Research Poster

Use of Experiential Learning to Support Climate Change Adoption

Andrew Waaswa
North Carolina State University
NCSU Campus Box 7607
Raleigh, NC 27695
awaaswa@ncsu.edu
(919) 515-6077

Abasiama-Arit Aniche
North Carolina State University
NCSU Campus Box 7607
Raleigh, NC 27695
aaaniche@ncsu.edu

Joy Morgan
North Carolina State University
NCSU Campus Box 7607
Raleigh, NC 27695
jemorga2@ncsu.edu

Introduction/Need for Research

Educators and Extension agents are tasked with developing research and instruction related to relevant and pertinent agricultural topics. Climate change has been at the forefront and the division on this topic presents a challenging task for those needing to find solutions. Climate-smart agriculture (CSA) as a strategy for climate change (CC) adaptation comprises management techniques or technological advancements that sustainably boost productivity, enhance resilience, reduce greenhouse gas emissions, and more effectively meet food security and development goals (Waaswa et al., 2022). Climate variability, characterized by low precipitation, flooding, high temperatures, prolonged sunshine, and delayed rainfall, has threatened agricultural productivity, leading to food insecurity. Several CSA strategies for increasing agricultural production have been developed to address these challenges. Specifically, institutional support and the use of experiential learning have been found to impact the adoption of CSA significantly (Okello et al., 2018).

Conceptual Framework

This study was based on adopting the CSA concept as a climate-smart agriculture adaptation strategy among farming communities. The concept of CSA is based on its triple-win impact of increasing production, improving resilience, and lowering emissions by integrating various goals and managing trade-offs (Newell & Taylor, 2018). This concept first used by Food and Agricultural Organization (FAO) in 2009 (Mann et al., 2009) was followed by the Wageningen statement, which identified scientific priorities to accelerate CSA. Since then, several foster the widespread use of CSA concept including the African Agricultural Ministers' call to action and Conference of Parties (COP) 17 in Durban, South Africa. During this meeting, parties asked the United Nations Framework Convention on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technological Advice (SBSTA) to explore the possibility of a formal work program on CSA (Newell & Taylor, 2018). In 2013, the FAO launched the Economics and Policy Innovations for Climate-Smart Agriculture (EPIC) program, which inspired the launch of the Global Alliance for CSA (GACSA) at the UN climate summit in New York the same year. In Africa, Kenya launched the National Climate Change Action Plan (NCCAP 2013–2017) in 2013 after successfully launching the National Climate Change Response Strategy (NCCRS) in 2010 (Ambrosino et al., 2020), followed by the CSA Strategy (KCSAS) in 2017. Utilizing an integrated agriculture, development, environment, food security, and climate change strategy, KCSAS guides changes to agricultural systemsby highlighting it as an "excellent opportunity for transformation by uniting agriculture, development, and climate change under a common agenda" (GoK, 2017). Kenya is vulnerable to CC and has implemented several interventions, such as the Climate and Water Smart Agriculture Centre (CaWSA-C) under Community Action Research Project (CARP+), to foster the adoption of CSAPs.

Methodology

The CSAPs commonly introduced to farmers include rainwater harvesting and storage, irrigation, mulching, minimal tillage, improved crop varieties, terracing, drainage management, intercropping, agroforestry, synthetic fertilizers, composting, furrow/ridge planting, crop rotation, apical rooted cuttings, and mini-tubers. Several of these projects allow farmers to learn about CSA as a climate change adaptation strategy through experiential learning at field days and the utilization of progressive farmer's farms to teach other farmers to boost the likelihood of CSA adoption. Those without transportation were shuttled from their villages to the various sites at the university due to the difficulty of finding potato minitubers and apical rooted cuttings (newly introduced technologies in Kenya) only in the field laboratories of the university. This allowed the farmers to learn by seeing and believing in these CSA practices' potential. Based on the CSAPs offered to Kenyan farmers, this study sought to test a hypothesis that adopting CSA is a significant strategy for climate change adaptation. A cross-sectional survey was used to collect data from smallholder potato growers in Kenya. A sample of 120 farmers was drawn from the 15,359 smallholder farmers actively engaged in potato production in Gilgil Sub-County using a 95 percent confidence level. Gilgil Sub-County was chosen for this study precisely because of its vulnerability to the effects of CC. Potato producers were selected for this study because CC is reducing the production of the potato crop, Kenya's second most important staple food crop, after corn (Bolt et al., 2019). Data was collected using a structured researcher-administered questionnaire. SPSS version 28 was used to analyze the data. The percentages and frequencies for the CSA adoption rates and potentials of different CSAPs were computed using descriptive analysis. A binary logistic regression model was used to test the hypothesis.

Results/Findings

The use of synthetic fertilizer was the most adopted CSAPs by 95% of the potato farmers, rainwater harvesting and storage (83.3%), irrigation (31.7%), mulching (64.2%), minimal tillage (72.5%), improved crop varieties (59.2%), terracing (75%), drainage management (70.8%), intercropping (89.2%), agroforestry (85%), composting (75.8%), furrow/ ridge planting (74.2%), crop rotation (83.3%), apical rooted cuttings (7.5%), and the mini-tubers were the least adopted CSAPs by 1.7%. However, an average of 64.56% of potato farmers adopted the CSAPs. Of the 64.56% of potato farmers who adopted the CSAPs, 94.2% reported that CSA helped them adapt to CC by improving soil fertility, increasing yields (94.2%), increasing incomes (95%), reducing soil erosion (88.3%), ensuring production all year round (56.7%), increasing livelihood diversification (84.2%), reducing labor requirements (92.5%), reducing input expenses (87.5%), reducing pests and disease infestation (86.7%), increasing product quality (89.2%), and watering animals (79.2%). Regarding the magnitude of the adaptation potentials, 12.4% of the farmers reported a low impact of CSAPs, 65.9% reported a moderate impact, and 21.8% reported a high impact. At a 5% significance level, hypothesis test findings from a binary regression analysis revealed that CSA is a significant CC adaptation strategy (Wald $\chi2 = 49.417$, df = 1, $p < 0.001$). Further, findings show that implementing CSA increases the farmers' chances to adapt to climate change by 19 times more than non-adopters. Unlike ensuring production all year round, all the CSA potentials investigated in this study significantly contributed to farmers' adaptation to CC.

Conclusion and Implications

Based on the findings, CSA is a significant climate change adaptation strategy especially if taught with the use of experiential learning. Farmers improved soil fertility; increased yields, incomes, and product quality; minimized soil erosion, labor needs, input expenses; pests and disease infestation; diversified their livelihood; and provided water for animals as a result. Educational programs should make CSAPs as a climate change adaptation strategy an integral component; this will establish a sustainable link between research and innovation and the farmers. Therefore, CSA training should be planned with an experiential learning approach, and linkages between research intuitions and farmers should be established and bolstered. Additionally, connecting progressive farmers with the rest of the farming community would greatly influence other farmers to accept CSAPs widely.

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