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# Agricultural Producers' Willingness to Pay for Real-Time Mesoscale Weather Information: A Response

Phil L. Kenkel and Patricia E. Norris

## Introduction

In their comment on our article, “Agricultural Producers’ Willingness to Pay for Real-Time Mesoscale Weather Information,” Cohen and Zilberman (CZ) conclude that our estimates of producers’ willingness to pay for weather information were biased downward. First, CZ assert that the decision to fund Mesonet, a system with widespread benefits, should not rest on value estimates obtained from only a subsection of potential users. Second, CZ suggest that the producers’ lack of information about the technology and strategic behavior of those surveyed resulted in an overly pessimistic estimate of the amount of user fees which might be paid by agricultural producers. We spend most of our time addressing the second concern since the first concern is beyond what our study addressed. Additionally, we present evidence that the actual market response of agricultural producers, once subscriptions to the Mesonet system were offered, were consistent with our findings.

## Purpose of the Study

The purpose of our study (Kenkel and Norris) was to answer the following question raised by the developers of Mesonet: How much could agricultural producers be expected to pay in user fees to receive mesoscale weather data, interpreted weather data, and weather information-related decision aids? Mesonet developers were faced with a need to raise revenues, beyond public sources of funds, for continued support of the system and development of additional components—primarily agricultural decision aids. Contingent valuation was used to assess agricultural producers’ perceptions of the value of the Mesonet system and, in particular, the proposed decision aids.

While CZ make several important points about using contingent valuation on this problem (and we discuss these later in this response), they appear to have misunderstood the central purpose for our work. It was never our intent, nor that of the Mesonet developers, to use “growers’ hypothetical willingness-to-pay responses as the sole basis for deciding whether to invest in Mesonet.” We agree that “a valuation of a government program that only focuses on a subsection of the potential adopters should not be the sole basis on which the decision to fund such a program is made.” Instead, in an attempt to answer the question posed by Mesonet developers and based on results of our study, we concluded that “supporting a substantial portion of the operating funds [for Mesonet]

through collection of agricultural user fees may be difficult” (Kenkel and Norris, p. 369). In addition, we concluded that costs of developing and supporting agricultural decision aids would likely not be recovered from agricultural user fees.

Cohen and Zilberman raise a valid point in their assertion that surveying other potential users would give a better estimate of the true value of the Mesonet system. The Mesonet developers were aware of the potential benefits to groups other than agricultural producers. In fact, while our article discussed only the results of the survey of agricultural producers, separate surveys were conducted of aerial applicators, grain elevators and input supply firms, and television stations. Mesonet developers also worked closely with emergency responders, the state water resource agency, and public school teachers, even though these groups were not targeted for user fees. At the time of the survey, the Mesonet developers had no commitment of public funds past the initial development phase. Given that public funds to develop specialized agricultural products using Mesonet were not likely to be made available, the developers believed that information on agricultural users’ willingness to pay for such products was needed as an indication of funds potentially available for such product development. Our study was never intended to be the sole basis of deciding whether or not to invest in Mesonet.

### **The Lack-of-Information Issue**

Cohen and Zilberman suggest that our willingness-to-pay estimates are likely negatively biased since the surveyed producers might not have possessed sufficient information about Mesonet to accurately assess its value. Their experiences with California farmers’ adoption of drip irrigation technology revealed that adoption became much more widespread in the wake of an extensive marketing and education effort on the parts of private firms and public agencies. They assert that “simply offering a description of the tools which Mesonet offers potential users without explicitly identifying the needs which those tools address and the potential benefits they offer does not give subjects the ability to make an informed response.”

Certainly, agricultural producers cannot precisely estimate the value of a technology which they have not yet adopted. On the other hand, consumers routinely make purchase decisions without first-hand experience with a product or service. In the contingent valuation survey for Mesonet, we attempted to describe the anticipated benefits of the new technology. For example, one of the weather-based decision aids described in the survey was a model which, based on weather conditions, would forecast when pesticide applications on peanuts are warranted. The wording of the description of the peanut leafspot model on the survey instrument was as follows:

*Peanut Leafspot Advisory Index—Indicator of when spraying for leafspot is justified based on local temperature and humidity conditions. Research indicates that two to three applications per year can be eliminated using the advisory schedule.*

While this description is no substitute for actual experience with the technology, it did explicitly describe the potential benefits of the technology. Producers could easily estimate the dollar value associated with such a reduction in pesticide applications.

More generally, in situations such as Mesonet when public funds for development and operation are limited, extensive efforts to demonstrate the benefits of new technologies are unlikely to occur. The level of information provided to potential subscribers may be

**Table 1. Respondent Motivation for Strategic Behavior in Revealing Willingness to Pay**

	Provision of Good Contingent upon WTP	Provision of Good Likely Regardless of WTP
Offered amount required	True value	Underbid
Uncertain amount required	Uncertain	Underbid
Fixed, nominal amount required	Overbid	Uncertain

similar to the information provided in the survey. In fact, willingness-to-pay estimates elicited after extensive free demonstration and usage periods could overstate potential user fee revenue if these promotional activities are not envisioned to occur when the service is actually offered to producers.

### The Strategic Bias Issue

Cohen and Zilberman propose that strategic bias in the survey responses might be a reason for the low willingness-to-pay estimates. Their assertion is that producers, when asked their hypothetical willingness to pay for a service for which they actually expect to pay, are likely to intentionally understate the information's value. In fact, research has shown that, when asked how much they would be willing to pay for a particular good or service, subjects may be motivated to strategically understate or overstate their true preferences.

Mitchell and Carson described six motivational states arising from the joint effects of two factors. The first factor influencing the respondents motivation to overbid or underbid is whether the respondent believes provision of the good is contingent upon the willingness-to-pay amount he or she reveals. The second factor is whether the respondent believes he or she will have to pay the exact amount revealed, an uncertain amount (which could be more or less than the amount revealed), or a fixed amount, likely to be nominal or even \$0. Table 1 illustrates the joint effects of these factors in terms of respondents' motivation to reveal true values, to overbid or to underbid. (In two cases, the joint effect is uncertain.)

The Bishop and Heberlein study referred to by CZ represents a case where respondents could assume that the hunting permits would ultimately be provided, regardless of expressed willingness to pay. Most wildlife management programs incorporate some type of hunting so the decision variable is who will do the hunting rather than whether the hunting will be done. That respondents clearly expressed a hypothetical willingness to pay lower than their actual cash offers suggests that, based on previous history of hunting permit costs, respondents had expectations about the relationship between their revealed willingness to pay and actual permit costs that led to strategic underbidding.

Despite the low willingness-to-pay amounts elicited in our survey, it is not as clear that respondents were in a position where strategic underbidding was likely. The discussion of the Mesonet system provided in the survey and cover letter emphasized that there were insufficient funds to develop all of the potential Mesonet products and that the

priorities for providing Mesonet to user groups and developing specific products would depend upon users' willingness to pay user fees. First, then, the survey material stressed that availability of Mesonet or of the associated decision aids was not a foregone conclusion. Producers could not be certain that the services would be provided regardless of their stated willingness to pay. Second, by revealing that Mesonet developers were considering a system of user fees to help pay operating and development costs for Mesonet, respondents might conclude that a fixed, possibly nominal, fee would be likely regardless of their stated willingness to pay. Thus, it appears that the producers surveyed in our study were more likely to overstate than understate their true willingness to pay.

In the California irrigation adoption study referenced by CZ, researchers compared estimated value of irrigation (producers' assessment of benefits) with producers' willingness to pay. The willingness to pay was much lower than the perceived benefits (Parker et al.). Our survey did not make that kind of comparison. While we collected limited data on producers' payments for other information services, we did not compile a sufficiently comprehensive data base which would allow us to compare individual producers' willingness to pay with actual payments for similar services. However, since the original article was written, Mesonet subscriptions have been offered. In addition, a limited number of agricultural decision aids have been made available. Producers' responses to these services provide some insights into the extent to which the original survey elicited negatively or positively biased willingness-to-pay estimates.

### **Evidence of Agricultural Producers' True Willingness to Pay**

Distribution of the Oklahoma Mesonet System via a dial-in computer network was officially initiated in March 1994. Marketing efforts promoting the benefits of the system to agricultural producers included spots on Oklahoma State University's "Sun-Up" television program (with a reported audience of over 100,000), information booths with active displays at annual state fairs, development of informational brochures, presentations at agricultural industry groups and field days, and a two-page feature article in a regional farm publication. Several workshops were also provided for county extension employees, and the county extension offices were provided access to the system without paying user fees. Large-screen promotional Mesonet displays were also placed at the Oklahoma State Capital and in the lobby of a new research facility on the OSU campus. All of the Oklahoma television stations subscribe to the Mesonet system and include the Mesonet symbol when they broadcast Mesonet-based information.

The Mesonet development committee shared the views of CZ that the value of Mesonet to agricultural producers was much higher than the contingent valuation results suggested. However, the fee schedule for agricultural producers was set at a low level—\$10/month. The total cost of obtaining Mesonet also included the long-distance charges and, of course, the producers' time. This total fee structure was therefore above the \$5–\$6 that the survey respondents indicated that they were willing to pay, but still extremely low compared with the amounts which producers pay for other sources of information.

As of August 1997, only three agricultural producers agreed to pay the \$10 user fee to subscribe to Mesonet. While approximately 40 of the 77 Oklahoma extension offices signed up for Mesonet access, the system operator indicated that only 10–15 offices routinely access the system. As envisioned, the Mesonet system has been used by other

groups. The public school system has become a significant user, as have television stations, and various other public sector groups, including the Department of Environmental Quality, the Oklahoma Water Resources Board, Forestry Agencies, and, in times of severe weather events, law enforcement agencies and emergency responders. These uses have been funded by new state appropriations for Mesonet.

There are undoubtedly a number of factors contributing to this low adoption during the initial three-year period (1994–97) of operation. Despite the efforts previously described, the campaign to market and promote Mesonet pales in comparison to a typical consumer or even a typical agricultural product. Also, since the Mesonet developers were not able to provide toll-free long-distance access to Mesonet, as was envisioned when the survey was conducted, the total cost of receiving Mesonet was raised to approximately \$30/month for the typical user.

Another factor which may have contributed to the low initial demand for Mesonet is the fact that not all of the agricultural decision aids were initially developed and offered. It is impossible to determine if the survey respondents did in fact engage in strategic behavior, understating their true willingness to pay in anticipation that the agricultural products would be developed regardless of their user fee revenue estimates. However, the events indicate that this behavior, if it did occur, was in retrospect a poor strategy. Because agricultural producers were not envisioned to be a major source of user fees, the development of the agricultural products was assigned a lower priority. Only two of the six Mesonet-based decision aids (the cotton growth stage and planting advisory and the alfalfa weevil advisory) were offered when the Mesonet system was made available in 1994. Two additional products (the peanut leafspot advisory and the irrigation evapotranspiration model) were added in 1996. The final two products (the fire danger advisory and the pecan scab model) were added in 1997.

It would be an oversimplification to suggest that the low adoption of Mesonet when offered with extremely low level of user fees validates the willingness-to-pay estimates from the contingent valuation study. It could also be argued that agricultural producers did not at the time of the survey, and still do not today, understand the potential value of the Mesonet-based information. However, the results do highlight the risks of basing expectations of initial product acceptance on a product developer's perception of the benefit of the product or technology. The Mesonet example also suggests that, despite the numerous pitfalls in eliciting a hypothetical willingness to pay, contingent valuation can provide useful information about the initial adoption of a technology or acceptance of a product.

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