A study on swarm-intelligence in group decision-making of farmers' self-help groups in Uttarakhand, India

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The concept and utility of self-help groups (SHGs) are proven facts, and they have significantly contributed to group-led extension activities on a large scale. These SHGs play an instrumental role in empowering their members and in many core aspects of farming. Still, these groups also face various challenges, among which ineffective group decision-making is prominent. Therefore, it is critical to strengthen the SHGs by resolving the issues of stability for strengthening the extension system in light of agriculture and rural development at the national level. Swarm intelligence is a phenomenon through which the swarm of honeybees perform various group tasks and takes crucial group decisions effectively and efficiently, utilizing their collective intelligence. Therefore, the study was intended to map the group decision processes among honeybee swarms and their inbuilt influences to relate them to the decision-making processes among SHGs. The present study inferred that seven key factors, i.e. decision impulse, conviction of the decision, engagement in decision, decision duration, decision alignment, extent of participation and real-time physical negotiation, contributed to the effectiveness of swarm-intelligence-based group decision-making.

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cause rather than external factors. Internal factors play an important role, from group formation to group performance[5,6]. Some researchers have reported the problems and constraints perceived by SHG members, such as lack of cooperation, lack of teamwork among members, ineffective group leadership, mismanagement of accounts, time constraints, lack of decision-making, lack of uniform growth and lack of information when needed. Among all these factors, ineffective group decision-making has been identified as one of the most prominent problems[2,5,7]. Research has been done on group performance and factors affecting it, but few studies are being conducted in the context of extension. Still, there is a dearth of empirical research indicating the exact reason for group failure, what makes a group successful, and the factors that lead to ineffective group decision-making and group leadership. Due to the lack of this analysis, upcoming SHGs and FPOs continuously suffer from group formation problems followed by group cessation. Looking into the parallel world of honeybees, an important concept of swarm-intelligence seems a probable answer to this emerging challenge. The ability of social insects like honeybees, ants, termites to collectively perform various tasks without any central control has been termed as swarm-intelligence[8]. Honeybees present an excellent example of swarm intelligence, wherein