Effective Training Through a Mobile App: Evidence from a Randomized Field Experiment

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Introduction

Farmers in developing countries usually lack access to vital resources and services

Agricultural extension services, including technical training, are an important method to overcome these deficiencies and reduce poverty by providing information and transferring knowledge to farmers (Anderson and Feder 2004, Nakasone et al. 2014)

However, traditional extension service typically entails a great number of human resources as well as high fixed and recurrent financial costs that limit their scalability and efficiency (Quizon et al. 2001, ICRAF 2018)

Rapid expansion of ICTs in developing countries offers great potential

Information and communication technologies (ICTs) may be an effective way to increase farmers' awareness of improved practices and improve agricultural productivity

- Radio, television, computer, mobile phones, etc

The mobile phone is one of the fastest-growing and most widespread forms of ICTs

- 83% of adults in developing counties have a mobile phone (Gallup World Poll 2018)

The rollout of extension programs though ICTs is still in an early stage, and little research is available regarding such programs' impacts (Nakasone et al. 2014)

- Voice messages (Cole and Fernando 2021, Walter et al. 2021)
- SMS messages (Fafchamps and Minten 2012, Casaburi et al. 2019)

Technical training through a mobile app may be an effective method

1. We study the impact of providing technical training through an ICT, an easy-to-use mobile application, on farmers' technical knowledge and welfare App Interface
   - Certain kinds of information may be too complicated to convey by text or voice (Fabregas et al., 2019)
   - Our mobile app automatically records app usage, we are able to identify what, when, and how long the farmer watched each video in our app
2. We also provided aspirational videos via the same app to examine whether farmers need aspiration to motivate them to adopt the technical skills from the training
   - Aspiration videos may enhance farmers' psychological well-being (Ridley et al. 2020) and facilitate learning among farmers (Fabregas et al. 2019)

Experimental Design

Study Setting

- Farmers residing in the grape-growing regions of Beizhen in Liaoning, China
  - 98 percent of rural villages have internet coverage
  - Cost of accessing the internet is low
  - Most mobile app downloads in the world
- 1,026 farmers from 38 villages at baseline
  - All farmers have mobile phones with access to the internet

Intervention

- Technical videos only (T1)
- Technical videos and aspiration videos (T2)
- Placebo videos

Randomization

- Unit of randomization is the zu (sub-village) of residence
- 116 clusters with a median number of 7 households interviewed per sub-village

Empirical Strategy

$$y_{iz} = \beta_0 + \beta_1 T1_z + \beta_2 T2_z + X_{iz}'\delta + \varepsilon_{iz}$$

y_{iz} is the outcome of interest measured at endline for farmer i in zu z

$T1_z$ is technical training only arm

$T2_z$ is technical training and aspiration arm

X_{iz} includes baseline characteristics

Treatment-on-the-treated (TOT)

First Stage:

$$k_{iz} = \alpha_0 + \alpha_1 D_z + X_{iz}^{'}\lambda + \nu_{iz}$$

Second Stage:

$$y_{iz} = \beta_0 + \beta_1 \hat{k}_{iz} + X_{iz}^{'}\delta + \varepsilon_{iz}$$

k_{iz} is farmer i's score on knowledge test at endline

$D_z \in \{T1_z, T2_z\}$ is an indicator for treatment status for the respective treatment group

Estimation of TOT is restricted only to a treatment group and the control group

Both interventions increase knowledge test scores

	(1) Standardized Test Score (All 10 questions)	(2) Standardized Test Score (Repeated 5 questions)
T1	0.520***	0.371***
	(0.097)	(0.095)
T2	0.451***	0.413***
	(0.102)	(0.083)
Observations	687	687
Control-group mean	0.000	0.000
T1=T2 (p-value)	0.492	0.572

Notes: All regressions include test score at baseline. Heteroskedasticity-robust standard errors, clustered by zu, in parentheses. *** $p<0.01$ ** $p<0.05$ * $p<0.1$

App training increases sweetness, but not when bundled with aspiration

	(1) Sweetness	(2) Count	(3) Weight
T1	0.297**	0.138	-0.114
	(0.132)	(0.117)	(0.103)
T2	0.099	0.010	-0.154
	(0.109)	(0.121)	(0.116)
Observations	679	679	679
Control-group mean	0.000	0.000	0.000
T1=T2 (p-value)	0.150	0.364	0.720

Notes: All outcome variables are standardized with respect to control group. All regressions include self-assessed grape quality at baseline. Heteroskedasticity-robust standard errors, clustered by zu, in parentheses. *** $p<0.01$ ** $p<0.05$ * $p<0.1$

How Did We Measure Sweetness

Larger TOT effect for app training

	(1) Sweetness (T1)	(2) Sweetness (T2)
Standardized Test Score	0.554*	0.218
	(0.294)	(0.241)
Observations	467	466
Control-group mean	0.000	0.000

Notes: All outcome variables are standardized with respect to control group. All regressions include self-assessed grape quality at baseline. Heteroskedasticity-robust standard errors, clustered by zu, in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Providing training through apps is an effective intervention

Technical training through mobile app improves farmers' knowledge and helps them enhance the quality of their produce

- Can be an effective alternative to traditional extension service
- Can be scaled-up quite easily App Usage

Motivating farmers through mobile app is not effective and undermine the impact of increased knowledge Impact on Aspiration

Bundling multiple objectives (e.g., motivation with technical training) on a digitally delivered training is not effective

- Can lead farmers to overestimate the quality of their product and contravene any potential increase in the actual quality of product Impact on Self-Assessed Grape Quality

- Thank you!
- Please contact me if you have any other questions or comments:
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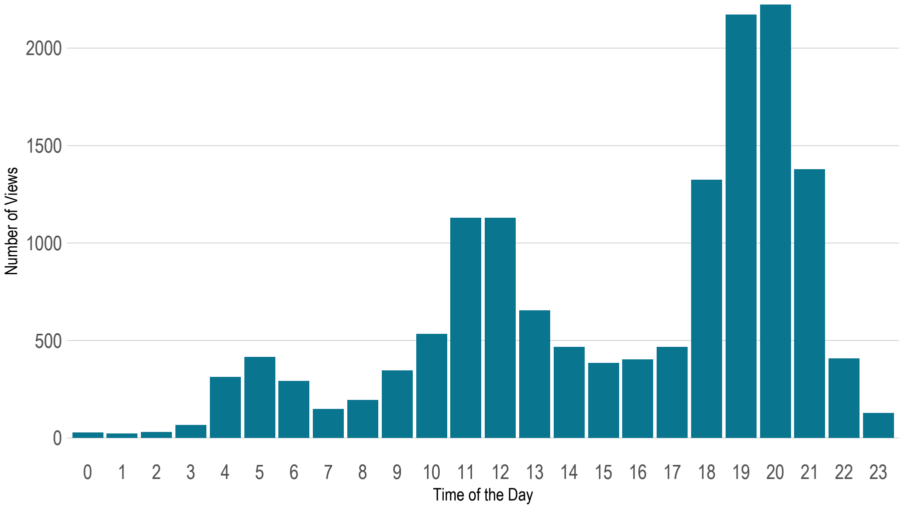
Mobile app interface

Back

Sweetness measure machine

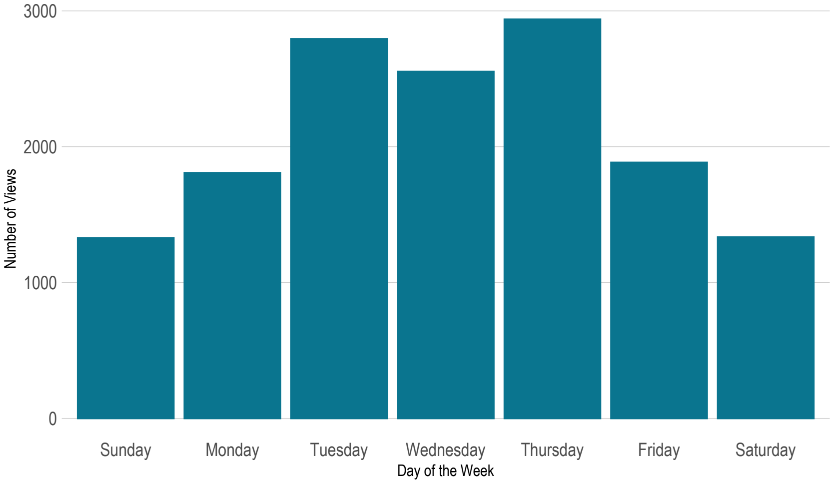
Back

App usage by time of the day



Back

App usage by day of the week



Back

Training and aspiration arm (T2) farmers experience a slight increase on their aspired sweetness in three years

	(1)	(2)	(3)	(4)
	3-year aspiration		5-year aspiration	
	IHS(Income)	Sweetness	IHS(Income)	Sweetness
T1	0.103	0.125	0.101	0.101
	(0.080)	(0.107)	(0.089)	(0.095)
T2	0.028	0.186*	0.034	0.095
	(0.094)	(0.107)	(0.094)	(0.096)
Observations	686	684	685	684
Control-group mean	12.215	0.000	12.392	0.000
T1=T2 (p-value)	0.404	0.562	0.475	0.946

Notes: All regressions include outcome variable measured at baseline. Outcome variables in columns (2) and (4) are standardized with respect to control group. Heteroskedasticity-robust standard errors, clustered by zu, in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Back

Farmers of both arms believe that their grapes are sweeter

	(1) Sweetness	(2) Count	(3) Weight
T1	0.474***	0.173*	0.213**
	(0.092)	(0.103)	(0.105)
T2	0.510***	0.039	0.149
	(0.086)	(0.093)	(0.106)
Observations	687	687	687
Control-group mean	0.000	0.000	0.000
T1=T2 (p-value)	0.666	0.202	0.576

Notes: All outcome variables are standardized with respect to control group. All regressions include self-assessed grape quality at baseline. Heteroskedasticity-robust standard errors, clustered by zu, in parentheses. *** p<0.01 ** p<0.05 * p<0.1

Back