

Effects of the creative environment on smallholder farmers' skills in rural Colombia

Efectos del ambiente creativo en las habilidades de los pequeños agricultores en las zonas rurales de Colombia

Research article

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Abstract

This study evaluates the effects of the creative environment on smallholder farmers' skills in rural Colombia. To achieve this, a quasi-experimental pre-test and post-test design was employed on a single group of 28 rural smallholder farmers from El Congal Village, in Pensilvania, Caldas, Colombia. Prior to immersion in the creative environment, smallholder farmers were tested on creative skills, and afterwards they were tested again. In order to compare the results of both tests to see whether the intervention was an effective means of improving rural smallholder farmers' creative skills, specially flexibility and fluency, the Wilcoxon rank sum test was used. It was found that the creative environment intervention significantly enhanced both skills. Flexibility measures improved from 8% to 22%, and fluency measures improved from 14% to 49% with the creativity environment intervention. This study suggests that rural smallholder farmers can develop their creative skills through participation in creative environments.

Keywords: creative environment, creative skills, fluency, flexibility.

Resumen

Este estudio evalúa los efectos del ambiente creativo en las habilidades de los pequeños agricultores de zonas rurales de Colombia. Para ello, se empleó un diseño cuasi-experimental con medición pretest y posttest en un solo grupo conformado por 28 pequeños agricultores rurales de la vereda El Congal, en el municipio de Pensilvania, Caldas, Colombia. Antes de su inmersión en el ambiente creativo, se evaluaron las habilidades creativas de los participantes, y posteriormente se aplicó una segunda evaluación. Para comparar los resultados de ambas mediciones y determinar si la intervención fue efectiva para mejorar las habilidades creativas, en especial la flexibilidad y la fluidez, se utilizó la prueba de rangos con signo de Wilcoxon. Se encontró que la intervención con el ambiente creativo mejoró significativamente ambas habilidades. Las medidas de flexibilidad aumentaron del 8% al 22%, y las de fluidez del 14% al 49%. Este estudio sugiere que los pequeños agricultores rurales pueden desarrollar sus habilidades creativas mediante su participación en ambientes creativos.

Palabras clave: ambiente creativo, habilidades creativas, fluidez, flexibilidad.

1. Introduction

Creative skills are essential for individuals to solve problems encountered in their personal and professional lives in a novel, viable, and effective manner (Haavold & Sriraman, 2022; Shet, 2024). The development of these skills is necessary in a wide range of industries and economic activities because they allow the creation of wealth, the sustainability of businesses, and the improvement of human welfare (Chatterjee et al., 2025). Specifically, these results are dependent on the consolidation of innovations, which emerge when individuals apply their creative skills successfully (Hirudayaraj & Matić, 2021).

Human beings do not reach their maximum creative potential by themselves or in isolation (Perry-Smith, 2024). Instead, they require interacting with others, sharing, and modifying knowledge, experiences and ideas in an environment that fosters creativity skills improvement (Hsia et al., 2021). Indeed, these skills emerge from sociocultural processes that involve social interaction, recognition of each other's abilities, trust and approaching problems with a collective perspective (Ness, 2021). According to researchers, creative skills need certain conditions to emerge, which enhances the results of human activities (Davies et al., 2013). In complex activities that require a person's full creative potential, creative skills are particularly needed (Mumford et al., 1996).

Particularly, rural smallholder farmers must possess creative skills to improve

productivity and prosperity (Thakur et al., 2025). These skills are essential for smallholder farmers' entrepreneurial orientation and daily survival, as they enable them to commercialize their products and provide for their own food requirements (Milone & Ventura, 2019). Rural smallholder farmers, especially in developing countries, are forced to be creative due to the challenging conditions and difficulties on their land (Touch et al., 2024; Veisi et al., 2022).

As a result, the development of these skills in rural smallholder farmers is a significant phenomenon that needs to be investigated (Vogl et al., 2016). Despite this, little research has been conducted on the environments or conditions that facilitate creative skills development in rural smallholder farmers. Previously, studies have examined how young farmers develop creativity (Sontirat, 1980), how creativity training works for smallholder farmers' women (Lourenço et al., 2014), and how the work environment of smallholder farmers affects their skill development (Vogl et al., 2016).

In general, the conditions and environments for the development of creative skills in individuals are a phenomenon widely analyzed at the scientific level, as these are necessary to improve the performance of various human activities (Ameen et al., 2022). Nevertheless, research on environments that foster and enhance human creativity has largely concentrated on for-profit organizations (Chen et al., 2021; Ronquillo et al., 2021; Oun & Abbas, 2022). Research on this topic has mostly focused on assessing

how creative environments in these organizations can influence innovation, understanding that this is a critical result for improving financial performance (Nguyen et al., 2023). These types of studies also occur in the educational context, since they aim to evaluate the postulate that the creative environment in the classroom improves students' academic performance (Licul & Jurišević, 2022).

The lack of studies on the impact of contexts and environments on creative skills development in rural smallholder farmers is a consequence of these trends. However, it is widely acknowledged that they can improve their creativity (Vogl et al., 2016). They are considered individuals who make the most of their resources and knowledge to generate income and goods that support their families' living standards (Thakur et al., 2025). Considering this, improvements in small-holder farmers' creative skills should improve farm productivity (Ndimbo et al., 2025).

Therefore, this study evaluates the effects of the creative environment on smallholder farmers' skills in rural Colombia. To achieve this purpose, a quasi-experimental pre-test and post-test design with a single group was used to evaluate the effectiveness of the creative environment intervention in the improvement of creative skills of 28 rural smallholder farmers from El Congal Village, in the Municipality of Pensilvania, Caldas, Colombia. This is a novel study in the context of rural smallholder farmers from Colombia, since this group has

very little access to initiatives that foster their creative skills, even though the improvement of these skills in farmers requires specific actions and interventions carried out by external experts (Herman, 2015).

2. Methodology

2.1. Basic concepts

Creativity and creative skills

According to Amabile et al. (1996), creativity involves coming up with answers, strategies, or products that are novel and appropriate to solve a problem. As Amabile et al. point out, creativity does not simply mean finding novel and different solutions to problems, but also achieving specific objectives related to those solutions. Amabile's statement is in line with the fact that creativity has a general scope in human activities, since, according to Stein (1974), it implies the production of novel and useful ideas in any domain, activity, or field of knowledge.

Achieving extraordinary results through the production of creative and effective solutions and responses is a complex process in any human activity (Sawyer & Henriksen, 2024). For this reason, creativity should be approached as a multidimensional construct, i.e., in practice it is developed through multiple characteristics observed in human beings (Green et al., 2024). For this reason, creativity, conceptually, is operationalized as a set of creative skills developed by an individual, which are

considered creative behaviors or characteristics (Kharkhurin, 2009).

According to Williams (1970), creativity involves four skills: fluency, flexibility, originality, and elaboration. The first consists of the production of many ideas that make possible the solution and approach to the same problem (Guilford, 1967); the second characteristic involves generating ideas from various conceptual and practical perspectives, thus ideas of various types and varieties (Kharkhurin, 2009); the third entails generating unique and novel ideas that are not usually applied in the solution of problems (Torrance, 1974); and the last corresponds to the improvement and complementation of an idea after it is implemented (Cooper, 1991).

We considered only the creative skills of flexibility and fluency in this study. This choice had to do, in the first place, with the fact that in farmers' rural contexts, like those of Colombia, it is more critical to find many effective and diverse solutions to their farms' problems than their level of novelty, given the lack of technical and economic assistance received from the Colombian government. Secondly, elaboration was not considered, since the activities carried out in the creative environment constructed in this study did not include the implementation of the ideas generated, but rather their formulation.

The creative environment

In groups and organizations, the environment refers to the observed and recu-

ring patterns of behavior, attitudes, and feelings that characterize the members' lives (Ekvall, 1996). Consequently, the environment is experienced by members of organizations or groups in accordance with their collective intentions, which affects how everyone perceives it (Qian & Plucker, 2021). Organizations, groups, and team environments play a crucial role in creativity development as their members' perceptions can limit or enhance it (Paulus, 2024).

Dubina (2005) describes the creative environment as the internal environment of a group or organization where new ideas, concepts, or solutions are generated, encouraged, and supported. According to Dubina, this environment is characterized by sociological and psychological conditions that facilitate human creativity in a particular setting. As a result, the creative environment is recognized as a set of factors that stimulate or block creativity and innovation in the various activities in which human beings participate (Ekvall, 1996). This implies that people can identify and correct problems depending on the context in which they operate (Licul & Jurišević, 2022).

In the literature, the elements or components of a creative environment tend to converge in the following areas (Ekvall, 1996; Licul & Jurišević, 2022): (1) members of the group or organization feel challenged by goals, operations, and tasks; (2) individual or group initiative regarding undertaking tasks and contacting others is not restricted; (3) ideas and initiatives for change are supported; (4) group members dare to participate, because

there is confidence in their abilities and skills; (5) ideas are discussed and analyzed openly and without contamination from conflicts or personal preferences; and (6) there is a tolerance for uncertainty that allows people to take risks, experiment and take advantage of opportunities.

2.2 Hypothesis

Relationship between creative environment and flexibility

Davies et al. (2013), state that creative environments broaden people's perspectives on the situations and problems they face. These environments, by encouraging human discretion and cognitive activation, enable the production of ideas with diverse and interesting content and perspectives (De Dreu et al., 2011). At the empirical level, studies have found that the improvement of creative conditions in work teams has an impact on the generation of ideas that are adapted to the nature of the relevant problems that affect the fulfillment of their objectives (Bock et al., 2012). Essentially, this result is explained by the fact that creative environments foster an open and meaningful exchange of information and knowledge, thereby improving individuals' cognitive flexibility and producing ideas with a variety of qualities (Ritter et al., 2012). Based on the above, the following hypothesis can be formulated:

Hypothesis 1: The creative environment positively influences flexibility.

Relationship between creative environment and fluency

Information and knowledge exchange in creative environments results in the emergence of many ideas and alternatives for solving specific and relevant problems (Santarsiero et al., 2023). At the research level, it has been shown that creative environments enable the intensive production of ideas, which underpin the design of products and services that are highly attractive to the market (Laud et al., 2023). Organizations, for example, increase the production of novel ideas when they improve the creative environment and, indeed, the interactions of the people involved in it (West & Richter, 2024). Regarding the above, Amabile et al. (1996) in their research showed that individuals produce few ideas when they perceive that the work environment is governed by control. Amabile et al. emphasize that the freedom and information exchange processes fostered in creative environments significantly increase the production of ideas. According to the arguments described above, the following hypothesis is posited:

Hypothesis 2: The creative environment positively influences fluency.

2.3 Method

This study employed a quasi-experimental design. In general, researchers use this design to reach causal conclusions (Cham et al., 2024; Grant & Wall, 2009). Because of this, its application assesses the effectiveness of an intervention to improve human beings' results in various activities they perform (Evers et al., 2006). In support of this design, the rural small-

holder farmers, who are the focus of this study, were not selected randomly.

As a result, this study used a single-group pre-test-post-test design, as a control group was not considered. This design was adequate to evaluate the effect of the creative environment on the improvement of creative skills, for the following reasons (Bonate, 2000): (1) the interval between pre-test and post-test was short, which ensures little interference by factors of creative skill improvement outside of the intervention; (2) the same rural smallholder farmers participated in all stages of the study.

According to the chosen design, first, an initial evaluation (pre-test) of the rural smallholder farmers' creative skills fluency and flexibility was carried out. Secondly, after the smallholder farmers had participated in a creative environment, a final evaluation (post-test) of these skills was carried out in the same group of farmers. Finally, both results were statistically compared to establish the effect of the creative environment on rural smallholder farmers' creative skills improvement.

2.4 Sample

This study was carried out through the participation of a group of rural smallholder farmers who reside and own their productive units (farms) in the "El Congal" village, in the Municipality of Pensilvania, in the province of Caldas, Colombia. This is a mountainous area that is difficult to access. A total of 28

rural smallholder farmers participated in the pre-test, intervention, and post-test. "El Congal" Village is composed of "El Congal", "La Armenia" and "La Esperanza". Prior to the intervention, a census of rural smallholder farmers in the village was carried out, which identified 65 farmers in the three communities. Respectively, from the communities of "El Congal", "La Armenia" and "La Esperanza", 10, 6 and 12 smallholder farmers participated in this study. Therefore, forty-three percent of village rural smallholder farmers participated in this study. 12 farmers were men and 16 were women. The 28 smallholder farmers who participated in the study provided written informed consent after being thoroughly informed of the study's objectives.

The inclusion of 28 rural farmers in our study allowed us to exercise greater control over the intervention. The selection of the said farmers was based on the following criteria: (1) meeting Colombian legal age requirements; (2) managing and operating small farms dedicated to agricultural production; and (3) completing a third-grade level of education in accordance with Colombian educational standards (this requirement was established due to the necessity of following some written instructions during the intervention in the creative environment). Furthermore, due to their location in rural areas with better geographical access and climatic conditions, the 28 smallholder farmers could easily reach the study area. The farmers' transportation, food and hospitality expenses were covered by the institution that financed this research.

2.5 Procedure

For the intervention, a small-holder farmer model farm scenario was designed and constructed, to simulate a creative environment. Construction of this scenario lasted for 3 years. The farm's creative environment was designed for Colombian rural smallholder farmers' conditions. This was done in such a way that it simulates creative acting conditions within the real context of life and work. Based on literature recommendations, the creative environment design, was based on three dimensions: physical, psychosocial, and pedagogical (González-Quitián, 2018).

Regarding the physical space, 3.3 hectares were used provided by a Higher Education Institution. This institution operates in the region where the rural smallholder farmers participating in the study live. In reference to the psychosocial and pedagogical dimension, this space simulates a rural farm, typical of Caldas (Colombia). The farm was built with three strategic axes that any rural farming system infrastructure requires for its proper functioning: (1) agroforestry arrangements, consisting of trees, livestock, and agricultural crops, were established within the unit; (2) rural constructions: this unit was equipped with physical infrastructure for vermiculture, storage, kiosks, and seedbeds (all this infrastructure was built with wood from plantations on the same farm); and (3) clean energy generation system: low complexity technologies were implemented in the intervention area to generate photovoltaic energy,

water use, rainwater harvesting to feed irrigation systems and water supply for cattle watering troughs.

To evaluate the effect of the creative environment on their creative skills, rural smallholder farmers participated in three activities. First, farmers were evaluated on their creative skills of flexibility and fluency without participating in the creative process. This evaluation was conducted by three agricultural experts. The second consisted of rural smallholder farmers being immersed in the creative environment designed on the farm, in which, with the help of an expert facilitator in agricultural production, playful activities were carried out to promote the exchange of knowledge among the participants, the development of exercises on the solution of real problems in the farming environment and the application of clean technologies. This was in line with promoting the psychosocial and pedagogical dimension of the creative environment. At the last stage, their creative skills were again evaluated by three agricultural production experts. The experts recorded the evaluation results using mobile devices such as tablets and cell phones, using a Google form. Creative environment intervention and creative skill evaluation were carried out from November 12th to 14th, 2022.

2.6 Measurement of creative skills (flexibility and fluency)

Flexibility and fluency skills were evaluated through George and Zhu's (2001)

creative behaviors scale. From this scale, items related to flexibility and fluency were included in this study. Flexibility was measured through four items or dimensions and fluency through three. A Likert-type scale of seven levels was used to measure each dimension. To facilitate measurement by experts, rating descriptors per level were used according to the BARS (Behaviorally Anchored Rating Scales) technique. Thus, with the use of BARS-type descriptors, we seek to reduce bias in the evaluation carried out by agricultural production experts (Bernardin & Smith, 1981), both in the pre-test and post-test. These experts were previously trained to perform evaluation through the BARS technique.

2.7 Data analysis

Hypotheses 1 and 2 were evaluated with the Wilcoxon rank sum test. This test is used for establishing the significance of differences between paired observations (related samples), as in the case of this study, since results were obtained from a pre-test (before the intervention) and a post-test (after the intervention),

both applied to rural smallholder farmers from the same sample (Gómez-Gómez et al., 2003). Additionally, this choice had to do with the fact that the differences in the results between the pre-test and the post-test did not conform to a normal distribution. In the same vein, it had to do with the fact that the data obtained in both assessments did not fit a normal distribution. This is usually the case with Likert-type data. Therefore, both conditions imply the use of a nonparametric test, such as the Wilcoxon rank sum test.

3. Results and discussion

3.1 Flexibility results

The results of the Pre-test and Post-test on flexibility's creative ability are shown in Table 1. After the post-test, the results of the evaluated items of this skill improved with significant differences based on Wilcoxon rank sum analysis (Flexibility 1: 1.16, p value: 0.002; Flexibility 2: 1.56, p value: 0.001; Flexibility 3: 1.28, p value: 0.000; Flexibility 4: 0.6, 0.14).

Table 1. Comparison of pre-test and post-test flexibility results: significance (Wilcoxon rank sum analysis).

Item	Pre-test		Posttest		Comparison	
	Mean	Ranking	Mean	Ranking	Difference	P value (Wilcoxon for a single sample)
Flexibility 1	3,92	1	5,08	2	1,16	0,002*
Flexibility 2	3,8	2	5,36	1	1,56	0,001*
Flexibility 3	3,68	4	4,96	3	1,28	0,000*
Flexibility 4	1,48	4	2,08	4	0,6	0.014*

*Statistically significant at 0.05.

Table 2 shows the results of the differences and their respective significance between Pre-test and Post-test for the creative ability of fluency. In the post-

test, the fluency items improved (Fluency 1: 3.48, p value: 0.000; Fluency 2: 1, p value: 0.000; Fluency 3: 1.48, p value: 0.000), which were significant differences.

Table 2. Comparison of pre-test and post-test fluency results: significance (Wilcoxon rank sum analysis).

Item	Pre-test		Posttest		Comparison	
	Mean	Ranking	Mean	Ranking	Difference	P value (Wilcoxon for a single sample)
Fluency 1	2,04	3	5,52	1	3,48	0,000*
Fluency 2	3,92	1	4,92	3	1	0,000*
Fluency 3	3,56	2	5,04	2	1,48	0,000*

*Statistically significant at 0.05.

3.2 Results implications

This study evaluated the effect of a creative environment intervention on rural smallholder farmers' creative skills. Twenty-eight rural smallholder farmers from the El Congal village in the municipality of Pensilvania, in the department of Caldas, Colombia, participated in the research. This study is unique in that it examines the relationship between creative environment and creative skills in rural smallholder farmers since previous studies focused mostly on for-profit organizations and education.

It was found that the creative environment improved the creative skill of flexibility in the group of rural smallholder farmers participating in this study. Therefore, this result supports hypothesis number 1 formulated in this article. The findings of this study are in line with previous research, which suggests that creative environments facilitate diverse

ideas generation and production (Bock et al., 2012; Davies et al., 2013; De Dreu et al., 2011). In this sense, adaptable ideas are enhanced by creative environments, since the free exchange of knowledge and information among individuals who share them generates cognitive flexibility that allows them to propose different ideas with different scopes and qualities (Ritter et al., 2012).

Second, the study findings indicate that the creative environment influences the improvement of fluency skills in the rural smallholder farmer group analyzed herein. This indicates that hypothesis 2 posited in this article is supported. Thus, in creative environments, smallholder farmers can exchange information and knowledge, which in turn allows them to generate innovative ideas (Laud et al., 2023; Santarsiero et al., 2023; West & Richter, 2024). Individuals in creative environments have freedom of action and opinion to come up with a wide range of ideas (Amabile et al., 1996).

4. Conclusions

This study indicates that rural smallholder farmers' creative skills can be improved through a creative environment designed for this purpose. This suggests that creative environments are not only useful in business and educational contexts. Furthermore, they can be used to improve the performance of rural smallholder farmers' productive units. In conclusion, this indicates the effectiveness of implementing creative environments to develop rural smallholder farmers' creative skills.

This study shows that the creative environment improves rural smallholder farmers' creative skills. The creation of creative environments should be considered an effective strategy for rural smallholder farmers to solve many of the problems they face on their farms. Thus, beyond the fact that the rural smallholder farmer has access to economic resources and government support, the participation of farmers in this type of development initiative can enhance the absorption of knowledge, information, and new work methodologies, which will facilitate the improvement of their productivity and greater possibilities of entrepreneurship that will allow them to generate wealth, welfare, and sustainability. With respect to the Colombian context, this study shows that rural smallholder farmers are individuals capable of improving their creative skills, so it is worth making them part of interventions aimed at improving them.

Smallholder farmers in rural Colombia still lack economic and technological support due to government's historical lack of attention. The first step towards rural Colombia's development can be achieved by providing them with opportunities to enhance their creative skills. Improving smallholder farmers' human capital is an initial and essential step in rural development. Eventually, this leads to innovation, entrepreneurship, technological advancement, and economic development. Accordingly, the Colombian government should develop a variety of policies aimed at improving Colombian farmers' creative skills while also taking into consideration the productivity requirements of their small farms and their pedagogical conditions.

Although it was found that the creative environment benefits the improvement of creative skills in rural smallholder farmers, certain cautions should be taken with the interpretation of the results achieved in this study. First, the study involved 28 rural smallholder farmers from Colombia, which restricts the generalizability of the results presented here. Secondly, the results cannot be extrapolated to other sectors since this study focuses on rural smallholder farmers from Caldas, Colombia. Thirdly, the development of creative skills in this study occurred under the conditions of the intervention carried out. However, it is unknown whether these skills are improved in the actual practice of rural smallholder farmers. Fourth, only the creative skills of fluency and flexibility were evaluated, so the study did not consider originality and elaboration. In

future research, it would be relevant to expand the study sample, as well as to carry it out on another type of farmer population. This would confirm the results of this study in a wider manner. In addition, it is imperative to examine how the real work context of rural smallholder farmers fosters creativity skills development.

Authors' contribution

Andrés Alberto Osorio-Londoño: Conceptualization, Formal analysis, Supervision, Methodology, Validation, Visualization, Writing - original draft, Writing - review editing.

Nixon Cueva-Márquez: Conceptualization, Data curation, Investigation, Methodology, Validation, Visualization.

Mónica Bibiana González-Calixto: Conceptualization, Investigation, Writing - original draft, Writing - review editing.

Ethical implications

There are no ethical implications to state in writing or publishing this article.

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Conflicts of interest

There are no conflicts of interest from the authors in the writing or publication of this article.

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