Extended Abstract
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Paper/Poster Title	**Adoption and impact assessment of improved groundnut varieties on poverty using DNA-Fingerprinting data: Evidence from smallholder rural farmers in Northern Nigeria**

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Abstract	***200 words max***
Poverty among rural farming households in sub-Saharan Africa (SSA) is associated with low adoption of modern farming technologies, especially improved crop varieties. Most studies that investigated adoption and impacts of improved crop varieties in SSA are based on farmers self-reported adoption status and average treatment effects. However, farmers self-reported adoption status is susceptible to errors and assessing adoption impacts using average treatment effects do not account for farmers' heterogeneity. To address these challenges, we used DNA-fingerprinting data and Marginal Treatment Effect (MTE) framework to analyse adoption and impacts of adopting improved groundnut varieties (IGVs) in Northern Nigeria. DNA-fingerprinting results showed 57% adoption rate compared to 45% self-reported by farmers. About 29% of the sampled farmers made type I error (mistaking local varieties for improved varieties) while 44% made type II error (mistaking improved varieties for local varieties). Formal sources of seed information and empowering agricultural extension to reach more farmers was significant in ensuring accurate variety identification. Further, adopting IGV significantly reduced poverty gap and poverty severity, especially among households headed by females, older persons, lowly educated and those with limited access to credit. Therefore, policy options that enhance adoption of IGVs will significantly help in reducing poverty.	

Keywords	Groundnut; Variety adoption; DNA fingerprinting; Poverty; Nigeria
JEL Code	**Q160** Agricultural R&D; Agricultural Technology; Biofuels; Agricultural Extension Services see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	***100 – 250 words***

Majority of sub-Saharan Africa (SSA) population live in rural areas and experience extreme poverty and other deprivations. Most of these households derive livelihoods from agriculture and their welfare deprivation is normally associated with poor agricultural productivity. Several, empirical studies have linked this low agricultural productivity to persistent use of archaic farming technologies. This is despite existing evidence showing that adoption of modern farming technologies like improved crop varieties can significantly increase productivity, improve food and nutrition security, and reduce poverty. Reasons for low adoption of improved crop varieties and impacts of these varieties on household welfare have been analysed extensively across SSA. However, majority of these past empirical studies were based on farmers self-reported adoption

status which is susceptible to errors due to farmers' inability to correctly identify varieties. To address this problem associated with variety misidentifications, use of DNA–fingerprinting (DNA-FP) data is slowly but steadily gaining popularity as a gold standard for tracking crop variety adoption. Further, most past empirical studies that investigated welfare impacts of improved crop varieties were based on sample average treatment effects (ATE), average treatment effects on the treated (ATT) and average treatment effect on the untreated (ATU). However, target farmers are usually heterogenous in terms of their propensity to adopt and the way the treatment (adoption) impacts their welfare outcomes. To address these challenges, we used marginal treatment effects (MTE) framework. On the other hand, poverty was estimated using the three classical Foster-Greer-Thorbecke (FGT) metrics (poverty spread, poverty depth, and poverty severity).

Methodology

100 – 250 words

We estimate and analyze the impact of adopting improved groundnut varieties (IGVs) on poverty in five States of Northern Nigeria (Bauchi, Jigawa, Kano, Katsina and Kebbi) using cross-sectional data collected from 1279 smallholder farming households. The data is complemented with DNA-FP results from groundnut grain samples collected from surveyed farmers. Multi-stage sampling design was used to select survey units (households). Adoption estimation is based on DNA-FP results of groundnut grain samples collected from surveyed households. Confusion matrix (CM) was used to understand farmers' ability to identify groundnut varieties. Further, multinomial logit regression model (MNL) was used to analyze the determinants of accurate variety identification among sampled households. On the other hand, poverty was estimated using Foster-Greer-Thorbecke (FGT) poverty measures (Foster et al., 1984) while impact assessment was based on marginal treatment effects (MTE) framework.

Results

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The DNA-FP analysis revealed that sampled farmers were growing 36 distinct groundnut varieties of which 28 (78%) were improved. Further, self-reported adoption rate was 45% and DNA-FP confirmed adoption rate was 57%. About 44% of the surveyed farmers mistook improved varieties for local (type II error) while 29% mistook local varieties for improved (type I error). Overall, variety identification accuracy rate (whether improved or local) was about 62%. On the other hand, using per capita annual expenditure as a measure of poverty, we found that non-adopters are significantly poorer than adopters. Poverty headcount was estimated at about 32% and it did not vary significantly between IGV adopters and non-adopters. Further, the estimated poverty gap was about 15% and it varied significantly across the IGV adoption regimes with non-adopters having higher poverty gap (19%) than adopters (12%). Similarly, poverty was significantly more severe among non-adopters (14%) compared to adopters (6%). Finally, the MTE results showed that households with high propensity to resist treatment are likely to have high poverty headcount, high poverty gap and more poverty severity compared to otherwise.

Discussion and Conclusion

100 – 250 words

The 12% underestimation of adoption among sampled households was statistically significant. Therefore, there exists a non-trivial variety knowledge gap among sampled households. This self-misreporting of adoption may lead to biased estimation of research impacts which may result into misdiagnosis and ineffective policy options. The significant proportion of smallholder farmers misidentifying the groundnut varieties that they grew is likely to have implications on how accompanying agronomic practices are adopted on plots where these varieties are grown. Further, availability of improved groundnut seed dealers in villages, formal sources of groundnut seed and groundnut variety information, engaging farmers in technology trainings and increased visits by agricultural extension staff were critical in ensuring that farmers correctly identify groundnut varieties they grew. On the other hand, the non-significant difference in poverty head between adopters and non-adopters of IGV compared to significant difference in poverty depth and severity showed that showed that poverty was spread equally among adopters and non-adopters though it was more deeply rooted and more severe among non-adopters. Finally, the findings showing significantly heterogenous impacts of IGVs implied that policy options that can enhance adoption of IGVs among vulnerable households will significantly help in reducing poverty.