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Programmed Effects of Surface Water Price Levels on U.S. Agricultural Water Use and Production Patterns: Reply

Andrew S. Morton, Douglas A. Christensen and Earl O. Heady

In recent years there has been increasing concern about diminishing water supplies and the ability of the existing institutional structure (in the form of federal and state water laws) to allocate water among competing uses in an efficient manner. Underlying this concern has been a notion that irrigation is a relatively low value user of water and that a more market oriented allocation system is likely to transfer water from irrigation to other uses. While this notion is widely held, no one has a real grip on the marginal product of water in competing uses. Thus, people have only had a vague notion, at best, regarding what would be the implications for irrigated agriculture and agriculture in general if water were allocated in a more efficient manner. Our study is designed to give a better understanding of how agriculture could use water if it were priced closer to its value to society at the margin [Morton, Christensen and Heady]. This is the type of information which is an essential input into developing an improved system for water allocation nationwide.

The arguments made by the author of the comment suggest that he views our analysis as positive or predictive in nature rather than being normative. His comments on the water use figures of Table 1 falls into this category.¹

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¹Table 1 gives water *consumption* for all crops and livestock for each and all of the irrigable river basins (not the whole U.S.).

Water consumption results of the base solution are significantly lower than the 96 million acre feet projection of the National Water Assessment (which is the relevant figure here as our results account for consumption net of conveyance losses) due to reasons mentioned earlier and because it is quite likely that we will continue to use a larger proportion of water in the agricultural sector than could be justified under an optimal allocation of resources. In addition, this normative conclusion would not have been possible had we restricted water allocation according to the existing institutional structure. There has long been a need to evaluate water allocation possibilities outside of a set of historic and obsolete set of water institutions. Such an evaluation could be made only with a model of the general type used in the analysis.

In addition, even though at this time the scenario of increasing real surface water prices would seem unlikely compared to other water price scenarios, this is not a compelling reason to ignore it completely. Of primary interest in our study was and is the amount of water use which might prevail if alternative levels of surface water prices were possible. Because agricultural water use does not take place in a conventional market, a statistical analysis of water demand is not possible. Thus, the programming approach is used. The author's dislike of the level of substitution allowed for surface water by groundwater and the movement of surface water between producing regions again reflects his misinterpretation of the nature of the study.

Finally, we would like to clarify the role of

irrigated pasture in the model. The comment states correctly that irrigated pasture is not a high valued crop. However, while irrigated pasture is exogenous to the model (3.5 million acre upper bound for 1985), activities are included in the model which allow irrigated pasture to be converted to dryland pasture to free water for endogenous commodity use at a cost of reducing non-legume hay yields. For example, in the base solution, .5 million acres of irrigated pasture are converted to dryland, leaving approximately 3 million acres irrigated. As surface water prices rise, the amount of irrigated pasture converted to dryland nearly triples.

Of course, most of the reviewers comments are accommodated in CARD 101 [Christensen, Morton and Heady]. This is the only comprehensive quantitative analysis which has been made of potential demand for ground and surface water in the 17 western states.

References

- Christensen, Douglas A., Andrew S. Morton, and Earl O. Heady. "The Potential Effect of Increased Water Prices on U.S. Agriculture." CARD Report 101, Center for Agricultural and Rural Development, Iowa State University. 1981.
- Morton, Andrew S., Douglas A. Christensen and Earl O. Heady, "Programmed Effects of Surface Water Price Levels on U.S. Agricultural Water Use and Production Patterns." *Western Journal of Agricultural Economics*, 6(1981):113-27.