



Varietal choice and adoption of improved cassava varieties under DNA fingerprinting and Farmer report. A case of Malawi.

Muzee L. Kazamwali^{1,3}, John Ilukor², Nakamatte Irene³, Deogracious Opolot³

1 Evangelical University in Africa, DR Congo, Makerere University, Uganda, 2 World Bank, Uganda, 3 Makerere University, Uganda

Introduction

Most studies on adoption and impact of improved crop technologies in Malawi and in Sub-Saharan Africa (Twine et al., 2007; Rusike et al., 2010, 2014; Simtowe, Kassie and Asfaw, 2012; Ayoade, 2013) have relied more on farmer reports for varietal identification and estimation of adoption rates. This approach, as suggested by empirical evidence has been found to be less accurate and less informative, leading to varietal misidentification and misclassification in adoption status. Although the extent of misidentification and misclassification has been established in several empirical studies (Wossen et al., 2015; Floro et al., 2017; Kosmowski et al., 2018), their implications have not been examined. In this study, we examine the implication of misidentification and misclassification on varietal choice and adoption analyses.

Methodology

The study used data from methodological experiment on cassava varietal identification and productivity measurement (CVIP 2015) in five districts in Malawi namely Nkhatabay, Nkhotakota, Lilongwe, Zomba and Mulanje. Collected on 1129 households, the data provides detailed information on households' sociodemographic characteristics, agronomic data, varietal identification (DNA and self-report) as well as yield data. Probit and multinomial logit models had been used for identifying drivers of adoption and varietal choice respectively both under DNA fingerprinting and farmer reports.

Results

Misclassification in adoption status

- DNA analysis reveals that only 0.18% of the farmers planted improved cassava varieties while farmer report shows that 21% of the households planted improved varieties (see fig 1).
- Table 1 presents the incidence of adoption of local and locally selected varieties.
- Manyokola, Beatrice and Gomani are the most adopted varieties

Varietal misidentification

- Manyokola and Beatrice were correctly identified by farmers (73% and 60% respectively).
- Other popular varieties like Masangwi and Gomani were completely wrongly identified.

Households' determinants of adoption of improved and locally selected cassava varieties (see table 2)

- Adoption factors significantly vary under farmer report and DNA fingerprinting.
- Farming experience, gender of the household head, taste of the varieties and access to extension services, though key determinants of adoption of improved varieties under farmer report, could not be considered as such under DNA fingerprinting.
- Instead, household's wealth index and engagement in non-farm activities were identified as key factors affecting adoption of improved cassava varieties.
- effects of farmer's level of education on adoption of improved varieties were underestimated by 4 percentage points through farmer reports.

Households' factors affecting choice of cassava varieties

Taste remains the most important factor driving farmers' choices and preferences towards a specific variety (see table 3)

Conclusion

These findings suggest that policy implications regarding choice and adoption of cassava varieties in Sub-Saharan Africa need to be reconsidered and re-oriented for better promotion of the crop.

References

- Floro, V. O. et al. (2017) 'Household Determinants of the Adoption of Improved Cassava Varieties using DNA Fingerprinting to Identify Varieties in Farmer Fields: A Case Study in Colombia', *Journal of Agricultural Economics*, pp. 1–19. doi: 10.1111/1477-9552.12247.
- Kosmowski, F. et al. (2018) 'Varietal identification in household surveys: results from three household-based methods against the benchmark of DNA fingerprinting in Southern Ethiopia', pp. 1–15. doi: 10.1017/S0014479718000030.
- Wossen, T. et al. (2015) 'DNA-fingerprinting based identification of cassava varieties in Nigeria', in 21st International Consortium on Applied Bioeconomy Research, pp. 1–16

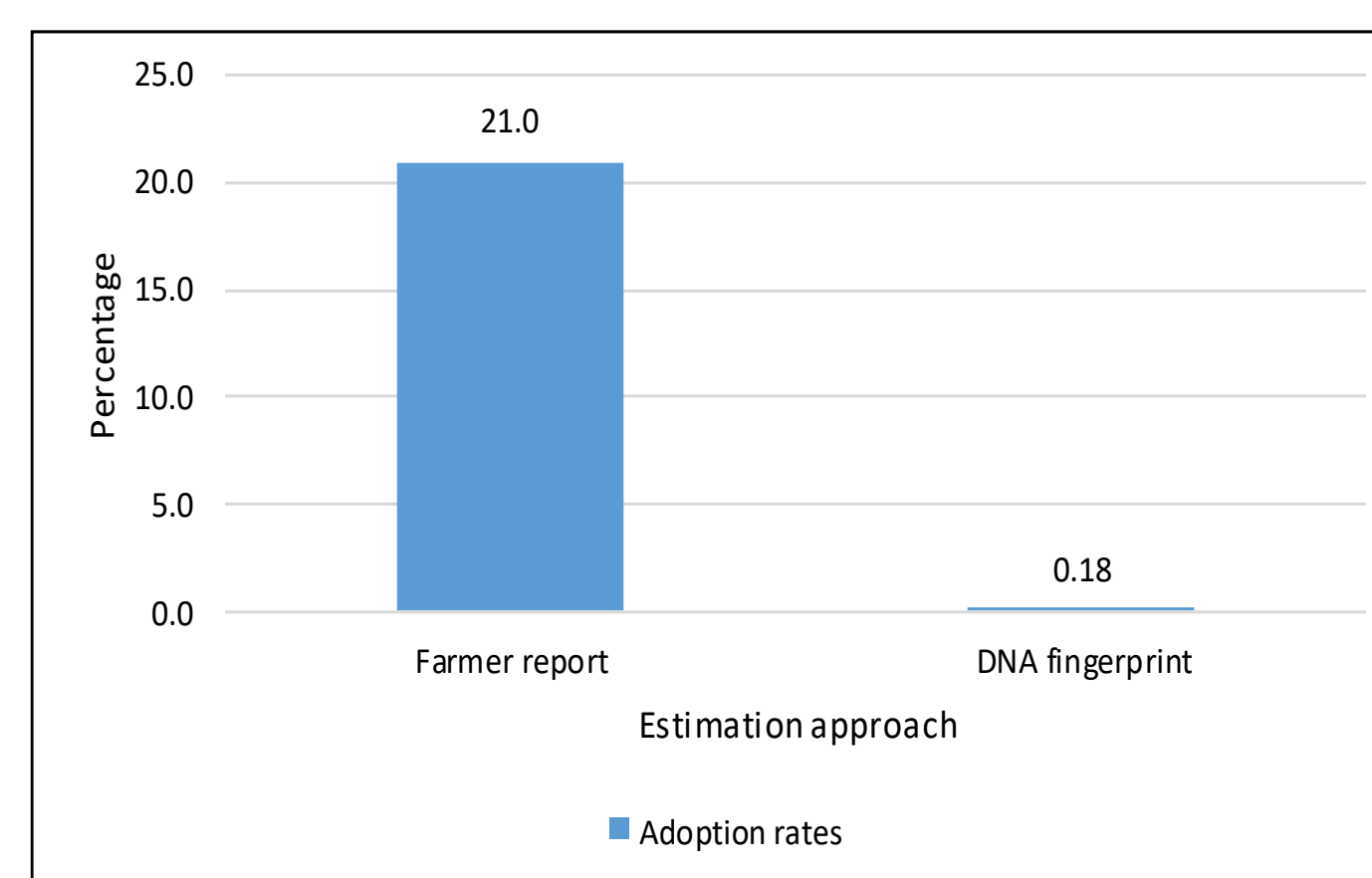


Figure 1: Adoption rates under DNA and farmer report

Table 1 Top 10 Most Cultivated Cassava Varieties based DNA Fingerprinting and Adoption Estimates as well as Rates of Correct Identification of Cassava Varieties Using Farmer Report

Variety Name	Variety type	Adoption DNA Fingerprinting (%)	Adoption Farmer Elicitation (%)	Farmer Elicitation Correct Identification (%)
Manyokola	Local selection	27.51	22.90	73.00
Beatrice	Traditional	9.94	14.00	60.00
Gomani	Local selection	9.32	3.45	21.00
Masangwi	Local selection	7.72	1.15	23.00
Matuvi	Traditional	3.02	2.66	37.00
MasoAzungu	Traditional	2.66	2.92	27.00
GomaniMtuwa	Traditional	1.77	5.70	2.00
Mzumuru	Traditional	1.42	0.00	-
Mchilingano	Traditional	1.06	5.14	12.00
Chitembwere	Local selection	0.89	0.18	0.00

Table 2. Household determinants of adoption of improved and locally selected cassava varieties

Variable	Farmer report dy/dx	DNA fingerprinting dy/dx
Logexperience	-0.0406492*** (0.009236)	0.011 (0.0097495)
Non-farm activities	-0.040 (0.0302534)	-0.1325894*** (0.0293557)
Household size	0.0094078* (0.0050674)	0.005 (0.0055756)
Female head of household	-0.054598* (0.0309255)	0.014 (0.0312909)
Education	0.0445853* (0.024169)	0.0870845*** (0.0241365)
Extension	0.0590777** (0.0274364)	0.000 (0.0262757)
Seeking for cassava info	0.016 (0.0271699)	0.007 (0.0283162)
Taste	0.203051*** (0.0249171)	-0.009 (0.0256922)
District Nkhotakota(2)	-0.015 (0.0420057)	0.0844143*** (0.0237279)
Lilongwe(3)	-0.0647402* (0.0373317)	0.9663774*** (0.0133524)
Zomba(4)	0.1447769** (0.0492099)	0.7128582*** (0.047934)
Mulanje(5)	0.1547849*** (0.0437677)	0.5172691*** (0.0409787)
LR chi2(21)	239.86	677.34
Prob>Chi2	0	0
Pseudo R2	0.2071	0.48
Observations	1125	1018
District fixed effects	Yes	Yes

Table 3. Household determinants of choice of cassava varieties

Variable	Beatrice		Manyokola		Gomani	
	Farmer report dy/dx	DNA Fingerprinting dy/dx	Farmer report dy/dx	DNA Fingerprinting dy/dx	Farmer report dy/dx	DNA Fingerprinting dy/dx
Childratio	-0.004 (0.0054298)	-0.006 (0.0047934)	0.0139013* (0.0076172)	0.002 (0.0057016)	0.0041838 (0.0041864)	-0.0024796 (0.0054685)
Non-farm activities	0.014 (0.0236527)	0.023 (0.0203104)	0.0563252** (0.026192)	-0.0732134*** (0.0219422)	0.0040238 (0.0152544)	-0.0128358 (0.0212056)
Household size	-0.0056176* (0.0030717)	-0.005 (0.0030174)	0.0084204* (0.0050396)	0.004 (0.003821)	0.0005616 (0.0019889)	-0.0006098 (0.0041516)
Logexperience	-0.005 (0.0051286)	-0.001 (0.0047193)	0.0147996* (0.0083102)	-0.003 (0.0068243)	-0.001495 (0.0036959)	0.0153241* (0.0078764)
Gardens owned/Gardens cultivated	0.0301312*** (0.0097444)	0.01 (0.0096842)	-0.006 (0.007901)	0.007 (0.007329)	-0.0207406*** (0.0078416)	-0.0067315 (0.0080875)
Education	-0.0359092* (0.0184684)	-0.003 (0.0167375)	-0.016 (0.0219163)	0.0338462** (0.016069)	0.0025133 (0.0119387)	0.0147012 (0.0166023)
Extension	0.11992*** (0.0240194)	0.0629503*** (0.0234626)	-0.012 (0.0239893)	0.014 (0.017936)	0.0098886 (0.0138195)	-0.0204106 (0.0174631)
Seeking for cassava information	-0.0556819*** (0.0167682)	-0.011 (0.0165202)	0.0957042*** (0.0243512)	-0.0440217** (0.02224)	-0.0068092 (0.0127704)	0.0360597 (0.0241343)
Wealthindex	-0.21786* (0.1303474)	-0.061 (0.1266706)	0.2251206** (0.099943)	0.113 (0.0914328)	0.0531567 (0.0608359)	-0.6025192** (0.2327229)
Taste	-0.0786649*** (0.0234177)	-0.1537885*** (0.0494685)	0.2931883*** (0.0340303)	0.1256229*** (0.0204728)	-0.0154202 (0.0125561)	-0.0613514*** (0.0138978)
Logcassavaseize	-0.001 (0.0108363)	0.0281058 (0.0107874)	0.009 (0.0112974)	0.004 (0.0091645)	0.0260221*** (0.0088178)	0.0202392 (0.0096252)
Percentage of intercropping	0.006 (0.0189527)	-0.008 (0.0177072)	-0.1555577*** (0.0323025)	-0.0818921*** (0.0206291)	0.0097494 (0.014205)	0.1045091** (0.039096)
Logyield	0.006 (0.0059416)	0.005 (0.0101961)	-0.0087408* (0.0045602)	-0.011 (0.0072295)	0.0014389 (0.003482)	0.0031439 (0.0075282)
District Nkhotakota(2)	0.1459261*** (0.048949)	0.146 (1.28382)	0.0354995* (0.0213788)	0.1262955*** (0.0435381)	-0.0194931 (0.0236367)	-3.87E-09 (0.00000618)
Lilongwe(3)	-0.2145407*** (0.034707)	-0.0649964*** (0.0179631)	0.2174974*** (0.02928)	0.8629996*** (0.056741)	-0.0665162*** (0.0185761)	7.94E-08 (0.0000977)
Zomba(4)	-0.2145407*** (0.034707)	-0.0649965*** (0.0179626)	0.4041189*** (0.041865)	0.235 (5.015761)	-0.0294508 (0.0278988)	0.417739 (9.140461)
Mulanje(5)	-0.2145407*** (0.034707)	-0.0649965*** (0.0179626)	0.221179*** (0.0432249)	0.0874413*** (0.038768)	-0.0665162*** (0.0185761)	0.0605769*** (0.0176023)
LR chi2(88)	1018.62	1591.77	1018.62	1591.77	1018.62	1591.77
Prob>Chi2	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R2	0.4134	0.5692	0.4134	0.5692	0.4134	0.5692
Observations	1125	1019	1125	1019	1125	1019
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes