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Grey matters: Exploring the uncharted fields of informal economic practices in the agricultural industry

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Abstract

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The grey economy in agriculture remains a persistent policy concern, as the sector combines seasonal labour peaks, heterogeneous farm structures, dispersed workplaces, and marketing channels where both labour and transactions may be only partly recorded. This paper reviews core definitions and conceptual boundaries of the grey economy and measurement limitations in the agricultural setting. To provide an empirical EU perspective, the paper applies descriptive triangulation using observable labour-market indicators for agriculture: temporary employment, part-time employment and self-employment. The results demonstrate substantial cross-country heterogeneity in the structure of agricultural work. Distinct patterns are presented such as seasonal employee-based systems, household-based farming dominated by self-employment and dual-activity part-time farming. The paper also discusses policy measures aimed at reducing incentives for undeclared work and underreporting in agriculture by combining enforceable rules with lower compliance costs.

Keywords: shadow economy; undeclared work; agriculture; seasonal labour; EU

Introduction

Unlike the substantial number of new colours being linked to various economic sectors, the grey economy, often referred to as the shadow or informal economy, has been a widely examined issue by policymakers, economists, and scholars for decades. It fundamentally embodies the market that functions outside of the formal regulatory framework, evading taxation and government oversight. The magnitude, contributing factors and defining features of the informal economy span across domestic borders, forging a complex web of operations with its own intricacies (Ridwan et al., 2024). The dynamics of the grey economy have gained increased attention in recent years, as a consequence of global phenomena including international conflicts, shifts in the labour market, climate change and technological advancements (Chu et al., 2023; Rahman et al., 2023). Although the grey economy exists in various sectors, it is significantly pronounced in agriculture. The global economic picture evolves, and understanding the implications of the grey economy is paramount for designing effective policy and regulatory strategies.

Farming and agri-food supply chains are characterised by short-term and seasonal labour demand, high use of family labour and geographically dispersed worksites. The farm structures are heterogeneous, ranging from small family farms to commercial holdings. These factors increase the risk that labour and output are undeclared or remain outside of formal legal and fiscal systems. In addition to labour, the informal activities in agriculture can also involve unrecorded farmgate sales, underreported turnover, vague boundaries between household production and market participation, and informal marketing through local channels. Compliance can become less attractive at farm scale, where regulatory and reporting systems are complex and hard to oversee. As a result, the shadow economy in agriculture has implications not only

for public finance but also for food-chain transparency, labour standards and occupational safety, agricultural support policies and overall rural livelihoods.

Despite being mainly delineated by its informal transactions and undocumented labour, the grey economy share varies extensively depending on the economic context. Recent analysis conducted by Medina and Schneider (2019) for the period 2010–2017 reveals that the shadow economy represents on average 14.2% of the GDP in advanced economies. The percentage share of shadow economy increases to 27.9% in emerging economies and further escalates to 36.3% in low-income countries. The indicated higher levels of undocumented economic activities underscore the significance of informal sectors based on a country's level of economic development. The agricultural sector is one of those crucial sectors, highlighting the importance of complex policies in addressing informal economies globally. The challenges that policymakers face globally to enhance tax revenue and the provision of public goods require an integrated approach in legislative measures and control mechanisms.

This study aims to demystify the grey nature of the shadow economy in agriculture, by providing a sector-oriented synthesis of (i) definitions, (ii) measurement methodologies, and (iii) key determinants of the informal activities in agriculture with reference to the Bulgarian context. The case of Bulgaria is relevant because institutional evidence identifies undeclared work in agriculture and food processing. The official statistics in Bulgaria implicate a dual farm structure with numerous small holdings, concentrated land use and financial incentives at EU level.

Core definitions and conceptual boundaries

The dynamic nature of the grey economy has produced definitions and interpretations in various ways in existing literature. Yet, there is still controversy about the exact definition and range of economic activities within its scope (Schneider, 2011). The definitions generally focus on the 'informal' aspect of the economic activities, reflecting the complex nature across different contexts. Shadow economy has been described as deliberate hiding of legal market-based production from authorities to evade taxes, labour standards and social security contributions (Schneider and Enste, 2000). It has also been regarded as economic activities that bypass regulations, observation and taxation (Williams and Schneider, 2016). Feige (1990) provided an even broader definition that includes both legal and illegal activities that are not accounted for in official GDP estimations. The Organisation for Economic Cooperation and Development (OECD) follows a very similar definition, covering legal and illegal economic activities that are required by law to be reported to the tax administration but remain unreported and untaxed (OECD, 2017). Therefore, definitions vary in scope and change over time, mainly depending on the analysed economic activities, the institutional and regulatory contexts, cultural and social norms, etc.

The definition of the grey economy which this paper employs is the one delineated by Medina and Schneider (2019) and encompassing all economic activities, deliberately concealed from authorities, due to regulatory, monetary and financial factors/reasons. Such motivations involve the evasion of social security contributions and tax payments, institutional issues like corruption or lack of trust in the political institutions and legal system, or regulatory challenges posed by the current regulatory framework like extensive bureaucracy. This definition narrows down the scope and excludes illegal or criminal activities, as well as personal, non-commercial ones like do-it-yourself projects and domestic chores. It aims to evaluate only actions of economic and political relevance with repetitive or large-scale characteristics in regard to GDP contributions. In agriculture, conceptual boundaries are of great importance, as farms could often combine household production, self-consumption and exchanges with market operations and sales. The labour aspect is also crucial, as farms might use family labour alongside hired seasonal workers. These features further complicate the definition and measurement and highlight the need for sector-specific analysis.

Measuring the shadow economy

The measurement of the grey economy in the agricultural sector has posed tremendous challenges due to the heterogeneity of the economic activities and diverse contributing psychological factors behind undocumented transactions (Kirchler, 2007). Key issues include the lack of official records, variability over time and location, indirect estimation techniques, and statistical basis. Despite advanced empirical methodologies, this diversity not only increases the complexity of the task but also challenges the accuracy of the produced estimations.

Three main approaches in methodology have been utilised in the attempt to quantify the grey economy – the direct, indirect and model methods (Achim et al., 2024). Each method offers distinct insights but also has its own limitations.

1) The direct approach incorporates surveys, questionnaires and samples, relying mostly on self-reporting data shared by households and businesses about their participation in informal activities. While this approach provides direct evidence of the shadow economy, it is sensitive to the formulation of the questionnaire and the respondents' will-

ingness to share information. Another source of data is tax audits and compliance data, which could potentially reveal any discrepancies between the reported and real income (Medina and Schneider, 2019). This method is constrained by the nature and scope of the audits.

2) The indirect approaches are generally macroeconomic and constructed upon observable indicators that could indicate involvement in informal practices. These are based on quantitative measures ranging from monetary metrics encompassing indicators like the circulation of large denomination banknotes, the proportion and volume of cash transactions, disparities between income and expenditure (both at the national and household levels), to non-monetary metrics like the number of small and medium-sized enterprises or electricity consumption (Kelmanson et al., 2019). Over time, however, researchers have begun to move away from the indirect approaches, due to their constrained applicability and relative inaccuracy, linked to inconsistencies in data (Gasparėnienė and Remeikienė, 2016; Renooy et al., 2004).

3) The model approach integrates various economic indicators and causes based on a Multiple Indicators, Multiple Causes (MIMIC) model, recognising the fact that unrecorded and informal activities measured directly (Buehn and Schneider, 2011). It has become one of the most widely used methods for assessing the size of the shadow economy, particularly in the agricultural sector. The MIMIC model incorporates a structural equation framework with multiple indicators and multiple causes, where the former include observable variables influenced by the presence of shadow economy, and the latter affect the size of informal activities within the economy. The model then employs statistical analysis to examine the relationships between indicators and causes to produce an estimation of the shadow economy size (Medina and Schneider, 2018). Indicators often include labour market participation, cash transactions, VAT contributions, etc., and causes such as tax rates, regulatory quality, GDP per capita.

Sector-focused studies on agriculture have begun to quantify the shadow economy using agriculture-tailored MIMIC models. For the EU-15 over 1996–2019, results estimate that the grey economy in agriculture is systematically larger than the overall economy and with highly pronounced cross-country heterogeneity (Schneider et al., 2023). The consolidated evidence highlights persistent structural exposure of the agricultural sector to informal activities (Quendler and Schneider, 2024). Results from new EU members reinforce the picture, where the EU-10 (2004–2020) show higher levels of grey economic activity in the agricultural sector than the share of the overall economy (Mou. Agriculture could display higher latent informality even in countries with a lower economy-wide shadow economy level (Morkunas, 2021). Despite its widespread usage and applicability, the MIMIC method has been criticised for its limitations such as dependence on sample size, model specifications, sensitivity to changes in data over time and generalisation issues (Kelmanson et al., 2019; Breusch, 2016).

Each method of measuring the grey economy has its own set of theoretical advantages and drawbacks. The selection of methodology is based upon the research objectives and availability of data (Williams and Schneider, 2016). The integration and usage of multiple methods allows for higher precision of estimates and a more nuanced understanding of the informal economy's scope and dynamics.

Determinants and mechanisms of the grey economy in agriculture

The shadow economy is influenced by a complex interplay of multiple factors. The investigation of correlation involves testing economic (i) and political factors (ii), the legislative system (iii), the business environment conditions (iv), and individual behaviour (v) (Mara, 2021). Certain economic indicators have exhibited significant correlation with the occurrence of informal activities in economies. Those indicators are mainly linked to the evasion of indirect and direct taxes (Schneider, 2011). Corruption, higher tax burdens, social security contributions and unemployment are estimated to have a positive correlation with the level of grey economy (Wijaya and Surbakti, 2024; Kelmanson et al., 2019; Schneider and Enste, 2000). Agriculture amplifies and modifies these determinants through sector-specific mechanisms. The quality of political institutions and the level of political stability are also important determinants. States with less political stability and higher levels of corruption tend to have a larger share of informal economic activities (Dreher et al., 2007).

Seasonality is a central driving force in agricultural informality. Harvest peak season creates a short, yet intensive labour demand that does not align with standard permanent contracts. Where formal hiring procedures are costly and administratively complex, farms may resort to undeclared day labour, underdeclared hours or envelope wages. Agricultural informality is also connected to non-standard forms of employment such as dependent self-employment (workers formally self-employed, but economically dependent on a single farm) and subcontracting chains. Evidence from the 2015 European Working Conditions Survey indicates that, in the EU-28 agriculture, forestry and fishing sector (NACE Rev. 2, Section A), employees without a written employment contract accounted for 15% of total sectoral employment

and 32% of employees in the sector, compared to 5% for the overall workforce, and 9% of agricultural employees received envelope wages (Williams and Horodnic, 2018).

Agricultural products are often perishable, which shortens the transaction windows and could encourage cash sales or rapid informal marketing, particularly for small producers (for example street stand sales). Informality risk may also rise when farmers face strong bargaining power asymmetries from processors and retailers, resulting in production liquidity stress and price squeeze. In such circumstances, underreporting of turnover or informal sales can be perceived as a coping strategy, especially in local markets with limited monitoring and enforcement.

Another key determinant is farm structure and incentive mechanisms. Small farms may combine market sales with self-consumption, relying heavily on household labour, and operate with limited accounting capacity. Such cases create measurement challenges and increase the risk of partial compliance or non-compliance. At the same time, large farm holdings could depend on labour contractors or complex seasonal workforce arrangements that obscure contracts and responsibility. Land tenure arrangements could also influence informality, as short-term or informal leasing and fragmented plots raise transaction costs, leading to complicated formal reporting or tax evasion.

High tax burdens and social security contributions, complex regulation and weak trust in institutions are commonly associated with higher informality (Schneider, 2011; Dreher et al., 2007; Torgler and Schneider, 2009). Excessive bureaucracy and an inefficient legal system significantly contribute to the growth of the grey sector. In agriculture, the compliance costs are especially salient for small and medium-sized producers, as they are linked to subsidies and tax reductions. Policy designs that require extensive documentation and administrative efforts for short-term hires or small-volume sales can further push the farms into informality. Conversely, credible and timely enforcement like risk-based inspections during peak seasons can increase detection risk. Labour inspectorates and revenue authorities, however, face capacity constraints, because agricultural work is seasonal and geographically dispersed, which raises monitoring costs.

There are also behavioural drivers that shape compliance decisions such as tax morale, perceived fairness and social norms (Alm and Torgler, 2006; Hofmann et al., 2008). In rural contexts, casual labour and informal exchange may be socially acceptable customary practices, especially in cases of high economic vulnerability. Therefore, policy strategies should improve farmers' perceptions of tangible benefits for formal activities.

Evidence from the European Union

Estimating the size of the shadow economy in agriculture is challenging because it combines (i) high shares of part-time and seasonal work, (ii) substantial family and unpaid help, (iii) self-employment and own-account work, (iv) dispersed worksites and sales channels. As explicitly noted by Eurostat, measuring labour in agriculture is not as straightforward as in other sectors, and Eurostat distinguishes between agricultural employment, the regular agricultural labour force, labour volume and farm managers to capture these structural features (Eurostat, 2025).

This paper proposes a triangulation strategy based on observable EU indicators identified by existing literature and institutional evidence as being strongly linked to undeclared work risks in agriculture. The goal of the analysis is not to estimate the size of the shadow economy in the agricultural sector, but to empirically document cross-country heterogeneity in exposure to labour structures: non-standard employment and seasonal hiring; high reliance on self-employment; and dominance of family labour and small-scale structures that complicate formalisation and monitoring.

EU statistics confirm that agriculture remains a structurally distinct and sizable employer. Eurostat estimates that 8.7 million people worked in agriculture in the EU in 2020, which is about 4.2% of total employment, with particularly high shares in some Member States (Eurostat, 2022). Most agricultural labour input is family-based at EU level, and labour estimates account for part-time and seasonal patterns. Those aspects of labour are tightly linked to informality risk, since they can reduce the use of standard contracts, and increase the scope for blurred boundaries between household production, reciprocal help, etc.

Institutional evidence shows that agriculture stands out in terms of employment formality and under-declaration risk markers. Employees in agriculture are substantially more likely to work without written contracts than employees in most other sectors, and envelope wages are present in agriculture (Williams and Horodnic, 2018). It is estimated that 15% of the agricultural workforce had no written contract in 2015, compared to 5% for the overall EU-27 workforce (Williams and Hodinic, 2020). Beyond sector averages, the work in agriculture shows that dependent self-employed and workers without written contracts in agriculture experience worse working conditions than fully formal employees, reinforcing the linked nature of labour market form and informality.

At the EU level, direct surveys indicate that undeclared work shows persistence rather than dramatic decline in the last decade, as 4% of EU-27 citizens have self-reported engaging in undeclared work, and the report notes that self-re-

porting should be treated as the lower bound due to underreporting (Williams and Horodonic, 2020).

Operational indicators

The practical limitation of the EU evidence base is that there is no official dataset to provide a directly comparable "share of shadow economy in agriculture" by Member State without modelling. To contribute to existing literature while remaining transparent and replicable, this paper identifies potential risks for informal activities by examining key drivers: temporary/seasonal hiring, blurred employment status/self-dependence, and family-labour dominance. This paper employs Eurostat data not as a measure of shadow economy itself, but as an evidence-based way to summarise agricultural labour structures that make undeclared work more plausible. Due to missing data, Malta and Luxembourg are omitted from the calculations.

Temporary employment in agriculture primarily reflects seasonal hiring, short-term labour and employment arrangements linked to harvesting cycles. The indicator $TEMP_A_{c,t}$ is defined as:

$$TEMP_A_{c,t} = \frac{Temporary\ employees\ in\ agriculture_{c,t}}{Total\ employees\ in\ agriculture_{c,t}}$$

In the agricultural context, short-term contracts are often associated with higher labour turnover and reduced continuity of employer-employee relationship. For this reason, TEMP_A is used as a proxy for labour instability and seasonality, without implying illegality or non-compliance. (Table 1).

Table 1. Temporary employees in agriculture, 2024 (% of employees)

Rank	Country	TEMP_A (%)
1	Italy	34.8
2	Cyprus	22.8
3	Spain	21.1
4	Netherlands	17.5
5	Portugal	14.9

Data: Eurostat
Source: Author's calculations

Temporary employment in agriculture displays substantial cross-country heterogeneity, ranging from nearly 35% in Italy to 1% in France. Southern and Mediterranean countries tend to have higher shares, consistent with production structures that rely more heavily on seasonal crop cycles and short-term labour demand. Countries with low TEMP_A generally reflect more stable employment relations or institutional arrangements that favour permanent contracts in even seasonal activities.

Part-time agricultural employment is also closely linked to seasonality, multiple job-holding and income diversification. In the agricultural context, part-time status may reflect complementary employment outside of farming or irregular labour demand over the year (Table 2).

Table 2. Part-time employment in agriculture, 2024 (% of total agricultural employment)

Rank	Country	PT_A (%)
1	Sweden	36.3
2	Finland	31.5
3	Slovenia	31.5
4	Netherlands	30.5
5	Austria	29.9
23	Hungary	5.7
24	Slovakia	3.9
25	Bulgaria	3.0

Note: The table presents the five highest and three lowest values; intermediate ranks are omitted.
Data: Eurostat
Source: Author's calculations

$$PT_A_{c,t} = \frac{Part\text{-}time\ employed\ persons\ in\ agriculture_{c,t}}{Total\ employed\ persons\ in\ agriculture_{c,t}}$$

Part-time employment in agriculture exhibits strong structural differences across EU Member States. Northern and Western European countries record the highest levels, consistent with widespread dual-activity farming, flexible labour arrangements and institutional acceptance of part-time work. Low PT_A values could reflect that agricultural employment is predominantly recorded as full-time or not recorded at all. The low PT_A values observed in countries such as Bulgaria, Slovakia and Hungary indicate a low recorded share of part-time employment. Yet, they do not, by themselves, establish the prevalence of undeclared work.

Another distinct indicator in agriculture is self-employment as it typically captures family farming, own-account work and small-scale production units. The $SE_A_{c,t}$ indicator is defined as:

$$SE_A_{c,t} = \frac{Self\text{-}employed\ persons\ in\ agriculture_{c,t}}{Total\ employed\ persons\ in\ agriculture_{c,t}}$$

High values of SE_A are commonly associated with fragmented farm structures and household-based agricultural activity. The higher values also pose a risk for increased informal activity and tracking as the farms are run by the same household. Labour in such cases is intertwined with ownership and family organisation (Table 3).

Table 3. Self-employment in agriculture, 2024 (% of total agricultural employment)

Rank	Country	SE_A (%)
1	Poland	79.3
2	Greece	76.8
3	Belgium	60.0
4	Finland	59.6
5	Austria	58.9

Data: Eurostat
Source: Author's calculations

Self-employment dominates the agricultural labour in most EU countries, exceeding three quarters of total employment in Poland and Greece. The pattern reflects family-based small-scale farming models, particularly in Central and Southern Europe.

The joint interpretation of the three indicators allows for the identification of distinct agricultural labour patterns. Some countries are characterised by seasonal employee-based systems, relying heavily on temporary contracts. Others have household-based systems dominated by self-employment, or dual-activity structure where agriculture is pursued on a part-time basis.

The cross-country differences in farm structure with non-standard employment are further illustrated in Figure 1. Using the 2020 Agricultural Census, it decomposes the farms into those operated exclusively by family labour, those with predominant family labour (≥50% but not 100%) and non-family farms. Across the EU, the farm labour is overwhelmingly family-based in most Member States. Romania leads in the EU in terms of the number of farms run by fami-

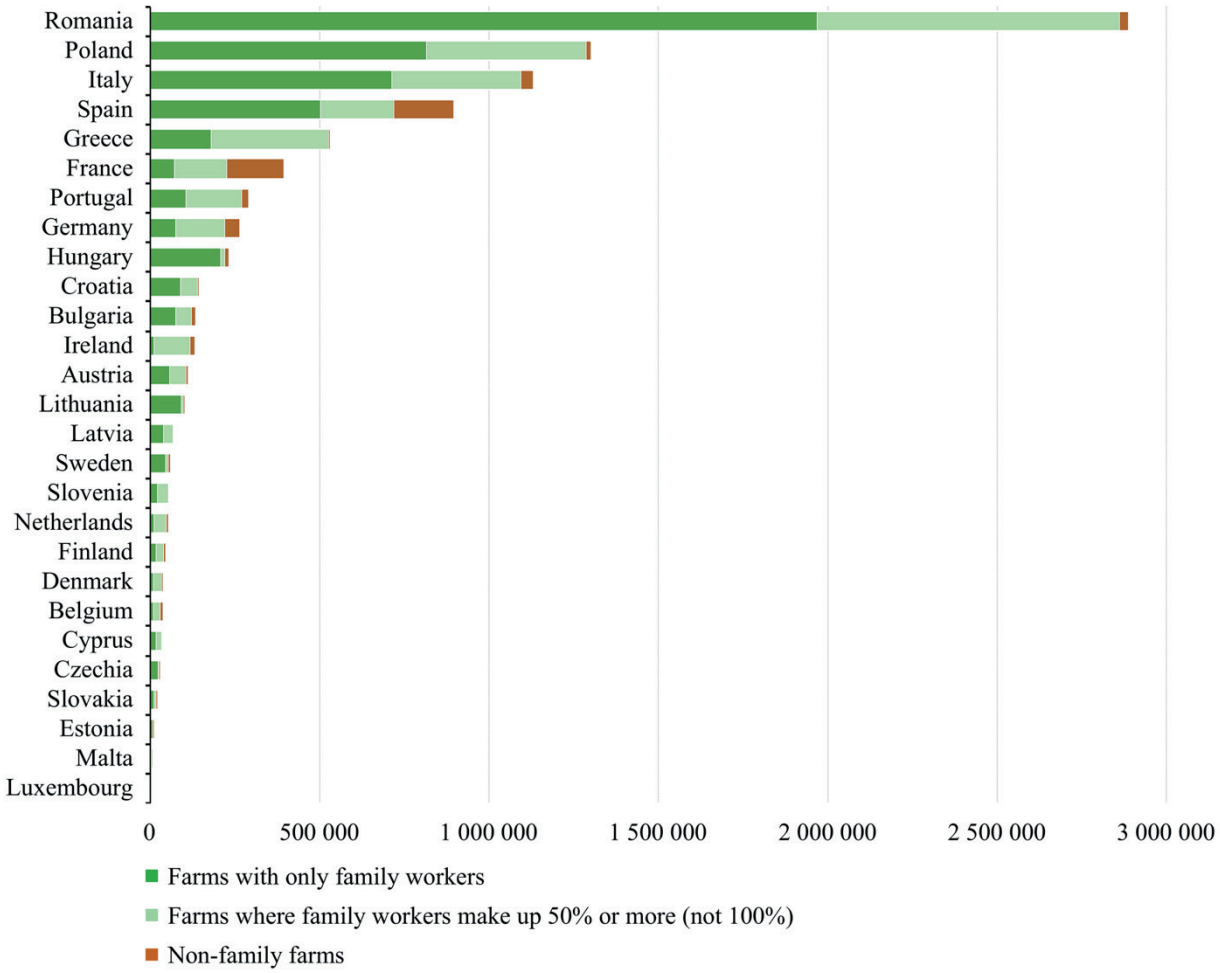


Fig. 1. Farms in the EU by family and non-family type, 2020
Note: Data for Spain, Lithuania and Slovenia are not comparable with those for other Member States.
Source: Eurostat (Agricultural Census, 2020)

ly-only workers. Poland, Italy, Spain and Greece also exhibit large farm counts with a strong family component. Where farms rely mainly on family labour, the boundary between household work, reciprocal help and market labour is harder to classify. This is one reason why measurement of agricultural labour is distinct and why undeclared work in the sector is hard to quantify directly.

Future challenges and policy measures

Policy responses to the grey economy in agriculture should combine enforceable rules with instruments that reduce compliance and transaction costs for farms, especially small holdings. First, seasonal hiring strategies need to be simple, yet legally robust and compatible with short-term demand for labour. Bulgaria's one-day contracts are an example of a policy instrument designed for this purpose (European Labour Authority, 2017). Second, inspection strategies from the revenue, labour and agricultural authorities should be timed to peak seasons and be risk-based, using intelligence and digital tracking. A practical implication is that labour and revenue controls should be timed to peak activity and targeted based on risk signals, rather than distributed across farms and months. Third, measures should address subcontracting and intermediation of labour, especially in cases of the importation of seasonal workers, in order to clarify responsibility and increase penalties for abusive informal arrangements. Policy design should ensure that responsibilities are clearly assigned and enforceable across contractual chains, with penalties that are credible and proportionate to the gains from non-compliance. Fourth, for micro and small agricultural producers selling small quantities locally, updated simplified reporting and proportionate regulation can reduce the incentives for grey operations, while strengthening food safety and fair competition.

In parallel, voluntary compliance should be stimulated by improving tax morale and institutional trust. Clear communication of the benefits of declared work (such as social insurance, accident coverage and enforceable rights) and rising costs of informality for workers can increase formal operations. Finally, sector-sensitive data collection for agriculture should be the foundation for policy evaluation, not economy-wide estimations. A credible policy approach requires monitoring that can track whether seasonal hiring instruments and enforcement timing are changing observable outcomes over time, and whether compliance costs are falling for small and medium farms.

Conclusion

Agriculture is structurally prone to shadow economic activity, due to dispersed worksites, seasonal labour demand, heterogeneous farm structures and sales channels where transactions may not be fully recorded. These structural features also explain why agricultural labour is more difficult to measure than in many other sectors, and why standard direct, indirect and model-based approaches often struggle to capture agriculture-specific realities, such as family labour, self-consumption, and short-duration seasonal hiring.

The policy implications indicate that agriculture requires a balanced strategy with feasible, yet enforceable measures. Sector-specific solutions encompass legally robust and administratively simple seasonal hiring pathways, risk-based enforcement timed to peak agricultural periods, clear responsibility in labour intermediation and compliance pathways for small producers.

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