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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Irrigation efficiency and water-policy implications for river-basin resilience" *by* C. A. Scott et al.

Anonymous Referee #2

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Scott et al review

This paper provides an overview of irrigation efficiency concepts, including links between efficiency and the basin water balance, and trade-offs with ecosystem services and agricultural production. Three case studies are presented where efficiency improvements have been made. The technological and institutional contexts that influence efficiency are addressed.

The paper provides a useful overview of irrigation efficiency concepts, and has a valuable institutional and policy perspective (vs technical perspective) on irrigation efficiency and its unintended consequences in three case studies. Particularly useful was the introduction of three paradoxes (unintended consequences) of basin efficiency :effi-

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ciency often increases water use, scale (efficiency can deplete water for downstream), and sectoral (savings often end up in other sectors). The abstract reads well, with a clear focus on the three paradoxes, but the introduction, key concepts, and case studies do not mention paradoxes, but instead focus on resiliency and technological and policy contexts. I found much of the rest of the paper (starting with key concepts in the introduction) needs rewriting for clarity, and didn't feel that in the end it held together to answer its stated research question about trade-offs among efficiency, ecosystem services and agricultural production. The section on "irrigation efficiency tradeoffs" needs rewriting for clarification. Below are summaries of how the paper did or did not address the stated research question:

Efficiency vs production: None of the case studies explicitly mention trade-offs between efficiency and production. Two of the three (limari and gue) suggest that efficiency enhanced production, though maybe the Imperial valley is an example where agricultural production may decline due to transfer to high value urban uses, creating higher regional efficiency? But even there the efficiency gains are intersectoral rather than within irrigation. Perhaps the authors intended to state that increased vulnerability to climate fluctuation is an impact on production, or that efficiency increases production (?), but that was not explicitly stated.

Efficiency vs ecosystem services: None of the case studies explicitly mention ecosystem services. The Imperial Valley case mentions avifaunal biodiversity, and the Spanish case mentioned impacted ecosystems, but none of the case studies links those ecosystem impacts to ecosystem services, defined as the benefits provided by ecosystems and their economic value.

The paper had two other themes that were not explicitly in the research question, but are of interest:

Resilience: The introduction and all three case studies mentioned resilience, but it wasn't part of the main research question. Resilience and vulnerability were also

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treated somewhat casually, with no mention of how they were measured in a way that backed the authors' statements about them. This may be part of the reason why each case study asserted different relationships between efficiency, irrigation development, and resilience. Perhaps the case studies could say that there are implications for resilience, but I didn't find the conclusive statements about the impact of efficiency on resilience convincing. If resilience is to be a part of the paper, it should be more carefully defined and incorporated into the research question.

Policy and technological contexts: The paper provides some interesting insights on the policy contexts that encourage or discourage efficiency. Perhaps this should be incorporated into the research question, or as a secondary question.

In sum, the elements of an interesting review of efficiency and its unintended consequences are in the paper, but the paper needs significant reorganization and rewriting for clarity, with a more streamlined connection between the key concepts, research question, and the case studies. Perhaps a focus on the three paradoxes, tying each of the case studies back to what paradoxes they illustrate, would be more effective than the tangents into resilience. The research question needs to better reflect the content of the case studies. The case studies allude to institutional and technological effects on the paradoxes, but the conclusion needs to tie it all together.

Additional questions/comments

Why were these three basins chosen? What trade-offs or paradoxes are each supposed to represent?

See comments in the PDF for more details.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C5313/2013/hessd-10-C5313-2013-supplement.pdf

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