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POLICY BRIEF

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THE CONTRIBUTIONS OF FARMER GROUP PARTICIPATION TO IMPROVED NATURAL RESOURCE MANAGEMENT PRACTICES

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NATURAL RESOURCES MANAGEMENT

The need to improve natural resources management (NRM) practices to enhance soil fertility and reduce natural resource degradation in Kenya continues to attract much attention. This is due in part to the decline in soil fertility which constrains agricultural production and farm incomes and, in part to the degradation of functional soil properties. At the same time, farmer groups are commonly being promoted as a means to advance the same productivity objectives. But what relationship, if any, exists between adoption of INRM practices and farmer group participation? Groups are often viewed as possible avenues for extending the results of relevant research technologies to more farmers.

Groups may facilitate low cost access to information, thereby stimulating technology adoption, enhancing contract enforcement and facilitating labor sharing at critical times. They may also be important in cooperative marketing, input supply, or savings and credit, all key enabling conditions for adoption of INRM practices. But the ability of the groups to respond to these tasks depends on the social structures internal to the groups, structures that organize the formulation and enforcement of rules, collective decision making and implementation of joint actions. This capacity also depends on the relationship of the groups with the state and other external agencies.

Thus, some types of groups may be more effective than others in supporting traditional extension functions by helping their members to identify farming constraints, problems and opportunities in their farming systems by locating the information, resources and influence necessary to facilitate utilization of INRM practices effectively. Farmer participation in research and extension activities may therefore be interlinked with farmers' adoption of INRM practices for a sustainable agriculture and livelihoods among smallholders.

However, despite widespread current fascination with community groups, little nuanced assessment of their impact on adoption of INRM practices among smallholder farmers exists. This is due in part, to past studies' focus on the effects of households' group membership and less on the social learning and access to services mediated by those groups, and partly due to failure to distinguish which group types are best placed for particular functions. These limitations hinder understanding of salient group participation effects on farmer technology use. Hence establishing whether adoption of INRM is a function of group type, the group's production of social learning and the extent of group mediation of access to services is a necessary investigation.

Three principal propositions underpin this analysis. First, the type of group that one participates in as measured by membership in either a community or a supra group, produces significant differences in farmers' level of knowledge and application of INRM practices. Community or local groups are groups formed endogenously within a community of their own accord based on their own identified needs, whereas supra groups are formed exogenously by or in cooperation with external agencies (e.g., government, NGOs, private businesses) in response to some anticipated resource flow between external entities and the community. Second, the type of participation that one experiences, as measured by the density of mediating structures and the quantity of services accessed through each type of structure, exerts an important and significant effect on adoption of INRM practices. Third, social learning, as measured by the number of learning platforms one uses to learn about the practices, has a significant effect on adoption of INRM practices. These propositions are important in

policy analysis and design concerning how government, donors, nongovernmental organizations and other actors can enhance groups' capacities to support smallholder agriculture.

METHODS

Data were collected through a survey on a random sample of 480 farmers in three purposively selected districts in Kenya: Embu, Vihiga and Baringo. In addition, focus group discussions were held with local groups to identify their functions and organization in order to determine the status of adoption of INRM practices, establish whether differences in knowledge and application of these practices are a function of participation in groups, identify socio-economic factors that influence adoption of the practices, and explore the influence of group participation and social learning on adoption of INRM practices.

Three measures are used to estimate propensity to adopt the practices: soil fertility enhancing (SFE); soil and water conservation (SWC); and integrated natural resources management (INRM) practices, which is derived from the first two sets. Ten SFE practices included use of inorganic fertilizers, animal manure, crop rotations, compost manure, improved fallows, and biomass transfer and crop residues. Sixteen SWC practices included contour (*fanya juu*) terraces, managed grass strips, use of banana trees, cut-off-drains, planting pits (*tumbukiza*), contour hedges, trashlines and napier grass. Accordingly, three adoption indices were computed using principal components analysis to internally generate weights on the practices, with higher scores indicating higher propensity to adopt a portfolio of the practices. These indices are unit-less normalized factors, (the first principal component in each set of measures), representing the factor that explains the largest variance in the portfolio of practices in use.

Participation in either local or supra groups is determined by the density of memberships of each type to which a household belongs. Such participation, in turn, may offer several benefits: *material* (increase in consumption, income or assets), *social* (services such as schools, health clinics, water systems, improved and better roads), and *personal* benefits such as self-esteem. The distribution of service access was estimated by summing all possible services obtained from each type of group. An increase in diversity of services provided, controlling for the density of group memberships, identifies the adoption effects of providing more services through the same group type.

Learning platforms are the group opportunities farmers use to learn about agricultural practices. For our purposes, such platforms include Farmer Field Schools, Common Interest Groups, Conservation Groups, etc., in which there is farmer-to-farmer sharing of information and experiences. We summed all the cases in which the farmers indicated learning about INRM practices in a group to derive the number of learning platforms. Farmers also rated their level of knowledge about each practice on a scale of 1-5 as 'very good,' 'good,' 'poor,' 'very poor,' and 'don't know' respectively. For each practice, the first two scales were rescaled 1 and the rest 0. The variation in the level of good knowledge about all the practices was thus obtained by comparing the sum of scores of these binary scores. The same computation procedure was used to develop an index of competence (skill) for each practice, with higher scores reflecting greater general knowledge and application of INRM practices.

ADOPTION PATTERNS OF NRM PRACTICES

The analyses reveal statistically significant differences in the adoption status of the INRM practices across the three districts except animal manures, crop rotation and improved fallows. In Embu over 99% of farmers use mineral fertilizers, and more practice crop rotation (74%) or improved fallows (24%) than in Baringo and Vihiga. In Vihiga, a higher proportion of farmers use compost manure (75%), biomass transfer (57%), green manure cover crops (79%) and crop residues (93%). This reflects the intensive agriculture practiced in land scarce Vihiga District. Natural fallows seem to be most common in Baringo (73%), compared to 35% of Vihiga and 29% of Embu farmers. However, a majority of the farmers use animal manure as a soil fertility management strategy: Baringo (74%), Vihiga (91%) and Embu (91%).

The majority of the SWC practices are in use by Vihiga farmers; 81% use *fanya juu* terraces, 85% use *tumbukiza* pits, 66% use trashlines and 95% use napier grass. More Baringo farmers use unmanaged grass (41%) and stone terraces (37%) than in either Embu or Vihiga. On the other hand, banana trees are grown more by Embu farmers (83%) compared to Baringo (27%) and Vihiga (61%) farmers. The growth of banana tissue culture groups in Embu working in collaboration with the Kenya Agricultural Research Institute, KARI, to promote banana biotechnology attests to the importance placed on bananas in Embu. The observed differences in the use of SFE and SWC practices suggest variation that could be accounted for by group participation, social learning, and service access by group affiliation.

Analysis of variance results show that there are statistically significant differences between Districts in households' propensity to adopt SFE and SWC practices (Table 1). Vihiga farmers have the greatest

propensity to adopt SFE practices compared to those in Embu and Baringo, with more than twice that by Baringo farmers and more than 80% by Embu farmers. A similar trend is observed in the propensity to adopt SWC practices, with Vihiga farmers having more than thrice that by Baringo and with more than 44% that by Embu farmers. Overall, Vihiga farmers have almost three times the propensity to use INRM practices as Baringo and more than 50% that by Embu farmers.

Table 1: Comparing Means of Adoption Factor Indices

Dependent Variable	(I) District	Mean	(J) District	Mean	Mean Diff. (I-J)
SFE Index	Vihiga	.63	Baringo	-.75	1.38(*)
	Vihiga	.63	Embu	.13	0.50(*)
	Embu	.13	Baringo	-.75	0.88(*)
SWC Index	Vihiga	.55	Baringo	-.85	1.40 (*)
	Vihiga	.55	Embu	.31	0.24 (*)
	Embu	.31	Baringo	-.85	1.16(*)
INRM Index	Vihiga	.60	Baringo	-.91	1.51(*)
	Vihiga	.60	Embu	.31	0.29 (*)
	Embu	.31	Baringo	-.91	1.22(*)

* The mean difference is significant at the .05 level.

Analysis of variance of the SFE and SWC indices show that the adoption rates differ for supra group participation but that they are almost the same for participation in community groups. It thus seems that adoption of INRM practices is associated with participation in supra groups, so areas with significant supra group participation exhibit higher rates of INRM adoption. Similarly, there are statistically significant differences in the knowledge and competence of using both SFE and SWC practices via supra group participation. This suggests that participation in supra groups provides members with opportunities – e.g., information, outreach experience- that are relevant in enhancing members' knowledge and application of INRM practices. In fact Embu has 11% farmers participating in at least four supra groups, while Vihiga has only 3% and Baringo none. Community group participation produces significant differences only in the knowledge and not competence in the use of both sets of practices. These results suggest that differences in the knowledge and application of INRM practices are consistently significant through supra group participation whereas participation in community groups only accounts for limited differences in the knowledge of INRM practices.

More importantly, the means of learning platforms for all the INRM indices are statistically significantly different from zero across participation and nonparticipation in both types of groups. This means that for each type of group, the means of learning platforms across those participating and those not participating are not equal. Furthermore, differences in the average levels of knowledge, skills and learning platforms are also statistically significantly different from zero across districts. Overall, these results suggest that among factors affecting the likelihood of uptake of INRM practices, the type of group in which a household participates and the social learning opportunities it is exposed to are significant contributors, regardless of the district.

EFFECTS OF GROUPS ON ADOPTION

Given our objective of understanding how to improve the adoption of INRM practices by smallholder farmers, we tested the effect of group participation and social learning by using multivariate regression analyses. The independent variables significantly explained over 64% of the variation observed in the adoption indices. The results show that household resource endowments – level of education, mode of land acquisition and security of land tenure – have the expected, significant, positive effects on all the adoption indices. Size of land holdings, however, is not significant but has a persistently positive effect on adoption indices. Surprisingly, numbers of family members in off-farm employment and size of livestock holdings have significant but negative effect on adoption. There are also significant positive effects associated with male-headed households and with location in Embu or Vihiga Districts.

Even controlling for household resource endowments and attributes, supra group participation has a significant positive association with only SFE practices. It has a positive effect on overall INRM practices and a negative effect on SWC practices, both statistically insignificant. Services access by supra groups has a significant and positive association with adoption of SWC practices and a slightly positive effect on practices overall. On the other hand, participation in more community groups has a significant negative effect on the SWC and practices overall. Services access via them is also statistically significant and has a positive effect on the same NRM practices.

These results suggest that farmers participating in fewer community groups but in more supra groups are more likely to utilize INRM technologies. This perhaps reflects the differences in service access effect by both types of groups. The results suggest that supra groups are better structured than community groups to deliver a higher range of services able to facilitate adoption of INRM practices. Vihiga farmers (89%) participate in 1-3 supra groups compared to 80% in Embu and 40% in Baringo. This perhaps explains the much higher and modest propensities among Vihiga

farmers to adopt SFE practices compared to Baringo and Embu farmers respectively.

Interestingly, the number of learning platforms has a statistically negative and significant effect on both SWC and overall INRM but insignificant effect on SFE practices. On the other hand, knowledge about the INRM practices has a statistically significant and positive effect on their adoption. Compared to all explanatory factors, farmers' level of knowledge about the practices produces the largest effect on their adoption. This underlines the need for farmers to have appropriate knowledge and skills necessary for enhancing sustained use of INRM practices.

Summary And Policy Implications

Evidently, the use of INRM practices varies significantly across the three districts. Part of this difference appears attributable to significant differences in supra group participation, which positively affects INRM practice adoption. By contrast, community group participation does not appear to exert a significant influence on the adoption of INRM practices by Kenyan smallholders.

The empirical evidence shows that participation in more community groups does not necessarily enhance adoption of agricultural technologies, but rather the more services that such groups are capable of permitting farmers to access. The findings suggest that supra groups are better equipped for this role, hence membership in supra groups matters. Memberships in community groups could be effective in enhancing social learning in so far as they enhance farmer knowledge of INRM methods. The significant but negative effect of the number of learning platforms suggests that the quality of learning is perhaps more important than the number of learning forums in which a farmer participates. Farmers who have good knowledge of a range of INRM practices report significantly higher adoption rates. This suggests that strategies to promote INRM should focus on enhancing social learning processes.

Three policy implications merit these findings. First, policymakers need to pay more attention to the structure and channels of participation. Specifically, participation in community groups can be made effective by supporting farmers' acquisition of knowledge crucial to adoption of INRM practices. Social learning is a crucial factor conditioning the amount, kind and success of participation. Second, complementary support services such as input markets, information, credit, etc., are necessary for the groups to effectively carry out their mandate. With good group facilitation of social learning and requisite resources and services, rural groups appear capable of helping many farmers adopt and adapt INRM practices, as is needed to enhance sustainable livelihoods among Kenyan smallholder families.

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Further Readings

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