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

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ABSTRACT

Providing farmers with access to technology and management approaches is crucial for sustainable agricultural development initiatives. For this purpose, policymakers make use of consulting and agricultural extension services. Historically, lawmakers have utilized the extension as a "top-down" institution to spread agricultural information to the general people. Some argue that conventional extension approaches are ineffective because they are "one size fits all," don't take into consideration the many different institutional and socioeconomic settings in which farmers work, and don't include them in developing practices and technologies that work in their specific settings. Furthermore, it was believed that in order to convey complicated information, more rigorous methods were necessary. One important part of the more inclusive approach to extension service delivery that has been in place since the 1980s is farmer field schools. In order to promote climate-smart agriculture, this article looked at farmer field schools. Also discussed in the article was FFS's role in public outreach and the promotion of climate-smart agriculture. Also included is a review of farmer field schools' experiences globally, with an emphasis on the approaches' consequences. Pros and cons of farmer field school approaches were also discussed in the article.

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

INTRODUCTION:

Osumba et al. (2021) found that climate change and variability had a detrimental influence on agricultural productivity, food systems, and food security. Overall agricultural yields in East Africa are projected to be negatively impacted by climate change by an average of 24.3%, with a range of 5-72% (Nyasimi et al., 2014). Agricultural productivity and agribusiness resilience may be enhanced by embracing more climate-resilient and ecologically sustainable production strategies (Recha et al., 2020). To back up revolutionary shifts, this investment from partners and entities in the agricultural value chain must be coordinated. Climate data that can be used to make a difference in the long run is crucial for this kind of change (Hansen et al., 2019; Clarkson et al., 2019). Despite this, most smallholder farmers are still struggling to make informed decisions in light of the climate "new reality" (Hulme, 2020; Osumba et al., 2021). The agricultural sector has to adopt a "climate-smart" approach if it is to tackle the complex challenges brought about by climate change. As a result, farmers will need to maintain effectively increase crop yields and incomes, adjust to a changing environment, and fortify oneself against its effects.

It is also required to minimize or eliminate emissions of greenhouse gases whenever feasible (FAO, 2013). To accomplish sustainable development goals, agri-culture must use climate-

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smart practices (CSA). By tackling food security and environmental issues simultaneously, it integrates the social, economic, and environmental dimensions of sustainable development. An important part of CSA is having all parties involved use a co-learning approach to encourage social learning. According to Rupan et al. (2018), Farmer Field Schools are an important strategy for capacity development that may help individuals and organizations improve their capabilities. One of the approaches used to teach adults agricultural skills is the field school model, which is based on group dynamics and practical experience (Stewart et al., 2014). Building resilient agricultural systems in the face of climate change may be achieved via the use of field school strategies that prioritize and integrate climatic information. According to Tomlinson and Rhiney (2017), Robert Chambers's "farmer first" principle is the basis of the FFS method, which is a bottom-up strategy. According to FAO (2019), this method has been extensively used to improve adaptive behaviors by means of social learning and capacity development.
A state-of-the-art, interactive, participatory learning technique, the FFS approach prioritizes learning via problem-solving and exploration. According to FAO (2016), the goal of FFS is to help farmers become better at evaluating their farming operations, finding issues, trying out remedies, and ultimately adopting the methods that work best for them. "Climate Field Schools" have emerged as an adaptation of the educational and empowering FFS method. In this study, we looked into FFS as a way to increase the scope of CSA programs.

Expanding Community-Based Systems: The Function of Extension and Advisory Services

The spread of climate-smart agriculture (CSA) may be greatly assisted by the use of advisory and extension services (EAS). Although EAS paves the way for the realization of all three of CSA's objectives—food security, adaptation, and mitigation—the organization is now concentrating on the former, namely enhancing food security. steadiness by means of increased output. Sulaiman (2017) argues that EAS should be used more actively to aid rural residents in adapting to and reducing the impact of climate change. There has to be a behavioral, strategic, and methodological shift among millions of agricultural farmers if CSA is to be expanded. Producers in this sector would do well to educate themselves on the effects of climate change if they are to adopt more environmentally conscious policies. By spreading information on developing technologies, EAS has long served as a connection between agricultural research and farmer assistance. While changes to farm-level agronomic techniques are important, they are not sufficient for the effective spread of CSA (Sulaiman et al., 2018). It calls for hospitable enabling environments to be identified and behaviors, technologies, and/or models (new, enhanced, adapted) to be promoted. Furthermore, it demands international and domestic supportive institutional frameworks, regulations, and financial investments (Neufeldt et al., 2015). Consequently, EAS requires substantial knowledge and experience to facilitate communication and information sharing across a broader set of stakeholders than is already feasible.

Aid in the long-term enhancement of productivity
As a result of the dynamic nature of agriculture and the changing demands placed on farmers, the emphasis of extension programs is moving from instructing farmers in the production of crops, livestock, and forestry products to co-developing technology with farmers and supporting innovation initiatives. Consistent with the shift in focus is the need for site-specific evaluations to determine which agricultural technologies and practices are required for CSA. In numerous countries, extension providers have found great success by utilizing participatory techniques and strategies. These include enabling rural innovation, innovation platforms for technology development and dissemination, and participatory technology development (Nederl & Pyburn, 2012). Along with extensive experience in traditional extension methods (e.g., in-person meetings, demonstrations, field days, printed materials, etc.), EAS has extensive expertise in the dissemination of technology, knowledge, and practices through the use of information and communication technologies (e.g., radio, mobile phones, video, social media), rural information centers (Takoutsing et al., 2014),

As an example from Kenya, there is farmer-to-

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farmer extension (Kiptot & Franzel, 2014). Improvements in adaption technology and consistent gains in productivity are both made possible by EAS's development and information sharing efforts (Shekmohammed et al., 2022).

Importance of creating resilience

According to Waddington and White (2014), EAS has extensive expertise with non-formal education and experiential learning methods, including farmer learning groups, local agricultural research committees, and farmer field schools. These programs aim to improve farmers' problem-solving and experimentation skills in order to promote the adoption and decision-making of knowledge-intensive agricultural practices. To help farmers diversify their income streams, some AS have taken a market-oriented approach to extension, including services like as marketing, value addition, and entrepreneurial skill development. Cooperation between EAS and humanitarian groups in the delivery of seeds and other inputs improves communities' ability to recover from severe weather events (Christo-plos, 2010). Despite the lack of focus on the subject, it is clear that new organizational and human competences and skill sets are often necessary to raise the importance of EAS in developing resilience (Davis et al., 2014).

Promotion of both adaptation and mitigation strategies for climate change

Historically, extension organizations have played the function of connecting farmers with other rural stakeholders and service providers by acting as a "bridge" between them. In recent years, AS providers from a number of nations have bolstered agricultural innovation systems (AIS) by contributing to the creation of multi-stakeholder innovation platforms in a variety of ways. Included in this role is serving as the primary innovation broker, which entails starting the innovation process and connecting all the participants. Other responsibilities include creating networks, supporting participants, facilitating access to information, knowledge, and expertise, and offering technical support, as well as acting as a "bridging" entity to encourage communication between participants (Sulaiman and Davis, 2012). In their 2013 article, Leeuw and Hall argue that innovation platforms, a kind of institutional innovation, may help with adaptation and mitigation efforts related to climate change. For a variety of purposes, including transporting research

When it comes to bringing together stakeholders like archers and farmers to talk about adaptation strategies and create instruments for climate service, AS can be a great mediator and facilitator. To help with mitigation efforts, extension agents may strengthen farmer groups and rural organizations, link them to carbon markets (both voluntary and regulated), and back plans to pay for ecological services.

Support for policies, campaigning, and monitoring

There is an immediate need for further data on the impacts of climate change on agriculture, and AS should take an active role in collecting that data and expanding CSA initiatives in tandem with farmers and researchers. Locally, in decentralized governance structures, AS can serve as an important voice in the "climate change advocacy coalition" (i.e., environmental advocacy groups, scientists, journalists, agency staff, lawmakers, and leaders in renewable energy technologies) to keep climate change at the forefront of policy discussions and to secure funding for community solar initiatives (CSA) (Pralle, 2009). When it comes to promoting CSA financing and policy change, EAS is uniquely positioned to educate lawmakers about the outcomes of climate-related catastrophes. Keeping climate change and CSA at the forefront of policy agendas can be achieved through the use of spokespersons who are directly affected by the changing climate. These spokespersons can put a human face on the problem, highlight potential solutions, and offer feedback on policies and progress (Pralle, 2009).

The Function of FFS in Raising Knowledge About Climate-Resilient Agriculture

Disaster preparedness and adaptation to climate change are only two of the many new subjects included in the FFS curriculum since its inception

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(Adger et al., 2009). According to Charatsari et al. (2015), the FFS methodology promotes the sharing and creation of knowledge that is tailored to the social and cultural contexts of the target population through group dynamics, interactive learning, hands-on experimentation, and direct peer-to-peer communication among participants. The fundamental means of educating farmers in the FFS approach are the ideas of experiential learning and social learning. people engage in social and environmental interactions (Nederlof & Odonkor, 2006). In a controlled environment, farmers may try out new methods of agricultural management, discuss and debate their results, and ultimately improve their practices (Settle et al., 2014). The FAO FFS program on Integrated Plant and Pest Management (IPPM) encouraged the use of more suitable cultivars and agroforestry techniques in Niger and Mali, two countries that are already adapting to the effects of climate change (FAO, 2015). Winarto et al. (2008) noted that Climate Field Schools in Indonesia promoted strategies for adapting to changing precipitation patterns, including collecting and analyzing data on rainfall on farms, collecting water from the ground, and raising awareness about the importance of climate change. A number of countries have started using field schools as a means to make communities more resistant to climate change since 2010. Countless countries have implemented environmental field school initiatives with the help of FAO. Disaster risk reduction and climate change adaptation have been incorporated in projects in Eastern and Southern Africa, namely in Uganda, with the support of short- and medium-term interventions. These programs aim to address several risks to livelihoods. Other groups have experimented with climate field schools in other nations, such as Nepal, Indonesia, the Democratic Republic of the Congo, and Bangladesh. Through its work in farmer fields and business schools, CARE has tackled the issue of climate change in several countries, including South Sudan and Honduras. These efforts have led to the release of several technical modules and guides on resilience building via field schools (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 dem- onstrated to have an impact on adoption, productivity, and knowledge. FFSs have allowed farmers to dram- atically 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 Ame- rica 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 evalu- ations revealed that studies consistently and signi- ficantly 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, con- nections, and regulations about better agro-ecosystem management (Van Den Berg, 2004). According to Davis *et al.* (2010), FFS raised earnings and produc- tivity 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 gra- duate was trained to start their farmer field schools,

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also known as farmer-to-farmer schools (FSS) (FAO, 2008). Through extension services, NGOs, and rese- arch 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 train- ing 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 Afri- can 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 beendeveloped 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 imp- roved 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 producti- vity 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 grea- ter 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 im- pact on net revenue (Davis *et al.*, 2010; Haile, 2020).

Framework for Institutional and Policy Engage- ment 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 metho- dology improves adult learning and local capacity dev- elopment. The participants were unanimous in their be- lief that to successfully integrate climate literacy into the process, agronomists must work more closely with available agrometeorological service providers to en- sure that farmers are properly instructed in how to apply climate information and "agro-weather" adviso- ries 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 pur- sue this advocacy agenda locally (Okoth *et al.,* 2006).

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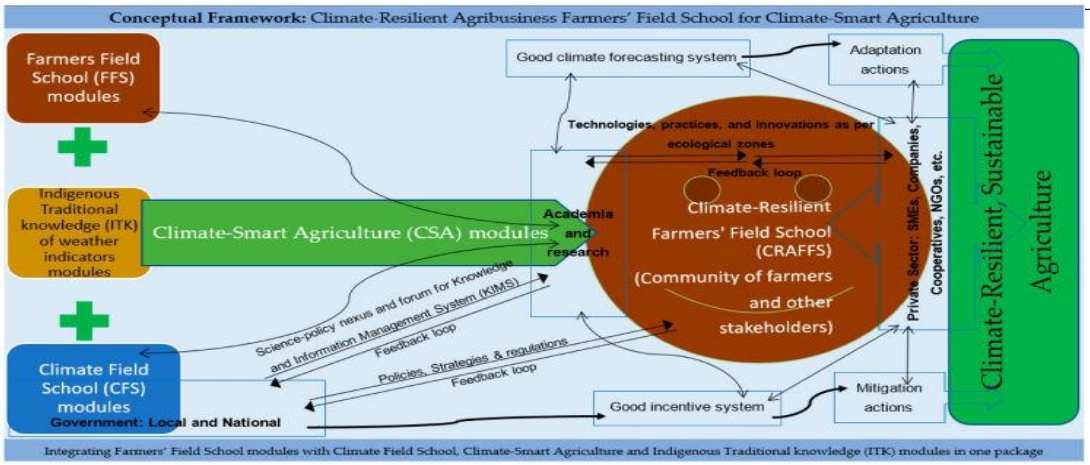

Fig. 1: A theoretical foundation for the new Farmers' Field School for Climate-Smart Agriculture, an integrated, innovative, and Climate-Resilient Agribusiness.

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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 quali- fied outside experts. To enhance human potential and empower people, FFS is essential in giving a plat- form. This can eventually assure the success of ser- vices provided to the community (Braun & Duveskog, 2008). The FFS process promotes group interaction and the growth of group management abilities, parti- cularly in women. In this way, the FFS serves as a tool to empower vulnerable farmers to form cohesive eco- nomic 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 com- munity, 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 pro- cesses. 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 ext- ension, 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 curri- culum design, which is often subpar or inappropriate.

Weaknesses

Extension, credit cooperatives, core estates without growers, farmers' training centers, and the use of mass media are more well-known technology-centered or profit-driven development strategies; FFS are not a replacement for these or any other well-known strategy (Braun & Duveskog, 2008). An educational model that heavily emphasizes experience learning, action research, and critical thinking is supported in order to equip farmers to take the lead in adapting local practices. Using the FFS to quickly and widely implement standardized recommendations is not the best course of action. In these cases, transferring technology may be helpful, and non-FFS methods, such as community meetings and radio, are often more suited to solving the issue at hand. Because of this, campaigns and the FFS were either carried out simultaneously or in tandem. There may be problems with the long-term financial feasibility of FFS because to its high price tag. Training activities may be rather costly per farmer. According to Zuger (2004), the cost of FFS per trained farmer is $62. Efficiency and long-term viability may be enhanced if farmer trainers were the main instructors. Executing FFS mostly involves funding facilitators, delivering supplies, monitoring, and graduation. FFS often suffer from a decline in quality because to ineffective curriculum design and an insufficient emphasis on student learning. On rare occasions, the approach's components will be selected apart from the FFS-integrated principles of adult education and practical training (FAO, 2013). You need to apply the strategy in its entirety to attain the desired results; ignoring its essential principles and components will usually render it ineffective.

CONCLUSION:

To tackle the complexity of CSA and make sure that all the different players in pluralistic rural advisory landscapes are working together efficiently, we need effective rural advisory systems. These systems include the organizations and individuals that provide extension and related services (like education, research, and agribusiness support), as well as the policy and regulatory frameworks that control how the system works. The

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role of public sector extension in rural advisory systems might vary depending on the setting, but generally speaking, government entities take the lead or work together on policy and regulatory frameworks. The assessment considered the FFS approach's merits and shortcomings as well as its concepts, implementation, and effectiveness. Nevertheless, it has expanded to include a wider range of subjects in many settings, such as organic farming, animal and soil husbandry, forest and groundwater management, human health, gender concerns, and advocacy, among numerous others. The main objective is to teach farmers how to use integrated pest management (IPM) techniques while cultivating rice. Latin America, Asia, and Sub-Saharan Africa have all seen extensive use of the FFSs Approach. The flexibility of local facilitators local cultural and economical changes have occurred simultaneously with the expansion to a national scale. Based on the available empirical evidence, the strategy successfully reached smallholder farmers by sharing information and skills. This had a beneficial influence on farmers' transformation, leading to higher quality product (yields) and revenue. Most of the research found that pesticide usage decreased with time, and that this decline was mostly attributable to the training's effect.

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