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Determinants for Adoption of ICT-Based Market Information Services by Smallholder Farmers and Traders in Mayuge District, Uganda

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Introduction

Access to market information has been a major factor influencing smallholder agriculture globally (Barrett, 2008). However, the potential of Information and Communication Technologies (ICTs) to uplift agricultural development in developing countries (DCs) has not been well understood and used by stake holders (Singh, 2006). Markets accessed by smallholder farmers who form majority of the poor in DCs are characterised by poor infrastructure and limited investment capital (Barrett and Swallow, 2006), and ICTs are only adopted at a slow pace and haphazardly (Singh, 2006), keeping household incomes low, Okello (2005).

By 2010 only 0.99% of Ugandans had fixed telephone lines, 0.29% had operating pay phones and 38.9% were mobile subscribers though 70% of population is covered by mobile telephony, Farrell (2007). Despite the fact that 68.2% of adults are literate, 31.5% fully attended school only 1.8% are internet users, 0.5% have Personal computers and only 6% of households have TVs, (UBOS, 2011). Despite agricultural information exchange need in Developing countries to enable farmers access markets, little is known about available ICTs for use in Market Information Services (MIS), including characteristics of both; the technology and its potential users, creating knowledge gaps thus this research.

Objectives

- Determine ICT component combinations used by farmers and traders in MIS and reasons limiting use,
- Determine factors influencing farmers' and traders' adoption of ICT-based MIS, in Mayuge District
- Determine factors influencing choice of ICT combinations

Methods



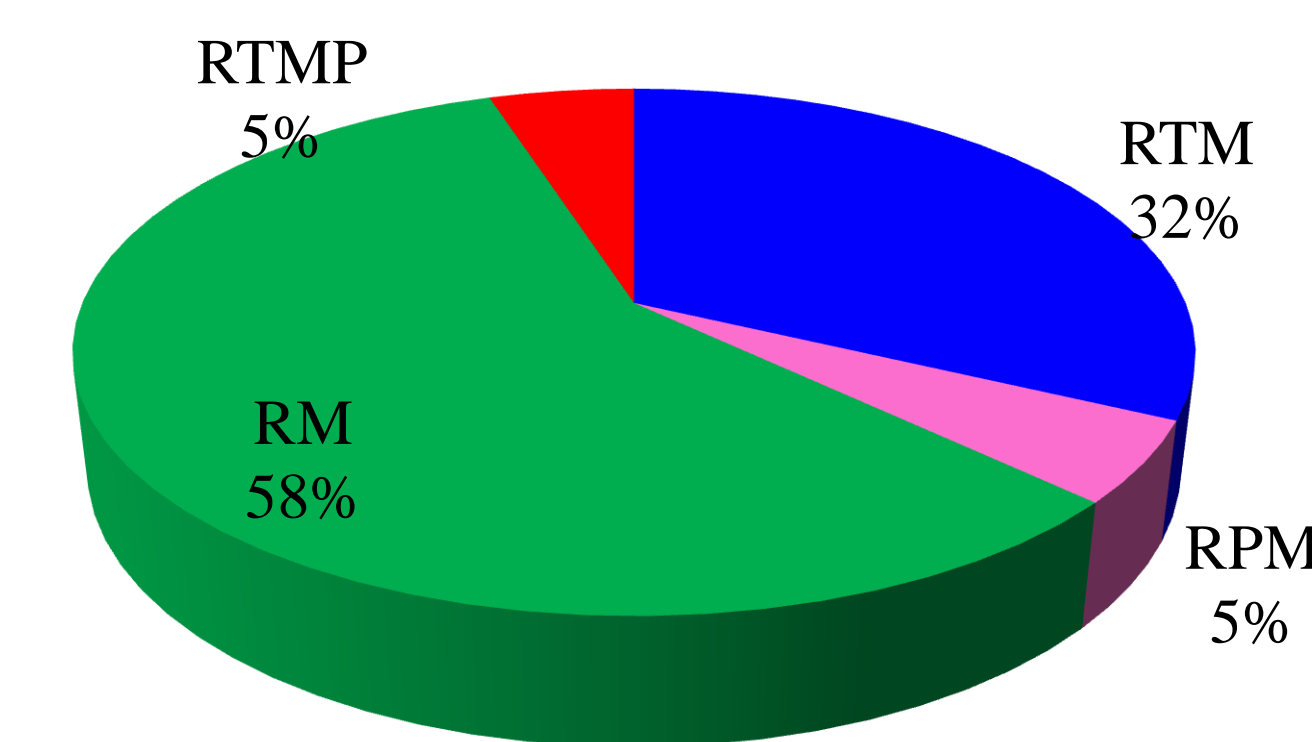
Five sub-counties where BROSDI (ICT rural initiative) operated were identified using regional coordinators who linked to village knowledge brokers with whom we walked around villages interviewing households. If household was described by brokers as BROSDI participating, its head was interviewed and next household was skipped if participated, unless it was described otherwise. Identification of starting household was random but maintained intervals of one (few participants) if more than one household were immediate neighbors of similar participation status. 150 farmers and 50 traders were interviewed. SPSS was used to generate descriptive statistics and STATA for Binary logit models on adoption for farmers, traders and Multinomial for sample's choice of ICT combination. Greene (2002) specifies logit model as ;

$$y = X'_i \beta + \varepsilon$$

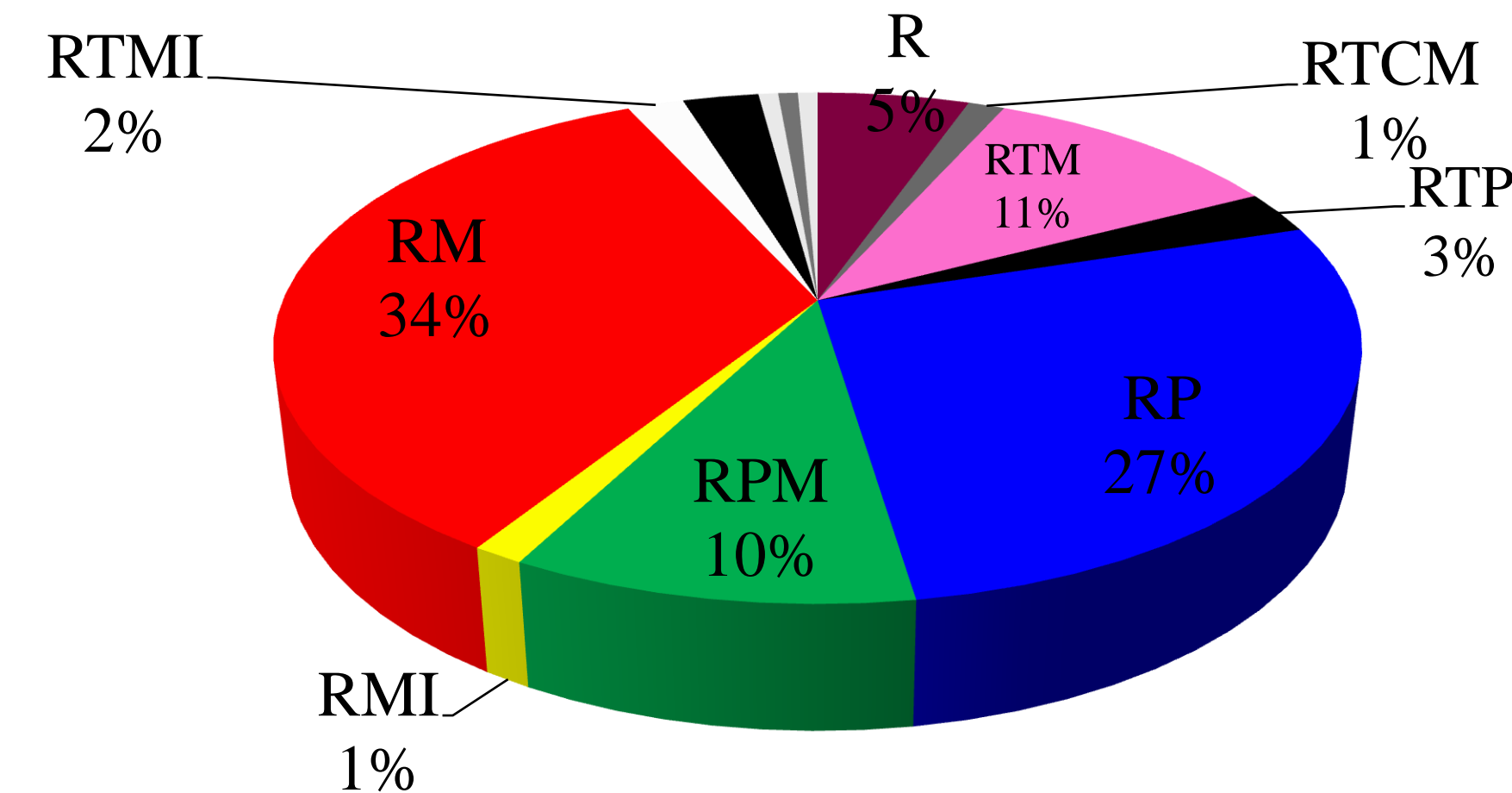
that is integrated to get Multinomial logit model. y = decision, X_{ij} = vector of household characteristics, β = vector of parameters, ε_{ij} = error terms.

Results and Discussions

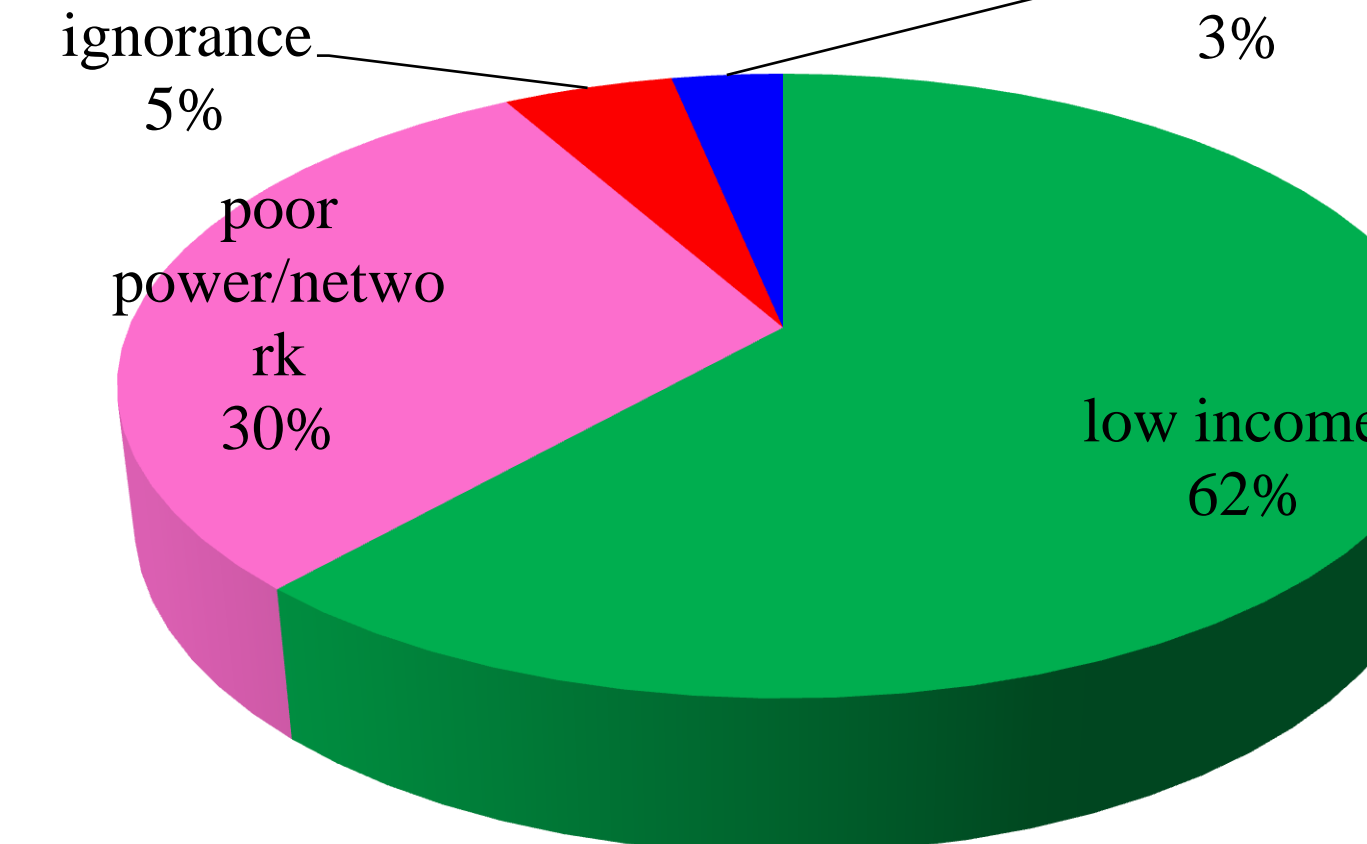
ICT COMPONENTS USED BY TRADERS



ICT COMPONENTS USED BY FARMERS



REASONS LIMITING ICT USE



Mobile phone was most used for reliability and Radio for Cheap Maintenance. R = Radio, M = Mobile phone, P = Payphone, T = TV, I = internet and C = CD-ROM

Determinants of ICT based-MIS adoption for Farmers, The Logit Model

| Variable | Coeff (Std Err) | Marginal effects |
|--|------------------|------------------|
| Gender ^a | -1.504 (1.482) | -0.305 |
| Knowledge of ICT groups ^a | 2.669 (1.033)*** | 0.582 |
| Thought if ICTs benefit Agriculture ^a | 6.374 (1.583)*** | 0.899 |
| Education of respondent ^a | 0.921 (1.156) | 0.219 |
| Monthly Cost on ICTs ^a | -0.218 (0.399) | -0.052 |
| Experience in using ICTs ^b | 1.109 (0.547)** | 0.265 |
| Family size ^b | 2.628 (0.854)*** | 0.627 |
| Distance to nearest town center ^b | -1.027 (1.416) | -0.245 |
| Land farmed previous season ^b | -2.840 (1.135)** | -0.678 |
| Constant | -6.338 (5.395) | -0.305 |

No. of observations = 96, LR chi²(10) = 87.02, Prob > chi² = 0.0000, Log likelihood = -22.009807, Pseudo R² = 0.6641, ^a=dummy variables, ^a = Logarithm, ^b = square root transformations. **, *** Significance at 10%, 5% and 1% levels respectively

By skills gained in groups, an increase by one in ICT groups farmers know, increased farmers' adoption of ICTs by 58%. Positive attitude toward use of ICTs in agriculture made farmers more likely to use ICTs at probability of 89% because farmers wanted to tap ready and quick good markets. Experience in using ICTs made farmers more able to use ICTs, enhancing usage probability by 26%. Family size increased ICT adoption probability by 63% because every member of family was a source of knowledge on using ICTs.

Determinants for choice of ICT component combination adopted by farmers and traders, The Multinomial Logit Model

| Variable | Coeff (Std Err) | Marginal Effects |
|----------|-----------------|------------------|
|----------|-----------------|------------------|

Radio and pay phone

| | | |
|---|-------------------|--------|
| Knowledge of existence of groups ^a | -1.452 (0.817)* | -0.055 |
| Profit making ^a | -2.651 (0.763)*** | -0.107 |
| Experience of using ICTs ^a | 1.832 (0.699)*** | 0.0613 |
| Family size ^a | -1.159 (0.539)** | -0.043 |
| Distance to nearest town center ^a | 2.457 (1.018)** | 0.101 |
| Monthly Income ^c | 177.69 (99.24)* | 9.739 |
| Land farmed previous season ^b | 0.949 (0.791) | -0.038 |

Radio and others (www, CD ROM, internet/email and TV)

| | | |
|---|--------------------|---------|
| Knowledge of existence of groups ^a | -1.127 (0.532)** | -0.1873 |
| Profit making ^a | -0.557 (0.486) | -0.071 |
| Experience of using ICTs ^a | 1.643 (0.527)*** | 0.2704 |
| Family size ^a | -0.609 (0.364)* | -0.0955 |
| Distance to nearest town center ^a | 0.372 (0.486) | 0.041 |
| Monthly Income ^c | -214.897 (125.55)* | -39.583 |
| Land farmed previous season ^b | -0.265 (0.496) | -0.0369 |

Radio and Mobile phone, is the Base outcome

No. of observations = 116, LR chi²(16) = 102.93, Prob > chi² = 0.0000, Log likelihood = -75.975361, Pseudo R² = 0.4038, ^a=dummy variables, ^a = Logarithm, ^b = square root, ^c = Inverse square root transformations, *, **, *** significance at 10%, 5% and 1% levels respectively

Due to low education, households were more likely to use the internet/web by 27% as experience in using ICTs increased by one year. With increasing distance to town centers, poor network and power supply were more evident thus households were more likely to use pay phone managed at service centers by 10% for a kilometer increase. With more interest in making profits, farmers were less likely to use pay phones or internet but rather the mobile phone for its quick delivery of information and mobility.

Determinants of ICT based-MIS Adoption for Traders, The Logit

| Variable | Coeff (Std Err) | Marginal Effects |
|---------------------------|------------------------|------------------|
| Family size ^a | 3.018 (1.829)* | 0.033 |
| Age | -2.412 (1.175)** | -0.026 |
| Experience | -1.027 (0.517)** | -0.011 |
| Monthly Income | 0.00002 (0.00002) | 1.71 e-7 |
| Age ^s | 0.026 (0.013)** | 0.0003 |
| Asset base ^s | -1.04 e-11 (8.38 e-12) | -1.13 e-13 |
| Education ^s | 0.046 (0.023)** | 0.0005 |
| Monthly Cost ^a | 5.954 (3.100)* | 0.066 |
| Constant | 0.369 (21.34) | 0.033 |

Number of observations = 47, LR chi²(11) = 19.49, Prob > chi² = 0.0124, Log likelihood = -14.58209, Pseudo R² = 0.4006, ^a = Logarithm, ^s = square transformations, *, ** Represents significance at 10% and 5% levels respectively

For every one person increase in family size, probability to adopt ICTs-based MIS by traders increased by 3.3%, because every family member has access to different sources of information on ICT use, in most households each adult has a phone. Increasing age by a year reduced ICT adoption by 2.6% due to reduced mental ability to cope with new technologies, though a year increase in education increased probability of ICT use by 0.05% through enhancing ability to read instructions. Monthly costs on ICT use for traders meant more business transactions thus a 1,000 Uganda shilling increase in costs increased probability by 6.6%

Conclusions.

Radio and mobile telephony were the most used ICT components. Radio and Mobile telephony was the most used combination. Expensive handsets, poor power supply and network coverage much limited use of ICTs. Farmers with ICT groups' existence knowledge and those who thought that ICTs benefited agriculture were more likely to adopt use of ICTs in agricultural Market information services. Experience in using ICTs, family size and land farmed influenced farmers' adoption, whereas age, experience, family size and monthly expenses influenced traders' adoption. Users of ICTs for profit were more likely to use the Radio-mobile phone combination. Community based education and skills training on use of phones by farmers need to be enhanced. Rural electrification, good road networks and reduction of taxes on mobile phone operating companies need to be revisited by government. It is realized that ICTs have a positive impact on agricultural sector and such impact need to be established by research to guide and strengthen ICT use policy.

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