

Evaluating Farmer Compliance in Rice Contract Farming: Empirical Insights from Burkina Faso

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Abstract

The rice sector in Burkina Faso faces major constraints, including soil degradation, irregular rainfall, pest pressure, and weak private sector engagement. Contract farming offers a pathway to strengthen coordination across value chains, but its success depends on farmers' compliance with contractual clauses. This study examines the determinants of contractual compliance among rice producers using data collected from a random sample of 400 farmers in Bama and Donna. A generalized ordered logit model is employed to relax the proportional odds assumption, allowing the effects of explanatory variables to vary across different degrees of compliance. This modeling strategy captures important heterogeneities in farmers' responses and offers a more comprehensive and nuanced understanding of compliance behavior than traditional binary or proportional-odds models. Findings show that both farmer characteristics (education, cooperative membership, farming experience) and contract-specific factors (duration, monitoring, payment modalities, and training) significantly affect compliance. Education and cooperative membership enhance the probability of partial compliance, while monitoring mechanisms and timely payments encourage adherence to multiple clauses. By contrast, longer-term contracts and greater farming experience lower the likelihood of full compliance, reflecting risk aversion and skepticism linked to past contractual failures.

Keywords: Contract farming; rice production; compliance; generalized ordered logit; Burkina Faso

Évaluation du respect des contrats par les producteurs de riz dans l'agriculture contractuelle : cas empiriques du Burkina Faso

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Résumé

Le secteur rizicole au Burkina Faso fait face à d'importantes contraintes, notamment la dégradation des sols, l'irrégularité des précipitations, les attaques parasitaires et le faible engagement du secteur privé. L'agriculture contractuelle constitue une voie palliative pour renforcer la coordination au sein des chaînes de valeur du riz, mais son efficacité dépend du respect des clauses contractuelles par les producteurs. Cette étude analyse les déterminants du respect contractuel chez les riziculteurs à partir de données collectées auprès d'un échantillon aléatoire de 400 producteurs à Bama et à Douna. Un modèle logit ordonné généralisé est utilisé afin de relâcher l'hypothèse des cotes proportionnelles, permettant aux effets des variables explicatives de varier selon les différents niveaux de respect des contrats. Cette stratégie de modélisation met en évidence d'importantes hétérogénéités dans les comportements des producteurs et offre une compréhension plus complète et nuancée du respect contractuel que les modèles binaires traditionnels ou les modèles à cotes proportionnelles. Les résultats montrent que les caractéristiques des producteurs (niveau d'instruction, appartenance à une coopérative, expérience agricole) ainsi que les facteurs propres aux contrats (durée, mécanismes de suivi, modalités de paiement et formation) influencent significativement le respect des clauses contractuelles. Le niveau d'instruction et l'adhésion à une coopérative augmentent la probabilité d'un respect partiel, tandis que les mécanismes de suivi et les paiements effectués en temps opportun favorisent le respect de plusieurs clauses. En revanche, les contrats de longue durée et une plus grande expérience agricole réduisent la probabilité d'un respect total, traduisant une aversion au risque et un scepticisme lié à des échecs contractuels antérieurs.

Mots-clés : Agriculture contractuelle ; production rizicole ; respect des contrats ; logit ordonné généralisé ; Burkina Faso

Introduction

Rice plays a central role in household consumption and economic activity across African countries, particularly in West Africa, where it has become both a staple food and a strategic agricultural commodity (FAO, 2018). Owing to its relatively stable availability, ease of preparation, and adaptability to evolving dietary preferences, rice is widely consumed in both urban and rural areas. Beyond its nutritional importance, rice constitutes a major source of income along the value chain, encompassing production, processing, and marketing, and represents a key livelihood component for millions

of households. In West Africa, rice has become a major source of dietary energy for millions of people and plays a central role in regional food security, while also representing a critical agricultural commodity with strong potential to contribute to economic growth and value-added in agricultural GDP (ECOWAS, 2025).

Within this regional context, rice has emerged as a strategic staple crop in Burkina Faso, reflecting profound transformations in consumption patterns driven by urbanization, population growth, and income dynamics. Per capita rice consumption increased from approximately 27 kg in 2000 to 36–39 kg per year in 2020–2021 (INSD, 2024). Rice is now regularly consumed across both urban and rural areas, in some cases multiple times per day, signaling its central role in national food systems. Aggregate national rice consumption is estimated at 0.8–0.9 million tons annually (INSD, 2024), with demand rising from 780,000 tons in 2019 to 825,000 tons in 2020. Projections indicate that rice demand will continue to grow at a rate exceeding 3% per year, underscoring the strategic necessity of strengthening domestic rice production and value-chain performance (DICK & SCHRAVEN, 2021).

Recent trends in Burkina Faso's rice value chain indicate notable progress. National paddy rice production increased from 438,982 tons in the 2022/2023 season to 504,254 tons in 2023/2024, representing a gain of 65,272 tons (+14.9%) (INSD, 2024). This growth reflects sustained public investment, improved access to seeds and fertilizers, enhanced producer capacity through extension and training programs, and an expansion of cultivated areas, accompanied by early indications of yield improvement. Concurrently, rice imports, largely destined for urban consumption, declined substantially, from 71,379.5 million CFA francs in 2022 to 57,480.3 million CFA francs in 2023, a reduction of 19.5% (INSD, 2024). This decline suggests a gradual substitution of imported rice with domestically produced rice, contributing to reduced exposure to international price volatility, lower foreign exchange outflows, and enhanced resilience of the national food system.

Notwithstanding these encouraging developments, domestic rice production remains structurally constrained and insufficient to fully satisfy growing demand. Between 2009 and 2019, national rice output increased by 76%, primarily due to a 92% expansion in cultivated area, while yield growth remained modest, indicating

limited productivity gains and extensive rather than intensive growth (FAOSTAT, 2022). In 2019, national rice consumption was estimated at 715,000 tons, while the self-sufficiency rate remained at only 53%, leaving the country heavily reliant on imports and vulnerable to external supply and price shocks (FAO, 2022). Rapid growth in urban rice consumption, estimated at 5% per year between 2015 and 2020, has further intensified pressure on domestic production systems (DICK & SCHRAVEN, 2021).

Burkina Faso nevertheless possesses considerable untapped potential for rice intensification, particularly within lowland agro-ecosystems. The country is endowed with an estimated 500,000 hectares of irrigable lowlands, of which less than 10% are currently developed (MARAH, 2023). Yields remain well below their agronomic potential, averaging 1.3 t/ha in non-developed lowlands and 2.5 t/ha in developed lowlands, compared with a potential yield of approximately 4 t/ha (INSD, 2024). Although lowlands account for nearly 67% of total rice-growing areas, they contribute only 42% of national rice production, highlighting significant inefficiencies and coordination failures along the rice value chain (MARAH, 2023).

In response to rising demand and persistent productivity gaps, contract farming has increasingly been promoted as an institutional mechanism to strengthen coordination within the rice value chain. From a contract-theoretic perspective, these arrangements aim to mitigate market failures by reducing transaction costs, aligning incentives between smallholder farmers and buyers, and facilitating access to inputs, credit, and technical assistance. However, agricultural contracts are inherently incomplete: not all contingencies related to production risk, price volatility, or quality standards can be fully specified or enforced *ex ante* (FARES, 2000; SAUSSIÉ, 2000). The effectiveness of contract farming, therefore depends on well-designed incentive mechanisms, the credible allocation of risks, and enforceable institutional frameworks. In contexts characterized by information asymmetries, unequal bargaining power, and weak enforcement, contractual imperfections may give rise to strategic behavior, non-compliance, and default, limiting productivity gains and undermining the welfare benefits of contract farming.

Despite its growing policy relevance, empirical evidence remains limited regarding whether contract farming effectively alleviates productivity constraints, ensures farmer compliance, and delivers

inclusive welfare gains within Burkina Faso's rice value chain. This knowledge gap raises critical questions about the capacity of contract farming arrangements to sustainably increase rice production, reduce import dependence, and strengthen national food security.

Given these challenges, it is essential to examine the conditions under which contract farming operates and to identify the factors that contribute to contract compliance or failure.

Accordingly, this study aims to assess the frequency and key determinants of contract non-compliance among rice farmers participating in contract farming schemes in western Burkina Faso. It also seeks to identify institutional arrangements and contractual design features that can mitigate default risks, strengthen enforcement, and enhance the efficiency, equity, and overall performance of agricultural contracts.

Rice Production Systems in the Study Sites

The study areas reflect contrasting rice production environments. In Bama, rice is produced under a fully irrigated lowland system with controlled water management, allowing multiple cropping seasons and higher input use. In contrast, rice production in Douna is predominantly rainfed, seasonal, and highly dependent on climatic conditions, with limited water control and lower input intensification.

Rice Production System in Bama

Bama is a municipality dominated by a fully developed irrigated lowland rice scheme located in the Guiriko area. The zone consists of extensive cultivable lowlands and covers a total area of more than 1,260 hectares, currently under rehabilitation to ensure sustainable year-round rice production during both the rainy and dry seasons. Water management is achieved through a structured network of canals, drainage systems, and small dams, allowing effective control of water supply and reducing production risks. Upon completion of the rehabilitation works, the Bama irrigation scheme is expected to support up to three rice cropping cycles per year, including one rainy-season and two dry-season campaigns, which will substantially increase annual rice output. Production systems in Bama are predominantly input-intensive irrigated systems, characterized by the use of improved and certified rice varieties, mineral fertilizers, and, to a lesser extent, mechanized land preparation and harvesting. High-yielding varieties

such as TS2, Orylux 6, and several FKR varieties are widely cultivated, with average yields commonly ranging between 5 and 7 t/ha, reflecting relatively high productivity compared to national averages. Institutional organization is a key strength of the Bama rice system. Farmers are organized under the Union of Rice Cooperatives of Bama (UCRB), locally known as *Faso Djigui*, which plays a central role in coordinating production activities, facilitating access to inputs and extension services, promoting sustainable production practices, and strengthening market linkages within the rice value chain.

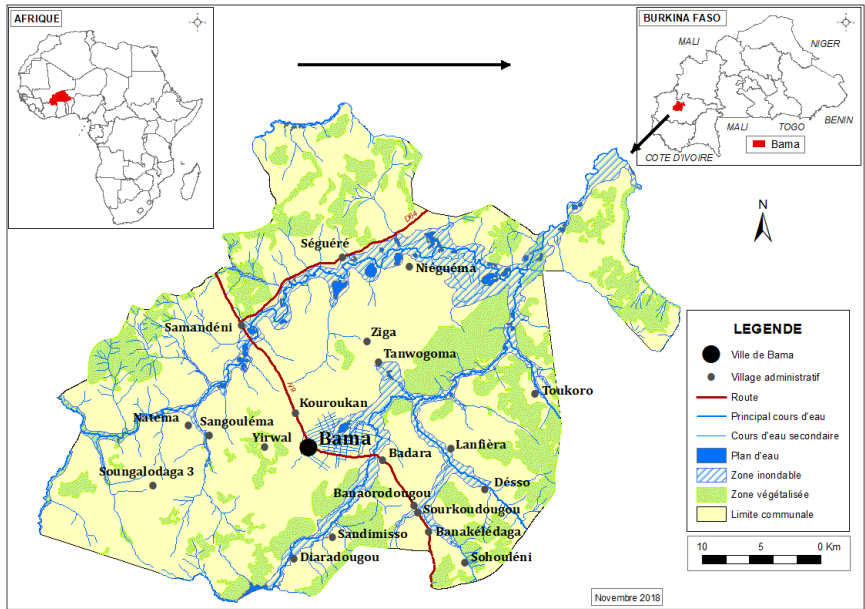


Figure 1. Overview of the Bama lowland rice production area

Source: SAWADOGO *et al.* (2020)

Rice Production System in Douna

The Douna Department, located in Léraba Province, is situated in an agro-ecological zone characterized by alluvial lowlands and limited small-scale irrigated areas, which are particularly suitable for rice cultivation during the rainy season. Rice production in Douna is largely based on traditional lowland systems, where water availability depends primarily on seasonal rainfall, temporary flooding, and surface runoff, with only minimal hydraulic infrastructure. Rice cultivation in Douna is therefore highly seasonal, with most production taking place during the rainy season. In contrast to Bama, the absence of large-scale irrigation schemes results in a production system that is more climate-

sensitive, leading to greater variability in yields and production outcomes. Input use is generally moderate, and production remains largely oriented toward household consumption, with limited market surplus. Nonetheless, some farmer organizations, including the Gouantina cooperative in Douna, have engaged in pilot initiatives to test improved rice production practices, particularly the System of Rice Intensification (SRI). This approach emphasizes wider plant spacing, improved water and weed management, and increased use of organic fertilizers. Evidence from local trials indicates that SRI can significantly enhance productivity, with yields increasing from approximately 2 t/ha under conventional practices to more than 3.5 t/ha. Institutional organization within the rice sector in Douna remains less formalized than in Bama, relying primarily on village-level cooperatives and farmer-led initiatives. The production system places strong emphasis on food security and livelihood resilience, while gradual improvements in rice quality, often driven by women's involvement in production and post-harvest activities, are enhancing opportunities for access to local and regional markets.

I. Materials and methods

I.1. Data collection and sampling procedure

A multi-stage random sampling approach was employed to select respondents. In the first stage, the rice-producing zones of Bama and Douna were purposively identified as the study sites due to their prominence in contract farming. In the second stage, villages within these zones were randomly selected, followed by the random selection of individual rice producers from village lists in the final stage. This systematic process yielded a representative sample of 400 rice farmers.

Data were collected using ODK, a computer-assisted tool that facilitates efficient data entry and real-time quality assurance. To safeguard data integrity, we embedded rigorous consistency checks and monitoring protocols throughout the survey. The entire operation was closely supervised by the researcher via a dedicated database management platform. Ultimately, reliable data were obtained from 400 rice producers actively engaged in rice contract farming.

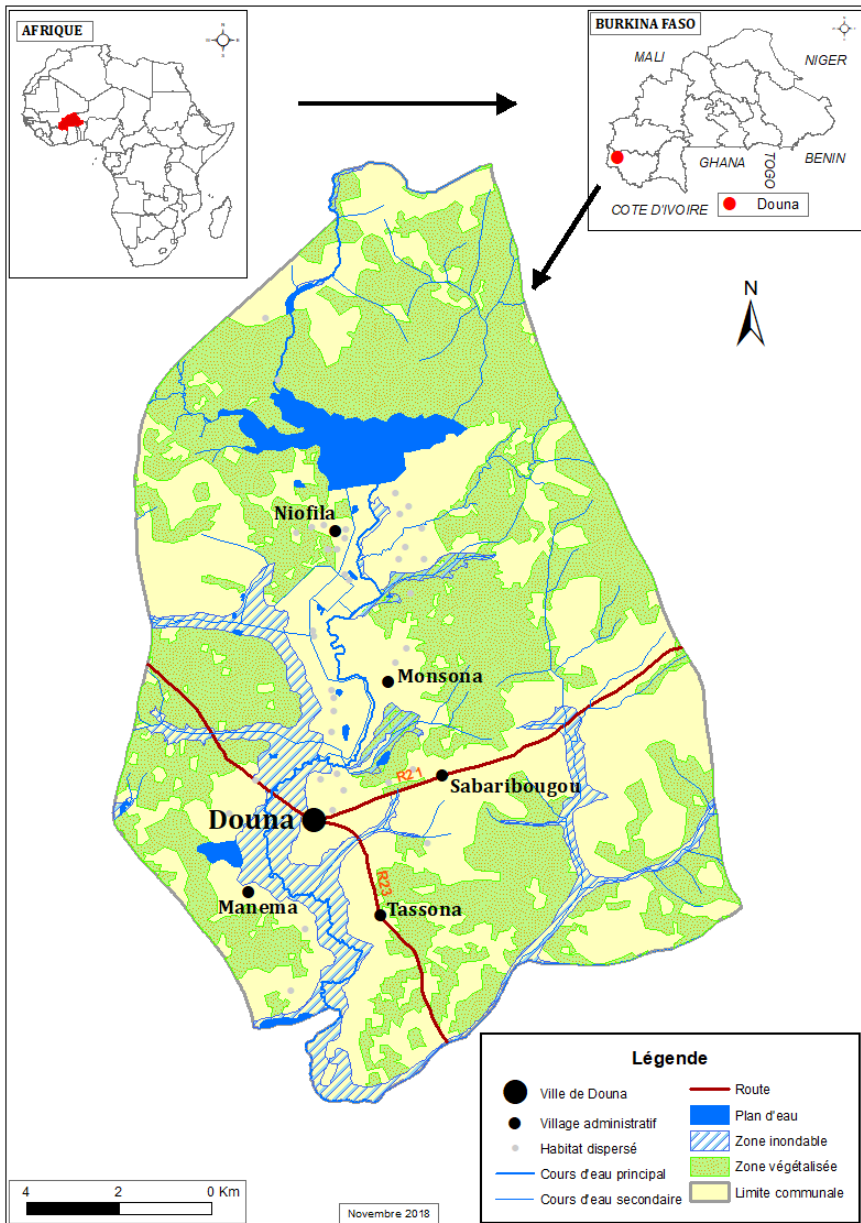


Figure 2. Overview of the Bama lowland rice production area Douna

Source: SAWADOGO *et al.* (2020)

I.2. Theoretical Framework

This study is grounded in Rogers' Diffusion of Innovation Theory (ROGERS, 1995) and the Technology Acceptance Model (DAVIS

et al., 1989), which emphasizes that individuals' acceptance and sustained use of innovations depend on perceived benefits, trust, experience, and access to enabling resources. In the context of contract farming, farmers' compliance with contractual terms reflects a behavioral response to both expected economic gains and perceived contractual risks.

Rice farmers are assumed to make compliance decisions under conditions of uncertainty, imperfect information, and enforcement constraints. Compliance with contractual clauses, such as price, quantity, quality, and delivery dates, therefore varies across farmers depending on their socio-economic characteristics, institutional environment, and contract attributes. Importantly, compliance is not binary but graduated, ranging from non-compliance to full compliance, justifying an ordered representation of farmers' behavioral outcomes.

1.3. Conceptual Framework

Building on the theoretical framework, farmers' compliance behavior is conceptualized as an ordinal decision process, where producers may accept none, some, or all contractual terms. Compliance outcomes are influenced by four main groups of factors: (i) household characteristics (e.g. age, education, gender, experience); (ii) access to productive resources and services (credit, training, membership); (iii) contract attributes (type, duration, payment modality); and (iv) monitoring and enforcement mechanisms (control activities).

These factors jointly shape farmers' incentives and capacity to comply with contractual obligations. Partial compliance represents an intermediate behavioral outcome between full non-compliance and full compliance, reflecting trade-offs between risk exposure, production constraints, and contractual enforcement.

1.4. Empirical Model Specification

Generalized Ordered Logit Model

To empirically analyze farmers' compliance behavior, this study employs a Generalized Ordered Logit (Gologit) model, which explicitly accounts for the ordered nature of the dependent variable while relaxing the proportional odds assumption of the standard ordered logit model (Williams, 2006).

Let $Y_i \in \{0, 1, 2, 3, 4\}$ denote the number of terms respected by farmer i . For each cumulative cutpoint $j = 0, 1, 2, 3$ we, define the generalized ordered logit as:

$$\log \frac{P(Y_i \leq j)}{P(Y_i > j)} = \alpha_j - X_i^{(c)'} \beta - Z_i^{(v)'} \tau_j, \quad (1)$$

where:

- α_j are threshold-specific intercepts for cutpoint j ,
- $X^{(c)}$ are covariates constrained to proportional odds (effects constant across cutpoints) such as age, education, training.
- $Z^{(v)}$ are covariates allowed to vary across cutpoints (partial proportional odds) such as contract type, contract duration, control activity and payment modality,
- β and τ are coefficient vectors.

The cumulative probability that farmer i respects up to j terms is:

$$F_{ij} = P(Y_i \leq j) = \Lambda \left(\alpha_j - X_i^{(c)'} \beta - Z_i^{(v)'} \tau_j \right) \quad (2)$$

where $\Lambda(z) = \frac{e^z}{1+e^z}$ is the logistic function. The probability of exactly j terms respected is recovered as:

$$P(Y_i = 0)F_{i0}, P(Y_i = j) = F_{ij} - F_{ij-1} (1 < j \leq 3), P(Y_i = 4) = 1 - F_{i3} \quad (3)$$

The cumulative and category-specific probabilities are derived using the logistic distribution function.

Estimation Method

The model is estimated using maximum likelihood estimation, under the assumption of independently and identically distributed observations. The log-likelihood function is given by:

The model is estimated using maximum likelihood estimation, assuming independent and identically distributed observations. The log-likelihood function is:

$$\text{Log}L(\beta, \tau) = \sum_{i=1}^n \sum_{j=0}^4 Y_{ij} \log P(Y_i = j) \quad (4)$$

where $Y_{ij} = 1$ if farmer i respects j terms and 0 otherwise.

Explanatory Variables and Hypothesized Effects

Farmers' compliance with contractual terms is a critical determinant of the performance and sustainability of contract farming arrangements. In the rice sector of Burkina Faso, compliance with agreed price, quantity, quality, and delivery conditions is shaped by both individual characteristics and contract design

- **Age** is expected to influence compliance through risk preferences and physical capacity, with younger farmers being more willing to engage in and comply with contractual arrangements (MAUCERI, 2004).
- **Gender** may affect compliance due to differential access to land, inputs, and resources, potentially disadvantaging female producers HEMA & SOMBIE, 2011).
- **Marital status** may signal stability and planning capacity, enhancing credibility and compliance (NYEMECK *et al.*, 2001).
- **Education** improves understanding of contract terms and strengthens compliance capacity (FEDER & SLADE, 1984).
- **Access to credit** relaxes liquidity constraints and supports timely input use, increasing the likelihood of compliance KRISTEN & SATORIUS (2002).
- **Membership in producer organizations** facilitates access to information, training, and markets, thereby strengthening contractual performance (WILSON, 2000).
- **Training** enhances technical skills and improves the ability to meet quality and delivery requirements.
- **Contract type and duration** influence incentives and enforcement, with formal and short-term contracts often associated with stronger compliance (GOW & SWINNEN, 2001; SANFO, 2016).
- **Control activities and payment modalities** affect enforcement credibility and trust, directly shaping compliance behavior.
- **Contract experience** improves learning and reduces opportunistic behavior over time (WILSON, 2000).

Table I: Signs of Variables Influencing Rice Farmers’ Contract Compliance

Variable	Description	Expected Sign (+/-)
Compliance	Number of accepted contract terms	–
Age	Age of the producer	–
Gender	Dummy, 1 if the household head is male	–
Marital status	Dummy, 1 if the producer is married	+
Education	Dummy, 1 if the producer has a formal education	+
Access to credit	Dummy, 1 if the farmer has access to credit	+
Membership	Dummy, 1 if the farmer belongs to a farmers’ group	+
Training	Dummy, 1 if the farmer received training	+
Contract type	Dummy, 1 if the contract is formal	+
Contract duration	Dummy, 1 if the contract lasts one campaign	–
Control activities	Dummy, 1 if the farmer’s activity is under supervision	+
Payment modality	Dummy, 1 if the farmer received payment on delivery	+
Experience	Total years of experience in contract farming	+

The dependent variable

Table II summarizes the combinations of contractual terms respected by rice farmers. The dependent variable in this study is categorical with five (5) levels, reflecting the degree of adaptation to the terms of the agricultural contract. Specifically, it captures the number of terms accepted by the rice producers, namely: price terms, quality terms, quantity terms, and date terms.

The five modalities of the dependent variable are defined as follows:

- Category 0: No terms accepted (the individual does not comply with any of the four contractual terms).
- Category 1: One term accepted (the individual complies with only one of the four contractual terms).
- Category 2: Two terms accepted (the individual complies with two of the four contractual terms).
- Category 3: Three terms accepted (the individual complies with three of the four contractual terms).
- Category 4: All terms accepted (the individual complies with all four contractual terms).

Table II: Combinations of respect of terms

Terms	Score
No terms accepted	0
Price <u>or</u> Quality terms <u>or</u> Quantity terms <u>or</u> Date terms.	1
Price Tuning + Quality Tuning / Any combination of two tunings	2
Price Tuning + Quality Tuning + Quantity Tuning / Any combination of three tunings.	3
Price terms + Quality terms + Quantity terms + Date	4

II. Results

II.1. Farmer Attributes and Socioeconomic Factors

Table III shows the descriptive statistics of the independent variables. The average age of operators is 46 years old, with a maximum of 67 and a minimum of 22 years. For all respondents, concerning gender, 63.2% of farmers are men, against 36.8% of women. This high rate is also similar to the reality of all farms, dominated mainly by men. This can be explained by the fact that men are more advantageous in acquiring land and means of production compared to more marginalized women. Concerning marital status, 98% of the farmers on the plains are married, compared to 2% who are single widowed. Concerning education, the majority of farmers are uneducated, 70% as against 30% who are educated. This high rate of non-education remains a hindrance to the monitoring and reading of technical itinerary prescriptions and the keeping of simplified rice farm accounts. In terms of group membership, the majority of farmers surveyed (86%) are members of a rice cooperative, while only 14% are non-members. Membership of a cooperative enables them to find outlets for production, negotiate better selling prices, and have access to credit to finance the campaign. Concerning the nature of contracts on the two plains, the majority of the contracts (92%) are formal, while 8% remain informal. The lack of insurance on price commitments and the uncertainty of rainfall lead some rice farmers to remain in the status quo (informal). Concerning training received, the majority of farmers (82%) say they have received training in farming operations and farm management. The number of years of experience on contracts is 13.18 years. This indicates that farmers

have long experience that can be a major asset in conducting rice cultivation and agreeing to move more towards formal contracts.

Table III: Descriptive statistics of variables

Variable	Description of Variables	Mean	SD
Compliance	Number of accepted terms	2.50	1.18
Age	Age of the producer	45.77	8.85
Gender	Dummy, if the household head is a male	0.63	0.48
Marital status	Dummy, if the producer has married	0.98	0.15
Education	Dummy, if the producer has educated	0.30	0.46
Access to credit	Dummy, if the farmer has access to credit	0.56	0.50
Membership	Dummy, if the farmer belongs to a farmers' group	0.86	0.35
Training	Dummy, if the farmer received training	0.82	0.39
Contract type	Dummy, if the contract is formal	0.92	0.26
Contract duration	Dummy, if the contract lasts one campaign	0.62	0.49
Control activities	Dummy, if the farmer's activity is under supervision	0.91	0.29
Payment modality	Dummy, if farmer received payment on delivery	0.72	0.45
Experience	Total years of experience in contract	13.18	5.85

Note: S.D: standard deviation

Table IV illustrates the distribution of compliance across contractual terms. The dependent variable reveals five distinct modalities based on the number of accepted terms. The analysis of this variable shows that the compliance rate of the three terms (36.34%) is the highest. Thus, the compliance rates of the two-term and four terms are also dominant, with 23.31% and 20.80%. The compliance rate corresponding to no terms (0 terms) remains the lowest and shows total compliance. It indicates that the rice producer has failed to adhere to any of the contractual obligations.

II.2. Factors Affecting Contract Compliance

The analysis employed a generalized ordered logit model to assess factors influencing the level of farmers' compliance with contractual clauses in rice contract farming arrangements in Burkina Faso. This approach was adopted due to the violation of the proportional odds

assumption, as evidenced by the significant likelihood-ratio test of proportionality ($\chi^2(30) = 64.69, p < 0.01$).

Table IV: Proportion of Compliance Terms

Number of terms	Frequency	Percentage (%)
Terms 0	33	8.27
Terms 1	45	11.28
Terms 2	93	23.31
Terms 3	145	36.34
Terms 4	83	20.8
Total	399	100

This result indicates that the effects of explanatory variables differ across the ordered levels of the outcome variable, justifying the use of a flexible model that relaxes the parallel lines assumption (WILLIAMS, 2006). The overall model is statistically significant, with a Wald χ^2 of 181.06 ($p < 0.01$), suggesting a good fit and that the included variables jointly explain a meaningful proportion of the variation in contractual compliance behavior. The dependent variable measures the number of contractual clauses accepted by each farmer, ranging from 0 (no clause accepted) to 4 (full compliance). This ordinal structure captures the intensity of engagement in formal contract arrangements. Education plays a significant role, especially at the lower levels of compliance. Farmers with formal education are more likely to accept at least one contractual clause (coef = 2.76, $p < 0.01$). The marginal effect analysis confirms that education increases the probability of being in the “1 clause” category by 23.7% ($p < 0.01$). This suggests that basic literacy and numeracy enhance farmers’ understanding of contractual obligations and initial willingness to participate. However, the effect diminishes at higher levels, indicating that education alone is insufficient for full compliance, which may require more targeted support or incentives. Farmer-Based Organization (FBO) membership positively influences compliance at intermediate levels (especially at 2 and 3 clauses). For example, being a member increases the likelihood of being in the “3 clauses” group by 12.6% ($p < 0.05$). Farmers who received agricultural or contractual training are significantly more likely to accept 1–2

clauses, but this effect wanes or even reverses at higher compliance levels (e.g., a -4.2% effect on full compliance, $p < 0.10$). Longer-term contracts (e.g., those lasting more than one season) are associated with lower probabilities of full compliance (e.g., Term 2: coef = -0.577 , $p < 0.05$). The marginal effects confirm that longer contracts reduce the likelihood of accepting all four clauses by approximately 7% ($p < 0.10$). Control mechanisms (such as supervision or compliance monitoring by contracting firms) have a strong positive effect at intermediate compliance levels. For instance, control at Term 0 increases the probability of accepting three clauses by 23.0% ($p < 0.01$). Payment arrangements, particularly delayed or uncertain payments, negatively affect compliance with multiple clauses (especially at the 2 and 4-clause levels). Although not always statistically significant, the direction and size of effects suggest that mistrust or dissatisfaction with payment terms can discourage deeper contract engagement. Interestingly, greater farming experience is negatively associated with full compliance (Term 4: coef = -0.091 , $p < 0.05$). The marginal effect also shows a -1.4% probability of being in the 4-clause group ($p < 0.01$). Experienced farmers may be more critical of contract arrangements due to past disappointments or perceived imbalance in power relations.

Table V: Results of Generalized Ordered Logit estimation

Variables	Generalized Ordered Logit Estimates							
	Terms 0		Terms 1		Terms 2		Terms 3	
	Coef.	(S.E.)	Coef.	(S.E.)	Coef.	(S.E.)	Coef.	(S.E.)
Age	0.022	(0.039)	0.001	(0.021)	-0.025	(0.016)	-0.017	(0.017)
Marital status	1.647***	(1.866)	-1.507*	(8.706)	0.675	(0.846)	-0.392	(1.194)
Education	2.756***	(0.905)	-0.824	(0.395)	-0.337	(0.299)	-0.280	(0.338)
Membership	5.032	(0.851)	0.325	(0.408)	0.649***	(0.374)	0.119	(0.470)
Training	1.946*	(0.939)	-0.624	(0.546)	-1.654***	(0.375)	-0.616*	(0.322)
Contract type	1.130	(1.220)	-0.404*	(0.621)	-0.156*	(0.465)	0.534	(0.579)
Contract duration	-2.191*	(0.889)	-0.598	(0.341)	-0.577*	(0.246)	-0.454*	(0.275)
Control activities	1.722*	(0.723)	0.343	(0.439)	0.719	(0.409)	-0.516	(0.567)
Payment modality	-0.034	(0.739)	-0.745**	(0.431)	-0.437	(0.293)	-0.672*	(0.299)
Experience	-0.047	(0.042)	-0.024	(0.026)	-0.020	(0.021)	-0.091**	(0.031)
Constant	-2.420	(1.867)	16.952	(8.707)	2.209*	(1.266)	2.109	(1.642)
Log pseudo-likelihood	-486.648							
Wald chi2	181.06							
Pseudo R2	0.16							
Number of observations	386							

Note: The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. S.E.: standard error

Table VI: Marginal effect estimates

Variables	Generalized Ordered Logit Estimates							
	Terms 0		Terms 1		Terms 2		Terms 3	
	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)
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Contract type	1.130	(1.220)	-0.404*	(0.621)	-0.156*	(0.465)	0.534	(0.579)
Contract duration	-2.191*	(0.889)	-0.598	(0.341)	-0.577*	(0.246)	-0.454*	(0.275)
Control activities	1.722*	(0.723)	0.343	(0.439)	0.719	(0.409)	-0.516	(0.567)
Payment modality	-0.034	(0.739)	-0.745**	(0.431)	-0.437	(0.293)	-0.672*	(0.299)
Experience	-0.047	(0.042)	-0.024	(0.026)	-0.020	(0.021)	-0.091**	(0.031)
Constant	-2.420	(1.867)	16.952	(8.707)	2.209*	(1.266)	2.109	(1.642)
Log pseudo-likelihood	-486.648							
Wald chi2	181.06							
Pseudo R2	0.16							
Number of observations	386							

Note: The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. S.E: standard error

III. Discussion

These findings are consistent with BELLEMARE (2012), who demonstrated that while education enhances farmers’ participation in contract farming, it does not necessarily ensure full compliance. This suggests that individual knowledge alone is insufficient to guarantee adherence to contractual obligations. Rather, collective action and peer learning play a critical role in fostering familiarity with contract systems and lowering transaction costs (Barrett et al., 2012). FBOs further support compliance by providing platforms for negotiation, dispute resolution, and trust-building between farmers and contractors. The results also indicate that existing training efforts, although effective in raising awareness, may fall short of inducing sustained behavioral change.

This underscores the need for practical, context-specific, and follow-up training programs that align closely with farmers’ production realities and the operational requirements of contract terms (TON et al., 2018). Moreover, uncertainty surrounding future market conditions, input availability, and contract enforcement encourages farmers to favor short-term, renewable contracts as a risk mitigation strategy. Similar preferences have been observed in other African

contract farming contexts (WARNING & KEY, 2002). Institutional mechanisms that ensure enforcement and accountability emerge as essential determinants of compliance, particularly in settings where trust in contractors is incomplete and informal norms are insufficient (BELLEMARE & NOVAK, 2017). Timely and transparent payment procedures further enhance contract credibility and reduce default risk (BELLEMARE, 2012). Consistent with this view, MICHELSON *et al.* (2012) show that even experienced producers may revert to spot markets when contractual arrangements fail to offer clear, reliable, and tangible advantages.

Overall, these results indicate that compliance is shaped by a combination of farmer-level characteristics, social networks, training interventions, contract design, and institutional support mechanisms. Effective contract farming schemes in Burkina Faso therefore require a holistic approach that integrates education, collective learning, practical capacity building, and robust enforcement structures. Tables V and VI further illuminate the institutional and behavioral factors influencing rice farmers' compliance with contract farming arrangements in Burkina Faso. The analysis highlights the central role of social capital, perceived risk, and experiential learning in shaping contract enforcement and trust between farmers and agribusiness firms.

First, membership in farmer organizations emerges as a significant driver of compliance. Farmers affiliated with cooperatives or producer groups are substantially more likely to honor contractual obligations than those operating independently. This finding reinforces evidence that farmer organizations serve as institutional intermediaries in contexts characterized by weak formal enforcement, providing collective bargaining power as well as essential governance functions (AROUNA & ZOSSOU, 2017; BELLEMARE, 2012). In the Burkinabe context, cooperatives have historically filled gaps left by the state and financial institutions, particularly in rural areas. Through peer monitoring and shared norms, they act as informal enforcement mechanisms that reduce opportunistic behavior. Additionally, they facilitate access to extension services, timely input delivery, and reliable market information, functions that are critical for scaling inclusive agricultural value chains (WORLD BANK, 2020). Strengthening farmer organizations through targeted training, policy recognition,

and financial support could therefore significantly enhance contract performance and reduce default risk.

Second, the results reveal that longer-term contracts are associated with lower compliance levels. Farmers appear reluctant to commit to multi-year agreements due to high exposure to climatic and market risks inherent in rice production systems in Burkina Faso. Limited access to crop insurance, volatile input prices, and the absence of price guarantees or responsive extension services render long-term contracts inflexible and poorly aligned with farmers' risk preferences. This finding aligns with MICHELSON (2013) and BELLEMARE & NOVAK (2017), who emphasize that contract duration must reflect local risk environments and that flexible, renewable contracts tend to perform better under conditions of uncertainty. Furthermore, farmers' distrust of long-term contracts may stem from prior experiences with delayed payments, contract breaches, or buyer withdrawal, challenges frequently documented in Burkina Faso's contract farming systems (SAWADOGO *et al.*, 2020). To improve compliance, contract design should prioritize adaptability and risk-sharing through mechanisms such as renegotiation clauses, price adjustment formulas linked to market trends, and weather-indexed insurance schemes.

Third, the analysis indicates that compliance declines with increased experience in contract farming. Contrary to expectations, more experienced farmers are not necessarily more compliant, suggesting a gradual erosion of trust over time. Repeated exposure to poorly implemented contracts, unreliable service delivery, or unmet expectations may lead to strategic disengagement or selective compliance. This phenomenon, often described as "contract fatigue," has been observed in other West African contexts where weak buyer accountability and limited farmer participation in contract design undermine long-term commitment (OYA, 2012; SOULLIER & MOUSTIER, 2018). In Burkina Faso, experienced farmers may also have diversified income sources or stronger market linkages, reducing their dependence on contractual arrangements. Sustaining their engagement, therefore requires more than initial recruitment; contract schemes must offer continuous incentives through participatory contract formulation, transparent communication, loyalty-based benefits, and jointly designed risk management instruments.

In sum, the study reinforces the view that the success of contract farming depends not only on economic incentives but also on institutional trust, adaptive contract design, and inclusive governance. Efforts to expand and deepen contract farming in Burkina Faso should prioritize strengthening farmer organizations, enhancing contractual flexibility, and sustaining incentives for both new and experienced farmers. These strategies are essential for building resilient and equitable agricultural markets in contexts marked by environmental and institutional fragility.

Conclusion

This study provides new empirical evidence on contract compliance in rice production in Burkina Faso by applying a generalized ordered logit regression framework. Unlike conventional binary or proportional odds models, this approach accommodates the observed violation of the parallel lines assumption and allows the effects of explanatory variables to vary across different levels of contractual compliance. This methodological refinement enables a more accurate assessment of partial versus full compliance with contractual clauses, price, quality, quantity, and delivery date, reflecting the nuanced realities of farmer behavior in contract farming.

The findings reveal several important patterns. Education significantly increases the probability of farmers accepting at least one contractual clause, highlighting the role of literacy and basic knowledge in lowering barriers to entry. However, its diminishing influence at higher compliance levels suggests that education alone does not ensure full adherence, and that complementary support is necessary. Similarly, membership in FBOs enhances intermediate compliance by reducing transaction costs and fostering trust, but it is not sufficient to guarantee full contract fulfillment. Training shows a comparable pattern: it raises awareness and encourages partial compliance, but its limited or even negative marginal effect on higher compliance underscores the need for more practical, context-specific, and sustained training interventions.

Contract-specific characteristics also play a decisive role. Longer-term contracts reduce the likelihood of full compliance, reflecting farmers' risk-averse behavior in environments marked by uncertainty and weak enforcement mechanisms. Conversely, control and monitoring mechanisms strongly increase compliance at

intermediate levels, demonstrating the importance of institutional oversight in contexts where trust is fragile. Payment modalities are another critical determinant: delayed or unreliable payments discourage deeper engagement with contracts, eroding farmers' willingness to accept multiple clauses. Finally, greater farming experience is negatively associated with full compliance, suggesting that repeated exposure to contract failures or imbalances may foster skepticism and resistance to multi-clause terms.

Together, these results highlight that fostering compliance requires more than simply drafting formal contracts. Effective arrangements must address both individual-level constraints (literacy, training, access to credit) and structural challenges (payment reliability, contract design, monitoring, and enforcement). Farmer organizations emerge as vital intermediaries, but they must be strengthened with clear legal frameworks, internal risk management mechanisms, and dispute resolution platforms.

Policy recommendations include: (i) investing in farmer Capacity building and tailored training programs that move beyond awareness to practical contract management skills; (ii) supporting cooperatives to serve as guarantors and facilitators of fair and enforceable contracts; (iii) promoting short-term, renewable contracts with transparent payment mechanisms to reduce risk perceptions; (iv) institutionalizing credible monitoring and dispute resolution systems; and (v) encouraging private sector and state collaboration in financing and overseeing contract farming arrangements.

Despite some limitations, notably the cross-sectional nature of the data and moderate explanatory power of the model, this research demonstrates the value of flexible econometric approaches in unpacking heterogeneous compliance behavior. Future studies should employ panel data to capture dynamic effects, while also examining the role of buyer behavior and trust-building mechanisms in sustaining long-term contract relationships.

In the evolving rice value chain of Burkina Faso, building resilient and inclusive contract farming systems requires aligning contractual design with farmers' capacities, perceptions of risk, and institutional realities. Strengthening trust, ensuring fairness, and embedding adaptive mechanisms will be crucial for promoting compliance and, ultimately, for advancing agricultural commercialization and food security in West Africa.

Author contributions

SD: conceptualization, data analysis, farm household survey, methodologies analysis, original draft writing, review, and editing of the writing. ZI: conceptualization, data analysis, and review and editing of the writing. AA: investigation, data analysis, methodology analysis, and review of the writing.

Competing interests

The authors declare that they have no competing interests

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