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Developing Market Mechanisms to Strengthen the Competitiveness of Small and Medium-Sized Producers in the Republic of Moldova

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Abstract

The competitiveness of pork producers in the Republic of Moldova depends on both their ability to meet food safety requirements and the economic conditions under which they compete with imports. The article examines the complementarity between regulatory optimization, technological modernization, investment support, and the improvement of price-formation mechanisms. The methodology combines an analysis of the national and European regulatory frameworks with descriptive data from an exploratory survey of 31 small and medium-sized producers. Documentary analysis highlights differences between the public support provided to EU producers and the predominantly investment-oriented instruments available in the Republic of Moldova. Consequently, the article proposes an integrated model based on proportionality, digital traceability, support for biosecurity and animal welfare, producer aggregation, and the phased development of a neutral reference pricing and transaction facilitation system. The model aims to enhance competitiveness without compromising consumer protection or introducing administrative price control mechanisms.

Keywords

Food Safety, Competitiveness, Compliance, Traceability

1. Introduction

Food safety is essential for protecting public health, ensuring the functioning of agri-food value chains, and securing market access for producers. In the pork sector, requirements regarding hygiene, traceability, biosecurity, and animal welfare

are closely linked to production organization, compliance costs, and the ability to supply consistent volumes of verifiable quality. For the Republic of Moldova, these requirements take on added importance in the context of aligning with the European Union acquis and competing with imports from production systems operating under different conditions regarding scale, financing, and public support [1] [2]. The issue cannot be reduced to a simple choice between regulation and deregulation. Inadequate requirements can increase consumer risks and undermine buyer confidence, whereas requirements implemented without proportionality, guidance, and financing mechanisms can impose disproportionate fixed costs on small farms. Furthermore, sanitary compliance does not automatically eliminate disadvantages related to feed costs, processing concentration, access to finance, and information asymmetry in price negotiations [3]. The aim of this research is to develop an integrated model for optimizing food safety regulations and market mechanisms to enhance the competitiveness of small and medium-sized producers in the Republic of Moldova. The specific objectives are: 1) identifying the relationship between compliance, investment, and performance; 2) examining the economic and institutional vulnerabilities of the pork sector; and 3) comparing relevant European instruments for price transparency. and 4) the formulation of public policy recommendations. The article's contribution lies in integrating three dimensions frequently analysed in isolation: food safety regulation, the economic competitiveness of producers, and price formation transparency. The recommendations are geared towards gradual implementation and take into account the relatively small scale and concentration of the national market.

2. Materials and Methods

The research uses a mixed methodology, which combines documentary analysis and descriptive quantitative analysis. The documentary component examines the national framework for food safety and relevant EU legislation, focusing on official controls, hygiene, traceability, proportionality, and the ongoing accession process. The empirical component is based on a survey of 31 agri-food producers in the Republic of Moldova. The sample comprises three main categories: dairy cattle farmers (12 respondents; 38.7%), pig farmers (10; 32.3%), and sheep/goat farmers (9; 29.0%). Geographically, 14 respondents are from the Central region (45.2%), 9 from the South (29.0%), and 7 from the North (22.6%); for one observation, the region was not specified. The variables analyzed include investments, market access, efficiency gains, quality improvements, sustainability, environmental impacts, employment, and costs associated with adaptation and compliance. The quantitative analysis is descriptive, incorporating frequencies, proportions, inter-group comparisons, and measures of central tendency. Particular attention is given to comparing producers who reported investments with those who did not. For financial variables, the median is used, as the dataset contains extreme values. The research does not claim a causal effect of regulation. The relationships identified between investments and performance should be inter-

preted as descriptive associations, given that the study is cross-sectional and lacks a control group or longitudinal data. The normative analysis starts from the premise that the economic impact of a regulation depends not only on the stringency of a requirement but also on how it is implemented. Consequently, the research assesses the extent to which compliance is associated with productive modernization, quality improvement, sustainability, and market access.

3. Results and Discussions

3.1. Compliance, Investment and Producer Performance

The structure of the producers included in the research consists of three categories of livestock holdings: cow's milk producers, pig farmers, and sheep/goat farmers. Holdings specialized in dairy cattle farming account for the largest share of the sample, with 12 responses, representing 38.7% of the total. This category is followed by pig producers, with 10 respondents (32.3%), while holdings focused on sheep and goat farming are represented by 9 respondents (29.0%). The distribution is relatively balanced across the three types of holdings; the difference between the category with the largest share and the one with the smallest share is only 9.7 percentage points. This is favourable for comparative analysis, as no single category of producers disproportionately dominates the sample. Furthermore, the relatively similar proportions of the three categories allow for the identification of specific characteristics regarding perceptions of—and the capacity to adapt to—food safety requirements, depending on the livestock profile of the holding. The respondents come from three geographical regions of the Republic of Moldova, ensuring a degree of territorial diversity within the sample. The largest group of interviewed producers is from the Central region—14 respondents, or 45.2% of the total. The Southern region is represented by 9 producers, accounting for 29.0% of the sample, while the Northern region includes 7 respondents, representing 22.6%. For one respondent, the region was not specified; this respondent accounts for 3.2% of the total. The territorial distribution reveals a moderate concentration of respondents in the Central region, which accounts for the largest share of the total sample. This can be explained, at least in part, by a higher density of economic and agricultural activities, greater accessibility for producers, and the concentration of relevant institutions and infrastructure in this area. At the same time, the inclusion of responses from the South (29.0%) and the North (22.6%) contributes to the territorial diversity of the research, allowing for the capture of varying production and marketing conditions. The gap between the region with the highest representation and the one with the lowest is 22.6 percentage points, indicating a less balanced regional distribution compared to the distribution observed across types of agricultural holdings. The sample of 31 producers presents a relatively diverse structure, both in terms of livestock-related profiles and geographical locations. This structure is significant for the study of food safety compliance, as it enables the examination of the phenomenon across two key dimensions: the type of livestock activity and the regional context. Nevertheless, given the

non-probabilistic nature and small size of the sample, the findings should be interpreted as indicative and exploratory, rather than as representative estimates for the entire population of producers in the Republic of Moldova. Investments are one of the most relevant indicators of adaptation to regulatory requirements. As shown in Table 1, 58.1% of respondents reported investments. The result suggests that a significant part of producers are mobilising resources for modernisation. However, investments should not be attributed exclusively to food safety regulation, as they can also be driven by the expansion of production, the replacement of equipment, access to support programmes or the commercial strategy (Table 1).

Table 1. Investments reported by the surveyed producers.

Investment status	N	Share (%)
They made investments	18	58.1
They did not make investments	13	41.9
Total	31	100.0

From a public policy perspective, the outcome supports the integration of compliance requirements with investment instruments. A mandatory requirement can become a modernisation mechanism when producers have access to grants, preferential credits, advisory services or investment support. Conversely, a requirement introduced without financial and technical support can become a barrier for small operators. Table 2 highlights a particularly strong descriptive association between investment and performance. All 18 producers reporting investments indicated efficiency gains and quality improvements. None of the 13 producers without investment reported these two improvements. The result is economically plausible: investments in equipment, hygiene infrastructure, process control and production organisation can simultaneously improve food safety and operational performance (Table 2).

Table 2. Reported effects on product efficiency and quality.

Performance indicator	N	Share (%)
Increased efficiency—Yes	18	58.1
Efficiency Gain—No/Unspecified	13	41.9
Quality Improvement—Yes	18	58.1
Quality Improvement—No/Unspecified	13	41.9

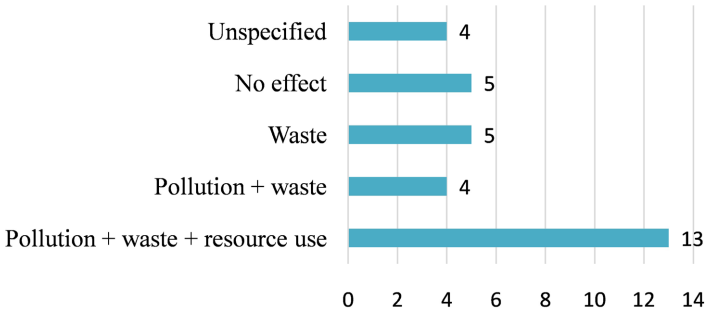
However, the result should not be interpreted as evidence of causality. Larger or better-managed enterprises may be simultaneously better able to invest and more likely to report improvements. Market access is the weakest dimension of empirical results. Only 16.1% of respondents reported improved access. Moreover, none of the 13 producers without investment reported market access, while only 5 of the 18 producers that invested indicated a positive result. This demonstrates that modernisation and compliance are necessary, but not sufficient for

competitiveness (Table 3).

Table 3. Market access reported by producers.

	N	Share (%)
Improved access to markets	5	16.1
No Enhanced Access	26	83.9

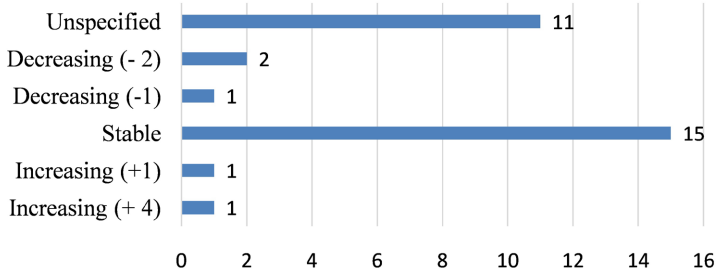
The finding has an important implication for public policy. Food safety should not be analysed in isolation from commercial infrastructure. A producer may comply with hygiene and traceability requirements, but may not have contractual relationships, sufficient volume, buyer-recognised certification, refrigeration logistics or demand information. The regulatory system must therefore be linked with laboratories, certification, traceability, producer organisations and market access support tools. 22 out of 31 respondents (71.0%) mention at least one positive environmental impact. A multifaceted impact—comprising pollution reduction, improved waste management, and lower resource consumption—is reported by 13 respondents (41.9%). Five respondents (16.1%) observe no discernible effects, while four (12.9%) provide no specification. This multifaceted positive impact is concentrated among enterprises that have made investments: 13 out of 18 (72.2%) report it, compared to zero in the group without investments. This finding suggests that investments can simultaneously generate both economic and environmental benefits (Figure 1).



Note: The X-axis presents the categories of environmental effects reported by re-spondents, while the Y-axis indicates the absolute frequency of respondents for each category (persons).

Figure 1. The impact of investments on environment.

In 15 cases (48.4%), employment remained constant. Increases were reported by two enterprises (+4 and +1 jobs), while decreases were reported by three enterprises (−1 and −2 jobs). For 11 respondents (35.5%), the situation was not specified. For the 20 observations involving either a change or stability, the cumulative net effect is +2 jobs, indicating a small, yet slightly positive, quantitative impact. Thus, the effect on employment appears to be indirect rather than a case of large-scale job creation (Figure 2).



Note: The X-axis presents the categories of employment change, while the Y-axis indicates the absolute frequency of respondents in each category (persons).

Figure 2. The impact of investments on jobs.

An analysis of financial indicators reveals a significant distinction between capital investments and the ongoing costs associated with producers' compliance with regulatory requirements. Out of 31 total respondents, 18 producers (58.1%) reported making investments related to the process of compliance and adaptation. The mean value of the reported investments was 3.39 million MDL, while the median was only 200,000 MDL. The substantial gap between these two figures points to a highly skewed distribution, influenced by the presence of extreme values. One investment of 100 million MDL was identified in the dataset, which significantly skews the mean. Excluding this outlier, the mean investment drops to approximately 166,700 MDL, and the median to 150,000 MDL. Consequently, the median serves as a more robust indicator for characterizing the typical level of investment made by producers. Training costs are considerably lower. For the 18 producers who reported such expenses, the mean value was 13,065 MDL, with a median of 5000 MDL. Additional annual compliance-related costs averaged 14,516 MDL, with a median of 10,000 MDL. The findings indicate that the primary financial burden for producers stems from initial investments in infrastructure and equipment, whereas training costs and recurring additional expenses are generally lower. At the same time, the highly asymmetric nature of the investment distribution justifies the simultaneous use of the mean and the median, and necessitates a cautious interpretation of the mean value (**Table 4**).

Table 4. Financial indicators associated with compliance and adaptation.

Indicator	N, pers.	Average, MDL	Median, MDL	SD, MDL
Investment Value	18	3,387,097	200,000	17,931,439
Cost of training	18	13,065	5,000	14,357
Annual additional cost	18	14,516	10,000	14,222
Total reported cost of compliance	18	294,516	400,000	280,593

Note: "Total reported compliance cost" represents the total compliance cost reported directly by respondents and is not calculated as the sum of the value of investments, training costs, and additional annual costs. N represents the number of respondents who reported a non-zero value for the respective indicator.

3.2. Structural Vulnerabilities of the Pig Sector

The pig sector faces simultaneous challenges regarding health risks, feed costs, price fluctuations, the concentration of slaughtering and processing capacities, and limited access to finance for small producers. The risk of African Swine Fever underscores the importance of biosecurity and can impact livestock numbers, trade flows, and market confidence. In this context, food safety and animal health requirements should be viewed not merely as administrative obligations, but as investments in production continuity and market viability [4]-[8]. Another vulnerability lies in the asymmetry of support mechanisms. The analysis characterizes European support for the pig sector as largely indirect—comprising subsidies for feed crops, animal welfare schemes, and crisis management tools. In the Republic of Moldova, support is primarily investment-oriented, taking the form of grants for infrastructure and equipment, whereas recurring support specifically targeting commercial pig production is limited (**Table 5**).

Table 5. Key vulnerabilities and their implications for the pig sector.

	Situation/problem identified	Implication for competitiveness
Sanitary compliance and biosecurity	Necessary investments in hygiene, traceability, process control and disease prevention	High upfront costs, but potential benefits for quality and market access
Feed and production costs	Exposure to grain and oilseed prices	Margins vulnerable to price shocks
Public support	Predominantly investment domestic instruments; indirect support and sectoral schemes in EU countries	Differences in the ability to finance modernisation and operational costs
Market structure	Limited number of buyers and unequal bargaining power	Risk of information asymmetry and bilaterally negotiated prices
Commercial access	Compliance does not guarantee adequate contracts, volumes or logistics	The need to connect standards with producer organization and market infrastructure

3.3. European Models for Price Formation Transparency

Price transparency is complementary to food safety regulation. A manufacturer that complies with sanitary requirements, but does not have comparable information on prices and transaction conditions, may remain in a weak negotiating position. European experience indicates that the formation of a credible benchmark does not always require a financial exchange or derivatives [9] (**Table 6**).

For the Republic of Moldova, the immediate introduction of a futures exchange for pigs would be disproportionate to the size and liquidity of the market. A realistic solution is the phased development of a price reference platform and confidential facilitation of transactions. The first stage would publish a weekly, indicative and non-binding reference price, calculated on the basis of verifiable data and comparable quality classes. Subsequently, the platform could integrate a table of offers with coded lots and sealed offers, standard contracts, forward delivery commitments and payment security mechanisms [9]-[12].

Table 6. Institutional benchmarks for the formation of prices for animals and meat products.

Model	Main mechanism	Lesson for the Republic of Moldova
European Union	Periodic publication of reference prices for housings by class	Relatively low-cost starting point for transparency
Franța—Breton Pork Market	Electronic auction organized by lots, with price discovered through bidding	It can inspire a trading platform with confidential offers
Spain—Mercolleida	Regular negotiation in a representative body of producers and industry	Balancing the representation of the parties can increase the credibility of the benchmark
US/China/Brazil—futures markets	Standardised contracts and derivatives, backed by high volumes	Requires liquidity, standardization and financial infrastructure that are not yet demonstrated in Moldova
Danish Crown—Denmark	Dominant cooperative weekly quotation	Validates the cooperative route
Poland/Czechia/Baltics	No exchange—bilateral + State statistics	Shows the gap Moldova must close

The governance of the platform is essential. It must not set minimum or maximum prices, publish individual transaction prices or facilitate commercial coordination between competitors. The published data must be aggregated and anonymised, and participation should remain voluntary. The platform should be designed together with the competition authority and representatives of producers, slaughterhouses and processors. The aim is to reduce information asymmetry and contractual risk, not administrative control of the market [13]-[15].

3.4. Integrated Model for Optimizing Regulation and Competitiveness

The empirical results indicate that the Republic of Moldova does not need a choice between regulation and deregulation. The strategic direction is smart regulation: maintaining the necessary level of consumer protection, while reducing the avoidable administrative and fixed costs of compliance. Based on the research results, six interdependent components are proposed (**Table 7**).

The first component is proportionality. Simplification for small producers should not mean lower food safety standards, but proportionate methods of demonstrating compliance. The Republic of Moldova has already taken steps in this direction by introducing simplified requirements for low-volume activities. The next step should be the systematic application of proportionality in inspection, documentation, laboratory requirements and reporting. The second component is formal risk-based control. Regulation (EU) 2017/625 provides an important benchmark as controls take into account hazards, compliance history and the reliability of their own controls. In the Republic of Moldova, a mature risk-based system could reduce repetitive controls for operators with demonstrated

compliance, while keeping controls targeted and unannounced where the level of risk requires it [16] [17]. The third component is digitalisation. An interoperable system between the National Food Safety Agency, laboratories, manufacturers and relevant public authorities could reduce duplicate documents, reporting time and data entry errors. Digital traceability should be seen not only as a control tool, but also as a competitiveness asset, as it allows manufacturers to quickly demonstrate compliance to buyers and importers. The fourth component is the development of compliance services. Small producers frequently face a skills constraint, not necessarily a lack of willingness to comply with requirements. Industry guidelines, simplified HACCP tools, training and advisory services can reduce fixed compliance costs [18]. The fifth component is the integration of regulatory requirements with investment policy. If an investment simultaneously improves food security and productivity, it should be treated as a productive investment, not exclusively as a mandatory expense. The results of the survey, in particular the strong association between investment, efficiency and quality, support this approach. The sixth component is market orientation. The ultimate objective of the policy must not only be that the operator passes control, but that the compliant operator can produce safe food, demonstrate compliance at a reasonable cost and compete effectively. Certification, accredited laboratories, traceability and commercial recognition must be connected in a coherent institutional architecture.

Table 7. Proposed model for optimising the regulatory framework on food safety.

Component	Proposed mechanism
Proportionality	Differentiate implementation requirements by risk, product type, production volume and produser size.
Risk-based control	Correlation of the frequency and intensity of controls with the risk profile, compliance history and reliability of internal controls.
Digitalization	Development of interoperable registers, digital traceability, electronic reporting and data exchange.
Compliance Services	Industry guides, HACCP models, training and technical support for small producers.
Investment linkage	Including investments to modernise food security in agricultural support programmes.
Market orientation	Using verified compliance as a tool for certification, contracting and access to EU markets.

4. Conclusion

The analysis indicates that increasing the competitiveness of pork producers in the Republic of Moldova requires an integrated approach, in which food safety, economic performance and market functioning support each other. The data of the exploratory survey show that 58.1% of respondents made investments, and all those in this group reported increased efficiency and quality improvement. At the same time, only 16.1% of the sample reported improved access to markets. The

result underlines that modernization and compliance must be complemented by certification, logistics, contracting and market information. For the pig sector, biosecurity, animal welfare, feed cost, buyer concentration and information asymmetry are interdependent constraints. Support policies must target investments that reduce health risks and increase productivity, and market mechanisms must improve transparency without imposing prices. The proposed model comprises six directions: proportionality, risk-based controls, digitalisation, technical assistance, investment support and market orientation through producer organisation and a phased reference price system. Implementation requires coordination between authorities responsible for food safety, agriculture and competition, producer organisations, slaughterhouses, processors and financial institutions. The main limitation of the research is the small size and exploratory nature of the sample; the survey indicators refer to agri-food producers from several branches and cannot be attributed exclusively to pig producers.

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Author Contributions

Conceptualization, A. Litvin and L. Caisin; methodology, A. Litvin and A. Ionescu.; validation, A. Litvin and L. Caisin; formal analysis, A. Raileanu and A. Ionescu.; investigation, A. Ionescu; resources, A. Ionescu; data curation, A. Ionescu and A. Raileanu; writing—original draft preparation, A. Litvin and L. Caisin; writing—review and editing, A. Litvin and L. Caisin; visualization, A. Litvin and L. Caisin; supervision, A. Litvin; project administration, A. Litvin; funding acquisition, A. Litvin. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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