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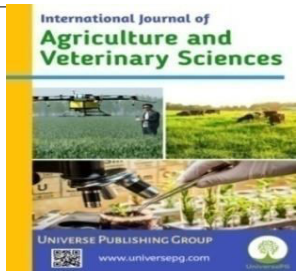

Review of Farmers Field School Approach for Facilitation of Climate Smart Agriculture

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ABSTRACT

Sustainable agricultural development strategies depend on ensuring that farmers have access to technology and management techniques. Policymakers employ agricultural extension and advisory services to accomplish this goal. The extension was traditionally viewed as a 'top-down' institution, and used by policymakers to disseminate knowledge about farming to the public. These traditional extension methods have received criticism for being "one size fits all," failing to account for the wide variety of socioeconomic and institutional contexts that farmers must operate in, and failing to involve farmers in the creation of technology and practices suitable for their environments. Additionally, it was thought that more intensive strategies were required to communicate complex messages. Since the 1980s, a more inclusive methodology has been used to deliver extension services, with farmer field schools emerging as a key component. This paper examined farmer field schools as a strategy for promoting climate-smart agriculture. The paper also examined FFS's function in promoting climate-smart agriculture and engaging the general public. A discussion of farmer field schools' experiences around the world is also included, with a focus on the effects of their methodologies. The paper also outlined the advantages and disadvantages of farmer field school strategies.

Keywords: Approaches, Advisory service, Extension service, Technologies, Traditional, and Social mobilization.

INTRODUCTION:

Agriculture production, food systems, and food security are all negatively impacted by climate change and variability (Osumba *et al.,* 2021). Depending on the crop, climate change is expected to continue to hurt overall crop yields in East Africa by up to 5-72%, or an average of 24.3% (Nyasimi *et al.,* 2014). More climate-resilient, environmentally sustainable agricultural production practices must be adopted to boost agricultural productivity and strengthen agribusiness resilience in the face of rising climate variability (Recha *et al.,* 2020). To support transformational change, this call requires coordinated investments from agricultural value actors and partners. For such a transformation, actionable, sustainable climate information is essential (Hansen *et al.,* 2019; Clarkson *et al.,* 2019). However, the majority of smallholder farmers currently do not receive actionable climate information for efficient decision-making due to the difficulties of the climatic "new reality" (Hulme, 2020; Osumba *et al.,* 2021).

To handle some of the complicated difficulties resulting from climate change, agriculture must become "climate-smart." To do this, agriculture must sustain-

ably boost agricultural productivity and incomes, adapt to the changing climate, and build resilience to it.

Wherever possible, it must also reduce and/or eliminate greenhouse gas emissions (FAO, 2013). Agriculture that practices climate-smart practices (CSA) helps to achieve sustainable development objectives. It com-bines the economic, social, and environmental aspects of sustainable development by jointly addressing the problems with food security and the environment. The employment of a co-learning strategy by all stakeholders to foster social learning is an essential component of CSA. One such crucial capacity-development tactic to enhance organizational and individual capacities is Farmer Field Schools (Rupan *et al.,* 2018). The field school model is a concept built on group dynamics and hands-on adult learning, and it is one of the delivery models utilized in agricultural extension (Stewart *et al.,* 2014). Using field school techniques that focus on and incorporate climate information can help develop agricultural systems that are robust to climate change. The FFS technique is a bottom-up approach based on the "farmer first" tenet of Robert Chambers (Tomlinson & Rhiney, 2017). The approach has been widely used to enhance adaptation behaviors through social learning and capacity building (FAO, 2019).

The FFS approach is a cutting-edge, interactive, participatory learning strategy that places a strong emphasis on problem-solving and discovery-based learning. FFS seeks to improve farmers' capacity to assess their farming operations, identify problems, test viable solutions, and eventually persuade members to adopt the methods most appropriate to their operations (FAO, 2016). The pedagogical and empowering FFS approach has also been evolving into "Climate Field Schools" to be adopted and grown. This paper examined FFS as a scaling-up strategy for CSA practices.

The Role of Extension and Advisory Services in CSA Scale-Up

The employment of extension and advisory services (EAS) can substantially aid the expansion of climate-smart agriculture (CSA). EAS makes it feasible to achieve all three of CSA's goals-food security, adaptation, and mitigation-but right now they are focusing mostly on the first goal, which is improving food security through greater productivity. EAS must now be utilized more aggressively to assist rural people with climate change adaptation and mitigation (Sulaiman, 2017). To scale up CSA, millions of agricultural farmers will need to alter their behavior, strategies, and farming methods. To embrace more climate-smart practices, these producers need to learn more about the impacts of climate change. EAS has long provided a link between agricultural research and farmer support by disseminating information on emerging technologies. The successful expansion of CSA, however, necessitates strategies that go far beyond modifying agronomic practices at the farm level (Sulaiman *et al.,* 2018). It necessitates the identification and promotion of appropriate practices, technologies, and/ or models (new, improved, adapted) within welcoming enabling environments. Additionally, it calls for beneficial institutional arrangements, policies, and monetary investments on both a local and global scale (Neufeldt *et al.,* 2015). Therefore, EAS needs to be supported by extensive expertise and skills to encourage interaction and the flow of knowledge among a wider range of stakeholders than is currently the case.

Contribution to sustainably increasing productivity

In response to the changing needs of farmers and the evolving nature of agriculture, the extension's focus is shifting away from teaching farmers how to produce crops, livestock, and forestry products and toward developing technologies alongside farmers and fostering and facilitating innovation processes. The demand for site-specific analyses to identify the right agricultural technology and practices necessary for CSA is consistent with the change in emphasis. Using participatory techniques and strategies, such as participatory technology development, enabling rural innovation, and innovation platforms to develop and disseminate technologies and promote innovation through multi-stakeholder engagement, extension providers have demonstrated great success in many countries (Nederl & Pyburn, 2012). EAS also has a wealth of experience in disseminating technologies, knowledge, and practices using a variety of approaches, such as conventional extension modes (such as face-to-face interaction, demonstrations, field days, printed materials, etc.), ICTs (radio, mobile phones, video, social media), rural information centers (Takoutsing *et al.,* 2014),

farmer-to-farmer extension (Kiptot & Franzel, 2014), for a Kenyan experience. Through development and information sharing, EAS significantly contributes to improving adaptation technology while steadily increasing productivity (Shekmohammed *et al*., 2022).

Role in building resilience

EAS has a wealth of experience with non-formal education and experiential learning approaches (such as farmer field schools, farmer learning groups, and local agricultural research committees), with a focus on enhancing farmer experimentation and problem-solving abilities to encourage adoption and decision-making regarding knowledge-intensive agricultural practices (Waddington and White, 2014). Some AS have embraced a market-oriented approach to an extension to encourage the diversification of sources of income by assisting farmers with marketing, value addition, and the development of their entrepreneurial abilities. To transfer seeds and other inputs, EAS works closely with humanitarian organizations, which increases resilience following harsh climate disasters (Christoplos, 2010). It is evident that to increase the importance of EAS in fostering resilience, new organizational and personal competencies and skill sets would normally be required, even though this topic has not gotten much attention (Davis *et al.,* 2014).

Encouragement of climate change mitigation and adaptation

One of the traditional roles of extension organizations is to serve as a "bridge" between farmers and other rural stakeholders and service providers. More recently, AS providers in several countries have supported agricultural innovation systems (AIS) by taking part in various ways in the development of multi-stakeholder innovation platforms. Among them are acting as the main innovation broker (the one who initiates the innovation process and links the participants), acting as a "bridging" entity to encourage communication between participants, planning and creating networks, supporting participants, facilitating access to information, knowledge, and expertise, and providing technical support (Sulaiman and Davis, 2012). Innovation platforms, according to Leeuw and Hall (Leeuw and Hall, 2013), are a sort of institutional innovation that can aid in both climate change adaptation and mitigation. For a range of tasks, such as bringing researchers and farmers together to discuss adaption strategies and developing tools for climate service, AS can play a significant facilitation and brokering function in this context. Extension providers can aid mitigation initiatives by empowering farmer groups and rural organizations, establishing connections between them and regulated and voluntary carbon markets, and supporting schemes for paying for ecosystem services.

Participation in policy support, advocacy, and monitoring

Given the urgent need for more information on how climate change is affecting agriculture, AS should actively participate in documenting those effects as well as the advancement of CSA efforts in close cooperation with farmers and scientists. Even though AS is not frequently referred to as a member of the "climate change advocacy coalition" (i.e., environmental advocacy groups, scientists, journalists, agency staff, legislators, and leaders in renewable energy technologies), they can play a crucial advocacy role at the local level in decentralized governance structures to ensure cli-mate change is kept at the top of the policy agenda and funds are allocated for CSA programs (Pralle, 2009). EAS is in a unique position to inform policymakers about the results of climate-related incidents and to promote CSA funding and policy change. By using farmers, pastoralists, and other people who are directly impacted by the changing climate as spokespersons to put a human face on the problem, highlighting potential solutions, and offering feedback on policies and progress, EAS can help to keep climate change and CSA at the top of the policy agenda (Pralle, 2009).

The Role of FFS in promoting climate-smart agriculture and public awareness

Over time, the FFS curriculum has expanded to cover many different topic areas, like disaster mitigation and climate change adaptation (Adger *et al.,* 2009). The FFS methodology places a strong emphasis on group dynamics, interactive learning, hands-on experimentation, and direct peer-to-peer communication among participants to encourage the dissemination and creation of knowledge specifically suited to the social and cultural contexts of the target population (Charatsari *et al.,* 2015). The FFS methodology is based on experiential learning and social learning concepts, which serve as the primary routes for informing farmers as

they interact with their peers and the environment (Nederlof & Odonkor. 2006). It provides farmers with a low-risk setting where they can experiment with novel agricultural management approaches, debate their findings, and learn from their experiences (Settle *et al.,* 2014). One FFS that included components of global climate change adaptation is the FAO FFS program on Integrated Plant and Pest Management (IPPM), which promoted better and adapted cultivars and agroforestry practices in Mali and Niger (FAO, 2015). In Indonesia, Climate Field Schools encouraged methods for coping with changing precipitation patterns, such as documenting and deciphering farm rainfall statistics and on-the-ground water collection and increased public understanding of global climate change (Winarto *et al.,* 2008). Since 2010, several nations have begun utilizing a field school strategy to strengthen community climate resilience. With assistance from FAO, field school projects focusing on the environment have been carried out in numerous nations. With the help of short- and medium-term intervenetions, projects in Eastern and Southern Africa, particularly Uganda, have integrated disaster risk reduction and climate change adaptation to address multiple threats to livelihoods. Climate field schools have been tried out by other organizations in various countries (e.g., Bangladesh, the Democratic Republic of Congo, Indonesia, and Nepal). In Honduras, South Sudan, and many other nations, CARE has addressed climate change using farmer fields and business schools. Several manuals and technical modules on resilience building through field schools have now been made available as a result of these initiatives (Rokonuzzaman *et al*., 2022; FAO, 2013b; FAO, 2015).

The Effects of the Farmer Field School Method

In various parts of the world, FFS have been demonstrated to have an impact on adoption, productivity, and knowledge. FFSs have allowed farmers to dramatically reduce their dependency on pesticides without negatively affecting overall production, according to market research and studies conducted in regions with high input prices (Jiggins *et al.,* 2005). Central America has tested an IPM labeling system to guarantee the clean products originating from FFSs and connect groups to higher-value urban markets. Similar to this, a group in Ecuador established production contracts with the agri-food industry, which provided more fair prices and let farmers stay away from the instability of National markets. The majority of the impact studies, which were 25 in total, revealed a continuous and consistent drop in pesticide usage that could be linked to the impact of training, according to the findings of a meta-analysis of the impact studies, which the FAO had commissioned. A review of 25 IPM-FFS evaluations revealed that studies consistently and significantly reduced the usage of pesticides, and this resulted from the influence of training (Waddington & White, 2014). The training's broader developmental impacts are the subject of numerous researches, which demonstrate impressive, long-lasting, and widespread consequences. FFS encourages lifelong learning and that it improved social and political competencies, which prompted a variety of regional activities, connections, and regulations about better agro-ecosystem management (Van Den Berg, 2004). According to Davis *et al.* (2010), FFS raised earnings and productivity in east Africa. Studies on the global effects of FFS revealed lower use of harmful pesticides and a 4-14% increase in yield for FFS graduates who grew cotton compared to the control group (Van Den Berg, 2004). Despite this effect, another advantage of FFS is that it fosters group action, leadership, organization, and enhanced problem-solving abilities (Ajayi and Okafor, 2006). From 2000 to 2004, Indian FFS graduate was trained to start their farmer field schools, also known as farmer-to-farmer schools (FSS) (FAO, 2008). Through extension services, NGOs, and research organizations, more than 50,000 farmers received training in cotton IPM techniques over the course of these years. Each state carried out 2,300 field-based surveys per year. Over 200,000 farmers have benefited from the organization of 248 FFS and the direct training of about 100,000 farmers in chickpea production. The results include an increase of 20-40% in Andhra Pradesh's knowledge (6947 plum bodies, another name for FFS, were organized) (IDE, 2009). According to an FFS study by Davis *et al.* (2010), FFS increased African farmers' income, productivity, and knowledge gains. According to research conducted in Ghana using four distinct extension tactics, FFS models have been extremely effective at increasing farmers' capacity and giving rural residents more authority, according to FAO (FAO, 2008). In all areas where FFS has been

developed and applied, the adult education concept and principles that underlie the design of curricula and the learning process are reliable (Braun & Duveskog. 2008). There is convincing evidence for the effects of reduced pesticide use, increased productivity, and improved farmer knowledge (Zuger, 2004). Changes in perspectives with shattered pride and self-confidence are reported as empowerment outcomes from FFSs, as are social change and action that is sparked as a result of participation in FFSs. Farmers now have more freedom to live their lives how they want. Many of the social changes that FFS graduates have witnessed are the result of farmers making decisions to overcome difficulties by using critical reflection or group action. FFS increased productivity, knowledge acquisition, and empowerment in Africa, however, only among the farmers who were most actively involved. According to Davis *et al.* (2010), FFs raised wages and productivity in East Africa. Participants in the FFS increased yield by an average of 13% and net revenue (profit per unit of land) by 19%, according to Waddington and Howard (2014). Due to lower costs as farmers use pesticides, projects in Africa, Asia, and Latin America reported a positive impact on net revenue that is greater than yield. The impacts were shown in IPM field schools in China, Pakistan, Kenya, Tanzania, and Ethiopia. Because it encompassed cash crops and also included complementing input-making components, the platformer's initiative connecting potato farmers with Agribusiness in Ecuador and coffee growers with the worldwide market in Peru had a considerable impact on net revenue (Davis *et al.*, 2010; Haile, 2020).

Framework for Institutional and Policy Engagement in FFS

Reviews of agricultural field school efforts around the world show that the method has become a paradigm for agricultural/agropastoral education in many parts of the world (farmer, agropastoral, agribusiness, etc) (Braun & Duveskog, 2011). This integrated methodology improves adult learning and local capacity development. The participants were unanimous in their belief that to successfully integrate climate literacy into the process, agronomists must work more closely with available agrometeorological service providers to ensure that farmers are properly instructed in how to apply climate information and "agro-weather" advisories for their agricultural production needs (Van den Berg *et al.,* 2020). The type of institutional framework that incorporates participant feedback is shown in **Fig. 1**. The field schools that are currently being established will develop a network of CSA FFS networks to pursue this advocacy agenda locally (Okoth *et al.,* 2006).

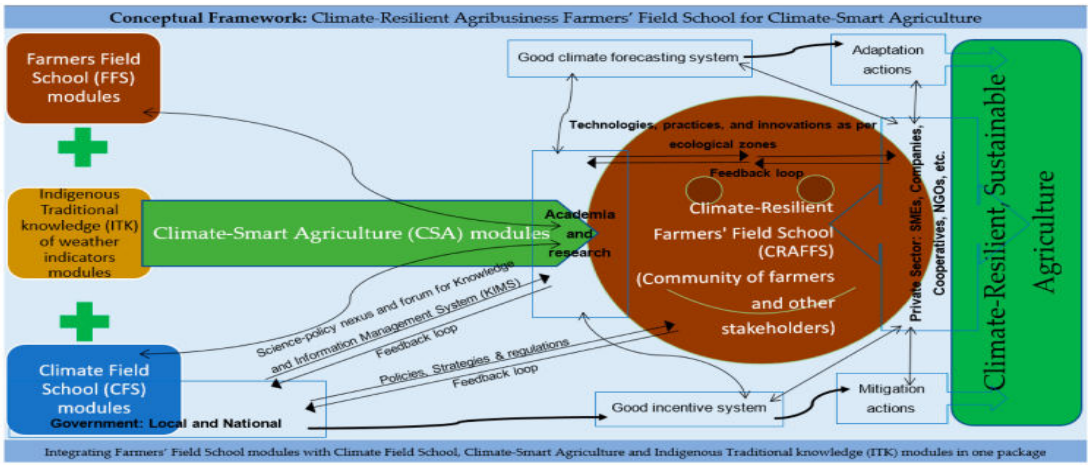

Fig. 1: A theoretical foundation for the new Farmers' Field School for Climate-Smart Agriculture, an integrated, innovative, and Climate-Resilient Agribusiness.

Source: Osumba *et al.* (2021).

Strengths and Weaknesses of the FFS Approach

Strengths

To improve farmer expertise in the management of particular agroecosystems, for which there appears to be no short-cut, hands-on education, is required. FFS is important because it uses the farmer's own research and reflection rather than the expertise of highly qualified outside experts. To enhance human potential and

empower people, FFS is essential in giving a platform. This can eventually assure the success of services provided to the community (Braun & Duveskog, 2008). The FFS process promotes group interaction and the growth of group management abilities, particularly in women. In this way, the FFS serves as a tool to empower vulnerable farmers to form cohesive economic empowerment groups that can engage in joint, profit-making ventures and communicate with service providers and market intermediaries. One of FFS's key advantages is that it aids in improving the productivity of cocoa farmers in the two states where social capital or civil society is at the village level (Gwary *et al*., 2015). This occurs when FFS sparks interest in a community, particularly among those who do not fall under the "official" classification of the community. As a result, farmers are given a voice once more and given greater consideration during the decision-making processes. Since graduates can be selected and employed as facilitators for new FFS groups in the community, FFS offers the opportunity for a farmer-to-farmer extension, which will scale up FFS intervention and cost reduction. This is related to the problem of a lack of formal extension staff, particularly in drylands and pastoral areas. Since the solution is developed jointly through the experimentation process, interventions can be scaled up even when there is very few extension staff. Even with facilitators with comparatively low technical skill levels, FFS can operate effectively. This is a significant benefit given the current state of curriculum design, which is often subpar or inappropriate.

Weaknesses

FFS are not a one-size-fits-all development strategy, nor are they a replacement for more well-known technology-centered or profit-driven development strategies like extension, credit cooperatives, core estates without growers, farmers' training centers, or the utilization of mass media (Braun & Duveskog, 2008). To empower farmers to take the lead in local practice adaptation, it supports an educational strategy that places a strong emphasis on experiential learning, action research, and critical thinking. For achieving swift and widespread application of standardized recommendations, the FFS is not the ideal tool. These are situations where technology transfer is advantageous, and for such problems, non-FFS techniques like radio and community meetings are frequently more suitable. Thus, campaigns and the FFS were implemented concurrently or as a complement. FFS is described as being expensive, which could lead to issues with long-term financial viability. Per farmer trained, the training activities are expensive. FFS is said to cost US $62 per farmer trained (Zuger, 2004). If only farmer trainers were to serve as the primary trainers, cost-effectiveness and financial sustainability could be improved. Facilitating trainers, shipping materials, supervision, and graduation are the main expenses associated with putting FFS into practice. FFS are prone to quality loss, especially when it comes to poor or inappropriate curriculum design and a lack of focus on the effectiveness of the teaching and learning process. On occasion, a component of the approach will be chosen without taking into account the adult education and practical training ideas woven into FFS (FAO, 2013). The strategy typically loses its effective-ness when the core concepts and components are ignored, and it must be applied as a whole to get the intended effects.

CONCLUSION:

Effective rural advisory systems, which include the organizations and actors involved in providing extension and closely related services (education, research, agribusiness support, etc.), the regulatory and policy structures that govern how the system operates, and the enabling environment, are required to handle the complexity of achieving CSA and to ensure the efficiency of the range of actors involved in pluralistic rural advisory landscapes. Governmental organizations typically play some sort of leadership or coordination role, especially when it comes to policy and regulatory frameworks, even though the role of public sector extension in rural advisory systems will vary depending on the context. The review looked at the FFS approach's ideas, execution, efficacy, strengths, and weaknesses. However, it has since broadened to cover other topics in a variety of contexts, including organic farming, soil and animal husbandry, forest management, groundwater management, human health, gender issues, and advocacy, among others. Its primary focus is on educating farmers about integrated pest management (IPM) programs for growing rice. In Asia, SubSaharan Africa, and Latin America, the FFSs Approach has been widely implemented. Local facilitators' adapta-

tion to the widespread has coincided with local cultural and socioeconomic change. The approach reached smallholder farmers by sharing knowledge and skills, which had a positive impact on transforming farmers and raising the quality produce (yields) and income of farmers, according to the available empirical evidence. The majority of the study reported a sustained and consistent decrease in pesticide use, which was also concluded to be due to the impact of training.

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CONFLICTS OF INTEREST:

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