Can Mobile Technology Improve Female Entrepreneurship? Evidence from Nepal

Conner Mullally[1],Sarah Janzen[2], Nicholas Magnan[3], Shruti Sharma[4], Bhola Shrestha[5]

[1]University of Florida
[2]University of Illinois Urbana Champaign
[3]University of Georgia
[4]US Bank
[5]Heifer International Nepal

ASSA 2023

Motivation

- Most of the developing world's small-scale entrepreneurs are women (Jayachandran, 2021).
- Gender norms may limit women's ability to fully exploit entrepreneurial opportunities (Jayachandran, 2020), e.g., travel to and participate in business training.
- By bringing training to women, mobile technology could increase women's ability to build their entrepreneurial skills.

Hybrid distance learning for female entrepreneurs in rural Nepal

- We use a randomized control trial to compare the effectiveness of traditional classroom-based business training (TT) and hybrid distance learning (DL) for women.
- DL substitutes two-thirds of training center time with studying at home.
- Through training women become certified as Community Animal Health Workers (CAHWs).
- Our study context is rural Nepal where livestock and poultry greatly outnumber people.

Results summary

- We estimate intent-to-treat effects and local average treatment effects of both training types compared to a control group, while also comparing impacts for each training system.
- Assignment to DL increases training completion by 52% versus 29% for TT.
- Both systems increase knowledge, and DL increases livestock responsibilities at home.
- No detectable effect on average income or savings, but there is evidence of income impacts below the median.
- Covid lockdown may have undermined average income effects.

Background

- Nepal has 29 million people, 28 million heads of livestock, and 83 million poultry birds.
- Livestock account for 11% of GDP.
- Our project implementing partner, Heifer International Nepal, has supported the livestock sector since 1996.
- Heifer helps women form self-help and savings groups, and these groups are eventually combined into producer cooperatives focusing on meat goats or dairy.
- There are currently 250 cooperatives that started with Heifer programming with around 1,000 members each.

Community Animal Health Workers

- In Nepal, CAHWs study a government-approved curriculum, take a certification exam, and then register with their local municipalities.
- Heifer pays the training fees of CAHWs supporting its cooperatives and provides each with a startup kit.
- The cost per TT trainee is $428.

Traditional CAHW training

- Completing TT requires staying at a training center for 35 days.
- Having to stay outside the home for extended periods might preclude many women from becoming CAHWs (Jayachandran, 2020).
- Women are expected to do the majority of childcare (Bittman et al., 2003; Sayer, 2005).
- Families might hesitate to allow women to spend the night outside of their villages (Dean and Jayachandran, 2019).
- In our data, women are an average of 100 km away from the nearest training center.

Hybrid distance training

- The DL system was designed by the research team, Heifer, and the Government of Nepal.
- Trainees stay at a training center for a five-day orientation, go home for 30 days, and return for a ten-day period of hands-on training and a final exam.
- DL trainees were monitored by phone and had access to a virtual “discussion board” where they could ask questions.
- There is no difference in the certification received by DL and TT trainees.
- When factoring in the cost of the tablets, the cost per DL trainee and TT trainee are approximately equal.

Conceptual model

- Distance learning could increase training completion if the key constraints are mobility or responsibilities at home.
- If the key constraint is available time, it might be effective or might not.
- If being a CAHW is seen as inappropriate for women by many households, then mode of training should have no effect on training completion.

Experimental design

1. 104 cooperatives participated.
2. Each was asked how many new CAHWs they could support.
3. They were then asked to nominate women meeting certain criteria to work as CAHWs.
4. We collected a baseline survey in fall 2018.
5. We eliminated candidates with no interest in training.
6. We worked with cooperatives to modify the sample until each cooperative had twice as many candidates as training slots.

Experimental design

1. We randomly assigned cooperatives to DL or TT, stratifying on geography, median income, and the median dependency ratio.
2. Within cooperatives, we randomly assigned women to training stratifying on income.
3. Sample balance is pretty good. ▸ Balance
4. Attrition perfectly balanced by treatment assignment.
5. Follow-up data were collected 18 months after the conclusion of training (by phone).

Hybrid distance learning increases training completion

	Completed training
ITT, distance	0.493***
	(0.094)
ITT, traditional	0.193*
	(0.101)
Difference	0.299**
	(0.138)
Control mean	0.044
Observations	276

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects.

Hybrid distance learning boosts knowledge and management responsibilities at home

	Percent correct, easy livestock questions	Percent correct, intermediate livestock questions	Percent correct, hard livestock questions	Overall score	Number of easy management practices, own livestock	Number of hard management practices, own livestock
ITT, distance	9.884**	22.070***	6.635*	12.814***	1.130***	0.899**
	(4.789)	(8.076)	(3.931)	(4.437)	(0.376)	(0.349)
ITT, traditional	3.724	6.731	4.327	5.011	-0.092	0.261
	(4.195)	(8.715)	(3.963)	(3.518)	(0.369)	(0.374)
Difference	6.160	15.340	2.308	7.802	1.223**	0.638
	(6.329)	(11.896)	(5.632)	(5.635)	(0.527)	(0.511)
LATE, distance	20.115***	44.763***	13.370**	25.984***	2.294***	1.824***
	(6.476)	(11.591)	(5.354)	(5.884)	(0.541)	(0.456)
LATE, traditional	19.072	34.764	22.495	26.003*	-0.478	1.348
	(15.829)	(31.012)	(16.087)	(14.534)	(1.369)	(1.257)
Difference	1.043	9.999	-9.125	-0.019	2.772*	0.476
	(16.992)	(33.108)	(17.036)	(15.723)	(1.472)	(1.337)
Control mean	87.348	60.097	52.068	65.856	1.715	0.993
Observations	276	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Hybrid distance learning boosts knowledge and management responsibilities at home

	Percent correct, easy livestock questions	Percent correct, intermediate livestock questions	Percent correct, hard livestock questions	Overall score	Number of easy management practices, own livestock	Number of hard management practices, own livestock
ITT, distance	9.884**	22.070***	6.635*	12.814***	1.130***	0.899**
	(4.789)	(8.076)	(3.931)	(4.437)	(0.376)	(0.349)
ITT, traditional	3.724	6.731	4.327	5.011	-0.092	0.261
	(4.195)	(8.715)	(3.963)	(3.518)	(0.369)	(0.374)
Difference	6.160	15.340	2.308	7.802	1.223**	0.638
	(6.329)	(11.896)	(5.632)	(5.635)	(0.527)	(0.511)
LATE, distance	20.115***	44.763***	13.370**	25.984***	2.294***	1.824***
	(6.476)	(11.591)	(5.354)	(5.884)	(0.541)	(0.456)
LATE, traditional	19.072	34.764	22.495	26.003*	-0.478	1.348
	(15.829)	(31.012)	(16.087)	(14.534)	(1.369)	(1.257)
Difference	1.043	9.999	-9.125	-0.019	2.772*	0.476
	(16.992)	(33.108)	(17.036)	(15.723)	(1.472)	(1.337)
Control mean	87.348	60.097	52.068	65.856	1.715	0.993
Observations	276	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Hybrid distance learning boosts knowledge and management responsibilities at home

	Percent correct, easy livestock questions	Percent correct, intermediate livestock questions	Percent correct, hard livestock questions	Overall score	Number of easy management practices, own livestock	Number of hard management practices, own livestock
ITT, distance	9.884**	22.070***	6.635*	12.814***	1.130***	0.899**
	(4.789)	(8.076)	(3.931)	(4.437)	(0.376)	(0.349)
ITT, traditional	3.724	6.731	4.327	5.011	-0.092	0.261
	(4.195)	(8.715)	(3.963)	(3.518)	(0.369)	(0.374)
Difference	6.160	15.340	2.308	7.802	1.223**	0.638
	(6.329)	(11.896)	(5.632)	(5.635)	(0.527)	(0.511)
LATE, distance	20.115***	44.763***	13.370**	25.984***	2.294***	1.824***
	(6.476)	(11.591)	(5.354)	(5.884)	(0.541)	(0.456)
LATE, traditional	19.072	34.764	22.495	26.003*	-0.478	1.348
	(15.829)	(31.012)	(16.087)	(14.534)	(1.369)	(1.257)
Difference	1.043	9.999	-9.125	-0.019	2.772*	0.476
	(16.992)	(33.108)	(17.036)	(15.723)	(1.472)	(1.337)
Control mean	87.348	60.097	52.068	65.856	1.715	0.993
Observations	276	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Hybrid distance learning boosts knowledge and management responsibilities at home

	Percent correct, easy livestock questions	Percent correct, intermediate livestock questions	Percent correct, hard livestock questions	Overall score	Number of easy management practices, own livestock	Number of hard management practices, own livestock
ITT, distance	9.884**	22.070***	6.635*	12.814***	1.130***	0.899**
	(4.789)	(8.076)	(3.931)	(4.437)	(0.376)	(0.349)
ITT, traditional	3.724	6.731	4.327	5.011	-0.092	0.261
	(4.195)	(8.715)	(3.963)	(3.518)	(0.369)	(0.374)
Difference	6.160	15.340	2.308	7.802	1.223**	0.638
	(6.329)	(11.896)	(5.632)	(5.635)	(0.527)	(0.511)
LATE, distance	20.115***	44.763***	13.370**	25.984***	2.294***	1.824***
	(6.476)	(11.591)	(5.354)	(5.884)	(0.541)	(0.456)
LATE, traditional	19.072	34.764	22.495	26.003*	-0.478	1.348
	(15.829)	(31.012)	(16.087)	(14.534)	(1.369)	(1.257)
Difference	1.043	9.999	-9.125	-0.019	2.772*	0.476
	(16.992)	(33.108)	(17.036)	(15.723)	(1.472)	(1.337)
Control mean	87.348	60.097	52.068	65.856	1.715	0.993
Observations	276	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Training may boost women's income control, no effects on average income

	Total household annual income	Woman's total annual income	Woman's non-farm annual income (0/1)	Woman's annual solely controlled income (0/1)	Woman's annual jointly controlled income
ITT, distance	124.905	28.085	0.014	0.151	142.534
	(580.049)	(187.741)	(0.103)	(0.099)	(464.243)
ITT, traditional	404.547	97.436	0.109	-0.065	-37.549
	(670.444)	(312.017)	(0.080)	(0.128)	(416.703)
Difference	-279.642	-69.351	-0.094	0.216	180.083
	(886.474)	(365.778)	(0.130)	(0.163)	(636.717)
LATE, distance	267.613	54.512	0.029	0.306**	294.859
	(796.843)	(262.550)	(0.143)	(0.140)	(652.703)
LATE, traditional	2036.462	501.468	0.565*	-0.341	-200.833
	(2328.851)	(1078.621)	(0.316)	(0.428)	(1512.662)
Difference	-1768.849	-446.956	-0.535	0.647	495.692
	(2442.557)	(1118.029)	(0.348)	(0.452)	(1688.582)
Control Means	2777.087	743.305	0.212	0.285	1574.522
Observations	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Training may boost women's income control, no effects on average income

	Total household annual income	Woman's total annual income	Woman's non-farm annual income (0/1)	Woman's annual solely controlled income (0/1)	Woman's annual jointly controlled income
ITT, distance	124.905	28.085	0.014	0.151	142.534
	(580.049)	(187.741)	(0.103)	(0.099)	(464.243)
ITT, traditional	404.547	97.436	0.109	-0.065	-37.549
	(670.444)	(312.017)	(0.080)	(0.128)	(416.703)
Difference	-279.642	-69.351	-0.094	0.216	180.083
	(886.474)	(365.778)	(0.130)	(0.163)	(636.717)
LATE, distance	267.613	54.512	0.029	0.306**	294.859
	(796.843)	(262.550)	(0.143)	(0.140)	(652.703)
LATE, traditional	2036.462	501.468	0.565*	-0.341	-200.833
	(2328.851)	(1078.621)	(0.316)	(0.428)	(1512.662)
Difference	-1768.849	-446.956	-0.535	0.647	495.692
	(2442.557)	(1118.029)	(0.348)	(0.452)	(1688.582)
Control Means	2777.087	743.305	0.212	0.285	1574.522
Observations	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Training may boost women's income control, no effects on average income

	Total household annual income	Woman's total annual income	Woman's non-farm annual income (0/1)	Woman's annual solely controlled income (0/1)	Woman's annual jointly controlled income
ITT, distance	124.905	28.085	0.014	0.151	142.534
	(580.049)	(187.741)	(0.103)	(0.099)	(464.243)
ITT, traditional	404.547	97.436	0.109	-0.065	-37.549
	(670.444)	(312.017)	(0.080)	(0.128)	(416.703)
Difference	-279.642	-69.351	-0.094	0.216	180.083
	(886.474)	(365.778)	(0.130)	(0.163)	(636.717)
LATE, distance	267.613	54.512	0.029	0.306**	294.859
	(796.843)	(262.550)	(0.143)	(0.140)	(652.703)
LATE, traditional	2036.462	501.468	0.565*	-0.341	-200.833
	(2328.851)	(1078.621)	(0.316)	(0.428)	(1512.662)
Difference	-1768.849	-446.956	-0.535	0.647	495.692
	(2442.557)	(1118.029)	(0.348)	(0.452)	(1688.582)
Control Means	2777.087	743.305	0.212	0.285	1574.522
Observations	276	276	276	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Evidence for positive effects of distance learning on aspirations

	Aspired people who would seek respondent's advice	Aspired income	Son aspiration index	Daughter aspiration index	Candidate aspiration index
ITT, distance	35.971	155.240	0.234	0.392	0.353*
	(32.725)	(303.696)	(0.181)	(0.270)	(0.192)
ITT, traditional	-83.773	-127.769	-0.147	-0.060	-0.283
	(51.035)	(1647.299)	(0.250)	(0.182)	(0.249)
Difference	119.744*	283.008	0.381	0.452	0.636**
	(60.626)	(1673.982)	(0.309)	(0.326)	(0.314)
LATE, distance	73.000	314.490	0.474*	0.795**	0.716**
	(48.737)	(423.736)	(0.259)	(0.405)	(0.296)
LATE, traditional	-433.435*	-622.429	-0.677	-0.313	-1.463
	(246.052)	(5687.692)	(0.857)	(0.688)	(1.117)
Difference	506.435	936.919	1.151	1.108	2.179
	(250.832)	(5697.321)	(0.896)	(0.798)	(1.156)
Control mean	81.567	2676.861	0.051	-0.062	-0.030
Observations	276	276	274	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Evidence for positive effects of distance learning on aspirations

	Aspired people who would seek respondent's advice	Aspired income	Son aspiration index	Daughter aspiration index	Candidate aspiration index
ITT, distance	35.971	155.240	0.234	0.392	0.353*
	(32.725)	(303.696)	(0.181)	(0.270)	(0.192)
ITT, traditional	-83.773	-127.769	-0.147	-0.060	-0.283
	(51.035)	(1647.299)	(0.250)	(0.182)	(0.249)
Difference	119.744*	283.008	0.381	0.452	0.636**
	(60.626)	(1673.982)	(0.309)	(0.326)	(0.314)
LATE, distance	73.000	314.490	0.474*	0.795**	0.716**
	(48.737)	(423.736)	(0.259)	(0.405)	(0.296)
LATE, traditional	-433.435*	-622.429	-0.677	-0.313	-1.463
	(246.052)	(5687.692)	(0.857)	(0.688)	(1.117)
Difference	506.435	936.919	1.151	1.108	2.179
	(250.832)	(5697.321)	(0.896)	(0.798)	(1.156)
Control mean	81.567	2676.861	0.051	-0.062	-0.030
Observations	276	276	274	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Evidence for positive effects of distance learning on aspirations

	Aspired people who would seek respondent's advice	Aspired income	Son aspiration index	Daughter aspiration index	Candidate aspiration index
ITT, distance	35.971	155.240	0.234	0.392	0.353*
	(32.725)	(303.696)	(0.181)	(0.270)	(0.192)
ITT, traditional	-83.773	-127.769	-0.147	-0.060	-0.283
	(51.035)	(1647.299)	(0.250)	(0.182)	(0.249)
Difference	119.744*	283.008	0.381	0.452	0.636**
	(60.626)	(1673.982)	(0.309)	(0.326)	(0.314)
LATE, distance	73.000	314.490	0.474*	0.795**	0.716**
	(48.737)	(423.736)	(0.259)	(0.405)	(0.296)
LATE, traditional	-433.435*	-622.429	-0.677	-0.313	-1.463
	(246.052)	(5687.692)	(0.857)	(0.688)	(1.117)
Difference	506.435	936.919	1.151	1.108	2.179
	(250.832)	(5697.321)	(0.896)	(0.798)	(1.156)
Control mean	81.567	2676.861	0.051	-0.062	-0.030
Observations	276	276	274	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Evidence for positive effects of distance learning on aspirations

	Aspired people who would seek respondent's advice	Aspired income	Son aspiration index	Daughter aspiration index	Candidate aspiration index
ITT, distance	35.971	155.240	0.234	0.392	0.353*
	(32.725)	(303.696)	(0.181)	(0.270)	(0.192)
ITT, traditional	-83.773	-127.769	-0.147	-0.060	-0.283
	(51.035)	(1647.299)	(0.250)	(0.182)	(0.249)
Difference	119.744*	283.008	0.381	0.452	0.636**
	(60.626)	(1673.982)	(0.309)	(0.326)	(0.314)
LATE, distance	73.000	314.490	0.474*	0.795**	0.716**
	(48.737)	(423.736)	(0.259)	(0.405)	(0.296)
LATE, traditional	-433.435*	-622.429	-0.677	-0.313	-1.463
	(246.052)	(5687.692)	(0.857)	(0.688)	(1.117)
Difference	506.435	936.919	1.151	1.108	2.179
	(250.832)	(5697.321)	(0.896)	(0.798)	(1.156)
Control mean	81.567	2676.861	0.051	-0.062	-0.030
Observations	276	276	274	276	276

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

For whom was distance learning most effective?

	Technology index	Mobility index	Empowerment index	Distance to training center	Dependency ratio (1-100)	Has an infant (0/1)	Household size	Household has a migrant (0/1)	Education (years)	Livestock knowledge score
Distance training	0.017	0.038**	-0.294***	-0.002**	0.002*	0.181	-0.065***	0.208*	0.033	0.007*
	(0.024)	(0.017)	(0.112)	(0.001)	(0.001)	(0.172)	(0.021)	(0.114)	(0.034)	(0.003)
Traditional training	-0.043	-0.015	-0.006	0.001	0.001	-0.249*	-0.002	-0.195*	0.031	0.004
	(0.027)	(0.026)	(0.059)	(0.001)	(0.002)	(0.129)	(0.016)	(0.106)	(0.031)	(0.002)
Difference	0.060*	0.052*	-0.288**	-0.003***	0.001	0.431**	-0.063**	0.403***	0.002	0.003
	(0.037)	(0.031)	(0.127)	(0.001)	(0.002)	(0.215)	(0.026)	(0.155)	(0.046)	(0.004)
Observations	139	139	139	139	139	139	139	139	139	139

Notes: * $p<0.10$, ** $p<0.05$, *** $p<0.01$. Cluster-robust standard in parentheses. All specifications include stratum fixed effects and lagged outcomes when available.

Distance learning shifts the distribution of income below the median

	Total household income	Respondent income	Jointly controlled income
Quantile = 15%, distance	562.957*	72.000	0.720
	(299.177)	(75.541)	(212.063)
Quantile = 15%, traditional	181.588	40.702	0.000
	(267.144)	(57.242)	(181.448)
Difference	381.369	31.298	0.720
	(341.438)	(78.546)	(247.610)
Quantile = 25%, distance	541.595*	118.000*	500.441**
	(306.985)	(70.167)	(200.342)
Quantile = 25%, traditional	416.399	34.318	0.000
	(344.212)	(66.138)	(153.045)
Difference	125.196	83.682	500.441**
	(390.996)	(86.807)	(207.725)
Quantile = 35%, distance	463.811	145.164*	620.000***
	(310.633)	(85.701)	(232.785)
Quantile = 35%, traditional	98.526	44.587	-80.000
	(382.103)	(74.064)	(164.124)
Difference	365.285	100.578	700.000***
	(407.717)	(108.073)	(249.044)
Observations	276	276	276

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications lagged outcomes when available.

Distance learning shifts the distribution of income below the median

	Total household income	Respondent income	Jointly controlled income
Quantile = 15%, distance	562.957*	72.000	0.720
	(299.177)	(75.541)	(212.063)
Quantile = 15%, traditional	181.588	40.702	0.000
	(267.144)	(57.242)	(181.448)
Difference	381.369	31.298	0.720
	(341.438)	(78.546)	(247.610)
Quantile = 25%, distance	541.595*	118.000*	500.441**
	(306.985)	(70.167)	(200.342)
Quantile = 25%, traditional	416.399	34.318	0.000
	(344.212)	(66.138)	(153.045)
Difference	125.196	83.682	500.441**
	(390.996)	(86.807)	(207.725)
Quantile = 35%, distance	463.811	145.164*	620.000***
	(310.633)	(85.701)	(232.785)
Quantile = 35%, traditional	98.526	44.587	-80.000
	(382.103)	(74.064)	(164.124)
Difference	365.285	100.578	700.000***
	(407.717)	(108.073)	(249.044)
Observations	276	276	276

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications lagged outcomes when available.

Distance learning shifts the distribution of income below the median

	Total household income	Respondent income	Jointly controlled income
Quantile = 15%, distance	562.957*	72.000	0.720
	(299.177)	(75.541)	(212.063)
Quantile = 15%, traditional	181.588	40.702	0.000
	(267.144)	(57.242)	(181.448)
Difference	381.369	31.298	0.720
	(341.438)	(78.546)	(247.610)
Quantile = 25%, distance	541.595*	118.000*	500.441**
	(306.985)	(70.167)	(200.342)
Quantile = 25%, traditional	416.399	34.318	0.000
	(344.212)	(66.138)	(153.045)
Difference	125.196	83.682	500.441**
	(390.996)	(86.807)	(207.725)
Quantile = 35%, distance	463.811	145.164*	620.000***
	(310.633)	(85.701)	(232.785)
Quantile = 35%, traditional	98.526	44.587	-80.000
	(382.103)	(74.064)	(164.124)
Difference	365.285	100.578	700.000***
	(407.717)	(108.073)	(249.044)
Observations	276	276	276

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications lagged outcomes when available.

Distance learning shifts the distribution of income below the median

	Total household income	Respondent income	Jointly controlled income
Quantile = 15%, distance	562.957*	72.000	0.720
	(299.177)	(75.541)	(212.063)
Quantile = 15%, traditional	181.588	40.702	0.000
	(267.144)	(57.242)	(181.448)
Difference	381.369	31.298	0.720
	(341.438)	(78.546)	(247.610)
Quantile = 25%, distance	541.595*	118.000*	500.441**
	(306.985)	(70.167)	(200.342)
Quantile = 25%, traditional	416.399	34.318	0.000
	(344.212)	(66.138)	(153.045)
Difference	125.196	83.682	500.441**
	(390.996)	(86.807)	(207.725)
Quantile = 35%, distance	463.811	145.164*	620.000***
	(310.633)	(85.701)	(232.785)
Quantile = 35%, traditional	98.526	44.587	-80.000
	(382.103)	(74.064)	(164.124)
Difference	365.285	100.578	700.000***
	(407.717)	(108.073)	(249.044)
Observations	276	276	276

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Cluster-robust standard in parentheses. All specifications lagged outcomes when available.

Conclusion

- We evaluated the effects of hybrid distance learning and traditional classroom-based training for CAHWs on training completion, livestock knowledge and management, income, savings, and aspirations.
- Neither type of training affected average income.
- Quantile regressions support the conclusion that training boosted income and women's income control below the median.
- Neither intervention had any effect on savings.
- Indicators of livestock knowledge and management were significantly increased by distance training.

Conclusion

- Distance learning was most effective for specific subgroups, e.g., women with infants.
- Our study provides strong evidence that hybrid distance learning can produce skilled rural service providers and open the door to rural women becoming entrepreneurs.

References I

Beg, S., A. Lucas, W. Halim, and U. Saif. 2019. “Engaging Teachers with Technology Increased Achievement, Bypassing Teachers Did Not.” Working paper, mar.

Bittman, M., P. England, L. Sayer, N. Folbre, and G. Matheson. 2003. “When Does Gender Trump Money? Bargaining and Time in Household Work.” *American Journal of Sociology* 109:186–214.

Casaburi, L., M. Kremer, S. Mullainathan, and R. Ramrattan. 2014. “Harnessing ICT to Increase Agricultural Production:Evidence From Kenya.” Unpublished.

Cole, S.A., and A.N. Fernando. 2020. “‘Mobile’izing Agricultural Advice Technology Adoption Diffusion and Sustainability.” 131:192–219.

Courtois, P., and J. Subervie. 2014. “Farmer Bargaining Power and Market Information Services.” *American Journal of Agricultural Economics* 97:953–977.

References II

Dean, J.T., and S. Jayachandran. 2019. “Changing Family Attitudes to Promote Female Employment.” 109:138–42.

Fabregas, R., M. Kremer, and F. Schilbach. 2019. “Realizing the potential of digital development: The case of agricultural advice.” 366.

Fafchamps, M., and B. Minten. 2012. “Impact of SMS-Based Agricultural Information on Indian Farmers.” *The World Bank Economic Review* 26:383–414.

Hildebrandt, N., Y. Nyarko, G. Romagnoli, and E. Soldani. 2020. “Price Information, Inter-Village Networks, and 'Bargaining Spillovers': Experimental Evidence from Ghana.” *SSRN Electronic Journal*, pp. .

Jayachandran, S. 2020. “Microentrepreneurship in Developing Countries.” Working paper, jan.

References III

—. 2021. “Microentrepreneurship in Developing Countries.” In *Handbook of Labor, Human Resources and Population Economics*. Springer International Publishing, pp. 1–31.

McKenzie, D., C. Woodruff, K. Bjorvatn, M. Bruhn, J. Cai, J. Gonzalez-Uribe, S. Quinn, T. Sonobe, and M. Valdivia. 2021. “Training Entrepreneurs.” *VoxDevLit* 1.

Mitra, S., D. Mookherjee, M. Torero, and S. Visaria. 2018. “Asymmetric Information and Middleman Margins: An Experiment with Indian Potato Farmers.” *Review of Economics and Statistics* 100:1–13.

Nakasone, E. 2014. “The Role of Price Information in Agricultural Markets: Experimental Evidence from Rural Peru.” Unpublished.

References IV

Rodriguez-Segura, D. 2021. “EdTech in Developing Countries: A Review of the Evidence.” *The World Bank Research Observer*, aug, pp. .

Sayer, L.C. 2005. “Gender, Time and Inequality: Trends in Women's and Men's Paid Work, Unpaid Work and Free Time.” *Social Forces* 84:285–303.

Sample balance

Variable	(1) Distance learning Mean/SD	(2) Traditional training Mean/SD	(3) Control Mean/SD	Difference (1)-(2)	Difference (1)-(3)	Difference (2)-(3)
Total household income	3,665.389 (2,822.429)	3,311.558 (2,663.332)	3,319.038 (2,824.011)	353.831	346.351	-7.480
Woman solely controls some income (0/1)	0.236 (0.436)	0.239 (0.430)	0.226 (0.363)	-0.003	0.010	0.013
Livestock knowledge test, percent correct	63.056 (22.283)	55.224 (22.719)	60.146 (24.213)	7.832	2.910	-4.922
Age (years)	30.153 (6.736)	28.522 (7.429)	28.927 (7.157)	1.630	1.226	-0.405
Woman's education (years)	10.514 (1.689)	10.269 (1.678)	10.599 (1.321)	0.245	-0.085	-0.330
Household owns livestock (0/1)	0.958 (0.199)	0.955 (0.196)	0.971 (0.206)	0.003	-0.012	-0.016
High interest in distance learning (0/1)	0.819 (0.353)	0.836 (0.394)	0.803 (0.443)	-0.016	0.017	0.033
High interest in traditional training (0/1)	0.764 (0.391)	0.701 (0.540)	0.730 (0.472)	0.062	0.034	-0.028
Observations	72	67	137			
Clusters	49	47	96			