Agricultural Irrigation Water Demand Forecast

Procedures for Estimating Irrigated Acres for Select Crops
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Irrigated acreage projections are based on long-run projections conducted by the United States Department of Agriculture (USDA). The USDA makes ten-year, national acreage projections for the following major field crops: corn, sorghum, barley, oats, wheat, rice, upland cotton, and soybeans (USDA, 2009). Broad categories of horticultural crops are also projected, namely, fruits and nuts, vegetables, and nursery and greenhouse products. Fruits and nuts are further divided into three categories: citrus, non-citrus, and tree nuts. Vegetables are divided into fresh, processed, and potatoes. Nursery and greenhouse products are not further divided. The reason for the highly aggregated projections is a lack of sufficient data.

USDA does not project peanut acreage. Data from the Food and Agricultural Policy Research Institute (FAPRI) were used to address peanuts (FAPRI, 2008).

Estimates for 2008 irrigated acres were generated from the mapped acreage as reported in SECTION ???. These estimates serve as the baseline for irrigated acreage projections for each crop. The particular challenge to the acreage projections is the uncertainty surrounding state-level and county-level historic irrigated acreage. Ideally, these projections would be based on empirical evidence regarding how farmers in Georgia expand and adjust irrigated acreage across crops in response to price changes.

Two studies have examined irrigated acreage responses to prices in Georgia (Tareen, 2001; Mullen et al., 2009). The Tareen study generated irrigated acreage elasticities with respect to expected profits and was exclusive to the Flint River Basin. The Mullen et al. study generated irrigated acreage elasticities with respect to output prices, under a fixed land constraint, for the whole state. Both of these studies focused on corn, cotton, peanuts, and soybeans. The major drawbacks of applying the Tareen estimates to the study at hand are their focus on the Flint River Basin and the counter-factual sign on the corn acreage elasticity – the estimate predicts irrigated corn acreage will fall when expected profits increase. The major drawback of applying the Mullen et al. estimates is the fixed land constraint.

USDA (1996) has also generated acreage response elasticities with respect to output prices. Estimates were produced at national and regional levels. In the Southeast Region, estimates were made for corn, cotton, and soybeans, but not peanuts. These estimates, however, are for total harvested acreage rather than irrigated acreage.

None of the aforementioned studies estimate irrigated acreage responses for tree nuts, or fresh or processed vegetables. Furthermore, the USDA national projections for these crops are in millions of pounds rather than harvested acres. To address these crops, several assumptions were made:

> Assumption 1: the growth rate of irrigated acres of tree nuts, fresh vegetables, and processed vegetables in Georgia will be equal to the respective projected growth rate of national production (in millions of pounds) for each crop, through 2018.
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> Assumption 2: the county-level growth rate of irrigated acres for each crop will be equal to the state-level growth rate.
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> Assumption 3: the growth rate of irrigated acres for each crop beyond 2018 will be equal to the average projected growth rate from 2016 through 2018.

In the interest of methodological consistency, projections for corn, cotton, peanuts, and soybeans are also made by applying similar assumptions. The only modification is in Assumption 1 – namely, the growth rate of irrigated acres of corn, cotton, peanuts and soybeans will be equal to the projected growth rate of national harvested acres for each crop, through 2018.

Projections were also made for corn, cotton, and soybeans using the acreage response elasticities for the Southeast Region (USDA, 1996). In addition, the elasticity estimates from Mullen et al. were used to generate projections for corn, cotton, peanuts, and soybeans. In both of these cases, projected prices from USDA through 2018 were applied to the acreage response elasticities (the peanut price projections were from FAPRI). Assumption 2 and Assumption 3 were employed, as above.[1]

In the short run – to 2010 – there is considerable consensus across the three methodologies for each crop. At the state level, the soybean projections differ by less than 2%. The peanut, corn and cotton projections differ by less than 6%, 9%, and 7%, respectively.

In the medium run – to 2020 – the consensus continues across methodologies continues for cotton, peanuts, and soybeans. The largest projected differences for these crops are 4%, 4%, and 3%, respectively. The maximum difference in projected corn acreage, however, has grown to 17%.

In the long-run – to 2050 – the difference in projected soybean acreage remains steady, at 4%. The difference in projected peanut acreage grows to a modest 10%. The difference in projected cotton and corn acreage grows to 24% and 30%, respectively. The divergence of projected irrigated acreage for these two crops is fueled by compounding small differences in projected growth rates over more than 30 years. One should keep in

[1] Projections using the Tareen elasticity estimates have not been done to date. However, preliminary calculations indicate they are extremely likely to fall within the current range of estimates.

mind the uncertainty associated with any projection increases exponentially as we move out in time.

Through 2020, the three methodologies provide remarkably similar projections of irrigated acres. Given this, we have used the irrigated acreage projections based on the growth rate of national harvested acres to project irrigation water use. This decision is based on our ability to apply a consistent methodology across all crops.

References

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