Adoption of Farmbook by Extension Agents in Africa: Challenges and Opportunities for the Future

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Outline

- Introduction: What is Farmbook
- Research question and hypothesis
- Objectives
- Methodology
- Provisional Results
- Conclusions

Introduction: What is Farmbook?

- Farmbook enables extension agents to help farmers plan their businesses more effectively and assess productivity and profitability of their enterprise (Ferris and Jannu 2012).
- Farmbook is a digital field-based application developed and field tested by the Catholic Relief Services (CRS) at the request of a consortium of NGOs working under the Southern African Agro-Enterprise Learning Alliance (MEAS 2013).

Research question and hypothesis

 What is the relationship between challenges faced by extension agents using Farmbook and the personal and societal socioeconomic context influencing their work?

 Null Hypothesis: Personal and wider socioeconomic context have no impact on challenges faced by extension agents using Farmbook.

Research objectives

- i. To identify and categorize the challenges hindering extension agents from the effective use of Farmbook
- To understand the relationship between selected national development indicators and the effective use of Farmbook by extension agents
- iii. To assess gender differences in the use of Farmbook by extension agents
- iv. To understand the relationship between socio-economic status of extension agents and the challenges faced in using Farmbook
- v. To understand the relationship between proficiency in the use of the internet and the use of Farmbook by extension agents
- vi. To recommend adaptive measures to improve the training received by extension agents adopting Farmbook in order to enhance their effective use of the technology

Methodology

- Data was collected through project document reviews, use of a structured questionnaire and focus group meetings with extension agents
- 40 questionnaires were distributed in January 2013 by email to CRS extension agents in Madagascar, Malawi, Zambia and Zimbabwe who had previously received the Farmbook training
- 30 questionnaires were filled and returned to researchers, given a response rate of 75%
- Data was analyzed using JMP 10 statistical software for the mosaic plots and SPSS 20 for regression analyses

Provisional Results – categorized datasheet (Table 1)

R	Country	Рор	Literacy	Internet	Road	Gender	Educational	Age	Challenges	Internet	Internet	Comfortable
		(million)	ratio	connectivity	network		qualification		to using	access	access	using
				ratio	per km2				Farmbook	workplace	field	internet
1	Malawi	15	0.74	0.04	0.13	Male	BSC	Below35	Farmer	Yes	Yes	Excellent
2	Zambia	13	0.71	0.12	0.12	Male	BSC	Below35	Farmer	Yes	Yes	Good
3	Zambia	13	0.71	0.12	0.12	Female	ProQual	Below35	Farmer	Yes	Yes	Good
4	Zambia	13	0.71	0.12	0.12	Male	ProQual	Below35	Farmer	Yes	Irregular	Excellent
5	Malawi	15	0.74	0.04	0.13	Female	ProQual	35Above	Farmer	Yes	No	Good
6	Zambia	13	0.71	0.12	0.12	Male	ProQual	Below35	Technical	Yes	Irregular	Average
7	Malawi	15	0.74	0.04	0.13	Female	Hschool	Below35	Farmer	Yes	Irregular	Excellent
8	Malawi	15	0.74	0.04	0.13	Male	Hschool	35Above	Farmer	No	Yes	Good
9	Zambia	13	0.71	0.12	0.12	Male	BSC	Below35	Technical	Yes	Irregular	Good
10	Malawi	15	0.74	0.04	0.13	Male	BSC	35Above	Farmer	Yes	Irregular	Good
11	Zambia	13	0.71	0.12	0.12	Male	MSc	35Above	Farmer	Yes	Irregular	Excellent
12	Zambia	13	0.71	0.12	0.12	Female	BSC	35Above	Technical	Yes	No	Excellent
13	Madagascar	20	0.64	0.02	0.11	Male	Hschool	35Above	Farmer	Yes	No	Good
14	Madagascar	20	0.64	0.02	0.11	Male	Hschool	35Above	Technical	Yes	No	Average
15	Zimbabwe	13	0.92	0.16	0.25	Male	BSC	35Above	Technical	Yes	Yes	Excellent
16	Malawi	15	0.74	0.04	0.13	Male	BSC	Below35	Farmer	Yes	Yes	Excellent
17	Malawi	15	0.74	0.04	0.13	Male	Hschool	35Above	Farmer	Yes	Yes	Average
18	Zimbabwe	13	0.92	0.16	0.25	Female	BSC	35Above	Farmer	Yes	No	Good
19	Zimbabwe	13	0.92	0.16	0.25	Male	BSC	35Above	Technical	Yes	No	Good
20	Malawi	15	0.74	0.04	0.13	Male	MSc	Below35	Farmer	Yes	No	Excellent
21	Zimbabwe	13	0.92	0.16	0.25	Male	Hschool	Below35	Farmer	Yes	No	Good
22	Zimbabwe	13	0.92	0.16	0.25	Female	BSC	Below35	Farmer	Yes	Irregular	Excellent
23	Zimbabwe	13	0.92	0.16	0.25	Female	MSc	35Above	Farmer	Yes	Irregular	Excellent
24	Zimbabwe	13	0.92	0.16	0.25	Male	ProQual	35Above	Farmer	Yes	Yes	Excellent
25	Zimbabwe	13	0.92	0.16	0.25	Male	BSC	35Above	Farmer	Yes	Yes	Excellent
26	Malawi	15	0.74	0.04	0.13	Male	BSC	35Above	Technical	Yes	No	Excellent
27	Zimbabwe	13	0.92	0.16	0.25	Male	ProQual	Below35	Farmer	Yes	Yes	Average
28	Zimbabwe	13	0.92	0.16	0.25	Male	Hschool	35Above	Technical	No	No	Average
29	Malawi	15	0.74	0.04	0.13	Male	BSC	Below35	Technical	Yes	Irregular	Good
30	Zimbabwe	13	0.92	0.16	0.25	Male	BSC	Below35	Farmer	Yes	Yes	Excellent

Respondents demographic characteristics (Table 2)

Country	Count		Age			Academic Qualification								
	1	V	<	35	≥	15	High :	school	Pro (Qual	Back	elors	Mas	sters
	М	F	М	F	М	F	М	F	М	F	М	F	М	F
Madagasear	2	0	0	0	2	0	2	0	0	0	0	0	0	0
Malawi	8	2	4	1	4	1	2	1	0	1	5	0	1	0
Zambia	5	2	4	1	1	1	0	0	2	1	2	1	1	0
Zimbabwe	8	3	3	1	5	2	2	0	2	0	4	2	0	1
Total	23	7	11	3	12	4	6	1	4	2	11	3	2	1

- Ratio of men to women is 3:1
- Respondents are about evenly distributed below and above the mean age of 35 years
- About half of the respondents are first degree holders

Country and challenge level (mosaic plot)



As shown in table 1, <u>challenges to using Farmbook</u> have been grouped into two categories, 'farmlevel' and 'technical', for ease of analyses

Gender and challenge level



Figure 2: Relationship between challenges to using Farmbook and Gender

A lower percentage of women reported having technical challenges to using Farmbook (14.29% of women compared with 34.78% of men)

Age group and challenge level



Figure 3: Relationship between challenges to using Farmbook and Age group

A higher percentage of persons 35years of age and above reported having technical challenges to using Farmbook (37.5 % compared with 21.43%)

Education and challenge level



Figure 4: Relationship between challenges to using Farmbook and Educational Qualification

		16.67	6.67	23.33
_		23.81	22.22	
Sug		71.43	28.57	
Ę	MSc	3	0	3
ш		10.00	0.00	10.00
		14.29	0.00	
		100.00	0.00	
	ProQual	5	1	6
		16.67	3.33	20.00
		23.81	11.11	
		83.33	16.67	
		21	9	30
		70.00	30.00	

Respondents with masters' degree reported no technical challenges but the surprise is the high ratio of BSc holders experiencing technical challenges with Farmbook

Internet ability and challenge level



Figure 5: Relationship between challenges to using Farmbook and ability to use the internet

The more competent the respondent were with using the internet, the lower the likelihood of experiencing technical challenges to using Farmbook

Internet access at work and challenge level



Figure 6: Relationship between challenges to using Farmbook and internet access at work

Internet access helps...

Internet access in the field and challenge level



Figure 7: Relationship between challenges to using Farmbook and internet access in the field

...again having internet access helps.

Regression analyses

- The regression analysis was done using ordinal logistic regression technique where the calculations are based on the log of the odds (likelihood) of an event occurring
- Example, if we code 'technical challenge' as 0 and 'farmlevel challenge' as 1, the probability (P) of 'farmlevel challenge' (Y₁) will be 21/30 or 0.7
 - The odds of $(Y_1) = P / 1 P = 0.7/0.3 = 2.33$
 - Natural log of (P / 1 P) = In (P / 1 P): this eqtn is often written as 'logit p'
- So the general linear equation for ordinal logistic regression is:
 - logit $p = \ln (p/1 p) = a + bx$ (where there is only one 'x' variable) OR
 - logit $p = \ln (p/1 p) = a+b1x1+b2x2+... + bixi$ (for multiple 'x' like our case)

• And
$$p = \frac{1}{1 + e^{-\log it(p)}}$$

 Note of caution – our sample size of 30 is very small so our regression lacks power, we present it as a trial run in anticipation of the larger dataset we will be collecting from our work with extension agents and about 1500 farmers in Kenya

More explanation is in the report by Tata and McNamara 2013

Regression coefficients (Table 3)

			Parameter Estimates								
		Estimate	Std. Error	Wald	df	Sig.	95% Confid	95% Confidence Interval			
		(a)		(b)		(c)	Lower Bound	Upper Bound			
Threshold [Ch	al = Farmer]	47.636	12779.777	0	1	0.997	-25000.267	25095.539			
Location Pop)	0.951	1005.117	0	1	0.999	-1969.043	1970.944			
Lit		-67.042	4784.145	0	1	0.989	-9443.794	9309.71			
Con	mect	208.777	23744.874	0	1	0.993	-46330.32	46747.874			
Ros	ad	0 ^a	-	-	0						
[Ge	nder=Female]	-39.635	437.583	0.008	1	0.928	-897.281	\$18.012			
[Ge	nder=Male]	0ª	-	-	0						
[Ed	u=BSc]	46.217	625.605	0.005	1	0.941	-1179.946	1272.38			
[Ed	u=Hschool]	5.098	909.464	0	1	0.996	-1777.419	1787.614			
[Ed	u=MSc]	-1.467	849.976	0	1	0.999	-1667.388	1664.455			
[Ed	u=ProQual]	0 ^a		-	0						
[A ₈	e=35Above]	-0.605	1.906	0.101	1	0.751	-4.341	3.131			
[A ₈	e=Below35]	0ª		-	0						
[Int	W=No]	51.397	0	-	1		51.397	51.397			
[Int	W=Yes]	0*	-	-	0						
[Int	F=Irre]	28.723	341.51	0.007	1	0.933	-640.624	698.071			
[Int	F=No]	45.842	529.605	0.007	1	0.931	-992.164	1083.849			
[Int	F=Yes]	0*	-	-	0		-				
[Int	C=Average]	43.358	1340.944	0.001	1	0.974	-2584.844	2671.56			
[Int	C=Excellent]	17.034	271.972	0.004	1	0.95	-516.021	550.088			
[Int	C=Good]	0*	-	-	0		-	-			

Link function: Logit

a. This parameter is set to zero because it is redundant

Additional tests of regression model (Table 4)

Model Fitting Information								
Model	elihood	Chi-	df	Sig.				
Intercept Only	35.20	66						
Final	5.10	5	30.161	13	0.004			
Link function: Logit								
Goodness-of-Fit								
	Chi-Square df Sig.							
Pearson	2.658	14	1					
Deviance	3.718	14	0.997					
Link function: Logit								
	Pseudo R-Square							
Cox and Snell	0.634							
Nagelkerke	0.899							
McFadden		0.823						
Link function: Logit	Link function: Logit							

These additional tests show that the regression model strongly fits the data

Recall that
$$p = \frac{1}{1 + e^{-\log it(p)}}$$

Using the coefficients from Table 3, our regression equation is:

logit $p = 47.64 + (0.95)^{*}(Pop) + (-67.04)^{*}(Literacy) + (208.78)^{*}(Internet connectivity) + Gender ("Female" -39.64) + Edu ("BSc" 46.23, "Hschool" 5.10, "MSc" -1.50) + Age ("35Above" -0.61) + Internet at work ("No" 51.40) + Internet field ("Irregular" 28.72, "No" 45.84) + Comfortable using internet ("Average" -43.36, "Excellent" 17.04)$

Actual versus predicted data (Table 5)

	Respondent	Country	Main challenges to using Farmbook (actual)	Main challenges to using Farmbook (predicted)
	1	Malawi	Farmer	Farmer
	2	Zambia	Farmer	Farmer
ĺ	3	Zambia	Farmer	Farmer
	4	Zambia	Farmer	Farmer
ĺ	5	Malawi	Farmer	Farmer
	6	Zambia	Technical	Technical
	7	Malawi	Farmer	Farmer
	8	Malawi	Farmer	Farmer
ĺ	9	Zambia	Technical	Technical
	10	Malawi	Farmer	Farmer
	11	Zambia	Farmer	Farmer
	12	Zambia	Technical	Technical
	13	Madagascar	Farmer	Farmer
	14	Madagascar	Technical	Technical
	15	Zimbabwe	Technical	Farmer
	16	Malawi	Farmer	Farmer
	17	Malawi	Farmer	Farmer
	18	Zimbabwe	Farmer	Farmer
	19	Zimbabwe	Technical	Technical
	20	Malawi	Farmer	Farmer
	21	Zimbabwe	Farmer	Farmer
	22	Zimbabwe	Farmer	Farmer
	23	Zimbabwe	Farmer	Farmer
	24	Zimbabwe	Farmer	Farmer
	25	Zimbabwe	Farmer	Farmer
	26	Malawi	Technical	Technical
	27	Zimbabwe	Farmer	Farmer
	28	Zimbabwe	Technical	Technical
ĺ	29	Malawi	Technical	Technical
	30	Zimbabwe	Farmer	Farmer

For respondent 15 using the regression equation Logit p =47.64 + (-46.73) Φ Logit p = 0.91

 $P = 1/1 + e^{(-0.91)}$ P = 1/1 + 0.4 = 1/1.4 P = 0.71

The P associated with respondent 15 by our regression model is that for farmlevel challenge

 Φ Calculation is shown in Table 6 on next slide

Calculating logit P₁₅ (Table 6)

Item	Value	b	X	bx		
Pop (million)	13	-0.95	13	-12.35		
Literacy ratio	0.92	67.04	0.92	61.68		
Internet connectivity	0.16	-208.78	0.16	-33.4		
Road network	0.25	0	0.25	0		
Gender	Male	0	1	0		
Edu	BSc	-46.23	1	-46.23		
Age	35Above	0.61	1	0.61		
Internet access at work	Yes	0	0	0		
Internet access field	Yes	0	0	0		
Comfortable using internet	Excellent	-17.04	1	-17.04		
Sum of 'bx' -46.73						
Note that the signs on 'b' are reversed because respondent 15 is						

male while the coefficients were for female respondents

Conclusion

Recall the null hypothesis: Personal and wider socioeconomic context have no impact on challenges faced by extension agents using Farmbook

The provisional results in here show clearly that education, gender, internet accessibility and use competence have effect on the challenges experienced by the extension agents surveyed in this research

However, our results are provisional and should be used with caution due to the small sample size (30 respondents)

We will continue with this research in Kenya and compare our results there with what we have here before we will draw firm conclusions

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