Wylie, Allan

From: Bryce Contor [bcontor.uidaho@gmail.com]
Sent: Tuesday, June 29, 2010 8:51 PM
To: Raymondi, Rick
Cc: Wylie, Allan
Subject: On-Farm parameters

Rick --

Allan's notice of the phone meeting reminded me I had promised to send something on irrigation efficiency. I wasn't planning on attending the phone meeting, pending a decision (and appropriate budget) for my involvmenet in calibration.

Here are my thoughts:

A. Efficiency Parameters

1) It is clear from the literature that as water volume applied to a given parcel decreases, consumptive-use fraction of applied water (one of many definitions of "irrigation efficiency" and the one implicit in the On-Farm method) approaches 100%. The bibliography in the linked document, along with the USDA irrigation manual and the concepts of runoff, percolation and root-zone stoarge make this clear.

http://www.iwrri.uidaho.edu/documents/200803-1_revision.pdf?pid=108520&doc=1

2) In the real world, of course, at some point farmers will no longer spread the water over existing parcels, but will instead reduce acreage. The linked document ignores this effect. I've been working on a revision and if I can lay my mitts on a draft fit for human consumption I'll forward it.

The nut of the problem is that commodity price is also a function of irrigation adequacy. For forage or pasture crops where this is not true, we actually see farmers attempting to spread what little water there is across as many acres as possible and actual irrigation efficiency does approach 100%. However for a crop like potatoes, the quality and therefore price are so sensitive to irrigation adequacy that we observe that farmers will immediately reduce acreas rather than engage the risk of deficit irrigation.

3) In a mixed-crop setting (i.e the ESPA), the expected behavior will be to give potatoes a full supply, engage in some deficit irrigaiton on grains, and engage in wholesale deficit irrigation on forage crops. I believe one could use the crop mix in each county and assume that in the case of severe water shortage, potatoes would still be irrigated 100%. Small grains, corn, sugar beets, beans, etc would be irrigated at 75% to 80%, and any remaining water would be applied to alfalfa and pasture.

With the acreage and diversion data, one could find the worst year in the record and calculate how much water would have been available for forage crops, and from that use the equations in the linked document (with a little gyration) to calculate the effective efficiency on forage crops. Similarly one could calculate the efficiency on other crops at 75% supply, and use the "system design efficiency" (the values currently in the *.eff table) for the potato acreage. Then one could calculate a weighted-average system efficiency for the dryest year of record, and that would be the appropriate constraint to use in the On-Farm algorithm.

In this process one should realize that potatoes are not irrigated by gravity, but only by sprinklers. Even as early as 1980 this was generally true, for quality reasons.

B) Percolation parameters

The percolation parameters should be adjusted to produce approximately the measured returns. I still don't fully grasp the difference between DPin and DPex so I can't speak to how this should be done.

Bryce

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