

## ***Interactive comment on “Water Food Energy Nexus: Changing Scenarios in India during recent Decades” by Beas Barik et al.***

**Anonymous Referee #3**

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### **1 General comments**

The work touches on a very interesting and relevant topic. I am not familiar with hydrological datasets such as the ones derived from GRACE but it appears that the presentation of groundwater storage from this information is a novel and valuable contribution. The shift to irrigated crops and the link with monsoon rainfall and groundwater depletion is also interesting.

If the story regarding the nexus is simple and linear (population growth leads to increased food demand as well as more farmers, needing to irrigate more and using more electricity for that), then it is presented in too complicated a way.

The language needs to be improved and there are many technical errors which need

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to be corrected.

### **2 Specific comments**

- The focus on agriculture is not apparent from the title and could be included.
- The link with electricity and food production is useful and yields insights with regard to the increased role of groundwater pumping in the absence of sufficient rainfall. Some assumptions are not explicitly stated however, e.g. no estimate is given of how much of agricultural electricity use is for pumping and how that changes over time. This makes the correlations less convincing as giving strong evidence of the relationships claimed in the manuscript.
- There is a positive feedback between groundwater depletion and electricity consumption for pumping which is hinted at but not conclusively illustrated. This implies a progressive relationship between the groundwater table depth and electricity consumption for pumping. If the data allow demonstrating this, it would be a valuable addition to this research.
- The manuscript is not easy to read because of long composite sentences, poor language (omission of words, contaminations, singular/plural correspondence errors, split composite words, word placement), and unclear references. It would be correct and kind to the reader to correct all of these. I suggest having the final version proofread.
- URLs in the body should go into footnotes if allowed or in the references section.
- I suggest the use of vector graphics where possible.
- It would be good to define food security, water security and energy security.

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- The summary and conclusions section must not contain new information but it does.
- The references are not formatted consistently, e.g. 'Pai D.S.', 'Panda, D. K.' and 'Pande S' are consecutive and all different.
- Line-by-line comments:
  - 2/16: 'water used as hydro electricity to generate power' does not make sense. Rather say e.g. 'water used for hydropower to generate electricity'
  - 4/9: 'depletion of ground water table' - 'falling groundwater table' or just 'depletion of groundwater'
  - 8/16: rate of population *growth*
  - 9/1: something is wrong with figures 2g and 2h: the 50000-130000 scale corresponds to electricity consumption in 2g and to expenditure in 2h.
  - 9/10-11: 'zero is the surface level denoting no change in the water table': this confused me - how does the surface level affect changes in the water table?
  - 15/31-32: this claim is incorrect. The study involves but does not encompass all three sectors of water, food and energy. This study refers only to fractions of the energy and water sectors.

### 3 Technical corrections

The various spelling and grammatical errors are not listed here.

- 5/7-10: inconsistent formatting of numbers, and decimals completely superfluous.

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- general: 'well depth'
- 15/16: 'Validation of satellite derived groundwater' - add 'data' at the end of this
- Fig. 3a: coordinates right and bottom are duplicate and unnecessary.
- Fig. 4a: 'Deficit/Excess' first in legend but on secondary axis (on the right), this is counterintuitive.

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