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Featured Article

Challenges in Recruiting U.S. Farmers for Policy-Relevant Economic Field Experiments

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Abstract *To develop evidence-based agricultural policies, researchers increasingly use insights from economic field experiments. These insights are often limited by the challenges of recruiting large and representative samples of farmers. To improve the effectiveness and cost efficiency of farmer recruitment, researchers should apply the same experimental methods to the recruitment process that they apply to their main research questions. Here we experimentally evaluate ten recruiting strategies in two large-scale, high stakes experiments. We find that monetary incentives and reminders are effective, but costly. Costless strategies, such as prominently citing a well-known institution as the sponsor, had positive but small, effects on recruitment.*

Key words: agriculture, experimental economics, farmer subjects, recruitment.

JEL codes: C9, Q16, Q18.

Introduction

The bipartisan Foundations of Evidence-Based Policymaking Act of 2018 (commonly referred to as simply the "Evidence Act") requires that federal agencies, including the United States Department of Agriculture (USDA), develop statistical evidence to inform policy (Abraham et al. 2017). Nonetheless, the USDA's use of evidence from randomized field experiments in the design of agri-environmental policies lags behind efforts of other US federal agencies, such as the Department of Education or the Department of Health and Human Services.[1] Field experiments provide a means to create evidence by allowing researchers to test decision-maker behaviors in real-world settings. However, to be

statistically valid, field experiments must recruit sufficient sample sizes, which has proven especially difficult when farmers are the subjects in the experiments.

Despite the challenges of conducting field experiments with farmers, there are a number of economic field experiments that have yielded important insights in agricultural economics. Many of them have been conducted in the developing context on topics such as credit, index-based weather insurance, price response, price information, contracts, and heterogeneity of conditions (an excellent overview of these experiments and more can be found in De Janvry, Sadoulet, and Suri 2017). However, the many experiments conducted in developing countries may have low external validity for agriculture in high-income and industrialized countries due to dramatic differences in average farm size, the share of the population employed in agriculture, and access to improved agricultural technology. In the United States, some successful economic field experiments on agricultural topics include the conservation reserve program (Wallander, Ferraro, and Higgins 2017), and designing auctions of irrigation rights (Cummings, Holt, and Laury 2004). These are important because they have yielded insights on causality and induce behaviors that mimic economic models. For additional descriptions of relevant economic field experiments, see (Rosch et al. 2020) in this issue.

This article evaluates the success and cost-effectiveness of multipronged recruitment strategies used in two large-scale field experiments conducted with farmers. The article is motivated by the need to evaluate the possible strategies of recruitment in the context of US farmers and economic experiments. What strategies cost effectively recruit farmers into experiments? We evaluate ten strategies used in recruiting farmers using data from two large-scale field experiments with large financial incentives. We first compare the odds ratio of participating for a given recruitment strategy using logistic regression. We then present an evaluation of the cost per participant and the relative savings of each recruitment strategy. Our results report which methods increased farmer participation rates and if these methods were cost-effective, which can provide guidance for researchers seeking to inform policy through experimental designs. We find that monetary incentives and reminders are effective, but costly. Costless strategies, such as prominently citing a well-known institution as the sponsor, had positive but small, effects on recruitment.

In the remainder of the article, we first provide background information on experiments with farmers. Next, we describe the recruitment attributes and methods implemented in these experiments. We then present the experimental context and our estimation approach. The results and discussion sections present our findings regarding the effectiveness of the recruitment strategies in increasing response rates. We also examine their relative cost effectiveness. The article concludes with potential research extensions and the methodological implications of our results.

Background

Evidence-Based Policymaking in the Agricultural Context

Since its founding, the US government has made commitments to use evidence in policymaking, yet policymakers frequently operate in the absence of data and evidence. The Evidence Act emphasizes a specific effort to develop data and

[1]*For example, the Department of Education has used evidence from randomized controlled trials in the design of policies related to financial aid and provision of preschool. The medical field has a long history of using experiments, in particular randomized controlled trials, to inform health policy.*

statistical evidence across many departments of the US government, including the Department of Agriculture, and shift investment away from "low-value" activities. Randomized experiments are the gold standard for producing quality evidence in science. Experiments go beyond correlation to determine what a policy change is likely to cause. Researchers must successfully and cost-effectively recruit farmers for policy-relevant field experiments to meet the demands of the Evidence Act to produce quality evidence. The law has three main components: maintaining data privacy, developing a research roadmap, and granting access of administrative data to researchers (Hahn 2019). In the context of agricultural policy, all three of these components are critical to the success and expansion of new programs. In the case of the first component, data privacy, developing and maintaining the trust of farmers is critical to sustained participation. With regard to developing research roadmaps and leveraging administrative data, experimental evaluations, when done deliberately and with the collaboration of researchers (*e.g.* Wallander, Ferraro, and Higgins 2017). Moving forward, agricultural policymakers will need to take into account that data collection and program implementation are potential evidence-building opportunities—particularly with experiments embedded in government programs.

Field Experiments with Farmers

To inform agricultural policy, researchers often use observational (nonexperimental) designs with naturally occurring data or laboratory experiments with monetary incentives where university students stand in for the agricultural decisionmakers. In observational studies, researchers find it challenging to isolate the effects of programs from the effects of all the other factors that influence agricultural decisions (low internal validity). In contrast, laboratory experiments with students can more easily isolate the effects of changes in the decision environment, but the results may not extrapolate to naturally occurring agricultural conditions outside the lab (low external validity) (Carpenter and Seki 2011; Herberich and List 2012; Suter and Vossler 2013; Maart-Noelck and Musshoff 2014). Field experiments attempt to achieve strong internal and external validity by mixing randomized treatments with natural settings using nonstudent populations (Cason and Wu 2019). However, recruiting nonstudent populations has several challenges. Farmers may participate in an experiment in exchange for a reasonable rate for their time, or if the experiment offers them an opportunity to participate in something of interest (*i.e.* a cost-share auction), or out of altruism. Professions more common in the literature than farmers that have participated in experiments include investors (Haigh and List 2005) and poker players (Van Essen and Wooders 2015; Levitt, List, and Reiley 2010). Often those are in the context of comparing students and professionals. There is at least some evidence that survey response rate varies by industry sector (Baruch and Holtom 2008). Economists use field experiments to evaluate individuals' responses to potential policies and to predict the policies' impacts (Harrison et al. 2004). Using farmers as subjects in economic experiments is often of particular interest to lawmakers and regulators who are concerned about the external validity, or generalizability, of laboratory experiments that use nonfarmer subjects (Levitt and List 2009; Higgins et al. 2017). Consequently, policymakers have recently put greater weight on the results of experimental studies in which farmers participated (Rosch et al. 2020). Despite the value of farmers as subjects to inform policy, many agricultural experimental studies in developed countries are conducted using

students because of the challenges associated with recruiting farmers—most importantly, cost and low response rates (Messer, Duke, and Lynch 2014).

Recruitment: Incentives and Communication

This section evaluates the literature on recruitment of students, the general public, and farmers for surveys and experiments. Studies going back decades have claimed that small monetary incentives increase survey response rates (Armstrong 1975; Duncan 1979; Brennan, Seymour, and Gendall 1993; Deserranno 2019). Limited research suggests farmers are more likely to respond when promised monetary incentives. Even small (i.e., $2 total) incentives have increased the response rate (Brennan, Seymour, and Gendall 1993; Glas et al. 2019). There is an absence of research evaluating large monetary incentives for farmers.

A wide range of strategies have been shown to effectively improve recruitment, including prenotification, reminders, prepaid postage, provision of return envelopes, sponsorship (identification of the messenger), and personalization of communication (Duncan 1979; Fox, Crask, and Kim 1988; Yammarino, Skinner, and Childers 1991; Dillman 2011; Stern, Bilgen, and Dillman 2014). Again, there are few studies examining such strategies with farmers. Personal letters and persistence in the form of several follow-up letters resulted in a 100% response rate among farmers in Wisconsin (Buse 1973). Mailed reminders increased participation from 57% to 59% in the context of an experiment embedded in a USDA conservation program (Wallander, Ferraro, and Higgins 2017). Across studies we consistently see response rates an order of magnitude above what is found in the present study. This may be due to many factors, including the relationship between the sender and farmers and the fact that the experiments in this study were recruiting for an online experiment rather than a survey. This study is one of few to test recruitment of farmers by academics who do not already have an established reputation with the population.

Electronic appeals are a potential low-cost alternative to other forms of recruitment. For example, use of e-mail and online services such as Amazon Turk and Google AdWords is becoming an increasingly feasible recruitment strategy (Charness, Gneezy, and Kuhn 2013; Bartneck et al. 2015). These approaches are relatively inexpensive and can be more expedient for researchers and respondents than the U.S. Postal Service (Antoun et al. 2016). Despite the low cost, competition with marketers and spammers for farmers' attention limits the efficacy of this medium (Porter and Whitcomb 2003). Recent evidence continues to demonstrate that e-mail contact can have response rates 25%–50% lower than postal mail for nonfarmer populations (Fowler *et al*. 2019; Daikeler, Bošnjak, and Lozar Manfreda 2020). It is important to reiterate the issue of the population in these studies. There are dimensions by which we would expect college students and farmers to be similar, but familiarity and trust in e-mail are not among them. Farmers are considerably older than college students and may be less response to e-mail.

Experimental Context

In 2018, the Center for Behavioral and Experimental Agri-Environmental Research (CBEAR) conducted two experiments with 25,616 farmers.[2]

[2]*Our mailing list comes from the private company Farm Market iD. They use publicly available data to create a database of farmer contact information, which we purchased for these experiments. There is overlap between the experiments, so we do not have 25,616 unique farmers.*

Experiment 1 was a time and risk preference experiment which consists of a small pilot (Experiment 1-A) and a larger main experiment (Experiment 1-B). Experiment 2 was a cost-share auction for an agricultural technology. Table 1 presents the combinations of the experimental treatments tested across the experiments and the resulting participation rates. As we did not know how best to recruit farmer participants for these studies, we tested ten recruitment strategies discussed in the literature. The recruitment strategies were:

1. Using e-mail for recruitment instead of postal mail. Despite evidence that e-mail results in lower response rates, e-mail is significantly less costly to test. Further, there is a need to test if the farmer respondents to e-mail differ than the respondents to postal mail—in the context of medical research they do not differ (Fowler et al. 2019; Millar et al. 2019).
2. Adjusting the messaging; for example, emphasizing the public goods nature of participating. There is some evidence that changing the message is a costless way to increase response rate (Petrovčič, Petrič, and Lozar Manfreda 2016).
3. Varying the messenger (i.e., Johns Hopkins University or USDA-funded). A meta-analysis of forty-one studies estimated a statistically significant 8.9% increase in response rates from use of university sponsorship (Fox, Crask, and Kim 1988).
4. Providing a higher incentive payment. The recruitment strategies offered relatively large financial incentives. Experiment 1-A presented farmers with an opportunity to receive $50 to $75 for their participation in a survey. Experiment 1-B had incentives between $25 and $100. Experiment 2 offered farmers either $0 or $50 to participate in an online auction. Most prior studies of monetary incentives for participation offered much smaller incentives, typically less than $10 (Brennan, Seymour, and Gendall 1993; Griffin et al. 2011; Glas et al. 2019).

Table 1 Project Summary

	Experiment 1-A	**Experiment 1-B**	**Experiment 2**
E-mail		x	x
Message	X	x	x
Messenger	X	x	x*
Payment	X	x***	x*
Payment Card	x	x***	
Postage			x
Premailers	x	x*	
Reminders	x*	x	x
Early Deadline		x*** (note that the early deadline *decreased* the likelihood of participation)	
Timing			x
Sample (U.S Mail)	1,000	8,064	11,810
Sample (E-mail)[1]	896	0	3,846
Participation Rate (excluding e-mail)	6.50%	4.10%	1.00%

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ indicates significance of impact on subject likelihood to respond.
[1]Note that there were zero responses to the e-mail sample.

5. Including physical prepaid cards with the invitation. Prepaid cards are becoming increasingly more common, and present a different option than the tradeoff of cash (more effective in increasing response rates) versus promise of cash (James and Bolstein 1992).
6. Using physical first-class stamps instead of printed presort stamps. A meta-analysis of eighteen studies estimated a statistically significant 1.8% increase in response rates from use of first-class stamps (Fox, Crask, and Kim 1988).
7. Sending either one or two reminders. A meta-analysis of thirty-six studies estimated a statistically significant 3.5% increase in response rates from use of a follow-up postcard (Fox, Crask, and Kim 1988).
8. Varying the timing of contacting farmers. The difference in busy versus slow time of year might have a large impact on the opportunity cost for a farmer to respond to the experiment. In a study involving almost 4,000 US farmers, a number of attributes of effective survey recruitment were identified, including good and bad times to contact farmers (Pennings, Irwin, and Good 2002).
9. Assigning a deadline for response. A deadline may encourage farmers to take immediate action rather than delay, but also limits the ability of researchers to send reminders. Evidence is mixed as to whether the deadline improves or worsens response rates. There is some evidence that a deadline should increase participation (Porter and Whitcomb 2003), although other studies have found deadlines to be not significant (Yammarino, Skinner, and Childers 1991).
10. Using premailers that serve as advance notification of the upcoming experiment without providing details about how to participate. A meta-analysis of twenty-two studies estimated a statistically significant 7.7% increase in response rates from use of prenotification (Fox, Crask, and Kim 1988).

Figure 1 illustrates the time-sensitive treatments in each experiment (treatments 7–10 described above). An Appendix of Supplemental Materials contains samples of all of our treatment mailings. Figure 2 presents the timing of farmer participation in relation to the time-sensitive treatments in Experiments 1A, 1B, and 2. As can be seen, the majority of responses came soon (within ten days) after the initial invitation.

Figure 1 Sequence of Time-Specific Recruitment Interventions in the Experiments

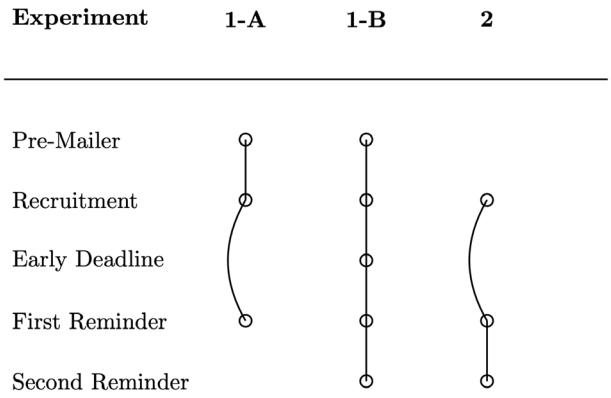
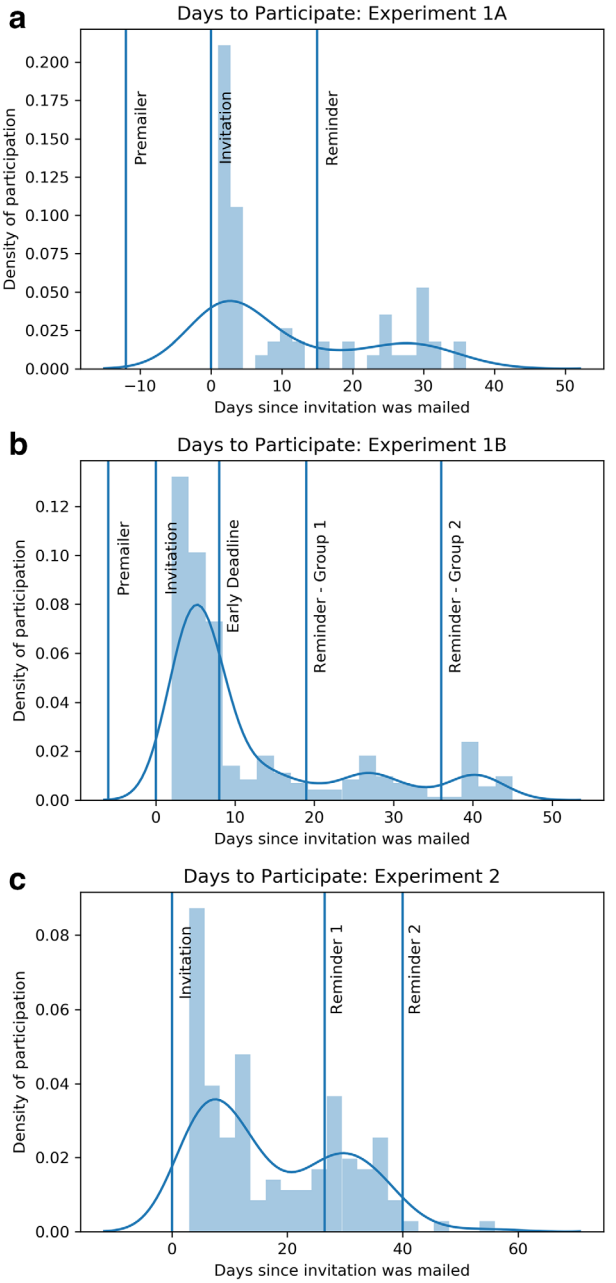


Figure 2 Days Since Invitation to Participation [Color figure can be viewed at wileyonlinelibrary.com]



Experiment 1 Recruitment

In Experiment 1, we conducted an experiment on farmers' time and risk preferences in two waves. In Wave A, 1,000 farmers were invited to participate via U.S. Mail and an additional 896 via e-mail.[3] In Wave B, we retested

[3]*While recruiting from a pool of 1,000 farmers is often considered a large sample, we note that the analysis could lack adequate power to detect meaningful effects.*

promising treatments from Wave A and two new treatments. For Wave B, 8,064 farmers were invited to participate via U.S. Mail. Since none of the farmers recruited via e-mail responded, they are excluded from further analysis. Contact information for farmers came from Farm Market iD, and we required that farmers operate at least 100 acres and be located in one of the top twenty-five states in terms of agricultural production. The threshold of 100 acres makes it very likely that invitees meet the USDA definition of a farm: $1,000 in agricultural revenue annually. The invitation included a unique login code that allows us to track who participates and prevents subjects from participating multiple times.

Experiment 2 Recruitment

In Experiment 2, we conducted a cost-share auction for an agricultural technology and invited 11,810 farmers *via* U.S. Mail and 3,846 via e-mail. In that experiment, we implemented a combination of seven recruitment treatments from Experiment 1. To be eligible for an invitation, a farmer had to operate at least 100 acres and be located in ten target states in the Southeast.[4] Half of the farmers, chosen at random, were sent their invitations in mid-September, a typically busy period for farmers. The other half received the invitations in early November, allowing us to study the effect of time of year on farmers' willingness to participate. The invitation explained how to participate and provided a participant code with which individuals could log in.[5] These unique identifiers allow us to track who participates and prevents individuals from participating multiple times.

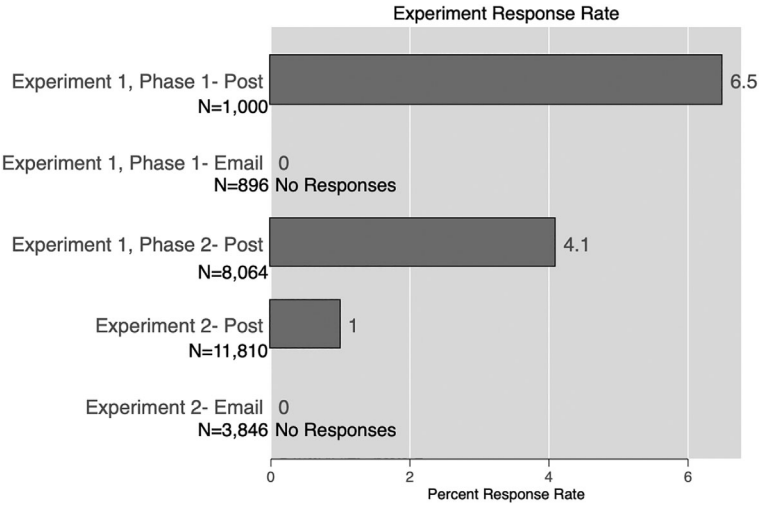
Results and Discussion

Despite the relatively high monetary incentives, the overall response rate for Experiments 1 and 2 collectively was just 2% of the 25,616 farmers contacted (4% of 9,960 in Experiment 1 and 0.7% of 15,656 in Experiment 2). The overall response rate increases to 2.4% with the exclusion of the farmers contacted by e-mail, none of whom responded.[6] Figure 3 illustrates the response rates from farmers for each wave of the experiments and for contact via U.S. mail and e-mail. We identify a number of factors that had significant positive impacts on the farmer response rate. Table 2 presents a summary of the results for each experiment and treatments that showed potential for increasing response rates.

In Experiment 1-A, 1,000 farmers were invited to participate in a survey *via* letters sent by postal mail. Only sixty-five of those farmers completed the survey (6.5%), forty-eight before a reminder was sent and seventeen after a reminder was sent. The reminder was sent to a randomly selected sample of two-thirds (634) of the remaining 952 farmers who had not yet responded at the time. The first two columns of table 3 present the outcomes of the recruitment effort in Experiment 1-A. Due to the small sample size estimations are imprecise and unable to detect small effects. The only significant effect we find is a positive effect on response rates for the reminder treatment, shown

[4]*The target states were Alabama, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Oklahoma, South Carolina, and Texas.*
[5]*The Appendix of Supplemental Materials shows the images of all recruitment materials.*
[6]*Some farmers opened the e-mail but none chose to complete in the experiment.*

Figure 3 Percent Response Rates in the Experiments



in the second column: a participant who received a reminder was eight times more likely to respond.

Columns 3 and 4 of table 3 present the outcomes of recruitment efforts in Experiment 1-B for the full sample using a logistic regression model. The outcome variable "Participated" takes a value of 1 when a recruited individual completed the experiment and 0 otherwise. We find that a $100 incentive increased response rates by 64% relative to a $25 incentive. Farmers who received a premailer were 30% more likely to participate than farmers who did not receive a premailer. Inclusion of a payment card increased the likelihood of participation by 76%, and there was no difference between inclusion of an actual card and printing an image of the card. As shown in Column 3 of table 3, we found that a stated deadline made farmers less likely to respond, though the effect diminished when we considered only those who completed the survey before receiving a reminder. Our analysis indicates that the public goods message had no significant effect. We also found no significant effect of identifying the messenger as Johns Hopkins University versus highlighting that the research was USDA-funded.

Columns 5 and 6 of table 3 present the outcomes of the recruitment efforts for Experiment 2 using a logistic regression model. Each specification includes state-level fixed effects. We use a logistic regression model, which indicates that a $50 payment increases the response rate by 60% over no payment. We also find a 50% higher response rate for recruitment that emphasized Johns Hopkins University as the messenger compared to Albany State University (ASU), though the effect is not present in ASU's home state of Georgia. In additional robustness checks,[7] we found that payment was not conditional on bidding in the auction. Bidders in the auction did not have a significantly greater response to any of the recruitment strategies, though the point estimates remain similar to those of the full sample. We find no significant differences for the mailing wave, postage provision, public goods message, or sending a second reminder for any specification.

[7]*These results may be found in the online Appendix.*

Table 2 Summary of Results

Strategy	Exp	Results
E-mail	1-B	No response to the 895 e-mail invitations.
	2	No response to the 3,846 e-mail invitations.
Message	1-A	No significant effect of public goods message.
	1-B	No significant effect of adding public goods message. (emphasis on improving USDA programs rather than payment for participating).
	2	No significant effect of different messaging: no difference between a private ("You can save") economic ("money") message, a public ("We need your help") economic message, and a public environmental ("damage from hogs") message.
Messenger (sponsoring institution)	1-A	No significant effect of Johns Hopkins University over CBEAR as the messenger.
	1-B	No significant effect of Johns Hopkins University over "USDA-Funded."
	2	Subjects are 50% more likely to participate if Johns Hopkins University is the messenger *vs*. Albany State University. However, the effect disappears when constrained to Georgia subjects.
Large Payment	1-A	No significant effect of the $75 payment *versus* $50.
	1-B	Subjects are 64% more likely to participate to the $100 payment *versus* $25.
	2	Subjects are 60% more likely to participate to the $50 payment *versus* $0.
Payment Card	1-A	No significant effect of including a payment card.
	1-B	No significant effect of printing an image of the prepaid card. Subjects are 76% more likely to participate if a physical prepaid card is included.
Postage	2	No significant effect of using physical stamps *versus* printed presort stamps.
Premailers—sent before an invitation and contained no information on how to participate	1-A	No significant effect of a premailer.
	1-B	Subjects are 29% more likely to participate when they received a premailer.
Reminders—sent after the invitation and containing all information necessary to participate	1-A	Subjects who had not yet responded by the date the reminder was sent are 700% more likely to participate with a reminder.
	1-B	All participants received a reminder.
	2	No significant effect of a *second* reminder (all participants received the first reminder).
Deadline	1-B	Subjects are 41% *less* likely to participate if an early deadline is assigned (because reminders cannot be sent).
Timing	2	No significant effect from the timing of the invitations at the end of September or the start of November.

Table 3 Experiment 1-A Recruitment (Logit Model)

	Experiment 1-A		Experiment 1-B		Experiment 2	
	(1) Full sample	(2) Reminder subsample	(3) Full sample	(4) No-reminder subsample	(5) Full sample	(6) Reminder subsample
Large Payment	1.03	0.55	1.638***	1.599***	1.604*	2.029**
	(0.27)	(0.28)	(0.19)	(0.20)	(0.30)	(0.55)
Premailer	0.95	0.42	1.290*	1.323*		
	(0.26)	(0.27)	(0.15)	(0.17)		
Card	1.16	0.66	1.764***	1.810***		
	(0.38)	(0.45)	(0.23)	(0.25)		
Image	0.74	0.55	1.02	0.95		
	(0.22)	(0.31)	(0.15)	(0.16)		
Reminder		8.177*				
		(8.45)				
Early Deadline			0.590***	0.78		
			(0.08)	(0.11)		
Messaging			1.17	1.12	0.74	0.74
			(0.13)	(0.14)	(0.17)	(0.23)
Messaging (Env.)					0.86	0.83
					(0.19)	(0.25)
Messenger					1.504*	2.528***
					(0.28)	(0.71)
Postage					1.11	1.11
					(0.20)	(0.28)
Later Mailing					1.11	
					(0.26)	
Constant			0.0270***	0.0261***		
			−0.00862	−0.00845		
Obs.	1,000	952	8,064	8,064	11,810	5,612

Notes: *Exponentiated coefficients; Standard errors in parentheses. State controls included. No reminder indicates participants that finished before their reminder was sent.*

*p < *0.05.*

**p < *0.01.*

***p < *0.00.*

Cost Effectiveness

Recruiting agricultural producers for surveys or experiments is expensive. In this section, we estimate the cost-effectiveness of the recruitment treatments used in the experiments, which can be framed in two ways. When a target population is sufficiently large relative to the target sample size, the researcher's goal is to minimize the cost of recruitment, subject to recruiting an adequate subject pool.[8] A researcher ideally recruits up to the point which marginal benefit is equal marginal cost.

Cost effectiveness depends on the cost of the status quo recruitment method and the resulting recruitment rate. We ignore nearly "costless" treatments (*e.g.*, changing the messenger or message), which are cost-efficient if they have a positive effect on the response rate. We estimate the effects of recruitment strategies using point estimates of ordinary least squares regressions of the treatments for simplicity of calculation.[9]

[8]*There may be benefits from increasing the recruitment rate, such as reducing selection.*

[9]*Tables of these estimates are available from the authors upon request.*

Table 4 Cost Efficiency Estimates

Panel A Premailer	Experiment 1-B Large payment	Card	Recruitment Rate	Cost per participant	Premailer savings	Payment savings	Card savings
0	0	0	0.026	$131.15			
0	0	1	0.051	$130.88			$0.27
0	1	0	0.045	$161.33		−$30.18	
0	1	1	0.07	$177.14		−$46.26	−$15.81
1	0	0	0.036	$121.11	$10.04		
1	0	1	0.061	$125.00	$5.88		−$3.89
1	1	0	0.055	$162.91	−$1.58	−$41.80	
1	1	1	0.08	$176.25	$0.89	−$51.25	−$13.34
			Average Savings:		$3.81	−$42.37	−$8.19

Panel B	Experiment 2 Large payment	Add'l reminder	Recruitment rate	Cost per participant	Payment savings	Reminder savings
	0	0	0.006	$333.33		
	0	1	0.01	$233.56		$99.78
	1	0	0.009	$275.40	$57.94	
	1	1	0.014	$229.94	$3.62	$45.45
			Average Savings:		$30.78	$72.62

Notes: *E-mail was not cost effective. E-mail addresses cost $0.50 each. Since no farmers invited by e-mail chose to participate, the cost per participant is not defined.*

In our experiments, the overall population of farmers was large relative to the target sample size. A cost-effective recruitment method reduces the cost of achieving the target sample size. Panel A of table 4 presents the amount saved per participant using three treatments from Experiment 1-B: premailer, a large monetary incentive of $100 instead of $25, and including the payment card with the invitation. The first three columns indicate the combinations of treatments used. The fourth column presents the recruitment rate for each treatment. For example, the control group without a premailer or included payment card, and a monetary incentive of $25, was 2.6%. The cost per participant, in the fifth column, is the estimated cost of recruiting a participant for a given set of treatments. Finally, the three columns on the right indicate the savings for each treatment. The treatment is considered cost effective when a positive amount is saved, e.g. an average of $3.81 saved by including a premailer.

Experiment 2 recruitment rates were lower than Experiment 1-B, despite higher costs. The costs for Experiment 2 are presented in Panel B of Table 4. The combinations of treatments are indicated in the first two columns—an additional reminder and a $50 payment compared to no payment. Recruitment rates are in the third column. With only one reminder and no payment, the response rate was 0.6%. Though both treatments are costly, they save money by raising the response rate and therefore reducing the number of mailings that need to be sent. Using both recruitment strategies reduced the cost of recruiting participants by 31%.

When working with agricultural producers, some experiments must draw from a limited subject pool. In that case, the researcher must define the value of a participant and choose which recruitment methods are worth the expense. It is difficult to estimate the effects of treatments in different experimental settings. Differences in the subject populations and the programs under study will invariably lead to different response rates and treatment effects. Our estimates, however, provide guidance regarding which recruitment strategies are likely to be worth the cost. To assist practitioners' efforts to determine the best strategies for their recruitment campaigns, in the Appendix of Supplemental Materials is an Excel workbook that allows users to enter assumptions about the target population, sample size, and the cost and efficacy of recruitment strategies. The workbook identifies the cost-effective strategies.

Conclusions

To develop evidence-based agricultural policy, we need research designs with high internal and external validity. In other words, designs that yield accurate and generalizable evidence about program impacts. Key to achieving that goal are field experiments, in which attributes of the decision environment are randomized and large groups of agricultural producers make real decisions in a natural setting. Yet recruiting farmers is difficult, and thus experimental research that tests how to best recruit them is critical for evidence-based policymaking.

In two large-scale recruitment experiments, we found that premailers, additional reminders, and greater monetary incentives can be cost-effective methods by which to increase recruitment. We found that using the right mixture of recruiting strategies can have large cost savings. Across our experiments, the cost of successfully recruiting a farmer as a research participant was 31%–32% lower with the most cost-effective strategies versus the least.

Similarly, when facing a fixed population, the most effective strategies can help practitioners get higher recruitment rates. Given a fixed population of farmers, the most effective strategies would recruit 133%–208% more farmers than the least effective strategies. Some of the recruitment strategies, such as revised messaging, required no additional expense and increased response rates relative to status quo language. Effectiveness of strategies is likely to vary across contexts. More tests of the strategies tested in this study will better characterize in which contexts each strategy is likely to be fruitful. Future research could determine if tailoring the message and emphasizing the involvement of a familiar messenger prove valuable.

The complete lack of a response to e-mail invitations is surprising. However, as people's reliance on physical postal mail declines, identifying ways to increase the effectiveness of online recruitment tools is critical, particularly since electronic communications are much less costly than physical mailings and younger generations of farmers are more familiar with technology in general. Online recruitment methods could also allow for larger pools from which to recruit and be more representative than pools reached solely through postal addresses.

Additionally, research is needed to evaluate the behavior of the respondents to determine whether the various methods were as effective at recruiting participants who actively engage in the experiment, for example, those that submitted bids for the agricultural technology in Experiment 2. Participant engagement could be especially important when studies examine adoption behavior or auction bidding behavior, as recruiting active participants rather than those who only participate for the fixed payment is critical.

There remains much to learn about recruitment to experiments. We implemented a number of strategies to increase participation, but our experiments had very low recruitment rates and our treatments did not provide any substantial cures, particularly not without a significant cost. Despite the lessons we describe in this paper, policy-relevant economic experiments with US farmers will likely experience low recruitment rates, at least when academics do the recruiting. Embedding recruiting experiments into larger experimental designs can generate insights into best recruitment practices. Further opportunities exist for practitioners who engage in farmer outreach for programs (*e.g.*, farmer field days, cost-share programs) to embed experiments into their outreach activities. The latter can shed light on recruitment for experiments as well as more generalizable knowledge about engaging with farmers for agricultural programs.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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