

Social and Behaviour Change Framework for the Adoption of Smart Farming Technologies

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Social and Behaviour Change (SBC) is a deliberate and systematic process aimed at understanding and facilitating changes in individual behaviours, social norms, and the broader contextual factors that shape them. Effective SBC interventions are grounded in theory and guided by empirical evidence, requiring a comprehensive understanding of the key drivers influencing behaviour (United Nations Children's Fund, 2021; United States Agency for International Development, 2022).

Behaviours is inherently complex and influenced by multiple factors operating across different levels. These influencing factors are referred to as behavioural determinants. SBC interventions focus on identifying and influencing these determinants as an intermediate step toward achieving desired behavioural outcomes. Multiple determinants often interact to shape a single behaviour, making it essential to identify and prioritize the most critical ones for targeted intervention (United States Agency for International Development, 2022).

Behavioural Determinants

Behavioural determinants are defined as the factors that influence whether an individual adopts or practices a particular behaviour. These determinants can function either as barriers or as enabling factors, depending on their nature and context (United Nations Children's Fund, 2021).

- Determinants that hinder or discourage the adoption of a behaviours are referred to as barriers.
- Determinants that promote or facilitate the adoption of a behaviours are known as drivers or facilitators.

Behavioural determinants are diverse and operate at multiple levels, including the individual, interpersonal, community, organizational, and societal levels. They encompass a wide range of influences such as social norms, personal beliefs, aspirations, interpersonal relationships, institutional structures, government policies, access to economic resources, social status, political networks, knowledge, perceived self-efficacy, trust, and emotional responses such as fear (United States Agency for International Development, 2022; United Nations Children's Fund, 2021).

The influence of these determinants varies across individuals and contexts, shaped by factors such as identity, socio-economic conditions, cultural environment, and readiness to change. Consequently, the most influential determinants in one setting may differ significantly from those in another. Understanding this contextual variability is critical for designing effective, targeted SBC strategies (World Health Organization, 2019).

Table 1 Behavioural Determinants and Illustrative Examples in the Adoption of Smart Farming Technologies

Determinant	Definition	Illustrative Examples in Smart Farming Context
Perceived self-efficacy / skills	An individual's belief in their capability to perform a behaviour	Farmers' confidence in using mobile-based advisory apps, operating IoT devices, or managing automated irrigation systems after training
Perceived social norms	Perception of approval or disapproval from significant others	Adoption influenced by progressive farmers, peers, or local leaders who endorse precision agriculture technologies
Perceived positive consequences	Expected benefits of performing the behaviour	Anticipated higher yields, reduced input costs, improved crop quality, and increased profitability
Perceived negative consequences	Expected adverse outcomes of performing the behaviour	Concerns about high initial investment, technical failure, maintenance issues, or data privacy risks
Perceived action efficacy	Belief that the behaviour effectively addresses a problem	Perception that soil moisture sensors or AI-based advisories can improve water-use efficiency and crop productivity
Perceived access	Perceived availability of resources and services	Access to smartphones, internet connectivity, affordable devices, technical support, and government subsidies
Cue to action / reminders	Triggers that prompt behaviour performance	SMS alerts, mobile notifications, extension visits, or peer reminders to use smart technologies at critical stages

Perceived susceptibility / vulnerability	Perceived risk of experiencing a problem	Farmers' perception of vulnerability to climate variability, pest outbreaks, or water scarcity
Perceived severity	Perceived seriousness of the problem	Belief that crop losses due to climate change or pests significantly threaten livelihoods
Perceived divine will	Beliefs about divine influence on outcomes	Perception that success depends on God's will, influencing adoption decisions
Policy	Formal rules and regulations influencing behaviour	Government schemes, subsidies, and policies promoting digital and precision agriculture technologies
Culture	Shared values, beliefs, and practices of a group	Traditional farming practices influencing resistance or openness to adopting new technologies
Social relationships	Social networks and interactions shaping behaviour	Influence of Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs), and peer learning networks
Emotion	Affective responses influencing decision-making	Fear of failure, anxiety about complexity, or enthusiasm for innovation
Collective self-efficacy	Shared belief in group capability to act	Confidence among farmer groups to jointly adopt and manage technologies such as drones or weather stations
Community capacity	Collective resources and skills supporting change	Availability of trained personnel, extension services, digital literacy, and institutional support systems

Rationale for Using Social and Behaviour Change (SBC) Theory

Given the inherent complexity of human behaviour and social systems, the application of theory is essential in guiding both research and intervention design in Social and Behaviour Change (SBC). Theoretical frameworks provide a structured lens for understanding behaviour, enabling researchers and practitioners to identify key behavioural determinants and formulate evidence-based hypotheses about how change can be achieved. By grounding programs in theory, SBC initiatives can more effectively allocate resources and design interventions that address the underlying drivers of behaviour (Icek Ajzen, 1991; Albert Bandura, 1986).

SBC is inherently interdisciplinary, drawing upon concepts and approaches from communication, psychology, sociology, social psychology, community mobilization, marketing, advocacy, behavioural economics, and Human-Centered Design. Different theoretical perspectives emphasize varying dimensions of behaviour, including psychological, social, and environmental influences, each associated with distinct assumptions regarding appropriate intervention strategies (Albert Bandura, 1986; Irwin M. Rosenstock, 1974).

The behaviours targeted in SBC programs vary widely in nature. Some behaviours are primarily individual and shaped by attitudes, intentions, and perceived control, as explained in the Theory of Planned Behaviour (Icek Ajzen, 1991). Others are socially embedded and influenced by observational learning, social norms, and reciprocal

interactions, as emphasized in Social Cognitive Theory (Albert Bandura, 1986). Additionally, perceptions of risk, susceptibility, and severity play a central role in shaping health-related behaviours, as described in the Health Belief Model (Irwin M. Rosenstock, 1974).

A wide range of behaviour change theories exists, each offering valuable insights into the factors that influence behaviour. However, no single theory can fully explain all behavioural contexts or provide a universal framework for intervention design. Given the complexity of human behaviour and the dynamic nature of social systems, it is essential to adopt a flexible and integrative approach. Researchers and practitioners should draw on multiple theories and apply them contextually, selecting those most relevant to the behavioural determinants identified within a specific setting (Icek Ajzen, 1991; Albert Bandura, 1986).

Table 2 Overview of SBC Theoretical Models

Theory	Emphasis	Best for
Socio-ecological Model	Multiple influences from enabling environment, structural context as well as social and psychological factors	Overall framework. Thinking about interventions at multiple levels (not just with individuals).
COM-B	Capability, Opportunities and Motivation as drivers of Behaviour	Considering opportunity (access) as well as factors such as

		capabilities and motivation.
Diffusion of Innovations	How new ideas move through society.	Focusing on the group most likely to change. Tailoring approaches for people's innate comfort with change
Stages of Change	People need different approaches depending on where they are in the change process	Segmenting approaches to people in different stages; thinking about sustainability.
Health Belief Model	Susceptibility, severity, benefits, barriers, cues to action and self-efficacy.	Thinking through possible determinants.
Theory of Reasoned Action	Attitudes and norms	Considering additional determinants

Theory of Reasoned Action in the Context of Smart Farming Technology Adoption

The Theory of Reasoned Action (TRA), developed by Martin Fishbein and Icek Ajzen (1975), provides a useful framework for understanding farmers' adoption of smart farming technologies. According to this theory, the likelihood of adopting a behaviour—such as using precision agriculture tools, mobile-based advisory services, or IoT-enabled irrigation systems—is primarily determined by an individual's behavioural intention.

Behavioural intention, in turn, is influenced by two key components: attitude toward the behaviour and subjective norms.

- **Attitude** refers to a farmer's overall evaluation of smart farming technologies. For instance, if a farmer perceives that using digital tools will enhance productivity, reduce input costs, and improve decision-making, they are likely to develop a positive attitude toward adoption.
- **Subjective norms** relate to the perceived social pressure to adopt or reject these technologies. Farmers are more likely to adopt smart farming practices if influential individuals—such as progressive farmers, extension agents, family

members, or community leaders—support and encourage their use.

In this context, the TRA suggests that a farmer's intention to adopt smart technologies (Figure 1) is shaped by both personal beliefs about the benefits of the technology and perceptions of how significant others view its adoption. Thus, when farmers hold favorable attitudes and perceive positive social support, their intention to adopt smart farming technologies increases.

However, a key limitation of the TRA lies in its assumption that behavioural intention directly translates into actual behaviour. In practice, this is often not the case in agricultural settings. Farmers may intend to adopt smart technologies but fail to do so due to various constraints such as high initial investment, lack of technical skills, inadequate infrastructure, or limited access to reliable services. For example, a farmer may recognize the benefits of precision irrigation and intend to adopt it but may be unable to implement it due to financial or logistical barriers.

Therefore, while the Theory of Reasoned Action provides valuable insights into the role of attitudes and social norms in shaping farmers' intentions, it may not fully capture the gap between intention and actual adoption. This limitation highlights the need to incorporate additional factors such as perceived behavioural control, resource access, and institutional support when analyzing the adoption of smart farming technologies.

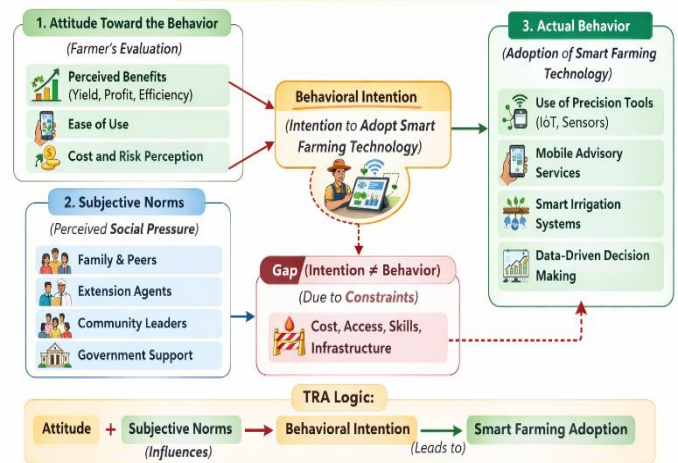


Fig. 1 TRA applied to smart farming adoption

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