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ORIGINAL RESEARCH ARTICLE

The role of Multi Actor Communities of practice in dissemination of push-pull technology

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ABSTRACT

Maize production is the main source of income in rural western Kenya, where 70% of the population lives below the poverty line. Many maize farmers over the years have been experiencing losses in their production that are brought about by striga weeds, stemborer, and fall armyworms as the major menaces. Push-pull technology (PPT), which was developed over three decades, has proven to be an effective organic method for reducing these biotic stressors. Multi-actor communities of practice (MACs) are important in the dissemination of agricultural technologies to diversified farming communities at different levels for enhanced adoption through the use of effective dissemination pathways. UPSCALE is a Horizon 2020 project whose aim is to promote wide-spread push-pull Pull Technology adoption through the transdisciplinary engagement of MAC. This paper focused on two objectives: to compare the differences in maize yield among adopters and non-adopters of PPT and to evaluate the effects of MACs on the adoption of push-pull technology in western Kenya. This brings the relevant stakeholders on board to ensure smallholder farmers realize the associated benefits of PPT and other agricultural technologies. It has been established that MACs collaboration can aid in increased adoption of agricultural technologies such as push-pull technology, as this is shown through responses from farmers via services they acquire from MACs. MACs inclusion is important because they interact directly with farmers to ensure farmers are up to date with new technologies in terms of information sharing, technology promotion, and the supply of inputs required to adopt technologies. Additionally, adopters tend to get higher maize yields as compared to non-adopters, based on the obtained results. Given the importance of involving MACs at every stage of technology adoption, there is a call to fully engage with stakeholders in ensuring the dissemination of agricultural research and technologies.

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Key words: Multi-actor communities of practice, macs upscale, push-pull technology (ppt), dissemination (uptake) stakeholders

1.0 Introduction

Agriculture is one of the most viable sectors in terms of achieving global food security, creating employment, increasing economic growth, and attaining environmental sustainability in Africa. Its transformation is an eminence in the policy agenda of African governments in their quest to meet the challenges of food and nutrition security, youth unemployment, mitigation of climate change, and economic growth (Osabohien et al., 2020). Most African countries, Kenya included, have over the years constituted various initiatives to address unemployment, food security, and youth participation in agriculture, but the impact of those initiatives has been minimal due to changes in governance, changing government policies, and inadequate implementation of new and existing agricultural technologies, among others (Ogunmodede et al., 2020).

Maize production is the main source of income in rural western Kenya, where 70% of the population lives below the poverty line. Many maize household farmers over the years have been experiencing losses in their production that are brought about by striga weeds, stem borer, and fall army worms being the major menaces. Push-pull technology, which was developed over three decades, has proven to be an effective organic method for reducing these biotic stressors (Cheruiyot et al., 2022). Despite the numerous benefits the technology has, there still exists inadequate information on the contributions of different actors to enhancing the adoption of push-pull technology. Available literature on push-pull technology, such as Medina-García et al. (2022), provides information on factors that affect adoption level without considering how different actors can be engaged in the adoption of PPT to scale up the dissemination of information for more maize household farmers to adopt the technology. Furthermore, despite the numerous food insecurity and nutrition reduction initiatives that have been implemented in the country, such as the Sustainable Development Goals (SDGs) that address food security and poverty reduction, high levels of grain losses still persist among rural households.
Several interventions to curb maize production losses have been established, including the use of chemicals and hand weeding, which have been considered unfriendly, insufficient, and unaffordable to the environment (Giller et al., 2014).

Push-pull technology (PPT) that was developed by the International Centre of Insect Physiology and Ecology (ICIPE) has gained popularity in its over twenty years of existence, as by the end of 2014, 27,560 smallholder maize household farmers had adopted it in its different variations.40% of these adopters were female maize household farmers. The study will focus on determining the maize yield among adopters and non-adopters of PPT and also evaluating the effects of MACs on the adoption of PPT. In western Kenya, it is estimated that more than 76% of land under maize

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production is infested with Striga weed, causing up to 100% losses in yield, which is equivalent to 10 estimated annual economic losses of $40.8 million (Kanampiu et al., 2018).

This highlights the significant roles of multi-actor communities of practice (MACs) in achieving the dissemination of push-pull technology. Multi actor communities of practice (MACs) refers to researchers and other stakeholders working together by integrating their knowledge and perspectives into a shared problem definition to solve a real-life problem. They are important actors in disseminating agricultural technologies to diversified farming communities, policy makers and service providers at different levels for enhanced adoption by the use of effective dissemination pathways. They operate in the community to support agricultural activities and innovations for increased food productivity.

Collaboration of MACs can aid in increased adoption of agricultural technologies such as push pull technology (PPT) because uptake and use of a technology is encouraged. MACs have been selected in this study because they directly interact with farmers in the public and private sector to ensure the farmers are up to date with new technologies in terms of information sharing, technology promotion and supply inputs required to adopt a technology. MACs ensure promotion and adoption of new/existing technologies so as to transform the agricultural sector.

It should be noted however that,(Sah et al., 2021) recommended that farmer to farmer methods were effective in technology transfer with about 80% of maize household farmers who attend field days understand and adopt a technology. Human and technical capacities of different actors build an effective and sustainable adoption thereby enhancing the link between the MACs. This in turn facilitates subsequent technology refinement and resource mobilization for improved policies designed to curb food insecurity of smallholder maize household farmers (Nyagwansa et al., 2021)

A study by Khan et al ,(2011) emphasized on the multi-level collaboration of research institutions, extension networks, NGOs and farmer groups as one way of effectively disseminating information on push pull technology. Additionally, extension efforts that are underpinned by a robust scientific base can accelerate the upscaling of the technology.

Access to clear information about an agricultural technology and its demonstrated efficacy are some of the key factors that determine technology adoption. mentioned improved farming system performance and reduction on external inputs depending through combination of traditional farming practices and modern science. According to (Kassie et al., 2018)about 77 percent of the western Kenya population relies on cultivation, forestry, fisheries and livestock as their main source of income. Therefore, interaction between MACs and the maize household farmers is a central tenet in agricultural technologies adoption.

According to Nyangau et al., (2018)maize household farmers need to be involved from the beginning of an agricultural technology implementation exercise with specific objective of

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empowering them, this ensures they co-create knowledge and adoption becomes easier with the actors i.e., policy makers, academia, extension agents and NGOs. Studies have shown that inclusiveness and active involvement of all Stakeholders nurtures a deep sense of pride in the agricultural developments for a great achievement of the set goals (Brownson et al., 2018)

Just like any other agricultural technology, push pull technology is attributed to many challenges that are entangled to lack of strong national extension support, shortage of inputs (desmodium and Brachiaria seeds) and lack of information by some maize household farmers. It must be noted that this study will focus on how agricultural extension, schools, agro dealers and farmer advisory systems (NGOs) can effectively collaborate to ensure successful adoption of push pull technology so as to address these challenges for sustainable food security and resource utilization.(Silva, 2016)explained that countering the negative effects due to lack of formal education of maize household farmers, access to extension services has to be upheld. Moreover, information received through extension services create the platform for relevant information acquisition. In addition (Silva, 2016), posits that reduction in transactions cost on information among the larger heterogeneous farming population requires extension advisory services which mostly are provided by MACs. And this requires collaboration of all stakeholders for why effective information sharing that aids in uptake of PPT to improve maize yield for adopters and also positively impact the non-adopters on how the yields can be improve.

2.0 Materials and Methodology

As a reflection of the ongoing discussions at the transdisciplinary level, multi-actor communities (MACs) of practice were constituted under the UPSCALE project in East Africa. MACs included UPSCALE partners, NGOs, farmers, farmer cooperatives, extension personnel, agrodealers, and traders of maize and PPT products. Through several meetings with stakeholders, a review of the literature, and a survey that was done, many smallholder farmers have access to information on PPT. Therefore, there is a great need to focus on how multiple actors can be involved in promoting agricultural technologies, especially push-pull technology among farmers. UPSCALE is about realizing the transformative potential of PPT by expanding the applicability of its scope. As many experts, organizations, and adopters advocate for the necessity of PPT, the main questions remain: who are the actors and what is their role as farmers? How can they be engaged in the dissemination of the PPT? KII was done on actors, and a survey was also carried out on farmers to ascertain the role of MACs on PPT dissemination. The findings on maize yield differences will be done using a paired mean t-test. The effects of MACs on the dissemination of PPT findings were done through questionnaires and KII, which was done through a survey.

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3.0 Results and Discussion

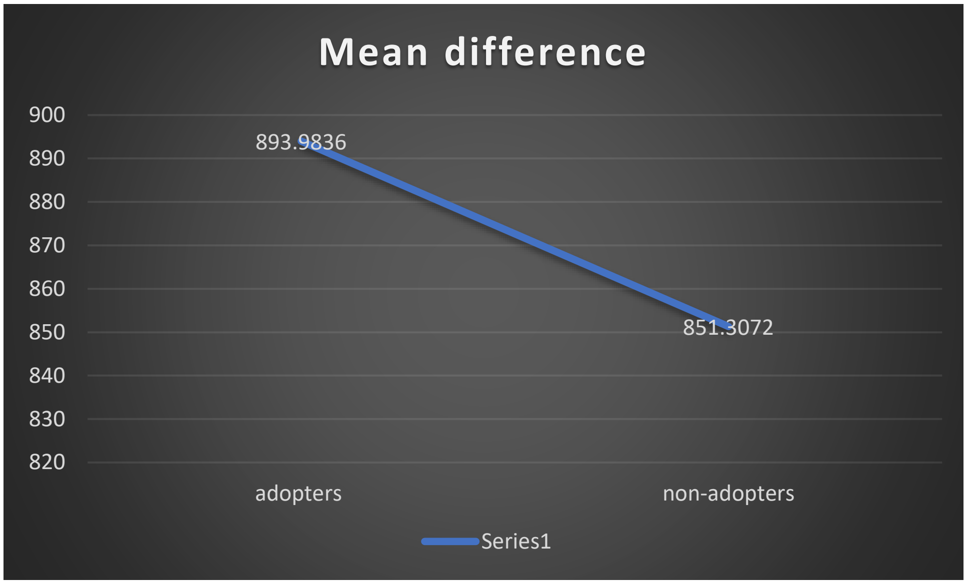

Figure 1:Maize yield mean difference between adopters and non-adopters of PPT

From the results, it was observed that there is a difference in productivity between those who are currently using PPT practices and those who are not. The adopters, on average, can produce 893.98 kg per acre, which is 42 kg more than their counter parts. In addition, the survey showed that the majority (77.3%) of the whole sample indicated that they were aware of PPT. The high level of PPT awareness is attributable to efforts being made by different MACs especially Icipe, in constantly promoting wider demonstrations through different dissemination pathways aimed at up-scaling PPT.

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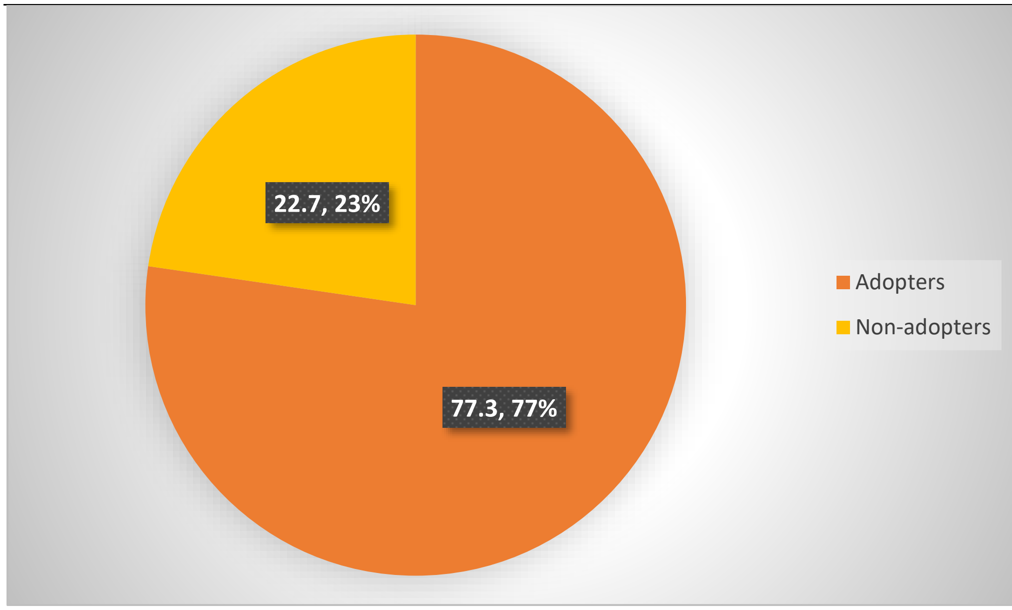

Figure 2: Farmer's level of awareness

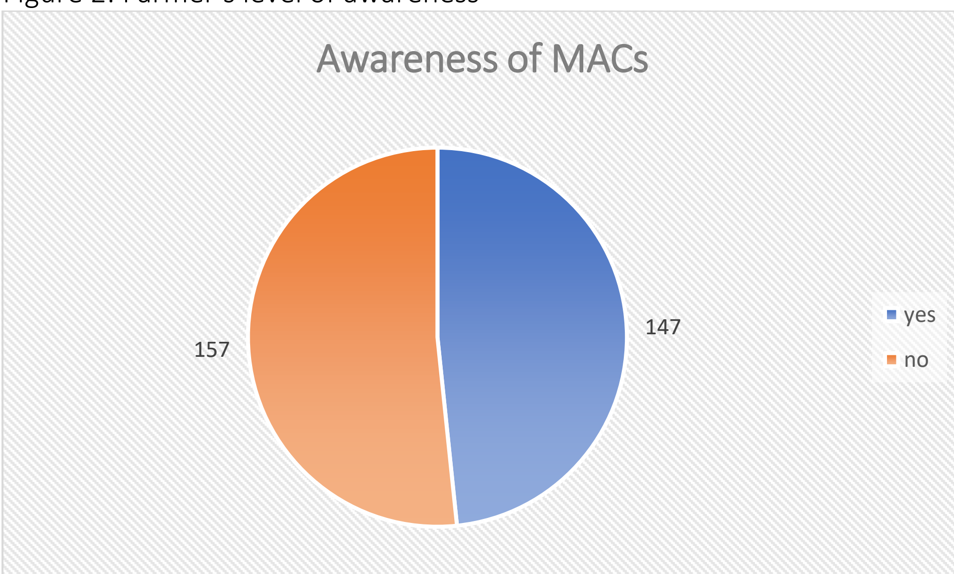

Figure 3: Awareness of UPSCALE Multi-Actor Community (MAC)

The results in Figure 3 showed that the farmers awareness of UPSCALE Multi-Actor Communities (MACs) was impressive, although it was still below average (48.36%). 70.75% of the farmers who were aware of the MACs organized PPT upscaling activities in the area. Of the portion of the farmers who were aware of these activities, 92.31% participated in those activities.

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Among the MACs, access to research, extension, and/or NGOs was reported to be the highest at 89.12%, while access to policymakers was the least at 6.12%. Access to the other MACs was reported as follows: access to financial institutions: 8.16%; access to agro-dealers: 45.58%. These results are further elaborated by the services that the farmers obtained from the MACs; high-end extension services were the most acquired service at 87.76%, followed by input supply at 55.78% and financial support at 8.84%. The results show the need for more engagement with the MACs on technology dissemination.

Variable	frequency	percentage
Icipe staff	175	74.7
Research centers	39	16.60
Government Extension	5	2.13
Farmer cooperatives/Groups	7	2.98
Farmer Field Schools	5	2.13
NGOs/CBO	7	2.98
Fellow Farmers	44	18.74
Universities	1	0.43
Social media: YouTube/ TV/radio	9	3.83

Table 1: MACs influence on dissemination of PPT

The farmers' awareness of the PPT was facilitated by a combination of different actors, ICIPE staff were the most influencers on PPT adoption at 74.47%, followed by influence of fellow farmers and Research Centre (trials/demos/field days) at 18.72% and 16.60% respectively. It is worth noting that even though the Universities had an influence in PPT awareness it was the least impactful at 0.43%. From the results it can be noted that farmers were aware of other farmers PPT practices as the reported an average 5.91 neighboring farmers to be practicing it.

As at the time of conducting the study, 44.68% of the farmers were practicing PPT while 55.32% were not practicing PPT. 44.76 % of those who were not currently practicing PPT had previously in the past adopted it and later disadopted it while, 55.24% of those who were not practicing currently had never adopted it even before. Of the farmers who were currently practicing PPT 76.84% had practiced it consistently over the past years.

4.0 Conclusion

The MACs engagement is critical to the dissemination of the PPT. Their effects on technology dissemination, primarily input supply, financial support, and extension services, are critical to farmers urge to adopt a technology. The farmers opinion on MACs calls for the need to enlighten

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them on the role of actors and engage the stakeholders to create a trans-disciplinary network, which will in turn call for a greater understanding of PPT production among the farmers in order to achieve food security.

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