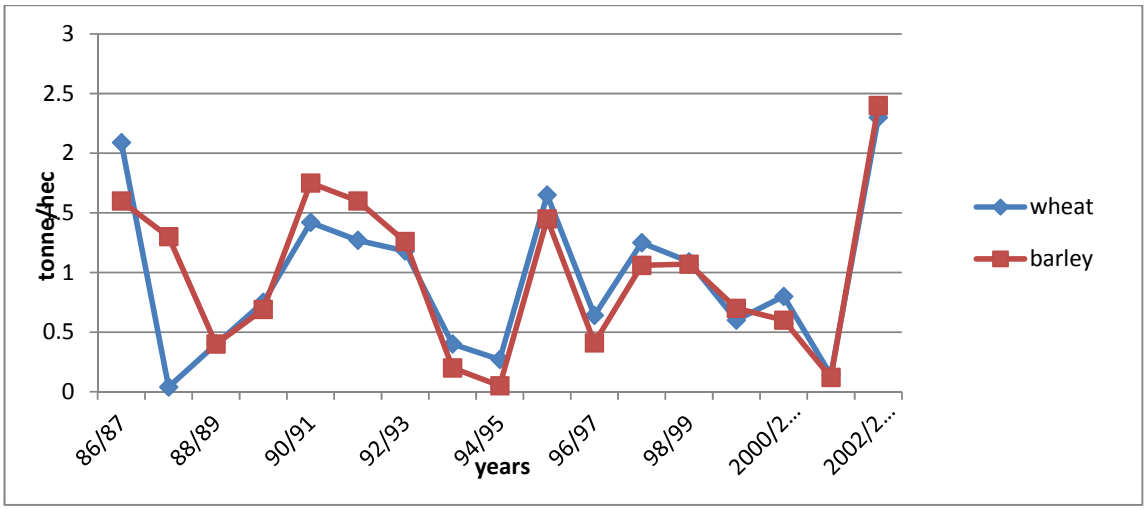
Notes: Column 2 reproduces exactly the results showed in Table 2.)

Table 6: Real and Ideal Choice

Variable	Real (binary choice)	Ideal (first best choice)
1. HS	**-0.4** (4.74)***	-0.7 (-0.8)
2. WC	**0.0003** (1.35)	0.00001 (1.35)
3. Credit	**0.0002** (2.56)***	0.0002 (3.5)***
4. PR.	**-0.16** (2.66)***	-0.05 (-1.57)
5. DW	**-0.002** (1.0)	-0.004 (2.72)***
6. ACT	0.1 (0.6)	0.2 (0.15)
7. Age	-0.00005 (0.4)	0.00003 (0.4)
8. EQ	0.0002 (3.3)***	0.0001 (3.18)***
N = 145	145	145
Pseudo R^2	0.52	0.25
LR chi^2	89.32	47.76

Annex

Annex 1: Cereal Yields in the Study Area



Annex 2: Correlation between Variables in First Stage (N=465)

	WC	PR	area	HS	NP
WC	1				
PR	-0.05	1			
area	0.26	0.34	1		
HS	-0.2	0.27	0.13	1	
NP	0.23	0.03	.14	0.12	1

Annex 3: Descriptive statistics of the main variables used in seconde stage (n=145)

VARIABLE	Mean	S.D.	min	Max
WC^T	10688,8	7961,8	500	43600
HS	2,93	1,53	1	6
Crédit	1981	3285	0	12000
Act	3,08	1,003	1	5
PR^T	5,63	4,74	0,5	25
DW	189	112	3	360
EQ	2191	4632	0	24000
Age	50,33	14,61	22	78

Annex 4: Types of Contracts

Type of contract : CT	contract code: CT_i	Share of the product kept by the tenant	Numbers of concerned household in the survey
Share 1	0	50 %	9
Share 2	1	66 %	11
Share 3	2	70 %[8]	61
Share4	3	75 %	24
Rent contract	4	100 %	40

[8] This share contract is relatively recent in the study area. Its emergence can be explained by the guarantee provided by the National Cereals Office to buy the harvested production.