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A Behavioural Lens on Smallholder Farmer Commercialisation: Evidence from Uganda's Maize-Based Farming Systems

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Abstract

Smallholder farmer commercialisation in sub-Saharan Africa depends not only on access to inputs and markets but also on the behavioural orientation of farmers toward market signals. Guided by the Market-Oriented Behavioural Model (MOBM), this study examined the extent and dimensions of market-oriented behaviour among smallholder maize farmers in Iganga and Mpigi districts, Uganda. A mixed-methods approach was used, combining survey data from 315 households with focus group discussions and key informant interviews. The Market Orientation Index (MOI) was constructed across three behavioural dimensions; Market Intelligence (MI), Good Agricultural Practices (GAPs), and Post-Harvest Handling (PHH), to generate a composite Smallholder Farmer Market Orientation Index (SHFMOI). Results reveal a moderate overall market orientation (SHFMOI = 0.44), characterised by strong engagement in production-related behaviours (GAPs = 0.64), moderate participation in PHH (0.35), and weak market intelligence (0.33). Farmers are motivated and adaptive but constrained by limited access to timely market information, affordable post-harvest technologies, and institutional support services. Qualitative findings highlight reliance on traders for price information, high input costs, and inadequate access to soil testing and quality-assurance services. The study concludes that strengthening market-oriented advisory systems, embedding market intelligence within extension delivery, and facilitating affordable post-harvest and soil-testing technologies are critical for reinforcing behavioural change and deepening smallholder commercialisation. Consistent with

the MOBM, such interventions can enhance farmers' capacity to transition from production-focused to market-responsive and commercially sustainable farming systems. Future research should examine how behavioural reinforcement mechanisms, such as demonstrations and digital peer-learning platforms, sustain market-oriented farming practices over time.

Keywords: Commercialisation, Good Agricultural Practices, Market Intelligence, Market-Oriented Behaviour, Post-Harvest Handling.

1. INTRODUCTION

Agricultural commercialisation led by small-scale and resource-poor farmers holds significant potential to enhance household food security, reduce poverty, and stimulate broader agricultural and economic growth (Neme & Tefera, 2021). By shifting from subsistence to market-oriented production, smallholders can improve their incomes, strengthen livelihoods, and contribute meaningfully to rural development and poverty alleviation (Cheber, 2018). Empirical evidence further demonstrates that commercialisation is positively associated with higher household income and asset accumulation (Geffersa & Tabe-Ojong, 2024). Nevertheless, progress remains uneven across farming systems, hindered by persistent barriers such as limited market access, low productivity, weak infrastructure, and inadequate financial and advisory services (Carletto et al., 2022; Poulton et al., 2010).

In Uganda, smallholder commercialisation is considered central to transforming agriculture into a market-oriented sector that enhances household welfare and food security (Adong et al., 2014). Empirical evidence shows that (Kilimani et al., 2020; Nivievskiy et al., 2010). Nonetheless, progress remains uneven across regions, constrained by limited financial inclusion, insecure land tenure, and restricted access to credit (Eton et al., 2021). These mixed outcomes suggest that structural factors alone do not fully explain variations in smallholder commercialisation, pointing to the need to understand the behavioural dimensions that shape farmers' engagement with markets. However, beyond market participation, the behavioural foundations that drive smallholders' commercial engagement remain poorly understood. Conceptually, two constructs underpin this transition: market orientation (MO) and market participation (MP). (Jaleta, 2011). Recent literature frames this as market-oriented behaviour (MOB), the capacity of farmers to anticipate and respond to market opportunities through informed decision-making and customer-focused production (Di Bari, 2022). In agriculture, MOB manifests through the use of market information, adoption of Good Agricultural Practices (GAPs), and post-harvest handling or value addition. However, emerging evidence indicates that this relationship is not linear. (Mkuna & Wale, 2022) observe that smallholders may participate in markets without being fully market-oriented and that repeated engagement can, in turn, stimulate orientation. This contrasts with studies that position orientation as a prerequisite for participation, suggesting instead that the two processes may evolve interactively. Recognising this dynamic relationship is especially relevant in Uganda, where many smallholders operate within semi-subsistence systems, and

behavioural adaptation plays a central role in sustaining market engagement.

Empirical evidence links strong market orientation to increased participation, productivity, and resilience (Gebremedhin, 2010; Okello et al., 2025). However, limited research in Uganda examines how smallholders internalise market signals and translate them into adaptive behaviours.

This study, therefore, investigates the market-oriented behaviour of smallholder farmers by addressing two questions:

1. To what extent do smallholders exhibit different forms of market-oriented behaviour?
2. What implications do these behaviours have for the commercialisation of smallholder farming?

1.1 Theoretical framework

The Market-Oriented Behavioural Model (MOBM) (figure 1) extends classical market orientation theory ((Kohli & Jaworski, 1990; Narver & Slater, 1990) to the realities of smallholder farming systems (Gebremedhin, 2010; Gebremedhin & Tegegne, 2012). It rests on three foundational elements, customer orientation, competitor orientation, and inter-functional coordination, which, within agriculture, manifest as distinct market-oriented behaviours (MOBs) guiding farmers' production and marketing decisions.

Market Intelligence (MI) corresponds to customer focus. It captures farmers' ability to obtain and apply information on prices and demand patterns (Shrivastava et al., 2019). By leveraging such intelligence, farmers can align production with profitable opportunities and strengthen their bargaining position in markets (Kohli & Jaworski, 1990; Pingali et al., 2019).

Good Agricultural Practices (GAPs) demonstrate cross-functional coordination through the consistent application of agronomic standards that guarantee quality, safety, and sustainability. Implementing GAPs builds trust with buyers, minimises production risks, and encourages participation in formal or high-value chains (Akkaya et al., 2005; Olaniyi, 2023; Xiong et al., 2020).

Post-Harvest Handling (PHH) integrates customer and competitor focus by emphasising activities like drying, sorting, grading, and storage to maintain quality and minimise losses. Effective PHH enhances competitiveness and allows farmers to access greater value in differentiated markets (Hussein et al., 2016).

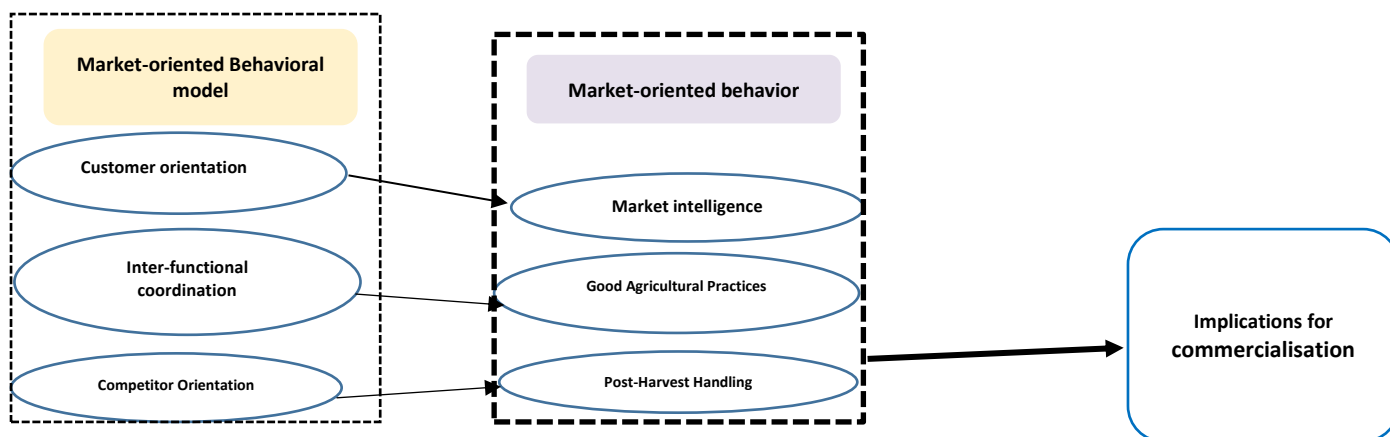


Figure 1: Theoretical and conceptual framework for the study

2. MATERIALS AND METHODS

2.1 Philosophical Orientation

The study was grounded in a pragmatic philosophical orientation, combining elements of both positivism and interpretivism to enable a nuanced understanding of smallholder farmers' market-oriented behaviour and its contribution to agricultural commercialisation in Uganda. A mixed-methods approach was employed to integrate quantitative measurement with qualitative insights, thereby generating contextually grounded and policy-relevant evidence. Fieldwork was undertaken in Iganga District (Eastern Uganda) and Mpigi District (Central Uganda), areas purposively chosen because of their advanced engagement with agricultural commercialisation initiatives, notably the Agriculture Cluster Development Project (ACDP), which has promoted innovations in input distribution, farmer training, post-harvest management, and market linkage development. The research focused on smallholder crop producers, treating the individual farmer as the primary unit of analysis. To capture diversity across farming systems, respondents identified their principal commercial crop, allowing the study to assess market orientation within farmers' specific production contexts rather than restricting analysis to a single value chain.

2.2 Study Area, Population, and Sampling

The study was conducted in Iganga and Mpigi Districts, representing eastern and central Uganda. Iganga, located in the Busoga sub-region, has fertile soils and bimodal rainfall supporting maize, beans, cassava, and rice. Mpigi's central agro-ecological conditions favour coffee, bananas, maize, beans, and horticultural crops. In both areas, farming is dominated by smallholders practising mixed subsistence and commercial production, making them suitable sites for analysing behavioural dynamics in smallholder commercialisation. The study population comprised male and female smallholder crop farmers engaged in diverse enterprises and sub-county Agricultural Extension Workers (AEWs) who facilitate advisory services and market linkages.

A multi-stage sampling approach was used. Two sub-counties were randomly selected from each district, and sampling frames were compiled from lists of registered farmers provided by Local Council II chairpersons. For the quantitative survey, the sample size was determined using Krejcie and Morgan's sample estimation formula introduced in 1970 (Chuan & Penyelidikan, 2006; Morgan, 1970). Respondents were distributed across sub-counties using probability proportional to size, and 315 farmers were randomly selected across multiple crop enterprises to capture variation in production systems and market engagement.

For the qualitative component, participants were purposively selected to ensure diversity in gender, group membership, and enterprise type. Gender-segregated focus group discussions (FGDs) were conducted following best-practice guidelines (Maldonado-Castellanos & Barrios, 2023), yielding eight FGDs; one male and one female per sub-county. Key informant interviews (KIIs) were held with AEWs and a farmer leader to explore institutional linkages and behavioural factors influencing market orientation. Combining probability and purposive sampling strengthened both the representativeness of the survey and the contextual depth of qualitative insights.

2.3. Research design and data collection

The study employed a cross-sectional design conducted between August 2023 and January 2024, using a convergent parallel mixed-methods approach. This design allowed the simultaneous collection and integration of quantitative and qualitative data, thereby strengthening triangulation and the robustness of findings (Greene et al., 1989; Johnson et al., 2007).

2.3.1. Qualitative Data

Qualitative data were gathered through eight focus group discussions (FGDs) and four key informant interviews (KIIs) with sub-county Agricultural Extension Workers (AEWs). The number of FGDs followed (Krueger & Casey, 2015) guidance for complex research, ensuring diversity of views. Gender-segregated FGDs allowed open discussion of men's and women's experiences, while KIIs provided institutional perspectives. Semi-structured interview guides, reviewed by supervisors and peers, elicited detailed insights on farmers' experiences and perceptions of commercialisation support. Data were collected by the researcher with two trained assistants, recorded, transcribed verbatim, and cross-checked with field notes for completeness.

2.3.2. Quantitative Data

Quantitative data were collected using a pretested structured questionnaire administered digitally through KoboToolbox. The instrument captured key dimensions of market-oriented behaviour, including:

1. Priority crops produced primarily for market sale;
2. Market intelligence, reflecting farmers' access to and use of market information;
3. Good Agricultural Practices (GAPs) adopted to enhance productivity and quality; and

4. Post-harvest handling practices related to value addition, storage, and quality
5. Socioeconomic, Demographic, and Institutional Characteristics

Enumerators received training in KoboCollect and ethical interviewing to ensure data accuracy and consistency. The individual farmer was the unit of analysis, enabling assessment of gender dynamics in market orientation.

Data Management

Responses were captured through face-to-face interviews and entered directly into KoboToolbox, allowing real-time validation and secure data storage. Regular quality checks were performed throughout fieldwork, and final datasets were exported to SPSS, Excel, and Stata for analysis.

2.4. Data Collection Process

2.4.1. Market Intelligence Component

As part of the household survey, farmers identified their main commercial crop, the enterprise primarily produced for sale during the first season of 2023. This served as a reference for analysing market-oriented behaviour across diverse farming systems.

To assess market intelligence, four indicators were adapted from (Ayalew & Belay, 2020; Nakasone et al., 2014; Piabuo et al., 2020; Wang et al., 2015). These captured both the acquisition and application of market information in production and marketing decisions. Specifically, farmers were asked whether they:

1. Sought price information from different marketing outlets;
2. Used price information to guide decisions on what, how much, and when to produce or sell;
3. Sought customer information on preferences, quality standards, and packaging; and
4. Used customer information to adjust production and marketing practices.

Collectively, these variables operationalised market intelligence as a measurable construct reflecting how effectively farmers access and apply market information to guide commercial decisions.

2.4.2. Good Agricultural Practices (GAPs)

The adoption of Good Agricultural Practices (GAPs) was assessed by examining whether farmers applied key agronomic practices in maize production. These practices are widely recognised for enhancing productivity, reducing production risks, and promoting commercialisation (Meena & Vishnuvardhan, 2021; Murphy et al., 2015). For this study, GAPs were operationalised into measurable variables covering soil management, crop establishment, input use, and pest and weed control. Specifically, farmers were asked about practices such as soil testing, land preparation, line and timely planting, use of improved seed, fertiliser application, weed management, soil and water conservation, and pest and disease control. Each variable was defined using standard agronomic benchmarks adapted from MAAIF (2019) and related literature (Meena & Vishnuvardhan, 2021; Murphy et al., 2015), forming the basis for quantifying the extent of GAP uptake among smallholder maize farmers in the study area.

2.4.3. Post-Harvest Handling (PHH) Practices

The adoption of post-harvest handling (PHH) practices was assessed using six key indicators adapted from national guidelines (MAAIF,

2019) and established best practices. PHH is critical for operational losses, preserving grain quality, and enhancing the marketability of maize. Farmers were asked whether they applied recommended practices, including drying on tarpaulins or raised platforms, sorting to remove impurities, and grading by size or quality. Additional indicators covered storage on pallets to prevent moisture and pest damage, use of hermetic or airtight bags to maintain grain quality, and basic processing such as milling before sale.

These variables collectively operationalized PHH as a measure of farmers' capacity to maintain product quality and value after harvest, forming an essential dimension of market-oriented behaviour.

2.5. Data Analysis

2.5.1. Qualitative Data Analysis

Qualitative data from focus group discussions (FGDs) and key informant interviews (KIIs) were compiled from audio recordings and field notes to ensure accuracy and completeness. Recordings in Luganda (Mpigi) and Lusoga (Iganga) were translated into English and transcribed for analysis. The transcripts were analysed using Atlas.ti software, guided by Braun and Clarke's (2006) thematic framework.

Initial open coding was employed to identify recurring ideas, which were progressively grouped into categories and refined into overarching themes that captured farmers' experiences and perceptions. This approach provided both structure and interpretive depth in analysing qualitative evidence.

2.5.2. Quantitative Data Analysis

Quantitative data were exported from KoboToolbox into Stata, cleaned, and analysed using descriptive and composite index techniques following (Centre, 2008; Talukder et al., 2017). Descriptive statistics (means, standard deviations, frequencies, and percentages) were applied to characterise the study sample and provide context for analysing smallholder commercialisation dynamics.

Descriptive statistics summarised farmers' priority crops, showing their distribution across the study population and highlighting the most commercially significant enterprises. This provided a basis for understanding crop diversity and contextualising market participation patterns in the study area.

A composite index approach was employed to quantify the extent of market-oriented behaviour among smallholder farmers. Following the procedures outlined by (Talukder et al., 2017) and (Takam Fongang et al., 2023), indicators were grouped under three behavioural dimensions, Market Intelligence (MI), Good Agricultural Practices (GAPs), and Post-Harvest Handling (PHH), as defined by the Market-Oriented Behavioural Model (MOBM). For each farmer, the number of behaviours demonstrated within a dimension was divided by the total number of recommended behaviours, producing a normalised score ranging between 0 and 1. The resulting sub-indices (MOI-MI, MOI-GAP, and MOI-PHH) were then averaged to obtain a composite Smallholder Farmer Market Orientation Index (SHFMOI). This index summarises multidimensional behavioural data into a single measure that reflects the overall degree of market-oriented behaviour, where higher values indicate stronger engagement with market-driven production and marketing practices. The index captures the interrelated dimensions of market-oriented behaviour; seeking and use of information, production practices, and post-harvest management,

providing a multidimensional measure of how these behaviours collectively shape smallholder commercialisation.

3. RESULTS AND DISCUSSION

3.1. Priority Crops Grown for Sale

Results show that maize is the dominant commercial crop in the study area, reported by 61.6% of farmers (Table 1). This underscores its central role in smallholder commercialisation as a staple food and a main source of cash income. Beans (9.8%) and coffee (9.8%) also feature prominently, contributing to household food security and serving as important income sources. Other crops, such as groundnuts (5.1%) and sweet potatoes (2.5%), show moderate diversification. In contrast, a variety of horticultural and perennial crops, including bananas, tomatoes, cassava, and rice, were cultivated by less than 2% of farmers each. The findings indicate that although crop diversity exists, maize remains the leading enterprise driving market participation. Therefore, in subsequent sections, maize was used as the reference crop for analysing farmers' market-oriented behaviour.

The findings reveal that maize dominates as the primary commercial crop, reflecting its dual role as both a household staple and a key source of cash income. This pattern is consistent with (Tschirley et al., 2006), who reported a similar role for maize in Mozambique. Its prominence highlights both farmers' production strategies and the structural realities of Uganda's agricultural markets, where opportunities for diversification into higher-value crops remain limited. Maize, therefore, underpins the commercialisation trajectory in the study area and serves as a reference point for assessing how smallholders engage with MI, GAPs, and PHH.

This dominance has several important implications. The dual role of maize as both a staple and a cash crop underscores the strong interdependence between food security and market participation, suggesting that commercialisation strategies should balance income generation with household consumption needs. From a behavioural standpoint, farmers' preference for maize reflects familiarity and low entry barriers rather than deliberate use of market intelligence or value-chain optimisation. Strengthening advisory and market information systems could therefore promote more informed production choices and facilitate gradual upgrading toward higher-value crops. At the policy level, targeted investments in input quality, post-harvest technologies, and aggregation infrastructure for maize could serve as strategic leverage points for advancing broader smallholder commercialisation.

Table 1: Priority Crops for Sale in the Study area

Crop	Freq.(n=315)	Percent
Banana	6	1.90
Beans	31	9.80
Cabbage	4	1.30
Coffee	31	9.80
Cotton	1	0.30
Cassava	4	1.30
Egg Plant	1	0.30
Ground Nuts	16	5.10
Maize	194	64.6
Other	3	1.00

Passion	1	0.30
Pineapple	1	0.30
Rice	4	1.30
Sugar cane	1	0.30
msim	1	0.30
Sweet Potato	8	2.50
Tomato	6	1.90
Vanilla	1	0.30
Water Melon	1	0.30

3.2. Market-Oriented Behaviour: Market Intelligence

Results in Table 2 show that smallholder farmers demonstrate relatively low market intelligence behaviour. About 35.2% of farmers reported seeking price information, while 33.6% sought information on customer preferences. However, the proportion of farmers who applied this information in decision-making was considerably lower; 18.4% used price information, and only 15.4% used customer information to guide production or marketing strategies.

Table 2: Farmers' Market-Oriented Behaviour on Market Intelligence

Variable	Percent (n=194)
Seek information about prices	35.2
Use price information	18.4
Seek information about customers	33.6
Use customer information	15.4

This disparity between information seeking and information use indicates that while some farmers recognise the value of market information, many lack the capacity or means to translate it into actionable decisions. The findings reveal weak integration of market signals into production planning and marketing practices, constraining farmers' ability to align output with demand, capture price advantages, and strengthen their competitiveness.

A similar pattern is reported across sub-Saharan Africa, where limited access to timely, reliable, and affordable information constrains smallholders' responsiveness to market signals (David-Benz et al., 2016; Liao & Chen, 2017).

Farmer testimonies illustrate these challenges vividly. A woman from Nakigo noted:

"The traders cheat us; they do not tell the truth about the prevailing prices at harvest time, especially if they have already given you an advance." (NKW2, FGD03, Women, Nakigo)

This dependence on traders as the main information source reinforces passive, price-taking behaviour and leaves farmers vulnerable to exploitation. Others described the absence of accessible modern channels:

"Most of us still rely on old knowledge because we do not get information on modern farming or markets... Sometimes there is a section on 'enkumbi telimba' in the

newspapers, which is useful, but they are not sold here, so we miss out.” (KNM5, FGD07, Men, Nkozi Rural)

Technological gaps further widen these constraints. One participant explained:

“We lack access to market information. In my village, only a few households have smartphones, solar power, or TVs... even then, it is hard to borrow them since they mainly use them for music.” (KNWI, FGD08, Women, Nkozi Rural)

These accounts reveal adaptive yet constrained behaviours. Farmers recognise the value of market intelligence but often rely on outdated or unreliable sources, which limits their ability to make informed production or marketing decisions. However, studies of functioning Market Information Systems show that reliable access to market intelligence can raise farm-gate prices by 7–10% (Courtois & Subervie, 2015).

Smallholders’ engagement with market intelligence remains limited, shaped by persistent information asymmetries, technological barriers, and reliance on traders as main information sources. Although many farmers actively seek market information, few translate it into effective production or marketing decisions. This weak integration of market signals restricts their capacity to compete in dynamic value chains and sustains their dependence as price takers. Strengthening market-oriented advisory systems that provide timely and localised information is essential for improving farmers’ responsiveness to market demand. This, in turn, enhances price realisation and accelerates their transition toward deeper commercialisation.

3.3 Market-Oriented Behaviour: Good Agricultural Practices (GAPs)

Analysis of data in Table 3 reveals substantial variation in the adoption of Good Agricultural Practices (GAPs) among smallholder maize farmers. The most commonly adopted practices were line planting (91.2%), weed management (91.2%), and land preparation (87.1%), reflecting strong emphasis on basic agronomic routines that directly influence yield outcomes. Pest and disease control (72.1%) was also widely practised, underscoring awareness of crop protection as a key production safeguard.

Table 3: Farmers’ Market-Oriented Behaviour in Good Agricultural Practices

Variable	Percent (n=194)
Soil testing	9.30
Line planting	91.2
Land preparation	87.1
Use of improved seeds	58.2
Weed management	91.2
Soil and water management	36.6
Fertilizer application	61.3
Pest and disease control	72.1

Moderate adoption levels were observed for fertiliser application (61.3%) and use of improved seed (58.2%), while uptake of soil and water management (36.6%) remained limited. Soil testing (9.3%)

was the least practised, suggesting constraints related to cost, access, or technical knowledge. This pattern highlights a production-oriented mindset driven by short-term gains rather than long-term sustainability and market quality standards.

Similar findings in other African contexts confirm that smallholders are more willing to adopt practices perceived to deliver quick and tangible harvest improvements (Bwambale, 2015; Sithole & Olorunfemi, 2024). As one extension worker in Iganga observed;

“I have success stories: farmers have adopted some technologies, like planting in lines, using improved seeds, and using fertiliser” (KE01, Iganga).

Such testimonies highlight that adoption is strongest when technologies are affordable, visible, and clearly linked to yield improvement.

The finding on moderate implementation of more resource-intensive practices, such as fertiliser application and uptake of improved seeds, may be hampered by high costs, counterfeit inputs, and informational barriers. Farmers emphasised these issues:

“Fertilisers are expensive; a bag of DAP costs UGX 50,000, which many farmers cannot afford” (RW15, Women, Nambale).

Others noted that product instructions are often inaccessible:

“Instructions on fertilisers, pesticides, and herbicides are only in English, yet most of us cannot read or understand them” (KNM2, Men, Nkozi Rural).

Concerns about fake inputs were also voiced:

“Some inputs sold are fake; they claim that they also do not know that they are fake” (RW12, Women, Nambale).

These narratives confirm that weak adoption cannot be solely explained by farmer reluctance; instead, it reflects systemic challenges in affordability, quality assurance, and institutional support. Similar findings were reported in Ethiopia, where Spielman *et al.* (2012) observed that high costs, unreliable supply chains, and weak institutional backing constrained the uptake of improved seed, fertiliser, and extension services.

The finding on minimal adoption of soil and water management practices, particularly soil testing, reflects farmers’ dependence on external support. As one participant explained:

“NARO has come on the ground and is now helping us with soil testing. They helped us to understand which type of seed to use on what soils. But sometimes they take a long time to bring back results.” (RW23, Women, Nambale)

This account demonstrates that while farmers value soil testing and recognise its benefits, access remains limited without institutional facilitation. The implication is that unless soil testing and related diagnostic services are institutionalised and embedded within extension delivery systems, individual extension workers will continue to lack the capacity to promote these practices effectively and at scale.

These patterns indicate that smallholders’ engagement with Good Agricultural Practices (GAPs) is adaptive but constrained. Farmers readily adopt simple, low-cost practices that deliver visible yield gains, yet uptake of advanced practices requiring financial, technical, or institutional support remains low. This uneven

behaviour reflects systemic constraints, including high input costs, counterfeit markets, weak regulation, and limited institutional support, rather than a lack of farmer motivation.

The implications for commercialisation are substantial: without broader adoption of advanced GAPs such as fertiliser use, improved seed, soil and water management, and especially soil testing, productivity gains will remain shallow and inconsistent. Kanyamuka et al (2020) note that productivity-oriented interventions translate into sustained commercialisation only when accompanied by policies that expand input access, ensure quality assurance, and strengthen farmers’ technical capacity.

3.4 Market-Oriented Behaviour: Post-Harvest Handling (PHH)

Analysis of post-harvest handling (PHH) practices (Table 4) reveals varying levels of adoption among smallholder maize farmers. These practices are vital for reducing losses, maintaining grain quality, and meeting market standards. The most common behaviours were drying on tarpaulins (56.7%) and sorting (55.7%), which generally focused on cleanliness and basic quality preservation.

Table 4: Smallholder Farmer Market-Oriented Behaviour in Post-Harvest Handling

Variable	Percent (n=194)
Drying on tarpaulin	56.7
Sorting	55.7
Grading	28.4
Store on pallets	34.5
Use airtight bags/hermetic	32.5
Processing	18.6

More advanced practices were less prevalent. Only 28.4% of farmers reported grading their maize by size or quality, suggesting limited differentiation to meet buyer specifications. Similarly, 34.5% stored maize on pallets and 32.5% used hermetic or airtight bags, reflecting moderate uptake of improved storage technologies that prevent pest and moisture damage. Processing maize into flour was least common, reported by 18.6% of respondents.

The findings reveal that farmers largely rely on basic PHH practices, while the adoption of value-enhancing and quality-assuring measures remains limited. The low use of grading, hermetic storage, and processing constrains farmers’ ability to maintain consistent quality, reduce post-harvest losses, and access higher-value markets, which are central to successful commercialisation.

The behavioural patterns observed in Good Agricultural Practices (GAPs) are mirrored in Post-Harvest Handling (PHH). Farmers readily adopt basic practices such as drying and sorting, which are low-cost, familiar, and directly linked to preventing immediate spoilage. Similar findings across sub-Saharan Africa show that smallholders prioritise simple, visible practices tied to immediate quality preservation (Akinyi et al., 2022).

In contrast, advanced PHH behaviours, such as grading, hermetic storage, and processing, remain uncommon. These practices demand greater technical knowledge, financial investment, and access to appropriate technologies, explaining their limited uptake. Prior studies attribute these gaps to high technology costs, weak extension

support, and limited credit access (Abebe & Debebe, 2020; Affognon et al., 2015)

Farmer testimonies reinforce these constraints. A woman in Nambale remarked:

“We need silos, particularly plastic ones, as using sisal bags leads to our produce being eaten by rats.” (RW12, FGD01, Women, Nambale).

Men in Kituntu highlighted structural limitations:

“One of the major challenges is that we lack proper storage facilities.” (KTM2, FGD07, Men, Kituntu).

Similarly, a woman from Nakigo noted:

“I do not have pallets, not even a store. I keep my maize in the house.” (NKW4, FGD03, Women, Nakigo)

These voices illustrate that smallholders are adaptive but constrained; they improvise within their means, balancing awareness of improved practices with limited access to infrastructure and technology.

However, advanced PHH practices are crucial for maintaining consistent quality, extending shelf life, and reducing pest or moisture damage, key determinants of access to higher-value markets (Mensah-Bonsu et al., 2025; Odjo & Ostermann, 2024).

Although smallholders perform basic PHH routines, their limited participation in quality-enhancing and value-adding activities weakens their competitiveness. Farmers remain confined to low-value channels without grading, improved storage, or processing, which restricts their access to structured markets. These findings, along with patterns in GAPs and Market Intelligence, inform the analysis of the Market Orientation Index (MOI), which combines production, information use, and quality management dimensions.

3.5 Smallholder Farmer Market-Oriented Behavioural Indices (MOI) Across Three Dimensions

The Market Orientation Index (MOI) was constructed across three behavioural dimensions: Market Intelligence (MI), Good Agricultural Practices (GAPs), and Post-Harvest Handling (PHH). For each dimension, the number of behaviours exhibited by individual farmers was recorded and transformed into indices by dividing the mean number of behaviours by the total recommended for that dimension. This approach enabled cross-dimensional comparison and the generation of a composite measure reflecting the overall extent of market-oriented behaviour.

Table 5 summarises the distribution of behaviours, mean scores, and resulting indices. The findings show substantial variation across dimensions.

Table 5: Smallholder Farmer Market-Oriented Behaviour Indices (MOI) Across Three Dimensions

No. of behaviours	MOI-MI		MOI-GAP		MOI-PHH	
	Freq.	Perc (%)	Freq.	Perc (%)	Freq.	Perc (%)

0	114	58.76	0	0	63	32.47
1	8	4.12	5	2.58	21	10.82
2	17	8.76	6	3.09	33	17.01
3	7	3.61	41	21.13	26	13.40
4	48	24.74	24	12.37	24	12.37
5	-	-	20	10.31	14	7.22
6	-	-	39	20.1	13	6.70
7	-	-	46	23.71	-	-
8	-	-	13	6.7	-	-

Summary Statistics

Dimension	Mean No. of behaviours	MOI (Mean ÷ Total Practices)
MOI-MI	1.3	0.33
MOI-GAP	5.13	0.64
MOI-PHH	2.11	0.35
Composite MOI		0.44

Note: MOI-MI = Market-orientation Index for Market Intelligence; MOI-GAP = Market-Orientation Index for Good Agricultural Practices; MOI-PHH = Market-orientation Index for Post-Harvest Handling.

On average, farmers demonstrated 5.1 out of 8 GAPs behaviours, 2.1 out of 6 PHH behaviours, and 1.3 out of 4 MI behaviours. Corresponding mean indices were 0.64 for GAPs, 0.35 for PHH, and 0.33 for MI. These results indicate that smallholders are most engaged in production-related practices, moderately engaged in post-harvest handling, and least active in information-seeking and utilisation.

Nearly all farmers adopted at least one GAP-related behaviour, whereas many reported none or only one behaviour under market intelligence. PHH practices occupied a middle ground, with common engagement in basic activities such as drying and sorting, but limited uptake of grading, improved storage, or processing.

3.6 Visualisation of Market-Oriented Behaviour Indices

Figure 1 illustrates the relative strength of market-oriented behaviours across the three dimensions. Farmers demonstrated the highest responsiveness in production-related practices (MOI-GAP = 0.64), compared with much lower engagement in post-harvest handling (MOI-PHH = 0.35) and market intelligence (MOI-MI = 0.33). The composite index (SHFMOI = 0.44) falls below the 0.50 benchmark for strong market orientation, suggesting a moderate overall level.

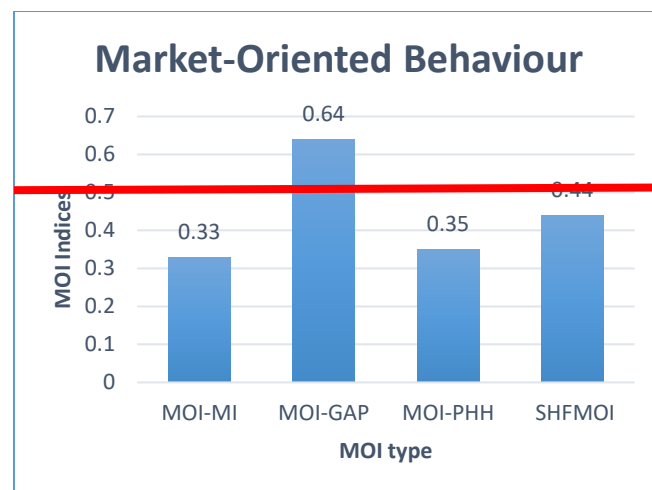


Figure 1. Visualisation of Market-Oriented Behaviour Indices

Source: Survey data, 2023/24

These findings confirm that smallholder farmers are predominantly production-oriented, focusing on agronomic and yield-enhancing practices while showing weaker responsiveness to market signals and post-harvest quality requirements. This imbalance constrains deeper commercialisation, as farmers' efforts remain centred on output expansion rather than strategic alignment with market demand and value-adding opportunities.

The results reveal a clear imbalance in market-oriented behaviours with farmers demonstrating stronger engagement in production-related practices and weaker performance in information use and quality management. This production-focused orientation mirrors broader trends across sub-Saharan Africa, where smallholders often adopt low-cost practices that deliver immediate yield gains, while resource-intensive and knowledge-demanding innovations diffuse slowly (Bwambale, 2015; Sithole & Olorunfemi, 2024). Systemic constraints in seed and input systems, such as high costs, unreliable supply chains, and limited private-sector engagement, further restrict the uptake of productivity-enhancing inputs (Abebaw et al., 2023). Consequently, even when farmers apply basic GAPs, the transformative productivity gains from improved varieties and fertiliser use remain uneven (Otieno et al., 2021).

The weak performance in Market Intelligence underscores persistent information asymmetries in smallholder markets. Many farmers still depend on itinerant traders for price signals, reducing their bargaining power and limiting evidence-based decision-making (Magesa & Mkasanga, 2021). Evidence from Market Information Services shows that reliable information can raise maize prices by up to 10% and groundnut prices by 7% (Courtois & Subervie, 2015). However, access, trust, and utilisation barriers undermine responsiveness (David-Benz et al., 2016; Liao & Chen, 2017).

Similarly, PHH behaviours remain basic. While drying and sorting are common, adoption of grading, hermetic storage, and processing is rare, practices that require capital, technical knowledge, and clear market incentives (Kimenju & De Groote, 2010). These dimension-specific patterns indicate structural and institutional limitations shaping farmers' behavioural choices.

Overall, the composite MOI of 0.44 reflects a partial and uneven market orientation, shaped by structural, informational, and institutional constraints. As Smale et al., (2014) and Myne & Moeletsi (2020) argue, productivity-focused interventions must be complemented by investments in seed systems, extension, finance,

and market services to achieve deeper and more sustainable smallholder commercialisation.

5. CONCLUSION AND RECOMMENDATIONS

This study examined smallholder farmers' market-oriented behaviour using the Market-Oriented Behavioural Model. The findings reveal that smallholder farmers remain deficient in key aspects of market-oriented behaviour, particularly in seeking and applying market intelligence and in adopting advanced post-harvest handling practices. However, this deficiency does not stem from unwillingness or ignorance but reflects adaptive behaviour within structural and institutional constraints. Farmers demonstrate initiative in production-oriented practices but face limited access to reliable information, affordable technologies, and market linkages. Consequently, their behaviour remains predominantly production-centric, with insufficient engagement in activities that strategically enhance market competitiveness and commercialisation. Strengthening market-oriented advisory systems, embedding market intelligence in extension delivery, and facilitating affordable post-harvest and soil-testing technologies are therefore critical for reinforcing behavioural change and deepening commercialisation. The study contributes empirical evidence on how behavioural and institutional factors jointly shape smallholder market responsiveness in Uganda. Future research should explore the long-term effects of behavioural reinforcement approaches, such as demonstrations and digital peer-learning platforms, on the sustainability of market-oriented farming practices.

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