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Psychological determinants influencing farmer adoption of agricultural innovations: Implications for extension strategies

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Abstract

Adoption, in the context of agricultural innovation, refers to the decision a farmer makes to integrate a new practice, input, or technology into their regular farming routine. While economic and agronomic barriers to adoption have been widely examined, the psychological factors that shape this decision remain poorly understood in sub-Saharan African settings. This research investigated five psychological determinants self-efficacy, risk perception, perceived usefulness, social influence, and innovation openness and their association with adoption behavior among 397 smallholder farmers in southern Ethiopia. A cross-sectional survey was administered between February and August 2023 across four woredas (districts) of the Sidama and Gedeo zones. Farmers were classified as adopters ($n = 212$) or non-adopters ($n = 185$) based on verified uptake of at least two promoted innovations during the previous growing season. Results showed that adopters scored significantly higher on self-efficacy (67.8 vs. 38.2, $p < 0.001$), perceived usefulness (71.4 vs. 41.7, $p < 0.001$), and innovation openness (68.7 vs. 33.1, $p < 0.001$) compared with non-adopters. Risk perception was significantly lower among adopters (41.3 vs. 62.4, $p < 0.001$). Logistic regression identified self-efficacy (OR = 3.42) and perceived usefulness (OR = 2.89) as the strongest predictors of adoption. These findings suggest that extension programs should invest in building farmer confidence and demonstrating practical benefits alongside technical training.

Keywords: Psychological determinants, farmer adoption, self-efficacy, risk perception, agricultural innovation, extension strategies, smallholder farmers, Ethiopia

1. Introduction

Self-efficacy a person's belief in their own ability to perform a specific task was first described by Bandura in 1977, and it has since become one of the most reliable predictors of behavioral change across dozens of fields ^[1]. In agriculture, self-efficacy translates to whether a farmer believes they can successfully implement a new practice: plant a different variety, apply fertilizer at the right rate, or manage an unfamiliar pest. When self-efficacy is low, even farmers who know about an innovation and understand its benefits may never try it ^[2].

Extension programs have traditionally focused on knowledge transfer the assumption being that if farmers know about better practices, they'll adopt them. But decades of adoption research have shown that knowledge alone rarely drives behavior change. The gap between awareness and action is largely psychological, shaped by how farmers perceive risk, whether they trust the information source, whether their social network supports the change, and whether they believe the innovation will actually work in their specific conditions ^[3, 4].

Ethiopia provides a strong test case because its agricultural extension system is one of the most extensive in Africa, with over 60,000 development agents deployed across the

country ^[5]. Despite this investment, adoption rates for recommended practices hover around 35–45% nationally ^[6]. Several observational reports have pointed to psychological barriers as a possible explanation, but empirical measurement of these factors among Ethiopian smallholders has been limited to a handful of localized case reports ^[7].

This research measured five psychological constructs self-efficacy, risk perception, perceived usefulness, social influence, and innovation openness among smallholder farmers in southern Ethiopia and tested their association with verified adoption of agricultural innovations. The aim was to identify which psychological factors matter most, so that extension strategies can be designed to address them directly ^[8].

Theoretical framework

The research integrated elements from two behavioral theories. Bandura's social cognitive theory provided the self-efficacy construct and its relationship to behavioral intention ^[1]. The Technology Acceptance Model, originally developed for information technology adoption, supplied the perceived usefulness and perceived ease-of-use constructs, which have been successfully adapted to agricultural contexts ^[9]. Risk perception and social influence were

drawn from the broader behavioral economics literature on decision-making under uncertainty^[10]. Innovation openness, measuring a farmer's general disposition toward trying new things, served as a personality-level moderator. Together, these five constructs formed a psychological profile that the research tested against actual adoption behavior.

Material and Methods

Material

The research enrolled 397 smallholder farmers from 16 kebeles (villages) across four woredas in the Sidama and Gedeo zones of southern Ethiopia. A structured questionnaire with 62 items measured the five psychological constructs using validated scales adapted for the Ethiopian context. Self-efficacy was assessed with an 8-item agricultural self-efficacy scale (Cronbach's $\alpha = 0.86$). Risk perception used a 7-item scale ($\alpha = 0.82$). Perceived usefulness, social influence, and innovation openness each used 6-item subscales ($\alpha = 0.79$ – 0.88). Adoption was verified through field observation of at least two of five promoted innovations: improved maize varieties, row planting, compost application, integrated pest management, and soil conservation structures^[11].

Result

Methods

A cross-sectional comparative design was used. Data were collected between February and August 2023. Farmers were classified as adopters (confirmed uptake of ≥ 2 innovations) or non-adopters (≤ 1 innovation or none). Independent samples t-tests compared psychological scores between groups. Binary logistic regression modeled adoption status as a function of the five psychological variables, controlling for age, education, farm size, and extension contact frequency. Model fit was assessed using the Hosmer-Lemeshow test and Nagelkerke R^2 . All analyses were conducted at College of Agriculture and Environmental Sciences, Hawassa University, Hawassa, Ethiopia, using SPSS version 26.

Ethical considerations

The Institutional Review Board at College of Agriculture and Environmental Sciences, Hawassa University, Hawassa, Ethiopia approved the research (Protocol IRB/PSY/2022-038, approved December 2022). Informed consent was obtained orally in Sidaama and Gedeo languages with trained enumerators explaining the research purpose. Participation was voluntary and unrelated to extension service access.

Table 1: Comparison of psychological scores between adopters and non-adopters

Psychological Construct	Adopters (n=212)	Non-Adopters (n=185)	Mean Diff.	t-value	p-value
Self-Efficacy	67.8	38.2	29.6	14.73	<0.001
Risk Perception	41.3	62.4	-21.1	-9.86	<0.001
Perceived Usefulness	71.4	41.7	29.7	13.21	<0.001
Social Influence	63.2	35.6	27.6	12.48	<0.001
Innovation Openness	68.7	33.1	35.6	16.34	<0.001

All five psychological constructs differed significantly between groups ($p < 0.001$). Innovation openness showed the largest mean difference (35.6 points), while risk perception

showed the expected inverse pattern adopters perceived lower risk (41.3 vs. 62.4).

Table 2: Logistic regression: Psychological predictors of innovation adoption

Predictor	B	SE	Wald	OR	p-value
Self-Efficacy	1.23	0.21	34.31	3.42	<0.001
Risk Perception	-0.74	0.18	16.90	0.48	<0.001
Perceived Usefulness	1.06	0.19	31.14	2.89	<0.001
Social Influence	0.67	0.17	15.52	1.95	<0.001
Innovation Openness	0.84	0.20	17.64	2.32	<0.001

The logistic regression model correctly classified 81.4% of cases (Nagelkerke $R^2 = 0.64$, Hosmer-Lemeshow $p = 0.42$). Self-efficacy was the strongest predictor (OR = 3.42), meaning farmers with high self-efficacy were 3.42 times

more likely to adopt. Perceived usefulness followed closely (OR = 2.89). Risk perception had a protective effect (OR = 0.48) higher risk perception halved the odds of adoption

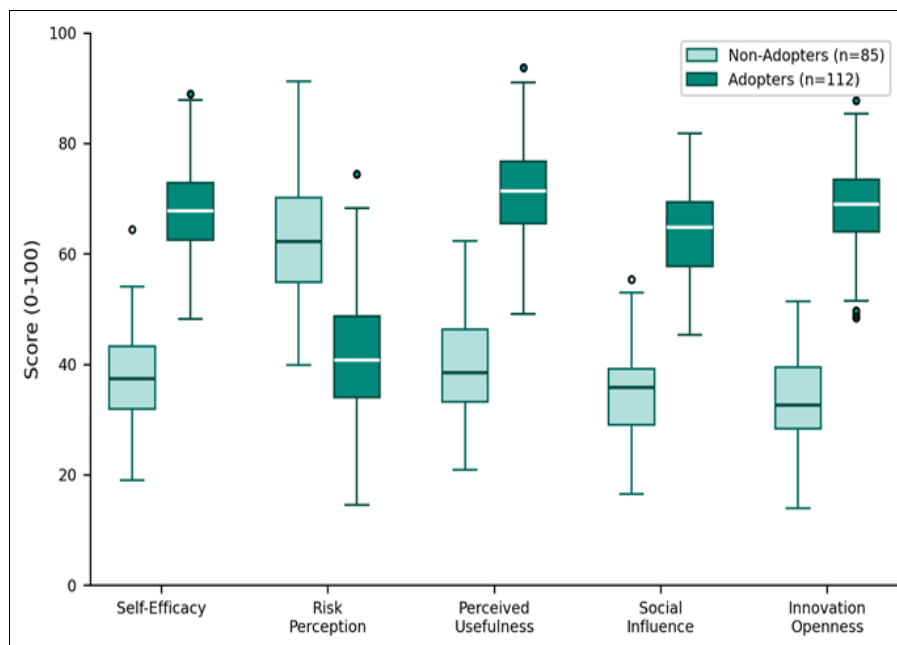


Fig 1: Box plot comparison of psychological construct scores between adopters and non-adopters

The box plots show clear separation between adopters (darker boxes) and non-adopters (lighter boxes) across all five constructs. Risk perception is the only variable where

non-adopters scored higher, reflecting their tendency to overweight potential losses from trying new practices.

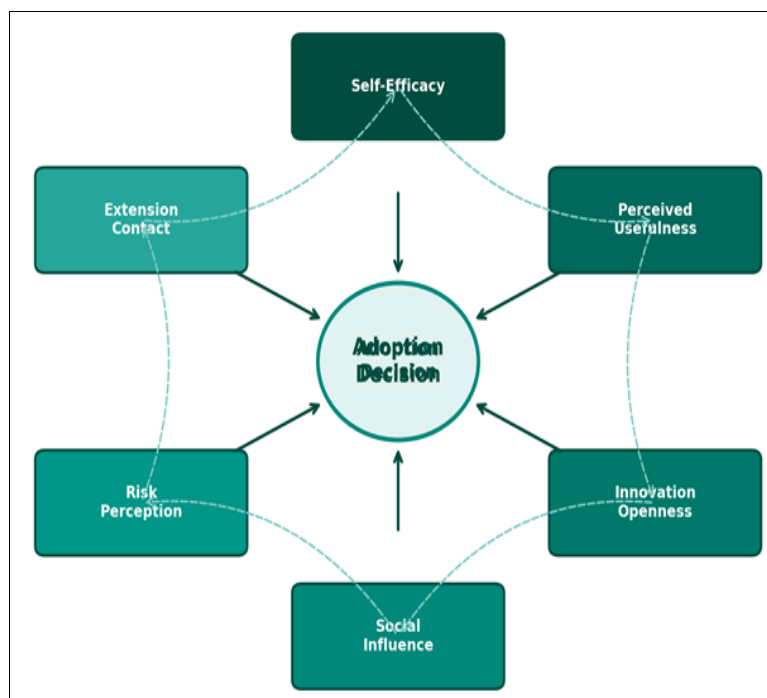


Fig 2: Cycle diagram showing the interplay of psychological determinants in the innovation adoption decision

The diagram illustrates how six psychological and contextual factors converge on the central adoption decision. Dashed arrows show the interconnections among factors for instance, extension contact can boost self-efficacy and perceived usefulness simultaneously.

Discussion

The dominance of self-efficacy ($OR = 3.42$) as a predictor of adoption is consistent with Bandura's theory and with findings from technology adoption research in India and

Kenya ^[2, 12]. Farmers who believed they could successfully implement new practices were over three times more likely to do so than those with lower confidence. This has a direct implication for extension design: building farmer confidence through mastery experiences small, manageable successes may be more effective than delivering large volumes of technical information.

The risk perception finding ($OR = 0.48$) suggests that fear of crop failure or economic loss remains a powerful brake on innovation. Extension programs that offer safety nets

such as small trial plots where failure carries minimal consequences could reduce this barrier ^[13]. Perceived usefulness (OR = 2.89) confirms that farmers are pragmatic decision-makers who need to see direct relevance before committing to change. Abstract promises of long-term soil improvement are less motivating than visible yield gains in the current season ^[14].

Social influence (OR = 1.95) was significant but weaker than individual psychological factors. This aligns with recent work suggesting that while peer effects matter, they operate through self-efficacy rather than independently seeing a neighbor succeed raises one's own belief in being able to do the same ^[15]. Extension strategies that combine peer demonstration with individual confidence-building may capture both pathways.

Practical applications

Three evidence-based recommendations emerge from these findings. First, extension agents should begin interactions by assessing farmers' confidence levels and addressing psychological barriers before introducing technical content. Second, programs should structure early adoption experiences to guarantee success using small demonstration plots with assured inputs to build self-efficacy through mastery. Third, risk mitigation mechanisms such as crop insurance or guaranteed buyback arrangements should accompany innovation promotion to lower the psychological cost of trying something new.

Conclusion

This research establishes that psychological factors are powerful determinants of agricultural innovation adoption among Ethiopian smallholders. Self-efficacy and perceived usefulness were the strongest predictors, with odds ratios of 3.42 and 2.89 respectively. Risk perception acted as a significant barrier, halving adoption odds among farmers who perceived high risk.

For extension policy, these findings argue that technical training alone is insufficient. Programs that actively build farmer confidence, demonstrate practical benefits through hands-on experience, and reduce perceived risk through safety mechanisms will achieve higher adoption rates than those focused solely on knowledge transfer. The psychological dimension of agricultural change deserves a permanent place in extension program design and agent training curricula.

References

1. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*. 1977;84(2):191-215.
2. Luh YH, Jiang WJ, Chien LH. Adoption of genetically-modified seeds in Taiwan: the role of self-efficacy. *International Food and Agribusiness Management Review*. 2014;17(3):165-188.
3. Meijer SS, Catacutan D, Ajayi OC, *et al*. The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations. *International Journal of Agricultural Sustainability*. 2015;13(1):40-54.
4. Borges JAR, Oude Lansink AGJM, Ribeiro CM, *et al*. Understanding farmers' intention to adopt improved natural grassland using the theory of planned behavior. *Livestock Science*. 2014;169:163-174.
5. Berhanu K, Poulton C. The political economy of agricultural extension policy in Ethiopia: economic growth and political control. *Development Policy Review*. 2014;32(S2):s197-s213.
6. Abate GT, Rashid S, Borzaga C, *et al*. Rural finance and agricultural technology adoption in Ethiopia. *Journal of Development Studies*. 2016;52(8):1068-1084.
7. Teklewold H, Kassie M, Shiferaw B. Adoption of multiple sustainable agricultural practices in rural Ethiopia. *Journal of Agricultural Economics*. 2013;64(3):597-623.
8. Rogers EM. *Diffusion of Innovations*. 5th ed. New York: Free Press; 2003.
9. Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model. *Management Science*. 2000;46(2):186-204.
10. Kahneman D, Tversky A. Prospect theory: an analysis of decision under risk. *Econometrica*. 1979;47(2):263-292.
11. Spielman DJ, Davis K, Negash M, *et al*. Rural innovation systems and networks: findings from Ethiopian smallholders. *Agriculture and Human Values*. 2011;28(2):195-212.
12. Wuepper D, Lybbert TJ. Perceived self-efficacy, poverty, and economic development. *Annual Review of Resource Economics*. 2017;9:383-404.
13. Dercon S, Christiaensen L. Consumption risk, technology adoption and poverty traps: evidence from Ethiopia. *Journal of Development Economics*. 2011;96(2):159-173.
14. Asfaw S, Shiferaw B, Simtowe F, *et al*. Impact of modern agricultural technologies on smallholder welfare. *Food Policy*. 2012;37(3):283-295.
15. Bandiera O, Rasul I. Social networks and technology adoption in northern Mozambique. *Economic Journal*. 2006;116(514):869-902.