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# Agricultural land-use change and migration intentions among peri-urban landowners: A population–environment perspective from Indonesia

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## Abstract

Peri-urban transformation increasingly reshapes land, livelihoods, and household mobility decisions across changing rural communities. This study examines migration intention among peri-urban rural landowners in Mulyoagung Village (Dermo and Jetak Ngasri hamlets), Malang Regency, East Java, Indonesia, where agricultural land use is changing alongside shifts in rural livelihoods, land values, and settlement conditions. Framed within a population–environment perspective and the theory of planned behavior (TPB), the study assesses associations between attitude toward migration, perceived behavioral control (PBC), and subjective norms and migration intention. A cross-sectional survey of 86 landowners was analyzed using partial least squares structural equation modeling with 5,000 bootstrap subsamples. Attitude showed the strongest positive association with migration intention ($\beta = 0.591$, $t = 5.631$, $p < 0.001$), followed by PBC ($\beta = 0.244$, $t = 2.012$, $p = 0.045$), whereas subjective norms showed a smaller and statistically nonsignificant association ($\beta = 0.121$, $t = 1.270$, $p = 0.205$). The model explained 58% of the variance in migration intention ($R^2 = 0.580$). These results indicate that, within this peri-urban land-conversion setting, migration intention is more strongly associated with favorable evaluations of migration and perceived capability than with the retained indicators of normative social evaluation. The study extends population–environment and migration research by situating TPB-based intention formation within agrarian transition, land commodification, and changing rural livelihood conditions. Policy implications emphasize place-based services, livelihood-transition support, farmland-sensitive spatial planning, and participatory land governance, while recognizing that implementation depends on institutional capacity, regulatory enforcement, and political–economic conditions surrounding land conversion.

***Keywords:*** Peri-urbanization; Agricultural land-use change; Population–environment dynamics; Migration intention; Sustainable rural development; Theory of planned behavior

## 1. Introduction

Agricultural land-use change is increasingly reshaping rural livelihoods across the Global South, and this dynamic is particularly visible in rapidly urbanizing parts of Southeast Asia where peri-urban transitions unfold at high speed. The conversion and reorganization of agricultural land can alter access to productive resources and disrupt established rural livelihoods (Ahammad *et al.*, 2021; Obubu *et al.*, 2022). Evidence from East Java further shows that accessibility, regional activity centers, infrastructure policy, population growth, landowner attitudes, and land ties are associated with land-use change, while built-up expansion along the Malang–Surabaya corridor has reduced paddy land (Prayitno *et al.*, 2018; Prayitno *et al.*, 2020). Land-use change also redefines land simultaneously as a productive base, a tradable asset, and a source of household security, prompting livelihood diversification and, in some cases, migration as an adaptive strategy (Mukherjee & Fransen, 2024). In peri-urban regions, land-market pressures and the commodification of farmland intensify these transitions, making land conversion a political–economic process that reconfigures household aspirations, perceived opportunities, and risk exposure. Planning decisions, infrastructure investment, and unequal access to rapidly changing land markets further determine how the costs and benefits of peri-urban transformation are distributed among rural households.

Agricultural land-use change is not only an economic or spatial process, but also an environmental transformation that affects soil-based livelihoods, local food production, ecological stability, and the long-term sustainability of rural settlements. As farmland is converted to residential, commercial, and infrastructure uses, its productive and ecological functions decline while land-market pressures intensify. Households must consequently reassess whether remaining in place can continue to provide viable livelihoods and future security. These changes can alter how rural households evaluate the feasibility of remaining in place, thereby linking environmental change to population mobility through household perceptions of livelihood viability, risk, and future security.

In this setting, migration is better understood as a strategic response to agrarian transition pressures than as a purely demographic outcome. Urbanization can reshape rural settlement patterns and the social and economic conditions associated with migration attitudes (C. Song *et al.*, 2024; Zhang *et al.*, 2022). Related evidence from the Indian Sundarbans shows that environmentally induced out-migration can also operate as an adaptation strategy with implications for household resilience and agency (Basu *et al.*, 2024). Remittances may further alter household adaptation and agricultural land-use decisions (Zhunusova *et al.*, 2022). However, development research increasingly emphasizes that migration is shaped by the interaction between aspiration and capability, both of which are unevenly produced through structural change. Accordingly, the key analytical task is to explain how land conversion reorganizes opportunity sets and redistributes risk in ways that make migration more or less desirable and feasible for particular households.

Despite extensive evidence on rural–urban migration, less is known about the cognitive and behavioral processes through which rural landowners form migration intentions under land-use stress. This gap matters because landowners experience land conversion not only as economic displacement but also as a redefinition of land's meaning and value, which can alter both perceived feasibility and desirability of mobility. Research on migration decision-making under environmental and agricultural change highlights the importance of aspirations, capabilities, perceived constraints, and adaptation options (Mukherjee & Fransen, 2024). In rural areas, these evaluations are intertwined with landholding arrangements, household strategies, and anticipated settlement outcomes (Su *et al.*, 2023; Zou *et al.*, 2022). For landowners, such evaluations also involve decisions about whether to retain, transfer, sell, or repurpose land as part of longer-term household and intergenerational strategies. Treating migration as an intention-driven process therefore calls for attention to the mechanism by which structural pressures, including land commodification and declining farm viability, translate into intention through perceptions of feasibility, household continuity, and shifting social meanings of staying versus leaving.

To capture these pre-migration processes, we adopted the theory of planned behavior (TPB), a widely used framework for modeling intention-based action. TPB posits that intention—the most proximal predictor of behavior—is shaped by attitudes toward the behavior, subjective norms, and perceived behavioral control (PBC) (Ajzen, 1991; Hagger *et al.*, 2022). In migration research, TPB provides a structured way to examine how shifting social, environmental, and economic conditions become internalized as intentions to move. In the present study, attitudes represent evaluations of migration, PBC represents perceived capability (e.g., resources, information, and adaptability), and subjective norms represent perceived social approval or disapproval. In peri-urban transitions, institutional change and land commodification may also reorient the reference groups that households consider when evaluating mobility, but this possibility is treated as a contextual interpretation to be tested rather than as an established effect. We therefore used TPB as a micro-

level lens to examine how agrarian transition pressures are translated into aspiration (attitude), capability (perceived control), and social regulation (norms) among rural landowners in a peri-urban conversion setting.

However, TPB has rarely been applied to the migration intentions of rural landowners in Southeast Asia, where agricultural land conversion is advancing rapidly alongside peri-urban expansion. Landowners are analytically distinctive actors in rural land-use systems because they control productive assets and their land decisions influence local development trajectories. Indonesian research has shown that landowners' intentions to convert agricultural land are associated with the strength of social–capital relationships, illustrating that land-use decisions combine asset control with socially embedded evaluation (Nugraha *et al.*, 2023). Unlike wage labor migrants or tenant farmers, landowners are embedded in land-based livelihoods and often retain bargaining power over whether to hold, transfer, sell, or repurpose land. Yet this "asset-based agency" is simultaneously restructured by land markets, planning institutions, compensation practices, infrastructure investment, and uneven access to peri-urban opportunities. Their intention to migrate therefore reflects more than push–pull economics; it may incorporate intergenerational planning, expectations of agrarian decline, and recalibrated household strategies under institutional and market change. This positionality makes landowners a strategic group for examining how political–economic transformation reshapes agency, social regulation, and capability in mobility decision-making.

This study addresses the underexplored question of how peri-urban rural landowners cognitively process migration under agricultural land-use change. We examine how TPB's core constructs—attitude, subjective norms, and PBC—relate to migration intention among landowners in Mulyoagung Village (Dermo and Jetak Ngasri hamlets), Dau District, Malang Regency, East Java, Indonesia. The study area is experiencing rapid land transformation driven by peri-urban expansion and land-market dynamics, making it a relevant setting to investigate how structural change is reflected in the formation of migration intention. By focusing on intention rather than realized migration, we respond to calls to theorize the anticipatory stage of migration as a planning process where households assess feasibility, risks, and future pathways. In development terms, intention is treated as the "translation point" where land conversion pressures are internalized as perceived options—whether to adapt in place, diversify locally, or exit via migration.

Accordingly, this study integrates peri-urban land-use change with TPB to explain migration intention among rural landowners from a population–environment perspective. We assess the relative associations of attitudes (aspiration), subjective norms (social regulation), and PBC (capability) with landowners' intention to migrate under agrarian transition pressures. This framing treats migration not merely as a coping response or demographic event, but as a behavioral outcome shaped by the interaction among environmental transformation, structural change, and subjective evaluation. Substantively, the study links a micro-level intention model to broader population–environment processes of peri-urban transformation, land commodification, and rural settlement sustainability. Policy-wise, the analysis is designed to inform context-sensitive interventions: if social regulation (norms) is weak relative to aspiration and capability, then policy responses should move beyond normative messaging and instead strengthen place-based services, livelihood transition support, farmland-sensitive planning, and participatory land-use governance that expands feasible *in situ* options while reducing distress-driven mobility, subject to local institutional capacity and existing land governance arrangements. Because the analysis is cross-sectional and geographically confined to two hamlets, the study does not claim statistical generalizability to Indonesia or Southeast Asia; rather, it provides a context-specific analytical account that can guide comparative research across other peri-urban land-conversion settings.

## 2. Literature review

### 2.1. Theory of planned behavior and migration intention

The TPB is a widely used behavioral framework for explaining individual intentions. According to TPB, intention is influenced by three principal components: attitude, subjective norms, and PBC (Ajzen, 1991; Hagger *et al.*, 2022). The framework has been applied in varied behavioral settings, including environmental behavior and farmers' adoption decisions (Wang & Mangmeechai, 2021; Xia *et al.*, 2023), while migration studies have examined how perceived opportunities and constraints are associated with intentions to move or settle (Efendi *et al.*, 2021; Zhao *et al.*, 2022). In development contexts, TPB is most analytically useful when treated as a micro-level mechanism that translates agrarian transition, land-use conversion, and related governance changes into household intentions, rather than as an isolated psychological model. This interpretation places individual cognition within the wider political economy of uneven rural and peri-urban development.

In migration contexts, attitudes can be defined as evaluative judgments about the desirability of moving,

subjective norms as perceived social approval or disapproval of moving, and PBC as perceived feasibility and capability. These definitions apply the original TPB constructs to migration behavior (Ajzen, 1991). For rural landowners under land conversion pressure, the constructs are interpreted in this study as aspiration (attitude), social regulation (norms), and capability (PBC), thereby linking behavioral intention to the specific conditions of agrarian and peri-urban transformation.

Migration research indicates that environmental change, agricultural adaptation options, labor market conditions, and access to services can shape migration decision-making (Mukherjee & Fransen, 2024; Toyin-Thomas *et al.*, 2023; Zhao *et al.*, 2022). This evidence supports examining how environmental and livelihood pressures are translated into migration planning. However, for land-controlling households, land commodification and changing governance arrangements may reconfigure the relative importance of aspiration, social regulation, and capability. Land markets, planning institutions, compensation arrangements, and household control over productive assets may therefore condition how each TPB component operates, making their relative strength an empirical rather than predetermined question.

### 2.2. Migration intention in rural and land-use change contexts

Migration intention is often positioned as a cognitive stage within the multi-step process toward actual mobility. In rural settings, intention connects structural pressures with household evaluation and planning. Changes in land use can alter access to productive resources and disrupt established livelihood strategies (Ahammad *et al.*, 2021; Obubu *et al.*, 2022), while migration may form one component of household adaptation to agricultural and environmental change (Mukherjee & Fransen, 2024). From a development perspective, land-use change is not only a biophysical shift but also a reordering of livelihood viability, land values, and institutional incentives. Its effects are mediated by land markets, planning decisions, and governance arrangements that shape both migration aspirations and the perceived feasibility of moving.

These dynamics are especially important in Southeast Asia, where changes in access to land and changes in labor mobility frequently occur together rather than as separate processes. Research on the region shows that labor migration, land-use transformation, and changing control over agrarian resources can jointly restructure household livelihood strategies (Kelley *et al.*, 2020). Evidence from Indonesia likewise indicates that rural transformation has been accompanied by an increasing role for rural non-farm employment, although the pace and welfare consequences of this transformation vary considerably across regions (Sudaryanto *et al.*, 2023). Accordingly, labor inclusion is relevant to migration capability: the availability of non-farm employment does not necessarily imply that all landowners can access it equally, because employment transition depends on skills, information, mobility resources, and exposure to alternative labor markets. In peri-urban areas, migration intention may therefore reflect not only declining confidence in agricultural livelihoods but also households' assessments of whether they can participate successfully in emerging non-agricultural labor opportunities. Environmental transformation can further intersect with these livelihood adjustments; for example, environmentally induced out-migration has been interpreted as part of household adaptation and resilience strategies in other vulnerable settings (Basu *et al.*, 2024).

### 2.3. Attitude toward migration and migration intention

Within TPB, more favorable attitudes toward a behavior are expected to strengthen behavioral intention (Ajzen, 1991; Hagger *et al.*, 2022). In migration and settlement research, individuals who associate relocation with improved services, environmental quality, or life prospects tend to report stronger intentions to move or settle elsewhere (Yao *et al.*, 2022; Zhang *et al.*, 2022). In rural transformation and peri-urban land conversion contexts, attitudes represent households' forward-looking evaluations of "staying" versus "moving" as alternative livelihood trajectories, especially where agricultural viability is declining and non-farm opportunities are becoming more accessible.

Among rural–urban migrants, destination characteristics and anticipated opportunities are associated with permanent settlement intention (Y. Song *et al.*, 2022). Rural landholding arrangements are also associated with migrants' integration intentions, indicating that origin-area assets remain relevant to future settlement decisions (Zou *et al.*, 2022). For landowners, these evaluative judgments may be shaped by land-market dynamics—such as anticipated land conversion, compensation, or rising land values—and by household strategies that conceptualize land simultaneously as a livelihood base and a form of tradable capital. Thus, attitudes toward migration may reflect not only expectations about destination opportunities but also judgments about the future value and viability of remaining land-based livelihoods.

Beyond economic motives, perceived environmental quality can also influence migration-related attitudes. Evidence from China shows that perceptions of air pollution are associated with the urban settlement intentions of

young talent (Yao *et al.*, 2022). This finding illustrates that migration-related evaluations can encompass economic security, environmental conditions, and perceived quality of life. Accordingly, attitude should not be interpreted merely as a preference for urban modernity, but as an expression of how households interpret development trajectories, service gradients, and the perceived long-term sustainability of rural livelihoods under land-use change. Where agricultural futures are perceived as increasingly uncertain, more favorable evaluations of migration are therefore expected to be associated with stronger migration intention. This leads to the following hypothesis (H): H1: attitude toward migration is positively associated with landowners' migration intention.

### 2.4. Perceived behavioral control and migration intention

Perceived behavioral control denotes a person's perceived capacity to perform a behavior and reflects both perceived ability and perceived constraints (Ajzen, 1991; Hagger *et al.*, 2022). Applied to migration in this study, PBC encompasses perceived financial capability, skills, access to relevant information, and confidence in adapting to an urban destination. In development terms, PBC represents the capability dimension of mobility: unequal access to resources, information, networks, and institutional support can make migration appear more feasible for some households than for others.

In the present study, PBC concerns readiness for livelihood transition, perceived ability to secure employment, access relevant information, and adapt to urban destinations. When individuals perceive themselves as economically and socially prepared, migration is expected to appear more feasible. For landowners, PBC may be shaped not only by wage prospects but also by land-related capabilities, such as the liquidity and convertibility of land assets, household labor availability, and the capacity to manage land arrangements (sale, lease, or transfer) during relocation. These capabilities may themselves depend on access to functioning land markets, transparent transaction procedures, and institutional information, linking perceived control to the governance environment surrounding peri-urban land conversion.

Landholding arrangements can remain relevant to migrants' future settlement and integration decisions (Su *et al.*, 2023; Zou *et al.*, 2022). In this study, PBC is conceptualized as a composite of perceived personal capacity, resource availability, and confidence in navigating urban life, encompassing both material and psychological dimensions of feasibility. Peri-urban land-use change may simultaneously undermine PBC through livelihood uncertainty while enhancing it through land-based capital gains; this dual possibility is proposed as a contextual mechanism rather than measured directly. It makes PBC a central construct for examining how landowners assess the feasibility of migration. Accordingly, H2 states: PBC is positively associated with landowners' migration intention.

### 2.5. Subjective norms, social capital, and migration intention

In TPB, subjective norms reflect perceived approval or disapproval from salient individuals or groups regarding a behavior (Ajzen, 1991). Applied to migration, the construct concerns whether people important to the respondent are perceived to support or discourage moving. However, the strength and direction of this normative influence may vary across positions within the rural political economy. Landowners, in particular, may experience forms of social regulation that differ from those affecting landless workers or tenant farmers because control over assets can allow migration to be framed as a household investment strategy—such as education, livelihood diversification, or asset management—rather than solely as departure from community expectations.

The influence of subjective norms is expected to be context-dependent. Where migration is socially valued, perceived approval may strengthen migration intentions; where local rootedness is emphasized, perceived expectations may discourage mobility. In villages undergoing rapid land conversion, normative coherence may become less stable as livelihoods diversify and land becomes increasingly commodified, potentially reducing or redirecting the authority of community-level reference groups over mobility decisions. These propositions are treated here as theoretically plausible mechanisms rather than as established characteristics of the study site. This context sensitivity is particularly important when applying TPB constructs developed in other social settings to rapidly transforming peri-urban communities.

Social capital also plays an important but conceptually distinct role. Strong social networks may provide logistical support and information for migration, while simultaneously fostering emotional bonds that discourage departure. Research on circular labor migration and land–livelihood dynamics in Southeast Asia illustrates how mobility, land access, and household strategies can remain interconnected (Kelley *et al.*, 2020). This duality underscores the importance of analytically distinguishing social norms from social networks: even when normative pressure is weak, networks may remain influential by enhancing perceived feasibility and reducing uncertainty, often operating at the household rather than community

level. Thus, a weak association between subjective norms and migration intention should not automatically be interpreted as evidence that social relationships are unimportant; networks may operate through information, resources, or PBC rather than normative approval itself.

In this study, subjective norms are conceptualized as perceived social endorsement or disapproval from the immediate social environment, including beliefs about the relative social value of urban versus rural livelihoods. Subjective norms are therefore both social and symbolic, operating at psychological and community levels. Crucially, we use this construct to examine whether peri-urban land-use change may coincide with a reconfiguration of local social regulation over mobility decisions. Because reference groups may change as livelihoods diversify and land becomes commodified, the strength and meaning of subjective norms must be interpreted cautiously. We therefore specify H3 as a comparative theoretical expectation, rather than as a formally tested coefficient-difference hypothesis: subjective norms are expected to show a weaker observed association with landowners' migration intention than attitude and PBC.

### 2.6. Study positioning and literature gap

The above review indicates that TPB provides a useful framework for examining migration intention across contexts. However, most existing studies center on general populations or labor groups and rarely focus on landowners within the setting of land-use transformation. More critically, from a development studies perspective, many TPB-based applications under-theorize how rural political economy and agrarian transition reshape the relative salience of aspiration (attitude), social regulation (subjective norms), and capability (PBC) in the formation of migration intention. They also give limited attention to how land-use governance, market institutions, and unequal access to peri-urban opportunities condition the behavioral choices available to land-controlling households.

This gap is significant, as landowners hold strategic roles in household economic decision-making and land-use decisions. As land productivity declines and structural pressures rise, landowners face critical decisions between staying and migrating. Yet few studies explicitly examine how attitudes, subjective norms, and PBC jointly relate to migration intention among land-controlling households. This omission limits understanding of how asset ownership shapes migration agency, as landowners may experience both greater autonomy and distinct constraints related to land management, conversion negotiation, and intergenerational planning. Their apparent asset-based agency may also be circumscribed by land-use regulation, bargaining asymmetries, compensation arrangements, market volatility, and uneven access to information and alternative livelihoods.

This study addresses the gap by investigating the TPB structure of migration intention among landowners in rural areas experiencing agricultural land-use conversion. By focusing on land-controlling households, the study advances TPB application beyond generic behavioral explanation and situates it within processes of agrarian transition, peri-urban transformation, and population–environment dynamics. Rather than treating TPB as a universal model, we use it as an analytical lens to examine the relative salience of its intention pathways within a land-conversion setting—specifically, whether aspiration (H1) and capability (H2) are more strongly associated with migration intention than social regulation (H3), where land commodification and household-centered livelihood strategies are increasingly salient. In doing so, the study links behavioral intention theory to broader debates on rural transformation, environmental change, land governance, and mobility under structural change, while recognizing that these relationships may differ across institutional and geographic contexts.

## 3. Data and methods

### 3.1. Research design

This study adopted a quantitative explanatory research design aimed at testing the structural relationships among theoretical constructs in the TPB—namely, attitude toward migration, subjective norms, and PBC—in predicting migration intention. The research employed a cross-sectional survey strategy to capture landowners' behavioral evaluations and intentions at a single point in time, enabling analysis of associations among the TPB constructs and migration intention within the context of agricultural land-use change. Because observations were collected at one point in time, the design does not establish temporal or causal relationships between land-use transformation, TPB constructs, and migration intention. Given the localized case-study setting, the design focused on identifying intention-formation mechanisms that are analytically informative for comparable peri-urban land conversion contexts, rather than producing statistically generalizable estimates for "rural landowners" as a broad population.

Migration intention served as the dependent variable, while attitude, subjective norms, and PBC functioned as the independent variables. To analyze these relationships, the study utilized partial least squares structural equation modeling (PLS-SEM), a statistical technique well-suited for estimating relationships among latent constructs in

prediction-oriented structural models (Hair *et al.*, 2021). We used a parsimonious TPB specification to establish the relative salience of evaluative (attitude), normative (subjective norms), and capability-related (PBC) pathways, and the variance not explained by the model may reflect additional household, institutional, environmental, and political–economic factors that are not directly represented in the core TPB constructs.

### 3.2. Study area and sample characteristics

The research was conducted in two hamlets—Dermo and Jetak Ngasri—within Mulyoagung Village, Dau District, Malang Regency, East Java, Indonesia (Figure 1). These areas were selected based on evidence of active agricultural land-use change and the resulting impact on rural livelihoods. Preliminary field observations confirmed the ongoing shift in land functions, particularly affecting landowners' income sources and decisions concerning alternative livelihood strategies, including migration. Because the site is situated in a peri-urbanizing district, the study context is characterized by exposure to nearby urban labor markets and intensifying land-market dynamics, which makes it a theoretically relevant setting for examining intention formation under agrarian transition pressures. The site should therefore be understood as a focused peri-urban case rather than as representative of the diversity of land-conversion processes across Indonesia or Southeast Asia.

The population consisted of 110 registered landowners in the two selected hamlets. Using the Krejcie and Morgan (1970) approach at a 95% confidence level and 5% margin of error, a sample of 86 landowners was determined. The sampling frame was the official landowner register, and 86 individuals were selected through simple random sampling. All 86 selected landowners completed the questionnaire; therefore, the response rate was 100%. Random selection from the register reduced enumerator discretion and provided systematic coverage of the target population. Representativeness was limited to registered landowners in the two study hamlets and did not extend to tenants, landless workers, or broader peri-urban populations.

Landowners were chosen as the unit of analysis due to their central role in land-use decisions and economic strategy formulation. This methodological choice is consistent with research that connects migration decision-making to agricultural adaptation, examines rural development under the combined pressures of poverty, urban attraction, and migration, and models landowners' intentions regarding agricultural land-use conversion (Gao *et al.*, 2018; Mukherjee & Fransen, 2024; Nugraha *et al.*,

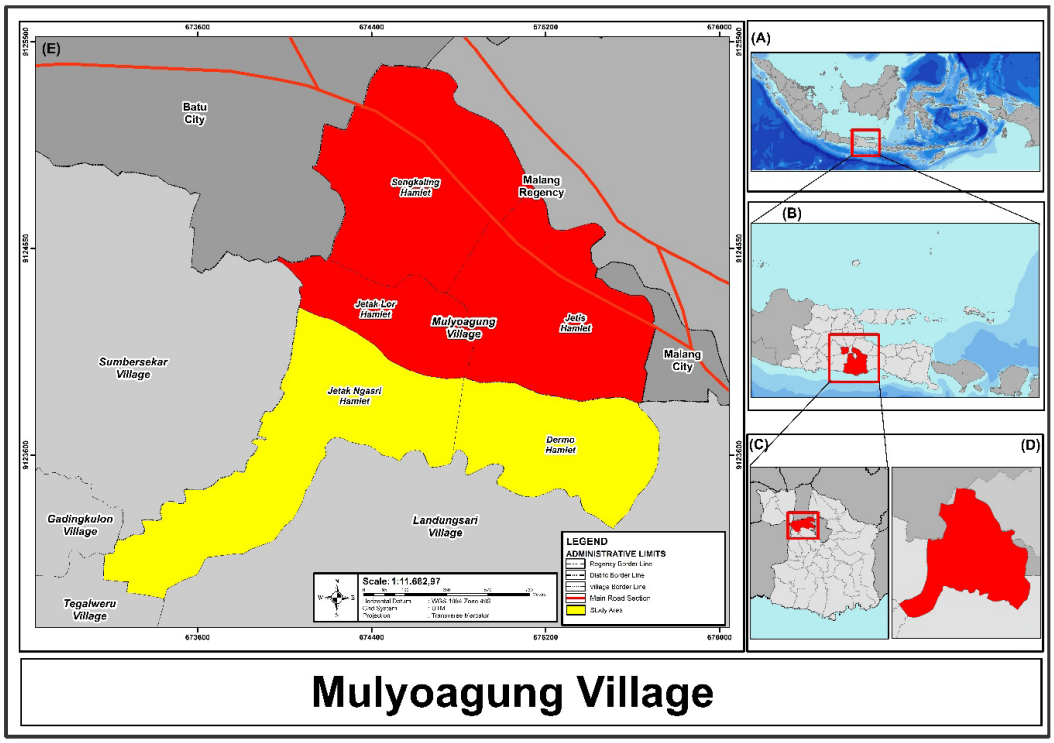



**Figure 1.** Study area

2023). Focusing on landowners also lets the analysis speak to development debates on asset-based agency: landowners may have greater autonomy than wage laborers, yet land conversion pressures, household obligations, and uneven access to peri-urban opportunities can still shape their mobility intentions. Moreover, ownership does not imply unconstrained decision-making: landowners' choices may remain conditioned by planning regulations, land-market conditions, bargaining power, conversion procedures, and the availability of viable local livelihood alternatives.

### 3.3. Instrumentation and data collection

Data collection was conducted using a structured questionnaire developed based on the TPB constructs. The instrument captured four key latent variables: attitude toward migration, subjective norms, PBC, and migration intention. Each construct was operationalized through multiple indicators adapted from validated TPB measurement scales (Ajzen, 1991; Hagger *et al.*, 2022; Xia *et al.*, 2023). Indicators were context-adapted for peri-urban landowners whose migration planning may involve employment change and land arrangement decisions (e.g., transfer or sale), while maintaining conceptual alignment with TPB definitions. This contextual adaptation was intended to preserve the theoretical meaning of the original TPB constructs while making the items relevant to landowners facing livelihood transition and possible changes in the management of their land assets.

The items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to measure respondents' agreement with statements concerning migration-related perceptions and evaluations. Table 1 presents the variables, item codes, and indicators. Data were collected through an interviewer-guided questionnaire rather than through unstructured interviews. Enumerators presented the standardized items to respondents and, when clarification was requested, provided standardized explanations while avoiding leading or evaluative prompts. This procedure was adopted because respondents differed in their familiarity with survey terminology and migration-related concepts; interviewer guidance was intended to reduce comprehension-related measurement error while maintaining consistency in the substantive meaning of the items. Respondents' answers were recorded according to the predefined Likert categories, and no substantive reinterpretation of an item was introduced during administration.

Data collection was conducted from September to October 2025 by six trained enumerators. Before field administration, the enumerators received one week of briefing and training on the questionnaire, respondent eligibility, standardized clarification procedures, and research ethics. The 86 randomly selected landowners were contacted at their residences or through prior appointments; local assistance was used only to locate addresses and did not influence respondent selection. Interviews were conducted at respondents' homes and lasted approximately 30–60 min. All selected respondents completed the questionnaire. The principal field challenges involved locating some addresses and coordinating interview times, which were addressed by extending appointment options and verifying each selected respondent against the official sampling frame. No replacement respondent was added outside the predetermined random sample.

The focus was placed exclusively on migration intention rather than actual migration behavior, due to the study's emphasis on cognitive processes. Migration behavior, being more retrospective and subject to exogenous factors, was considered less consistent with the study's theoretical framing. This choice is also consistent with the study's cross-sectional design: intention captures the anticipatory planning stage in which respondents evaluate prospective household strategies under changing structural conditions, while recognizing that subsequent behavior may be constrained by shocks, policy change, or family events not observable in a single survey wave. Accordingly, the study examined intention formation and did not assume that reported intentions will necessarily result in subsequent migration behavior.

### 3.4. Analytical strategy and measurement validation

Data analysis employed a two-stage procedure using PLS-SEM, which is suitable for evaluating measurement and structural models involving latent constructs in a prediction-oriented framework (Hair *et al.*, 2021). The analytical strategy involved evaluating the measurement and structural models within a unified framework. The TPB specification was treated as a parsimonious baseline model for assessing the relative associations of attitude, subjective norms, and PBC with migration intention. Variance not explained by the TPB constructs may reflect additional structural and household-level conditions, including landholding characteristics, life-course constraints, institutional conditions, and exposure to alternative livelihood opportunities, which were not directly modeled in this study.

In the measurement model phase, convergent validity was examined through outer loadings, where indicators exceeding the threshold of 0.70 were retained. Items A2, B1, C5, and D4, which did not meet this criterion, were excluded from further analysis. Average variance extracted (AVE) values exceeded the 0.50 benchmark, confirming adequate

convergent validity. Internal reliability was established via Cronbach's alpha and composite reliability (CR), with all constructs meeting the minimum 0.70 threshold (Dzin & Lay, 2021; Hair *et al.*, 2021). Discriminant validity was assessed using both the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio, with HTMT values below 0.90 for all construct pairs (Hair *et al.*, 2021). The four indicators were removed on the basis of the specified empirical loading criterion rather than because their underlying substantive domains were assumed to be theoretically unimportant. Because the excluded indicators span several constructs, their removal reflects context sensitivity in adapting standardized TPB measures to peri-urban landowners rather than confirmation that the corresponding social or behavioral dimensions are absent. In particular, excluding B1 (perceived family support) requires cautious interpretation of the subjective-norm construct because the retained indicators capture other dimensions of perceived social evaluation. Accordingly, discussion of construct meaning was based on the retained indicators and avoided generalizing beyond what the validated measurement model captures.

For the structural model assessment, the relationships between the independent variables—attitude toward migration, subjective norms, and PBC—and the dependent variable, migration intention, were tested using bootstrapping with 5,000 subsamples. Bootstrapping was used to estimate path coefficients, *t*-statistics, and *p*-values for hypothesis testing, while the coefficient of determination ($R^2$) was used to assess the proportion of variance in migration intention explained by the model. Because the data were collected cross-sectionally, statistically significant structural paths were interpreted as associations within the specified TPB model rather than as evidence of temporal causation. The remaining unexplained variance may reflect unmeasured institutional, political–economic, and household conditions, including land-market pressure, compensation expectations, service accessibility, and life-course considerations, that may operate alongside the TPB pathways.

H1 and H2 were evaluated from the sign, magnitude, and statistical significance of their respective structural paths. H3 was treated as a comparative theoretical expectation concerning the relative observed salience of subjective norms. Because the analysis did not include a formal bootstrap test of pairwise differences between structural coefficients, H3 was assessed descriptively from the standardized coefficient pattern and individual path tests. Accordingly, the *p*-value for the subjective norms path tested whether that coefficient differs from zero; it did not test whether the coefficient is statistically smaller than the attitude or PBC coefficients.

**Table 1. Theory of planned behavior-based variables and indicators**

| Variable | Code | Indicator |
|---|---|---|
| Attitude toward migration | A1 | Evaluation of the level of modernity in urban life |
| | A2 | Evaluation of the availability and adequacy of services in urban areas |
| | A3 | Evaluation of the compatibility of urban lifestyles with personal expectations |
| | A4 | Evaluation of preference for rural life compared to urban life |
| | A5 | Evaluation of the potential improvement in family well-being through migration |
| | A6 | Evaluation of the perceived burden of living in urban areas |
| Subjective norms | B1 | Perceived family support for the decision to migrate |
| | B2 | Perceived support from friends or neighbors for migration |
| | B3 | Perceived societal views that working in urban areas is more highly valued |
| | B4 | Perceived views of respected individuals regarding the decision to migrate |
| | B5 | Perceived social recognition associated with working in urban areas |
| Perceived behavioral control | C1 | Perceived financial and skill capacity to undertake migration |
| | C2 | Perceived ability to adapt to urban life |
| | C3 | Perceived ease of access to information and opportunities related to migration |
| | C4 | Perceived opportunities to increase income through employment in urban areas |
| | C5 | Perceived level of social acceptance in urban environments |
| | C6 | Perceived difficulty in adapting to urban life (negative indicator) |
| Migration intention | D1 | Consideration of migrating to urban areas within the next 2–3 years |
| | D2 | Intention to seek employment in urban areas |
| | D3 | Willingness to adjust land ownership arrangements to support migration |
| | D4 | Plans to relocate family members to urban areas for education or employment |
| | D5 | Strength of desire to migrate to urban areas |

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### 3.5. Ethical considerations

This study involved human participants and received ethical approval from the Journal Publishing Board, Faculty of Engineering, Universitas Brawijaya (Approval No. 11289/UN10.F0801/B/PJ/2025; approval date: June 18, 2025). Participation was voluntary, and every respondent provided informed verbal consent before data collection. Verbal rather than written consent was used because the survey was administered through an interviewer-guided, face-to-face procedure to respondents with differing familiarity with formal survey documents; the enumerator provided a standardized oral explanation of the study, confidentiality, voluntary participation, and the right to decline or withdraw, and recorded oral confirmation before beginning the questionnaire. The approved protocol covered the human-participant procedures. Respondent confidentiality and anonymity were protected, and the data were used solely for academic research.

This methodological framework supports a systematic and theoretically coherent examination of behavioral intentions among landowners in a localized peri-urban land conversion setting under rapid land-use change (Table 1). Interpretation and implications are therefore framed as context-sensitive and analytically transferable rather than universally generalizable.

## 4. Results

### 4.1. Assessment of the measurement model

To rigorously assess the validity and reliability of the TPB-based measurement instrument, the measurement model was evaluated before assessment of the structural model through PLS-SEM. The first step examined convergent validity by analyzing the outer loadings of each indicator. In accordance with accepted standards, a loading threshold of 0.70 was applied. Indicators A2 (0.676), B1 (0.409), C5 (0.657), and D4 (0.654) did not meet this criterion and were removed from the final measurement model. Because the indicators were adapted to the peri-urban landowner context, their exclusion reflects context-sensitive item performance rather than evidence that the substantive dimensions they represent are unimportant. In particular, the removal of B1 (perceived family support) warrants caution when interpreting the retained subjective norms construct.

Following the refinement, the remaining indicators displayed outer loadings between 0.710 and 0.935. This range meets the specified loading criterion for the retained indicators, as shown in Figure 2, which presents the outer loadings for all retained items. Figure 2 additionally displays the structural path coefficients and the $R^2$ value for

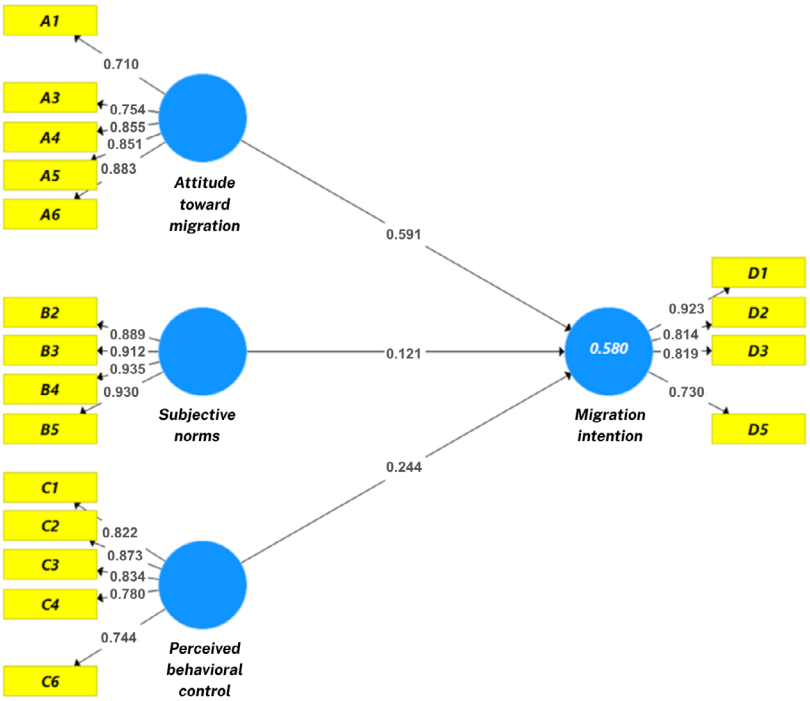



**Figure 2.** Outer loadings and structural paths (final model)

migration intention. Figure 2 also visualizes the retained indicators by construct (A1, A3–A6; B2–B5; C1–C4, C6; D1–D3, D5), enabling transparent inspection of the measurement refinement.

Further evidence of convergent validity is provided by the AVE values for each construct. As shown in Table 2, all AVE values exceeded the 0.50 benchmark: attitude toward migration (0.661), subjective norms (0.840), PBC (0.659), and migration intention (0.680). This indicates that more than 50% of the variance in observed variables is captured by the underlying constructs. Internal consistency reliability was also verified. Cronbach's alpha values ranged from 0.844 to 0.938, while CR values fell between 0.894 and 0.955. These values exceeded the accepted threshold of 0.70, indicating satisfactory internal consistency and reliability across all four constructs. However, because four indicators were removed during model refinement, the resulting construct scores should be interpreted with reference to the retained items and the specific study context.

To assess discriminant validity, two complementary techniques were employed. First, the Fornell–Larcker criterion was applied. In Table 3, the diagonal values (square roots of AVE) are compared with inter-construct correlations. For example, the diagonal value for attitude toward migration (0.813) exceeded its correlations with migration intention (0.732) and PBC (0.734). This pattern is consistent across all constructs and supports the conclusion that each construct shares more variance with its own indicators than with those of other constructs. The Fornell–Larcker results therefore provide evidence of discriminant validity among the four latent constructs.

**Table 2. Measurement models' reliability and validity statistics**

| Variable | Items | Initial outer loading | Final outer loading | Cronbach's alpha | Composite reliability | Average variance extracted |
|---|---|---|---|---|---|---|
| Attitude toward migration | A1 | 0.730 | 0.710 | 0.870 | 0.907 | 0.661 |
| | A2 | 0.676 | – | | | |
| | A3 | 0.766 | 0.754 | | | |
| | A4 | 0.830 | 0.855 | | | |
| | A5 | 0.839 | 0.851 | | | |
| | A6 | 0.873 | 0.883 | | | |
| Subjective norms | B1 | 0.409 | – | 0.938 | 0.955 | 0.840 |
| | B2 | 0.800 | 0.889 | | | |
| | B3 | 0.892 | 0.912 | | | |
| | B4 | 0.938 | 0.935 | | | |
| | B5 | 0.942 | 0.930 | | | |
| Perceived behavioral control | C1 | 0.814 | 0.822 | 0.870 | 0.906 | 0.659 |
| | C2 | 0.854 | 0.873 | | | |
| | C3 | 0.818 | 0.834 | | | |
| | C4 | 0.809 | 0.780 | | | |
| | C5 | 0.657 | – | | | |
| | C6 | 0.741 | 0.744 | | | |
| Migration intention | D1 | 0.917 | 0.923 | 0.844 | 0.894 | 0.680 |
| | D2 | 0.793 | 0.814 | | | |
| | D3 | 0.830 | 0.819 | | | |
| | D4 | 0.654 | – | | | |
| | D5 | 0.727 | 0.730 | | | |

**Table 3. Fornell–Larcker discriminant validity matrix**

| Parameters | Attitude toward migration | Migration intention | Perceived behavioral control | Subjective norms |
|---|---|---|---|---|
| Attitude toward migration | 0.813 | – | – | – |
| Migration intention | 0.732 | 0.824 | – | – |
| Perceived behavioral control | 0.734 | 0.658 | 0.812 | – |
| Subjective norms | −0.322 | −0.110 | −0.169 | 0.917 |

Second, the HTMT was examined, with results summarized in Table 4. All HTMT values were below the 0.90 threshold. The highest HTMT value was between attitude and PBC (0.835), which is still within acceptable limits. Particularly low HTMT values involving subjective norms (e.g., 0.124 with migration intention) also remained well below the specified threshold. Taken together, the HTMT results provide additional evidence that the constructs are empirically distinguishable.

Collectively, these measurement tests provide satisfactory empirical support for the validity and reliability of the constructs used in this study. The measurement model is therefore deemed adequate to proceed with the structural modeling phase. Given the removal of four indicators and the localized sample, the validated measurement structure should nevertheless be interpreted as context-specific rather than assumed to reproduce unchanged in other peri-urban populations.

### 4.2. Assessment of the structural model

The structural model was developed to test the hypothesized associations among the core TPB constructs—attitude toward migration, subjective norms, and PBC—and migration intention. Structural path coefficients, *t*-values, and *p*-values were obtained through bootstrapping procedures with 5,000 subsamples. Given the cross-sectional design, results are interpreted as evidence of relative pathway salience in this localized peri-urban land conversion context, rather than as definitive causal effects. Accordingly, hypothesis evaluation follows H1 (Attitude → Intention), H2 (PBC → Intention), and H3 (Subjective norms weaker than attitude and PBC). Because no formal pairwise test of differences between path coefficients was conducted, H3 was evaluated in terms of the observed relative coefficient magnitudes rather than as a statistically tested difference between coefficients.

As shown in Table 5, attitude toward migration exhibited the strongest direct association with migration intention, with a path coefficient of 0.591, a *t*-value of 5.631, and a *p*-value of less than 0.001. This result supports H1 and indicates that more favorable evaluations of migration are associated with stronger migration intention. Attitude also displayed the largest standardized coefficient among the three TPB predictors. Further interpretation of why this pathway is particularly salient in the peri-urban land-conversion context is presented in Section 5.

**Table 4. Heterotrait–monotrait discriminant validity matrix**

| Parameters | Attitude toward migration | Migration intention | Perceived behavioral control | Subjective norms |
|---|---|---|---|---|
| Attitude toward migration | – | – | – | – |
| Migration intention | 0.810 | – | – | – |
| Perceived behavioral control | 0.835 | 0.726 | – | – |
| Subjective norms | 0.362 | 0.124 | 0.185 | – |

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**Table 5. Structural path results and hypothesis assessment**

| Hypotheses | Coefficient | *t*-statistics | *p*-values |
|---|---|---|---|
| H1: Attitude toward migration → Migration intention | 0.591 | 5.631 | <0.001 |
| H2: Perceived behavioral control → Migration intention | 0.244 | 2.012 | 0.045 |
| H3: Comparative expectation: Subjective norms → Migration intention | 0.121 | 1.270 | 0.205 |

Note. The *p*-values tested each structural path against zero. H3 was evaluated descriptively from the relative standardized coefficients because no pairwise coefficient difference test was conducted.

Perceived behavioral control also showed a positive and statistically significant relationship with migration intention, supporting H2. The coefficient value was 0.244, with a *t*-value of 2.012 and a *p*-value of 0.045. Thus, higher PBC was associated with stronger migration intention, although its standardized coefficient was substantially smaller than that of attitude toward migration. The substantive implications of this capability-related pathway for livelihood transition and land management are examined in Section 5.

In contrast, subjective norms were not statistically significantly associated with migration intention (β = 0.121, $t$ = 1.270, $p$ = 0.205). The standardized coefficient was smaller than those observed for attitude (β = 0.591) and PBC (β = 0.244), making the observed pattern descriptively consistent with the comparative expectation in H3. However, because no formal pairwise test of differences among structural coefficients was conducted, H3 cannot be classified as statistically supported or rejected. Furthermore, B1 (perceived family support) was removed during measurement model refinement; therefore, the nonsignificant path should be interpreted specifically in relation to the retained normative indicators rather than as evidence that family or social relationships are generally unimportant in migration decision-making.

Model explanatory power was evaluated through the coefficient of determination ($R^2$). The model accounts for 58% of the variance in migration intention ($R^2$= 0.580). Thus, the three TPB predictors jointly explain a substantial proportion of the observed variance in migration intention within the study sample. The remaining 42% indicates that factors outside the specified TPB model also contribute to variation in migration intention; the possible structural, institutional, and household-level sources of this unexplained variance are considered in Section 5.

In summary, the structural model shows that attitude and PBC are statistically significant predictors of migration intention, whereas the subjective norms pathway is not statistically significant. H1 and H2 are therefore supported. The smaller subjective Norms coefficient is descriptively consistent with H3, though this is subject to the absence of a formal coefficient difference test. These results demonstrate the explanatory usefulness of the TPB specification for the present sample, while the findings are interpreted as context-specific to landowners in the peri-urbanizing Mulyoagung case rather than as causal or statistically generalizable claims about rural landowners elsewhere.

## 5. Discussion

### 5.1. Interpretation of key results and literature comparison

The findings of this study underscore the relative importance of individual cognitive factors—particularly attitude toward migration and PBC—in their association with migration intention among peri-urban landowners in Mulyoagung (Dermo and Jetak Ngasri hamlets). The significant associations between attitude and PBC and migration intention align with the TPB, which positions these components as key predictors of behavioral intention. At the same time, the results are interpreted through a development lens: intention formation can be understood as the point at which structural transformation (land conversion, livelihood reorientation, and service gradients) is translated into aspiration (attitude) and perceived capability (PBC) at the household level. Taken together, the results support H1 and H2. The smaller and statistically nonsignificant subjective norms coefficient is descriptively consistent with H3, although the study did not formally test whether this coefficient differs significantly from those of attitude and PBC.

The strong association between attitude toward migration and intention, consistent with prior studies of settlement and migration intention (Y. Song *et al.*, 2022; Zhao *et al.*, 2022), reflects the critical role of personal evaluations of the benefits and costs of urban relocation.

Landowners who perceive better economic prospects, improved public services, and enhanced well-being in urban areas are more inclined to consider migration. More broadly, research on migration decision-making under environmental and agricultural change indicates that mobility can be evaluated as one among several household adaptation options (Mukherjee & Fransen, 2024). Related research on environmentally induced out-migration also shows that mobility can form part of household adaptation and resilience strategies under ecological transformation (Basu *et al.*, 2024). In this peri-urban land conversion setting, "attitude" can be read as a comparative evaluation of staying versus moving under agrarian transition: where agricultural futures are perceived as less secure and urban opportunities more visible, favorable evaluations of migration may become stronger. This interpretation aligns with H1, which frames attitude as the aspirational pathway associated with migration intention.

Conversely, subjective norms were not statistically significantly associated with migration intention. This result differs from the general TPB expectation that perceived social approval contributes to behavioral intention (Ajzen, 1991), but migration decisions are embedded in multilevel drivers whose salience varies across populations and contexts (Toyin-Thomas *et al.*, 2023). In the present setting, the weak pathway may reflect differences in the social position of landowners, changing livelihood structures, or shifts in the reference groups considered relevant to migration decisions; these remain interpretations rather than directly tested mechanisms. The result should therefore not be interpreted as evidence that social relations are generally unimportant. Notably, B1 (perceived family support) was removed during measurement model refinement, meaning that the retained subjective norms construct primarily represents other forms of social evaluation. Under land commodification, mobility decisions may increasingly be framed as household investment and risk management (education, diversification, land transactions), but this remains a contextual interpretation rather than a directly tested mechanism. Importantly, the smaller subjective norms coefficient is descriptively consistent with H3; however, its statistical weakness does not by itself establish a shift from community-level regulation to intra-household decision-making. Such a shift should be investigated directly in future mixed-method or longitudinal research.

### 5.2. Contextual dynamics: Land-use change and construct interactions

The contextual uniqueness of agricultural land-use change provides an important structural setting for interpreting the TPB relationships; the present study does not statistically test moderation among the constructs. Landowners may need to evaluate migration alongside agricultural adaptation, land retention, transfer, or livelihood diversification rather than as an isolated residential decision (Kelley *et al.*, 2020; Mukherjee & Fransen, 2024). In peri-urban contexts, these considerations are coupled with market exposure: land conversion reshapes not only land productivity but also land value, bargaining power, and expectations about compensation or future development. These conditions are further embedded in land-use planning, infrastructure investment, market institutions, and governance arrangements that influence whether landowners can retain, transfer, lease, or monetize their assets. Such political–economic conditions may shape both evaluations of migration and perceptions of its feasibility, even though they are not directly modeled in the present TPB specification. This context offers a plausible interpretation of the stronger observed attitude and PBC pathways without establishing that land-use change itself caused the differences among coefficients.

In this study, PBC is rooted in perceptions of capability—not just financial, but also in terms of access to information, social adaptation, and readiness to navigate the complexities of urban life. The significant PBC–intention association is consistent with migration being perceived as a decision whose feasibility depends on resources, information, skills, and confidence in adapting to destination conditions. This supports H2 at the level of statistical association: respondents reporting greater perceived control also reported stronger migration intention. Similarly, the comparatively strong attitude pathway indicates that favorable evaluations of migration are closely associated with intention, supporting H1 without demonstrating that declining agricultural viability directly caused those evaluations. However, subjective norms showed a weaker observed association with intention. Because the retained PBC indicators do not directly measure the management of land sale, leasing, or transfer, such land-related capability should be treated as a plausible extension for future research rather than as an empirically demonstrated component of PBC in the current model. Likewise, the weak subjective norms pathway is consistent with, but does not prove, a reconfiguration of social regulation under rapidly changing livelihood structures.

### 5.3. Theoretical contributions: Extending the theory of planned behavior framework

The differential strength of TPB constructs in this study suggests the need to interpret and potentially extend the model in contexts marked by rapid structural changes. While TPB usefully captures micro-level cognitive associations with migration intention, its conventional

framing may underrepresent the roles of macro-level and cultural dynamics. Our contribution is not only to propose "adding variables," but to interpret TPB parameters within the wider context of agrarian transition: attitude can represent households' evaluations of welfare prospects and future livelihood credibility; PBC captures perceived capability associated with resources, information, and exposure to peri-urban opportunities; and the weak subjective norms pathway is consistent with the possibility of changing forms of social regulation. External conditions—including land governance, compensation arrangements, bargaining power, access to non-farm labor markets, and service inequalities—may shape these cognitive evaluations even though they lie outside the core TPB model. Framed this way, H1 and H2 represent the empirically stronger aspiration- and capability-related pathways, while H3 identifies a comparatively weak normative pathway whose underlying social mechanism requires further empirical examination.

The findings motivate future extensions of TPB that explicitly measure environmental, institutional, and policy conditions rather than inferring their effects from the core psychological constructs. For instance, the nonsignificant subjective norms pathway may reflect changes in the social organization of migration decision-making, but the present quantitative design cannot establish whether landowners increasingly prioritize household strategies over communal expectations. Moreover, the operational focus on intention rather than actual behavior is analytically useful because it captures the anticipatory stage of migration planning before mobility is realized or constrained by subsequent events. Conceptually, the findings support a context-sensitive extension of TPB in which behavioral evaluations are situated within land markets, governance arrangements, livelihood restructuring, and environmental transformation. This perspective is also compatible with evidence that environmentally induced migration can function as an adaptive response whose consequences for household resilience depend on broader social and institutional conditions (Basu *et al.*, 2024). Rather than treating subjective norms as a "missing predictor," the weak pathway can motivate closer investigation of which reference groups remain influential and how. Accordingly, the finding is best described as descriptively consistent with H3, not as definitive evidence that community-level social regulation has weakened.

### 5.4. Sustainability implications for population–environment dynamics

The findings also carry important sustainability implications. The significant association between attitude and migration intention indicates that landowners who evaluate migration more favorably are also more likely to report stronger migration intentions. In the context of ongoing peri-urban land conversion, such evaluations may partly reflect concerns about the long-term viability of remaining in an agricultural village, although these structural mechanisms were not directly tested in the model. When farmland conversion reduces productive capacity, increases uncertainty over land futures, and weakens confidence in local livelihood prospects, migration intention may therefore serve as an early population-level signal of perceived rural sustainability stress rather than solely reflecting a preference for urban life.

From a population–environment perspective, the effects of peri-urban transformation may become visible in anticipatory mobility intentions before migration is actually realized. Intention formation provides insight into how households evaluate prospective settlement futures, livelihood risks, and the feasibility of adapting in place. This interpretation is consistent with broader research showing that environmentally induced migration can form part of household adaptation and resilience strategies under ecological transformation (Basu *et al.*, 2024). The weak subjective norm pathway is also consistent with the possibility that mobility decisions are becoming more household-centered as land is commodified and livelihoods diversify; however, the present data do not directly establish such a social transformation. If longitudinal or qualitative research confirms such shifts, they could have implications for the social basis of rural settlement continuity.

Sustainable peri-urban planning may therefore consider migration intention as one potential early indicator of perceived livelihood and settlement stress, alongside direct measures of agricultural land conversion, income security, service accessibility, environmental conditions, and land governance performance. Migration intention should not be interpreted as a direct measure of governance quality because the present model does not estimate governance as a predictor. In the Indonesian context, the more immediate policy task is to strengthen implementation of existing spatial planning and sustainable agricultural land protections while expanding viable local livelihood options. Transparent information regarding zoning and protected land status, accessible participation, effective monitoring, and coordination between spatial planning and rural development interventions may reduce uncertainty and expand the range of feasible *in situ* adaptation strategies.

### 5.5. Policy implications for rural development and land governance

The findings have implications for rural development policy, but the appropriate policy response is not to manipulate migration preferences directly. The stronger

associations of attitude and PBC with migration intention indicate that policy should instead improve the conditions within which households evaluate staying, livelihood diversification, and migration. Service upgrading, vocational and employment-related training, job matching, and support for farm–non-farm livelihood combinations may broaden local opportunity sets and reduce migration driven primarily by deteriorating livelihood prospects. This approach is also consistent with evidence from Indonesia that rural transformation increasingly involves non-farm employment and that its welfare consequences vary across regional contexts (Sudaryanto *et al.*, 2023). Migration should nevertheless remain a legitimate voluntary livelihood strategy; the policy objective is therefore to reduce involuntary or distress-related constraints rather than to prevent mobility itself.

Recent research similarly emphasizes that the resilience of peri-urban agriculture is constrained by persistent urban–rural governance gaps and spatial planning challenges, thereby requiring more integrated and participatory planning responses (Munkombwe *et al.*, 2025). These recommendations must be situated within Indonesia's existing land governance architecture. At the national level, sustainable food agricultural land is governed by Law No. 41 of 2009 on the Protection of Sustainable Food Agricultural Land, as amended, while spatial planning operates under Law No. 26 of 2007 on Spatial Planning, as amended, and Government Regulation No. 21 of 2021 on the Implementation of Spatial Planning. At the study-site level, Malang Regency has a specific legal basis through Regional Regulation No. 6 of 2015 on the Protection of Sustainable Food Agricultural Land and Regional Regulation No. 1 of 2024 on the Malang Regency Spatial Plan for 2024–2044. Consequently, the relevant governance challenge is not simply the absence of formal rules, but the effectiveness, transparency, and coordination of their implementation under intense peri-urban land-market pressure.

Regional Regulation No. 6 of 2015 is particularly relevant because it already provides mechanisms for community involvement in agricultural land planning, including public feedback on planning proposals and participatory land inventories. It also provides policy instruments involving incentives and disincentives, permitting and protection mechanisms, supervision, and specific requirements governing conversion of protected agricultural land. Accordingly, participatory governance in the study area should be understood less as a recommendation to create an entirely new institution and more as a recommendation to strengthen the accessibility and implementation of mechanisms that already have a regulatory basis. In practical terms, landowners require timely access to zoning information, transparent communication on protected-land status and proposed conversion, meaningful opportunities to provide input before land-use decisions are finalized, and credible monitoring and enforcement.

The political economy of implementation is equally important. Formal participation does not necessarily ensure equal influence when landowners differ in information, negotiating capacity, land value expectations, and access to administrative processes, while developers and other market actors may possess greater financial and institutional resources. For protected agricultural land, the local regulatory framework establishes restrictions on conversion and, in specified public-interest cases, requirements concerning strategic assessment, release of ownership rights, compensation, and replacement land. Therefore, policy feasibility depends not only on the existence of compensation or zoning rules but also on consistent enforcement, transparent valuation and information procedures, coordination among spatial planning, land, agricultural, and local development authorities, and accessible channels for grievance or dispute resolution. The present study did not directly measure these governance processes, so they should be interpreted as institutional conditions that may shape the opportunity structure surrounding migration intention rather than as empirically tested TPB determinants.

Finally, the nonsignificant subjective norms pathway provides limited justification for using moral or community-based "stay" campaigns as the principal migration management instrument. It does not, however, imply that social relations are irrelevant. Networks may affect access to labor market information, employment opportunities, relocation assistance, and other resources through mechanisms that are distinct from normative approval. Policy should therefore prioritize structural conditions—livelihood quality, labor market access, education, healthcare, skills, information, and fair land governance procedures—while allowing households to choose to remain, diversify, or migrate. This interpretation connects the TPB findings to a broader understanding of peri-urban transformation in which mobility choices are conditioned by both individual evaluations and unequal access to land, employment, services, and institutional support.

### 5.6. Methodological reflections and future research directions

Several methodological limitations should be acknowledged. The cross-sectional design restricts causal

inference and may not capture temporal shifts in migration intention. A longitudinal approach would allow direct examination of how perceptions evolve in dynamically changing environments. Future research could also test the stability of H1–H3 over time (e.g., before vs. after conversion events), clarifying whether aspiration, capability, and social regulation pathways shift with changes in land governance and market conditions. Following the same households would also allow assessment of whether stated migration intentions translate into actual migration, continued residence, or other forms of livelihood adaptation.

Geographic limitation is another concern. The study focuses on two hamlets in Mulyoagung Village, which may not reflect diverse socio–ecological settings elsewhere. Comparative research across multiple villages or regions with varying degrees of land-use change would allow a stronger assessment of the external validity of the observed relationships. Accordingly, the contribution of this paper is framed as mechanism-oriented and analytically transferable to similar peri-urban conversion contexts, rather than statistically representative of rural landowners in general. Multi-site studies could test whether the nonsignificant subjective norms pathway and the relative strength of attitude and PBC recur across different land governance regimes, degrees of urban proximity, and landholding structures in Indonesia and other Southeast Asian settings.

Additionally, integrating qualitative methods could uncover deeper insights into the meanings and narratives that underpin cognitive constructs. A mixed-methods design could connect the statistical patterns observed here with participants' accounts of migration, land, and household decision-making. In particular, qualitative inquiry could explore possible explanations for the weak subjective norms pathway—including changes in reference groups, household-based decision authority, or the normalization of mobility—while also examining how removing the family support indicator affects the construct's local meaning. Such research could identify institutional and political–economic factors that may contribute to the 42% of variance not explained by the TPB model, including land-market bargaining, compensation expectations, planning uncertainty, and livelihood constraints. Finally, mixed-method designs can refine interpretation of the H3 pathway by identifying whether, how, and under what conditions normative reference groups shift from community to household under commodification.

A further limitation concerns the treatment of land-use change and governance as contextual conditions rather than directly measured structural variables. The statistical model estimates associations between attitude, subjective norms, and PBC and migration intention; it does not estimate the direct effect of farmland conversion, zoning decisions, compensation arrangements, labor market inclusion, or governance quality. Future research should therefore combine parcel- or household-level indicators of land conversion with measures of landholding size, transaction history, zoning status, compensation expectations, access to non-farm employment, and exposure to planning processes. Multilevel or longitudinal designs could then assess whether changes in these structural conditions precede changes in TPB constructs and migration intention. This extension would provide a stronger empirical basis for evaluating the population consequences of peri-urban land transformation.

## 6. Conclusion

This study examined migration intention among peri-urban landowners in Dermo and Jetak Ngasri hamlets, Mulyoagung Village, Malang Regency, East Java, Indonesia, within a setting characterized by agricultural land-use transformation. Using TPB within a population–environment perspective, the study found that attitude toward migration and PBC were positively and significantly associated with migration intention, with attitude showing the largest standardized coefficient. Subjective norms showed a smaller and statistically nonsignificant association. H1 and H2 are therefore supported, whereas the observed coefficient pattern is descriptively consistent with H3; because no formal pairwise test of coefficient differences was conducted, the results do not establish statistically that the subjective norms coefficient is smaller than the other paths.

The findings demonstrate the usefulness of interpreting migration intention through aspiration- and capability-related processes while situating those processes within a broader peri-urban transformation context. The weak subjective norms pathway should not be interpreted as proof that community regulation has disappeared or that household decision-making has replaced social influence. Rather, particularly given the removal of the family-support indicator during measurement refinement, it raises an important question about which social reference groups remain relevant to landowners and how they influence mobility. Longitudinal and qualitative research is required to determine whether land commodification actually changes the organization of social regulation over migration.

Policy implications lie primarily in expanding meaningful household options rather than discouraging migration itself. Improved public services, access to non-farm employment, skills development, livelihood

diversification, and transparent land-use information may strengthen the feasibility of remaining in place while preserving voluntary migration as a legitimate adaptation strategy. These interventions should be implemented through, rather than independently of, Indonesia's existing spatial planning and agricultural land protection architecture. In Malang Regency, the practical issue is therefore the effectiveness of implementation, enforcement, participation, coordination, and access to information under rapid peri-urban land-market pressure. Because the study is cross-sectional, geographically concentrated, and does not directly model land-conversion or governance variables, its findings should be understood as context-specific evidence on TPB relationships rather than causal or nationally representative estimates. Future longitudinal, multi-site, and mixed-methods research should test whether these relationships persist as land-use, labor market, and governance conditions change.

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## Conflict of interest

The authors declare that they have no known competing financial or non-financial interests that could have appeared to influence the work reported in this paper.

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## Ethics approval and consent to participate

This study involved human participants and received ethical approval from the Journal Publishing Board, Faculty of Engineering, Universitas Brawijaya (Approval No. 11289/UN10.F0801/B/PJ/2025). The study was conducted in accordance with the approved research protocol and the committee's standard conditions of approval. Informed consent was obtained from all participants prior to data collection. Participants were provided with a clear explanation of the study objectives, procedures, expected duration, potential risks and benefits, and their rights as participants, including the right to withdraw at any time without any negative consequences. Given the rural field context and varying literacy levels, informed consent was obtained verbally through an interviewer-administered process. Enumerators read a standardized participant information script aloud and documented each participant's agreement in an enumerator-signed consent log before administering the questionnaire. No minors were involved in the study. Confidentiality and anonymity were strictly maintained, and all data were used solely for academic research purposes.

## Consent for publication

Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were strictly maintained, and all data were used solely for academic research purposes.

## Availability of data

The data that support the findings of this study are available from the corresponding author upon reasonable request, subject to ethical approval and data protection considerations.

## Further disclosure

During the manuscript preparation, the author(s) used ChatGPT for English language refinement. The content was subsequently reviewed and edited by the author(s), who assume full responsibility for its final form.

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