Adoption and Impact of Sustainable Intensification Practices in Ghana

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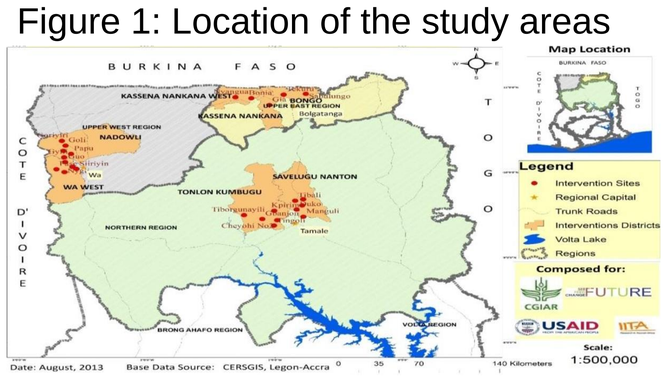
1. Introduction

While agricultural output can be increased by putting more lands under cultivation, it is becoming more and more difficult nowadays for many African countries to realize agricultural growth in such a way because of increasing land scarcity. Consequently, agricultural intensification has been promoted particularly since the remarkable achievements of Asian countries during the era of green revolution. More recently focus has been given to the sustainability of such practices mainly because of the negative environmental externalities of past practices. Sustainable intensification entails the application of multiple inputs and practices in an integrated manner to increase productivity while increasing contributions to natural capital and environmental services (Pretty et al 2011, Tilman et al 2002). This study aims to assess the adoption of sustainable intensification practices (SIPs) and analyse its impacts on farmers' income.

2.The study areas and the data

The study is based on data collected from 1284 households residing in 50 rural villages of northern Ghana in 2014.

Figure 1: Location of the study areas



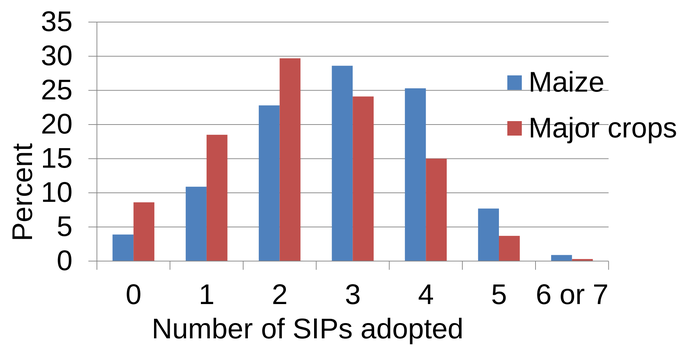
3. Method of Data Analysis

Seven SIPs were considered in our analysis namely, inter-cropping, crop rotation, organic fertilisers (mainly manure), soil and water conservation practices, inorganic fertilisers, improved seeds, and pesticides (including herbicides). A multivariate probit (MVP) model was estimated using a simulated maximum likelihood method to assess the integrated adoption of multiple SIPs. Moreover, we used a multivalued semi-parametric treatment effect model (MVTE) to estimate the effects of adopting SIPs on three productivity indicators i.e. gross return, net return, and returns to labour in maize production.

4. Findings

4.1.Rate of adoption

Figure 2: Adoption SIPs in Ghana



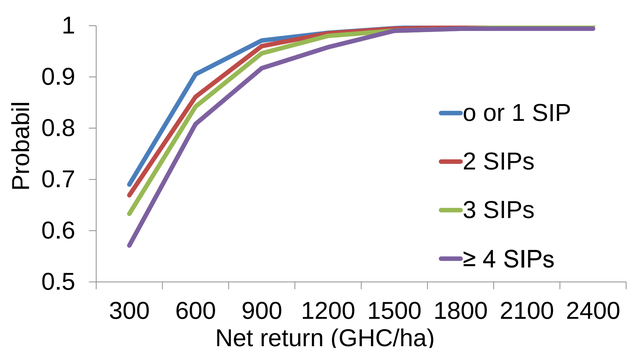
4.2. Determinants of adoption

The MVP regression result shows that 27 out of 29 explanatory variables could explain adoption decisions in at least one of the SIPs. Factors such as plot size, perception of soil erosion, off-farm income, contact with model farmer, and social capital have consistent positive relationships with at least three SIPs while per capita land size and distance from market have negative relationships. Other factors, such as plot ownership, slope, soil type, home-plot distance, livestock holding, access to credit, and sex of household head have a mixture of positive and negative effects. For instance, having more livestock enhances the use of organic fertilizers (manure) but reduces the likelihood of applying chemical fertilizers. The results also show that the adoptions of the SIPs are interdependent and that most farmers adopt agricultural practices as a package but not as a single technology.

4.3. Impacts of adoption

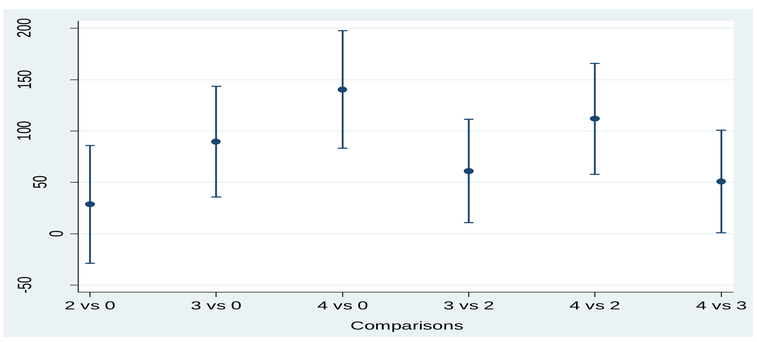
The first stochastic dominance analysis shows that the probability of lower returns is lower for farmers adopting more number of SIPs than those who adopt less (Figure 3)

Figure 3:Impact of SIPs on net return of maize



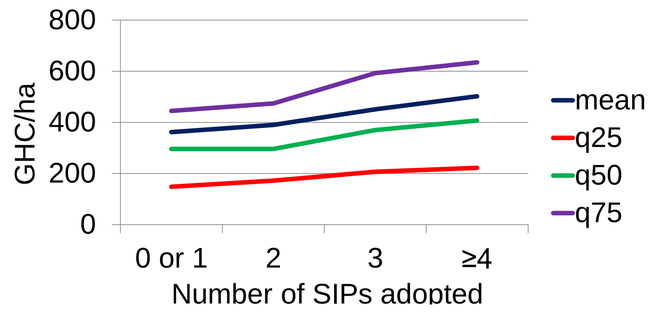
The mean maize gross return increases across treatment levels as one goes from no adoption of SIP category through to adoption of four or more SIPs category (Figure 4). All the coefficients are statistically significant at 5% or 1% levels.

Figure 4: Effect of SIPs on maize productivity, mean level



The Average Treatment Effect (ATE) increases as the number of SIPs increases for the 25th, 50th, and 75th quantiles. In all cases, the ATEs are significantly different from zero (Figure 5).

Figure 5: Effect of SIPs on maize productivity, by quantile



Conclusion

Our result shows that SIPs are interdependent and hence most farmers adopt agricultural practices as a package but not as a single technology. Such a mechanism of adoption has helped those farmers who adopted multiple SIPs to exploit potential complementarity among the technologies.

Acknowledgements

The authors are grateful to USAID/FtF Initiative for its financial support. We also thank project team members at IFPRI specifically Carlo Azzari and Beliyou Haile for sharing the data set with us.

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