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MULTILINGUAL COMMUNICATION STRATEGIES FOR KNOWLEDGE TRANSFER IN SUSTAINABLE AGRICULTURE

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Abstract. *The global challenge of transitioning to sustainable agricultural practices is fundamentally a challenge of knowledge transfer. Effective dissemination of agroecological knowledge across diverse linguistic and cultural contexts is critical for empowering farmers, enhancing food security, and promoting environmental resilience. However, the prevailing model of knowledge transfer, often reliant on monolingual or direct-translation approaches from dominant languages, fails to account for linguistic diversity, local epistemologies, and culturally embedded communication practices. This study investigates the efficacy of multilingual communication strategies in facilitating the adoption of sustainable agricultural practices. Using a mixed-methods approach, we conducted case studies across three distinct agro-ecological zones in Southeast Asia, East Africa, and Latin America, analysing agricultural extension programs that employ multilingual tactics. Data was gathered through surveys with several smallholder farmers, in-depth interviews with extension officers and community translators, and discourse analysis of communication materials. Our findings reveal that multilingual strategies which go beyond simple translation, such as the use of local interpreters, culturally adapted visual aids, participatory video in local languages, and the integration of indigenous knowledge terms, significantly increase farmers' comprehension, recall, and perceived relevance of sustainable practices. For instance, farmers exposed to multilingual, participatory communication were several times more likely to accurately describe key practices like integrated pest management or soil conservation techniques compared to those receiving information only in a national language. The study identifies key success factors, including the central role of trusted, bilingual community members as "knowledge brokers," the strategic code-switching between languages for different technical concepts, and the alignment of new information with existing cultural models and metaphors. We conclude that investing in contextually appropriate multilingual communication is not merely a logistical consideration but a foundational pillar for equitable and effective knowledge transfer in global sustainable agriculture initiatives, ultimately bridging the gap between global environmental goals and local agricultural realities.*

Keywords*: multilingual, knowledge transfer, agriculture, sustainability.*

INTRODUCTION

The global imperative to shift towards sustainable agricultural systems is unequivocal. Confronting the intertwined challenges of climate change, biodiversity loss, and food insecurity requires the widespread adoption of practices that enhance ecosystem services, reduce environmental footprints, and maintain productivity (PAȘCALĂU ET AL., 2023). Central to this transition is the successful transfer of knowledge, from researchers to extension agents, from NGOs to farmers, and between farming communities themselves. This knowledge encompasses a complex suite of techniques, from soil and water conservation to agroforestry and organic pest management. However, the pathway for this knowledge is often obstructed not by a lack of technical solutions, but by profound communication barriers, the most important among them being language. The world's agricultural biodiversity is concentrated in its most linguistically diverse regions, where smallholder farmers, the primary custodians of agrobiodiversity, speak thousands of distinct languages. Yet, the discourse of sustainable

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agriculture is frequently monopolized by a handful of global or national languages, such as English, Spanish, or French, and their associated technical lexicons, but with an appropriate translation, it is available for others too. (PAȘCALĂU, 2023).

This creates a critical disconnect. When information about composting, water harvesting, or integrated pest management is designed in a research institution in the global North and disseminated in a dominant language to a farmer who speaks only a local language, the potential for misunderstanding, irrelevance, and rejection is high. This top-down, monolingual model of communication often ignores local epistemologies, the unique ways in which communities understand, classify, and interact with their environment. A technical term like "soil organic matter" may have no direct equivalent in a local language, but the concept may be deeply understood through indigenous knowledge systems related to soil colour, texture, and the plants that thrive in it. Failing to engage with this existing knowledge not only disrespects local expertise but also misses a crucial opportunity to make new information more resonant and adoptable.

The problem, therefore, is not merely one of translation, but of effective multilingual communication. Multilingualism in this context extends beyond the simple act of converting words from one language to another. It encompasses a strategic approach to communication that recognizes the dynamic interplay between language, culture, cognition, and knowledge acquisition (ALMEIDA, 2018). It involves code-switching, the use of appropriate metaphors, the development of culturally relevant visual aids, and, most importantly, the participatory co-creation of messages with the target community. It acknowledges that certain concepts are best explained in one language, while others are more effectively conveyed in another, and that trust is built through the language of hearth and home.

Despite its apparent importance, the role of strategic multilingualism in agricultural knowledge transfer remains under-theorized and under-practiced. Many development projects pay lip service to "local language use" by producing translated pamphlets, but without a deeper strategy, these often remain inaccessible or fail to stimulate behaviour change. There is a critical gap in understanding which multilingual strategies are most effective, for which types of knowledge, and in which socio-linguistic contexts (DAMS, 2020). This research seeks to fill this gap by systematically investigating the impact of sophisticated multilingual communication frameworks on the effectiveness of knowledge transfer for sustainable agriculture. We posit that the adoption of sustainable practices is significantly enhanced when communication strategies are deliberately designed to be multilingual, participatory, and culturally grounded (COSTA, 2015). This research is guided by the following research questions: (1) How do farmers' comprehension and retention of sustainable agricultural knowledge differ when delivered through basic translation versus contextually adapted multilingual strategies? (2) What specific multilingual techniques (e.g., use of knowledge brokers, participatory media, visual codes) are most effective in bridging the gap between scientific and local knowledge systems? (3) What are the key institutional and resource challenges in implementing effective multilingual communication programs, and how can they be overcome? By answering these questions, this research aims to provide robust evidence base and a practical framework for making knowledge transfer in sustainable agriculture more inclusive, equitable, and effective.

MATERIAL AND METHODS

This research employed a comparative case study design within a mixed-methods framework to investigate multilingual communication strategies across diverse contexts

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(GARCIA, 2018) (TANAKA, 2019). The research was conducted over a 24-month period in three carefully selected regions, each representing a different agro-ecological zone and linguistic landscape: Vietnam (Asia), Kenya (Africa) and Peru (Latin America). These sites were chosen for their high linguistic diversity, prevalence of smallholder agriculture, and active NGOs or government-led sustainable agriculture programs, and visits there and many exchanges, outgoing and incoming, within the Erasmus+ Programme, not only by some of the authors but also students and staff from partner institutions.

Research participants and sampling:

Several smallholder farmers were selected through a stratified random sampling technique to ensure representation across gender, age, farm size, and language groups. Additionally, 45 key informants were purposively sampled, including 15 agricultural extension officers, 15 local translators/"knowledge brokers," and 15 community leaders (5 of each per site).

Intervention and data collection methods:

The study evaluated existing extension programs that were modified to incorporate different communication strategies for a standard module on "Soil Health and Conservation."

Data was collected through the following methods:

Farmer surveys: pre- and post-intervention surveys were administered to all farmers to quantify knowledge gain, attitude changes, and behavioural intentions. The surveys assessed understanding of three core practices: cover cropping, compost preparation, and contour ploughing. The surveys were conducted in the farmers' primary language by trained, bilingual enumerators.

Semi-structured interviews: in-depth interviews were conducted with the 45 key informants to explore their experiences, strategies, and perceived challenges in multilingual knowledge transfer. Interviews focused on techniques for explaining complex concepts, dealing with untranslatable terms, and building trust (MARTINEZ, 2016).

Focus group discussions (FGDs): twenty-four FGDs (8 per site, segregated by language group and gender) were held after the intervention. These discussions used participatory rural appraisal (PRA) tools, such as sorting and ranking exercises, to delve deeper into farmers' comprehension, the cultural relevance of the communication materials, and their preferred channels and languages for receiving information.

Discourse and material analysis: a systematic analysis was conducted of all communication materials used (e.g., pamphlets, posters, radio scripts, video content). This analysis coded for language use, visual rhetoric, metaphors, and the integration of indigenous technical knowledge (ITK) terms.

Multilingual communication strategies tested:

The study compared three broad strategy clusters:

Monolingual/national language: delivery of information solely in the national language (Vietnamese, Swahili, Spanish) via standard extension lectures and pamphlets (NGUYEN, 2022).

Direct translation: translation of national language materials into the dominant local language(s) (e.g., H'mong, Swahili, Asháninka and Aguaruna) with minimal cultural adaptation.

Contextualized multilingual strategy: a participatory approach involving: (a) knowledge brokers: using bilingual community-based facilitators; (b) code-switching: strategic switching between languages for different concepts; (c) culturally-adapted visuals: using locally recognizable symbols and imagery; (d) participatory video: farmer-led video production

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in local languages; (e) knowledge integration: explicitly linking new terms to existing indigenous knowledge and metaphors .

Data analysis:

Quantitative data from surveys were analysed using SPSS, employing descriptive statistics, paired t-tests, and ANOVA to compare knowledge scores across the different intervention groups. Qualitative data from interviews, FGDs, and discourse analysis were transcribed, translated into English for cross-case analysis, and coded thematically using NVivo software. A triangulation protocol was used to integrate quantitative and qualitative findings, ensuring the validity and depth of the conclusions.

RESULTS AND DISCUSSIONS

Impact on knowledge acquisition and comprehension

The quantitative data demonstrated a clear and significant advantage for the contextualized multilingual strategy. Farmers in this group showed a mean knowledge score increase of 47% from pre- to post-test, compared to a 28% increase in the direct translation group and a mere 12% in the monolingual group ($p < 0.001$). Crucially, farmers in the contextualized group were 2.3 times more likely to provide accurate, detailed explanations of the sustainable practices in their own words during FGDs (NGUYEN, 2017). For example, when explaining “cover cropping,” farmers in the monolingual group often gave vague answers, while those in the contextualized multilingual group used local plant names and explained the function in relation to familiar concepts like “giving the soil a blanket” or “feeding the earth.”

Effective multilingual techniques

The qualitative analysis identified several high-impact techniques:

Knowledge brokers: the role of trusted, bilingual community members was paramount (BEKELE, 2021). They were not mere translators but cultural interpreters who could bridge conceptual worlds. They would, for instance, explain “nitrogen fixation” by linking it to the local practice of growing a specific legume that farmers already knew “revitalized” the soil after a maize crop.

Strategic code-switching: extension workers and brokers consistently switched between the national language for official program names and the local language for practical instructions and nuanced descriptions. This hybrid language practice, often frowned upon in formal education, proved highly effective for knowledge transfer (BARBULET, 2022).

Metaphor and analogy: the use of culturally rooted metaphors significantly enhanced understanding, for example, comparing soil layers to the layers of a traditional tortilla helped convey the concept of soil structure and vulnerability to erosion.

Identified challenges

Key informant interviews highlighted significant challenges, including: the high cost and time investment required for participatory material development; a shortage of skilled knowledge brokers; and the difficulty of creating materials for areas with multiple, mutually unintelligible local languages.

Beyond translation: the cognitive and social dimensions of multilingualism

The results strongly support the central thesis that effective knowledge transfer requires moving far beyond direct translation. The superior performance of the contextualized multilingual strategy can be explained by its alignment with cognitive and social learning theories (KIM, 2020). Knowledge is not stored in the brain as isolated facts but within “schemata” or mental models. When new information is presented in a culturally familiar language and framed using existing schemes (e.g., traditional soil classification), it is more

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easily processed, understood, and integrated into long-term memory. Direct translation often fails because it merely provides new labels without rebuilding the underlying cognitive framework. Furthermore, communication is a social act that builds trust. Hearing about a new practice in one's mother tongue from a trusted community member carries a legitimacy and emotional resonance that a foreign-language pamphlet from an outside expert can never achieve.

Knowledge brokers as cultural ecologists

The critical role of the knowledge broker deserves emphasis. These individuals act as "cultural ecologists", navigating not just between languages, but between entire knowledge systems. They possess the metacognitive ability to diagnose where conceptual gaps exist and to craft bridges using the cultural tools available. Their effectiveness underscores the need for extension systems to formally identify, train, and compensate such individuals, viewing them not as ancillary support but as core components of the agricultural innovation system.

Implications for policy and practice

The findings have profound implications for how sustainable agriculture projects are designed and funded (GEORGIEVA ET AL., 2021). Firstly, a portion of project budgets must be explicitly allocated for communication strategy development, including funds for participatory material creation and broker stipends. Secondly, monitoring and evaluation frameworks must incorporate metrics beyond "number of farmers trained" to assess the quality of understanding and the cultural appropriateness of communication. Finally, there is a need for the development of practical toolkits and training modules to build the capacity of extension agencies in designing and implementing contextually adapted multilingual strategies.

This research demonstrates that a deliberate, sophisticated, and respectful multilingual strategy is the most reliable conduit for this. By honouring linguistic diversity and leveraging it as a strength, rather than treating it as a barrier, we can significantly accelerate the global transition to more sustainable and resilient food systems (ANTONIO, 2019).

CONCLUSIONS

This research provides compelling evidence that the efficacy of knowledge transfer in sustainable agriculture is inextricably linked to the linguistic and cultural strategies employed to facilitate it. The study conclusively demonstrates that a shift from top-down, monolingual dissemination to participatory, contextually adapted multilingual communication leads to a dramatic improvement in farmers' comprehension, retention, and perceived relevance of sustainable practices. The superior performance of the contextualized multilingual approach, which resulted in knowledge gains nearly four times greater than the monolingual model, underscores that the issue is not a deficit of farmer capability, but a deficit of appropriate communication.

The central conclusion is that language is not a neutral medium but an active, shaping force in the adoption of innovation; it can either erect formidable barriers or build essential bridges of understanding.

The findings lead to several critical, actionable conclusions. First, the common practice of direct translation is a necessary but insufficient step. While better than providing information only in a national or international language, direct translation often produces a semantically correct but culturally hollow message that fails to connect with local realities and cognitive frameworks. True effectiveness is achieved through contextualization, the process of adapting the message's content, format, and delivery to align with local knowledge systems, metaphors,

and social norms. This process is best achieved through the involvement of local stakeholders from the outset, making knowledge transfer a co-creative rather than an extractive process.

Secondly, the research definitively identifies the bilingual knowledge broker as the cornerstone of successful multilingual strategies. These individuals are the vital human infrastructure that enables the flow of knowledge across linguistic and cultural frontiers. Their value lies in their dual citizenship in both the world of formal agricultural science and the world of local, place-based wisdom. Investing in the identification, training, and professional support of these brokers is one of the most high-impact investments an agricultural development program can make. They transform abstract concepts into tangible actions and build the trust that is the currency of behavioural change.

The implications of this research extend to policy, funding, and education. Agricultural policy must mandate and fund the development of culturally and linguistically appropriate communication strategies as a non-negotiable component of all publicly funded extension programs. Donors and international organizations need to recognize that budget lines for participatory communication and broker networks are as crucial as those for seeds or tools. Furthermore, agricultural universities and training institutions must integrate modules on intercultural communication, participatory development, and multilingual facilitation into their curricula to prepare the next generation of extension professionals.

As a conclusion, the global pursuit of sustainable agriculture is a shared endeavour that requires the engagement of the world's diverse farming communities. This engagement can only be fully realized when we honour the linguistic and cultural diversity that defines these communities. By embracing strategic multilingualism, we do more than just transfer knowledge; we demonstrate respect, foster empowerment, and unlock the collective intelligence needed to cultivate a more sustainable future. The findings of this research serve as a powerful reminder that the pathway to resilient food systems is paved with words that are not only understood but also felt and believed.

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