4th International Conference on GLOBAL FOOD SECURITY

ONLINE LIVE AND ON-DEMAND 7-9 December 2020

PRE-CONFERENCE MINI-SYMPOSIA ON 4 December 2020

One size fits all? Experimental evidence on the digital delivery of personalized extension advice for food security in sub-Saharan Africa

A. Arouna[a,*], J.D. Michler[b], W.G. Yergo[a] & K. Saito[a]

[a] Africa Rice Center (AfricaRice), 01 B.P. 2551, Bouake 01, Côte d'Ivoire
[b] Department of Agricultural and Resource Economics, University of Arizona, Tucson, USA
*Corresponding author: a.arouna@cgiar.org

AfricaRice — Rice science at the service of Africa / La science rizicole au service de l'Afrique

CGIAR Research Program on Rice — Global Rice Science Partnership

Introduction

Throughout Sub-Saharan Africa, efforts by governments and development agencies to spur agricultural intensification have been meet with continued low levels of adoption of improved inputs. One explanation for the lack of adoption is the simplified blanket advice on fertilizer application rates which has failed to achieve potential yield gains for crop production in much of Sub-Saharan Africa. However, Decision Support Tools (DST) now makes it possible to deliver personalized extension services to farmers at a much lower cost. We assess the impact of personalized extension services delivered using a specific DST: RiceAdvice. RiceAdvice is an Android-based application (or app) that was developed by AfricaRice to provide personalized recommendations on nutrient management (type, quantity, and timing of fertilizer) in rice production.

This study, along with Tjernström et al. (2020), are the first RCTs to assess the economic impact of DSTs on agricultural production.

Methodology

❑ *Study* area

The study was conducted in Kano state because it is the major rice producing region in Nigeria (Fig. 2). We randomly selected five from the eight major irrigated rice production LGAs.

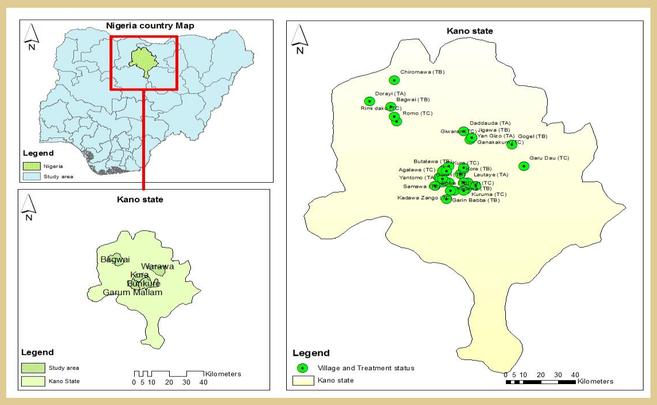
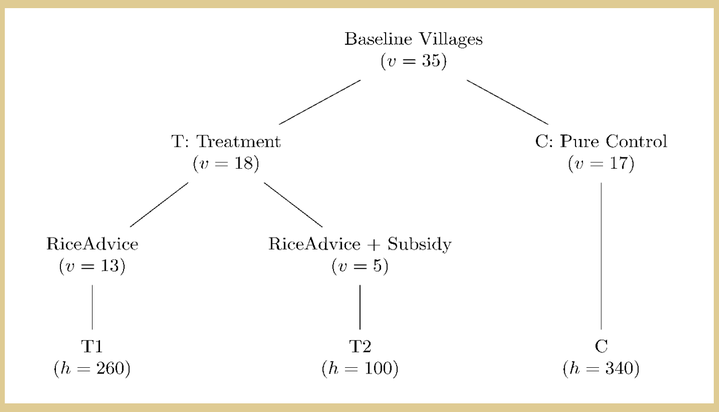


Fig. 2: Study area

❑ *Experimental design and sampling*

Two treatments and control were considered (Fig. 3):

- In the first treatment group (T1), households were offered personalized advice delivered by the extension agent using the RiceAdvice app.
- In the second treatment group (T2), households were offered personalized advice using the app along with a 100% subsidy (grant) for the quantity of fertilizer recommended by the app.
- In the control group (C), households received blanket advice provided by the extension agent.



In total, 35 villages were selected and within village we randomly selected 20 households from a census of all rice farming households. Thus, 700 households were sampled.

Figure 3: Experimental design

❑ *Data analysis*

We calculate impacts using OLS along with analysis of covariance (ANCOVA) estimation. The ANCOVA estimator has more power than the typical difference-in-difference estimator, especially when there are multiple rounds of post treatment data (McKenzie, 2012).

Results

Table 1: Treatment effects on rice yield (t/ha)

	OLS (1)	OLS (2)	ANCOVA (3)	ANCOVA (4)
Treatment effect: all years				
RiceAdvice [T1]	**0.253****	**0.249****	**0.260****	**0.258****
	(0.123)	(0.116)	(0.125)	(0.118)
RiceAdvice + Subsidy [T2]	**0.737*****	**0.725*****	**0.736*****	**0.728*****
	(0.125)	(0.117)	(0.127)	(0.120)
Combined treatment [T]	0.990***	0.974***	0.996***	0.986***
	(0.222)	(0.211)	(0.229)	(0.219)
Difference between treatments [T2-T1]	0.484***	0.477***	0.476***	0.470***
	(0.109)	(0.098)	(0.105)	(0.095)
Mean dependent variable in control	3.755			
Observations	1,368	1,368	1,353	1,353
R-squared	0.214	0.221	0.215	0.222
LGA FE	Yes	Yes	Yes	Yes
Household covariates	No	Yes	No	Yes

Regardless of the estimation strategy (Table 1):

- T1 increases yield by about 250 kg/ha, or 7% over control households.
- T2 increases yields by about 730 kg/ha, which represents a 20% gain over yields for control households.

Table 2: Treatment effects on profit (US$/ha)

	OLS (1)	OLS (2)	ANCOVA (3)	ANCOVA (4)
Treatment effect: all years				
RiceAdvice [T1]	115.6**	118.9**	122.0**	126.1**
	(50.69)	(48.95)	(51.29)	(49.58)
RiceAdvice + Subsidy [T2]	275.9***	273.2***	282.0***	279.9***
	(50.77)	(48.22)	(51.00)	(48.94)
Combined treatment [T]	391.5***	392.1***	404.0***	406.1***
	(92.85)	(89.24)	(94.19)	(90.90)
Difference between treatments [T2-T1]	160.2***	154.3***	160.0***	153.8***
	(40.90)	(38.44)	(39.88)	(38.01)
Mean dependent variable in control	1,181			
Observations	1,368	1,368	1,353	1,353
R-squared	0.14	0.15	0.33	0.33
LGA FE	Yes	Yes	Yes	Yes
Household covariates	No	Yes	No	Yes

- T1 and T2 increase their profit by around 10% and 23%, respectively (Table 2).
- There are significant differences between outcomes for those in each treatment.

Fig 4 also reveals substantially larger means for each treatment group relative to the control group for yield and profit ().

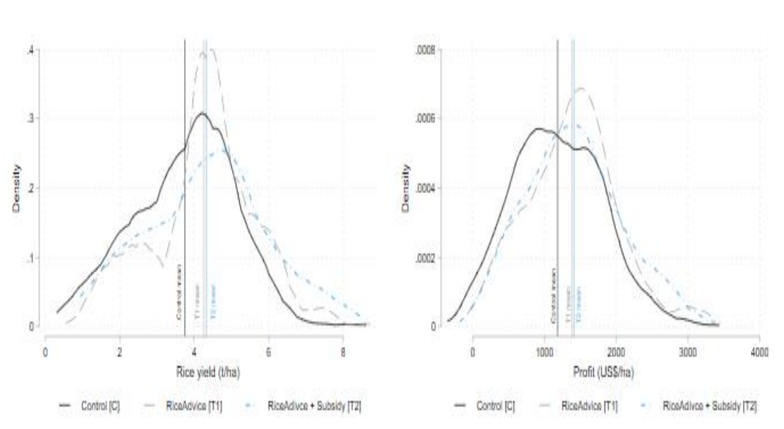


Figure 4: Distribution of post-treatment outcomes pooling both 2016 and 2017 data

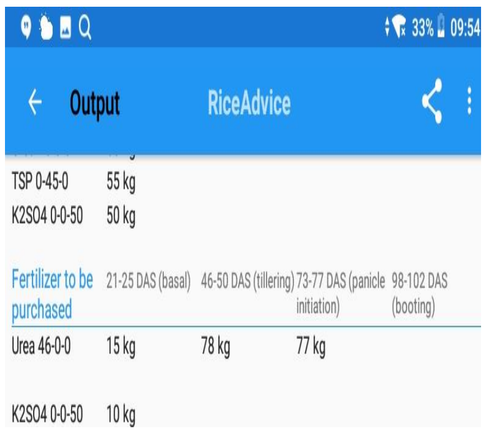


Fig. 1: RiceAdvice app

Table 3: Treatment effects fertilizer (kg/ha)

	OLS (1)	OLS (2)	ANCOVA (3)	ANCOVA (4)
Treatment effect: all years				
RiceAdvice [T1]	-8.777	-11.775	-8.179	-10.92
	(10.61)	(10.08)	(10.55)	(10.01)
RiceAdvice + Subsidy [T2]	-31.67***	-33.62***	-31.00***	-32.65***
	(10.98)	(11.45)	(10.98)	(11.40)
Combined treatment [T]	-40.45**	-45.39**	-39.18**	-43.57**
	(18.69)	(19.25)	(18.67)	(19.19)
Difference between treatments [T2-T1]	-22.90**	-21.84**	-22.82**	-21.74**
	(10.81)	(9.738)	(10.73)	(9.601)
Mean dependent variable in control	366.6			
Observations	1,368	1,368	1,353	1,353
R-squared	0.14	0.15	0.33	0.33
LGA FE	Yes	Yes	Yes	Yes
Household covariates	No	Yes	No	Yes

We find little evidence that personalized advice on nutrient management has an effect on the quantity of fertilizer (Table 3).

Conclusion

Personalized advice increases yields without increasing the overall quantity of fertilizer used. We conclude that the scaling of personalized extension services could improve productivity and livelihoods in Sub Saharan Africa without necessarily increasing the total amount of fertilizer in use.

References

McKenzie, D. 2012. Beyond baseline and follow-up: The case for more T in experiments. *Journal of Development Economics 99*: 210-21

Tjernström, Emilia, Travis J. Lybbert, Rachel Frattarola Hernández, and Juan Sebastian Correa. 2020. Learning by (Virtually) Doing: Experimentation and Belief Updating in Smallholder Agriculture. Mimeo: University of Sydney.

This poster is based on **Arouna, A., Michler, J. D., Yergo, W, G. & Saito, K. (2020). One size fits all? experimental evidence on the digital delivery of personalized extension advice for food security in Nigeria. *American Journal of Agricultural Economics*.** https://doi.org/10.1111/ajae.12151