

Farmponds for Horticulture: Boon or Curse?

Analyzing Impact on Farm Profitability,
Resource Sustainability and Social Welfare

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Organization

- Introduction: Context and the problem statement
- Conceptual model
- Model setup, baseline calibration and scenario details
- Results and conclusion

Indian agriculture: the emerging situation

- >50% population in farming; but agricultural output is 15% of GDP
- Government push to **increase farm incomes** by **promoting horticulture**
 - High value fruit and vegetable crops (e.g. tomatoes, grapes, pomegranates)
 - Water intensive with need for assured water even in summer months
- Rising uncertainty in water availability
 - Erratic rainfall, frequent droughts and depleting ground water levels
- Farmponds store water until summer enabling horticulture cultivation
 - *“Miracle drought-proofing tool”; “game-changer in Indian agriculture”, “response to climate change”* [Ansari 2016, Pawar 2012]
 - State Government has announced *“Magel tyala shettale”* (Farm pond for anyone who demands it)

Farm ponds

- Large plastic lined ponds: **Not rainwater harvesting** but groundwater storage
- Built in areas with groundwater (GW) uncertainty
- Filled with groundwater during monsoon, used in summer months *large evaporation losses*
- Considered by many as **exploitative and environmentally unsustainable** [Kale 2017]
- Owned by economically better off farmers with larger landholding



Problem statement: Farmponds - Boon or curse?

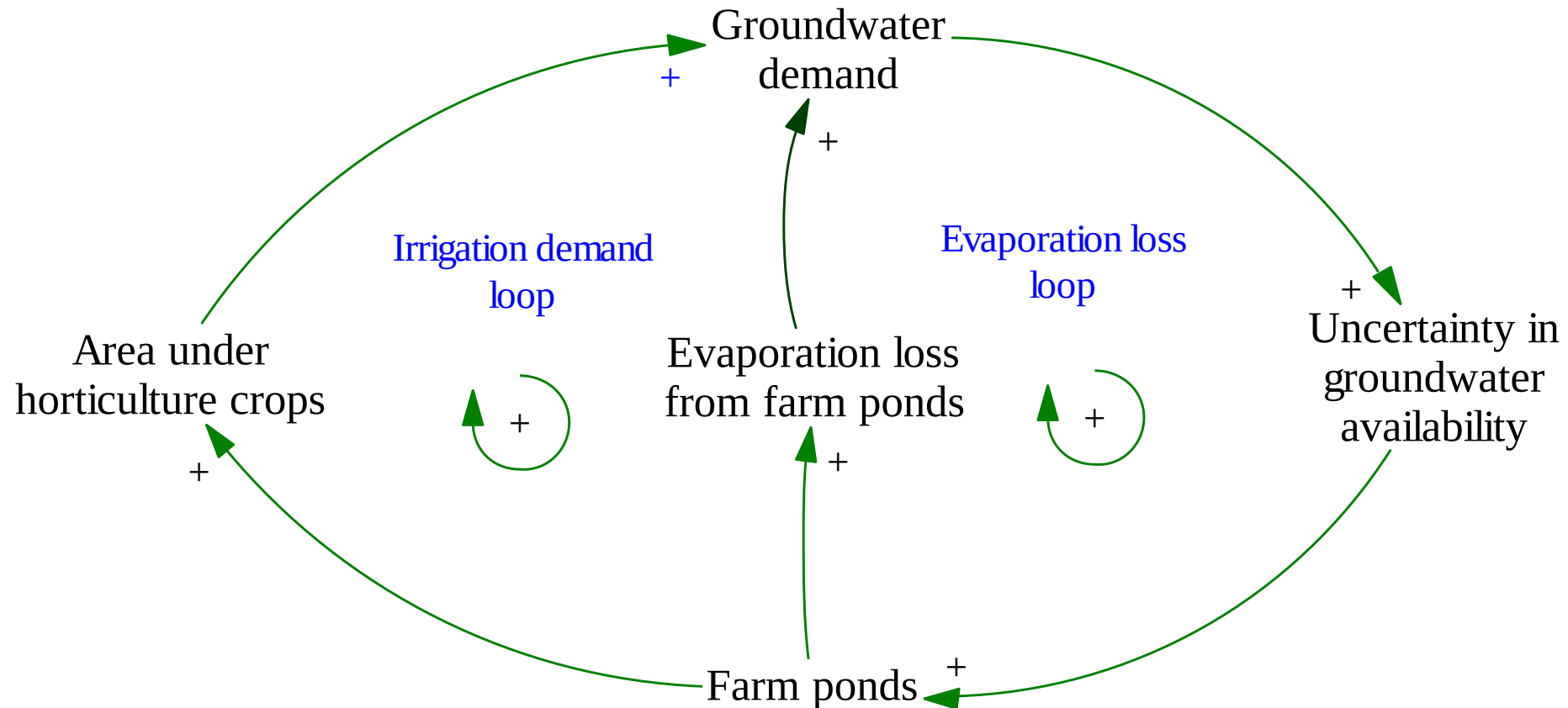
- Objective: To assess the impact of ground water filled farm ponds and recommend practical solutions
 - Multiple dimensions: economic, hydrological and social
 - Multiple stakeholders: Farmers, state agencies, politicians, economists, environmentalists, policy makers
 - Multiple goals: to raise farm incomes, to be drought-resilient, judicious use of a scarce resource, maintain social welfare
 - Dynamic analysis is crucial because agents adapt and respond

Building the conceptual model: Working with stakeholders

- Ground level
 - Extensive field work
 - Farmer surveys and collection of panel data over 2 years
 - Tracking farmers who have built or are considering building farm ponds
- Policy level
 - An MoU in place with the state government
 - Engagement with Water Conservation Department, Agriculture Department

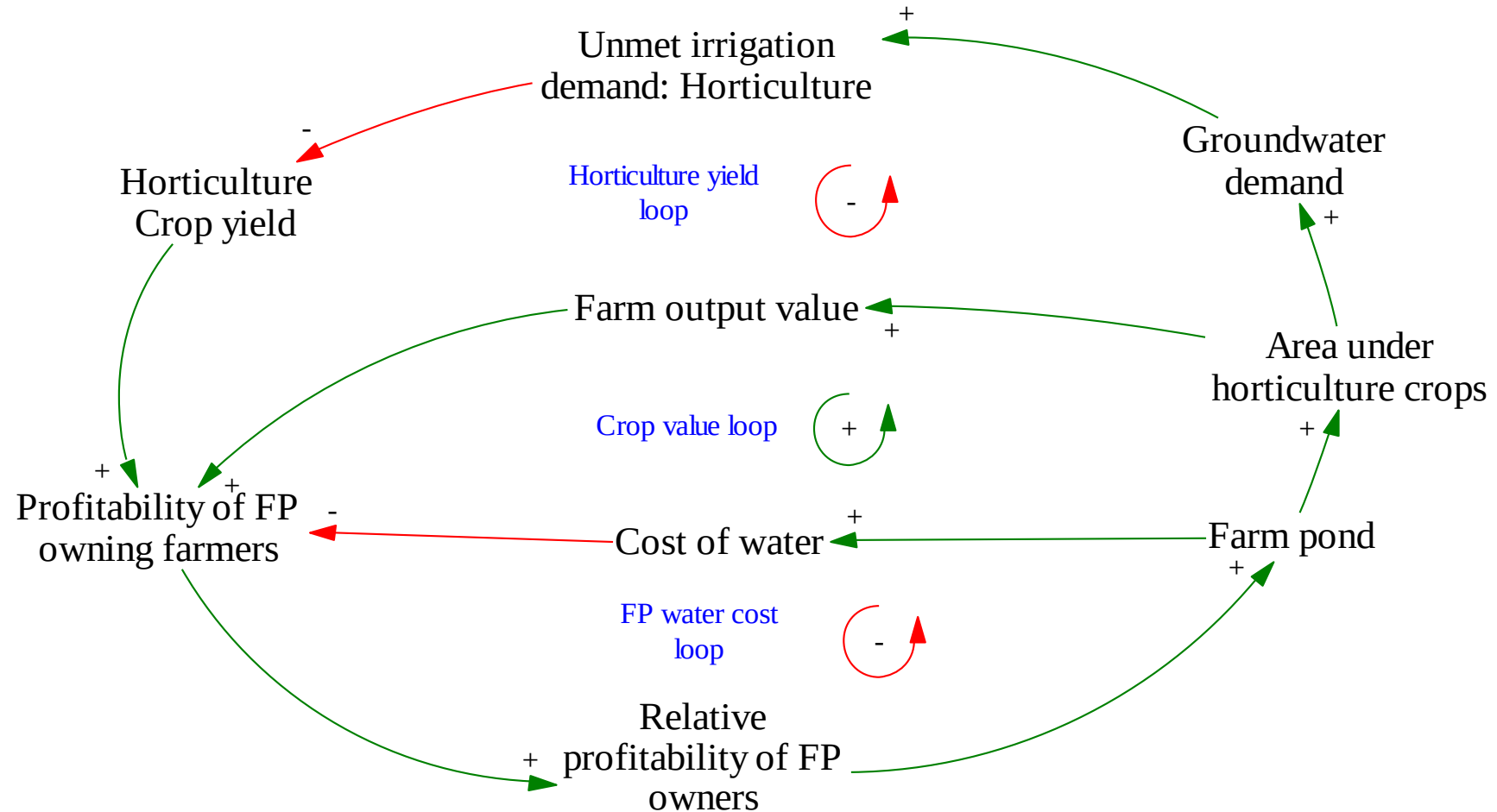
Conceptual model: Feedbacks due to GW uncertainty

Feedback due to rising groundwater uncertainty



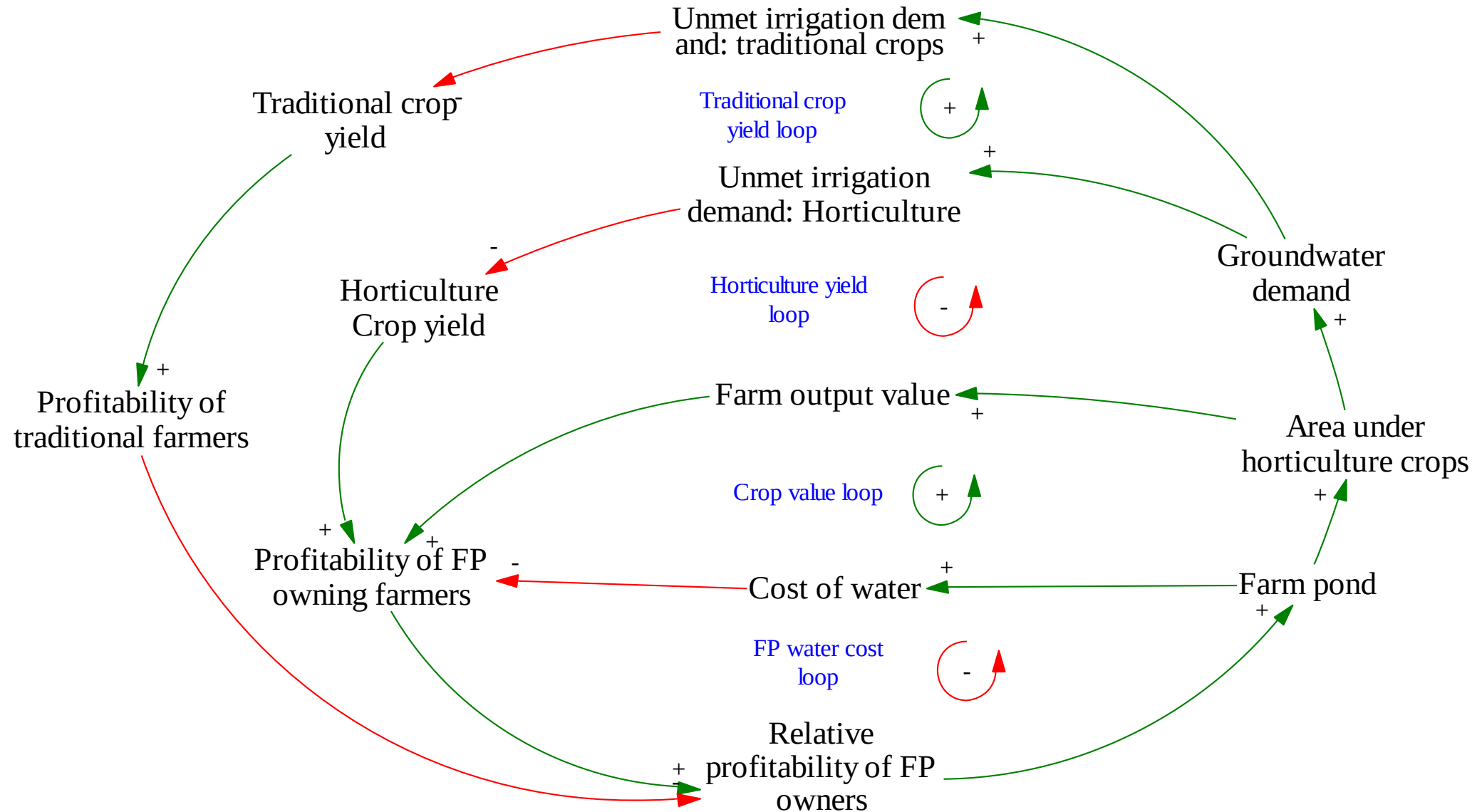
Conceptual Model: Feedbacks due to Profitability

Feedback due to relative profitability of farmers with farmponds



Conceptual Model: Feedback due to Profitability

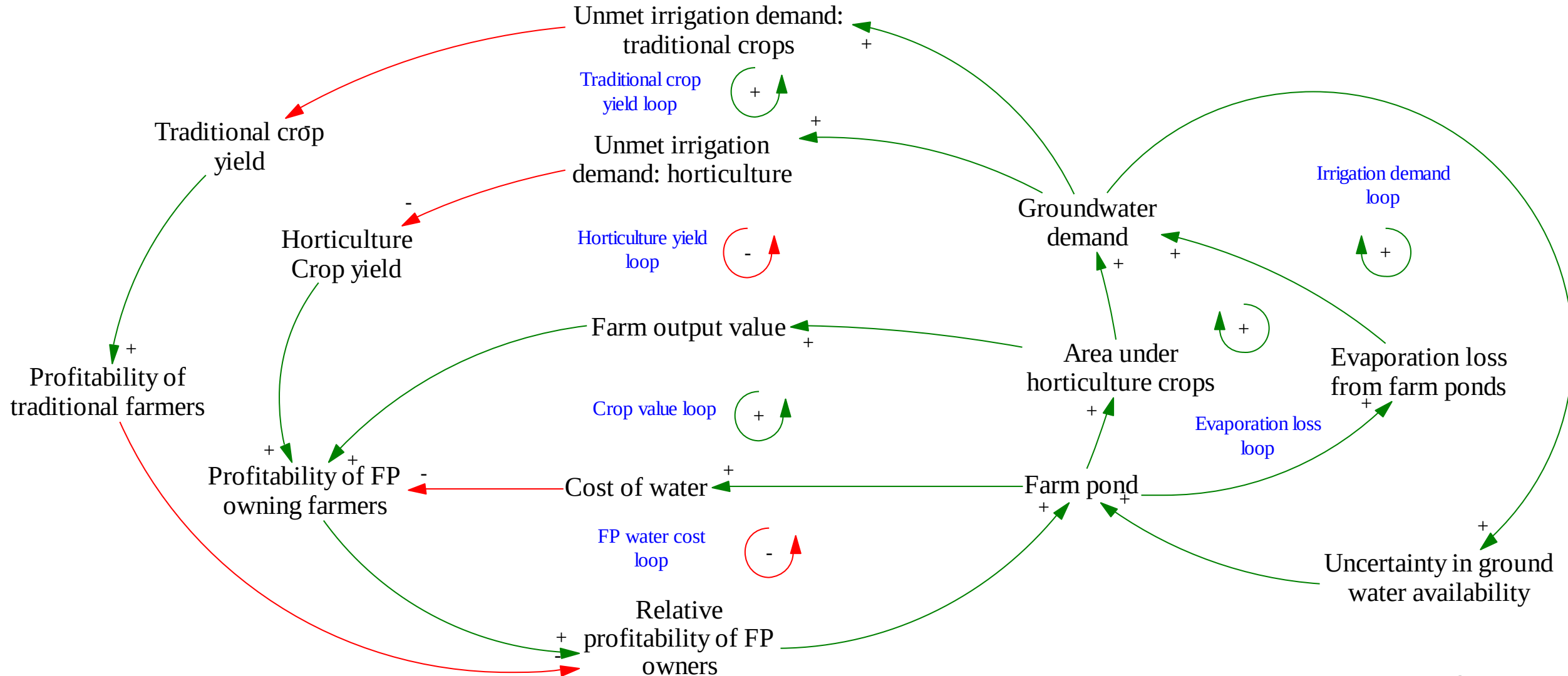
Feedback due to relative profitability of farmers with farmponds



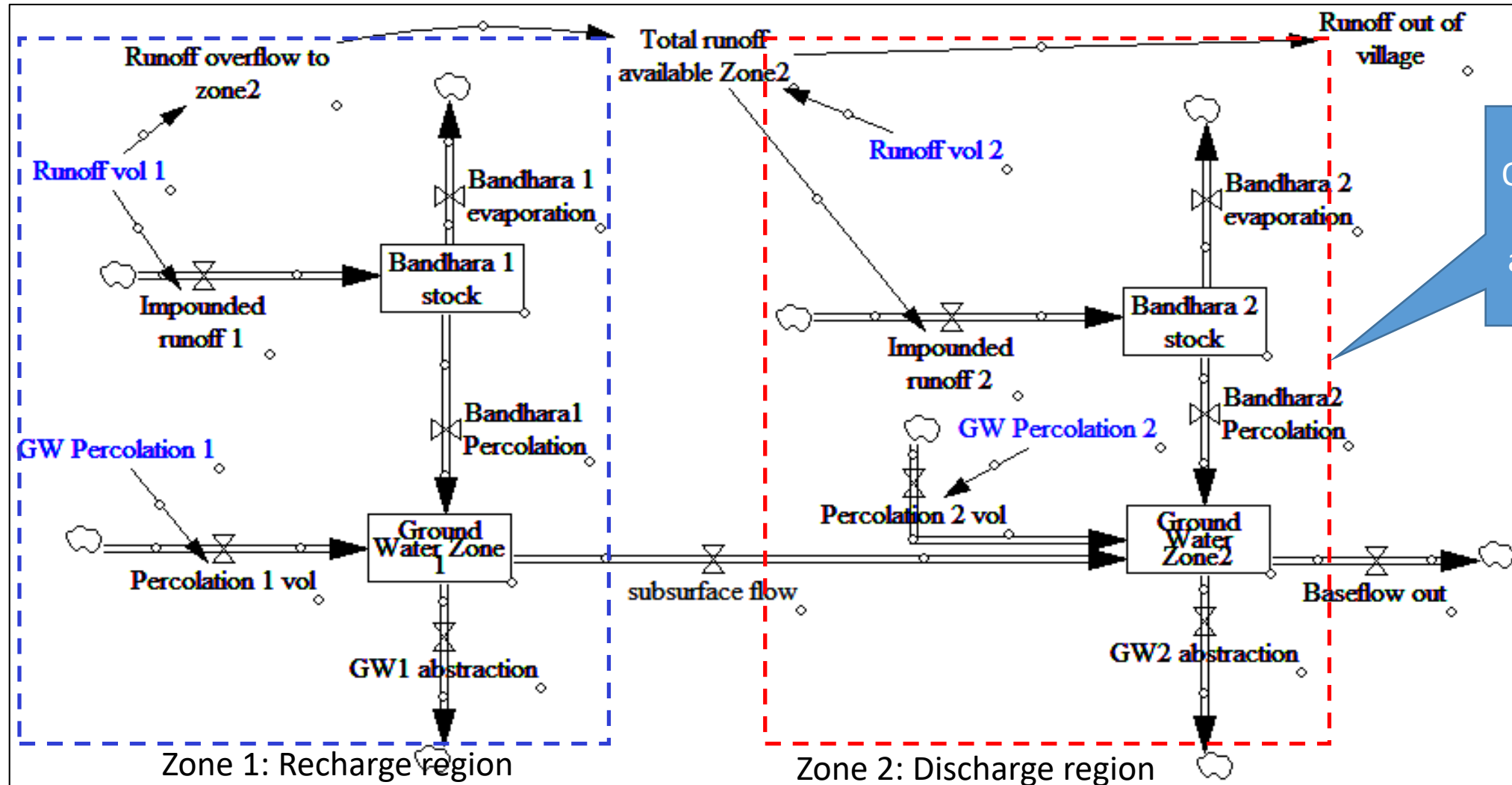
Conceptual Model: Putting it together

Feedback due to relative profitability of farmponds farmers

Feedback due to groundwater uncertainty

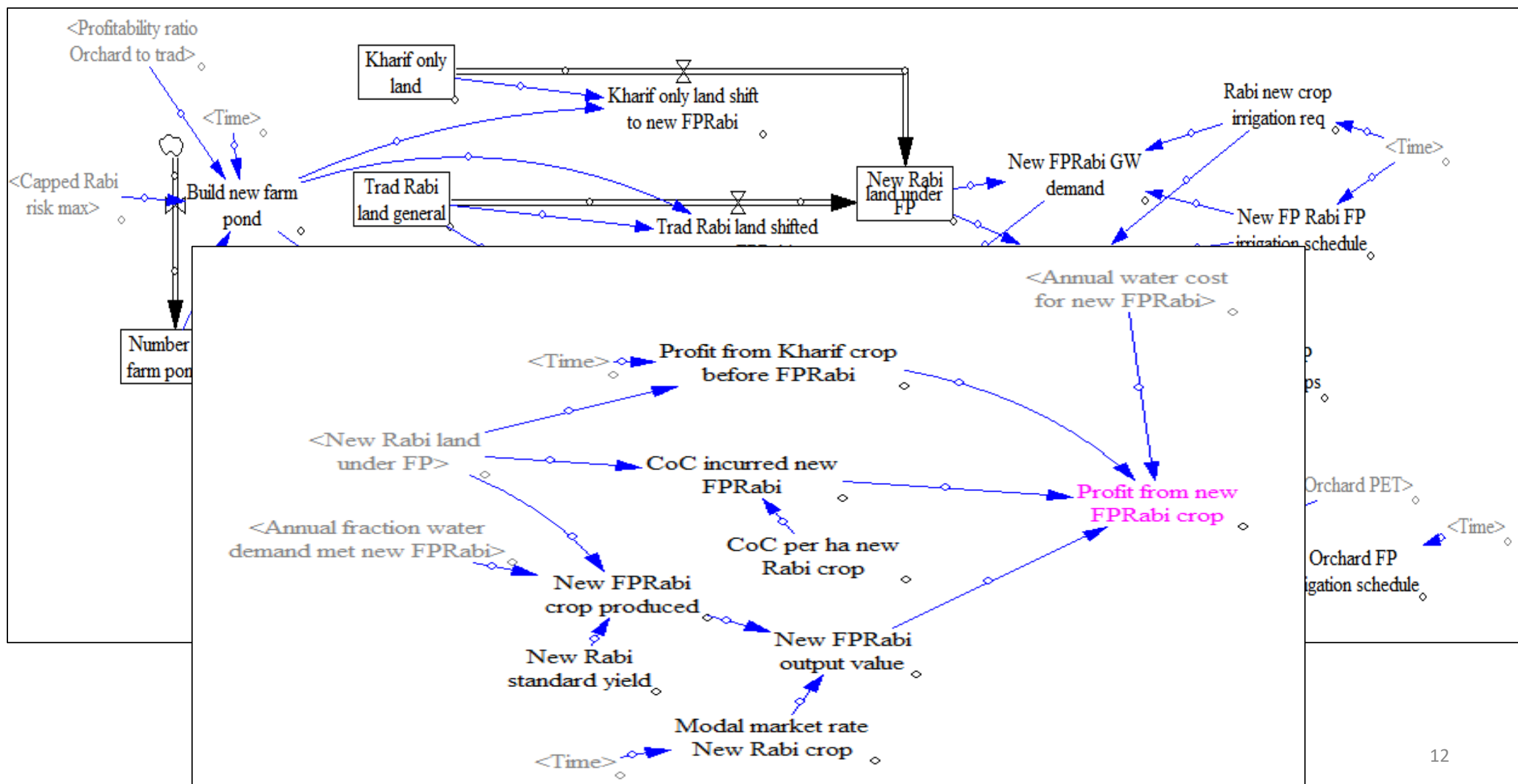


Hydrological Model



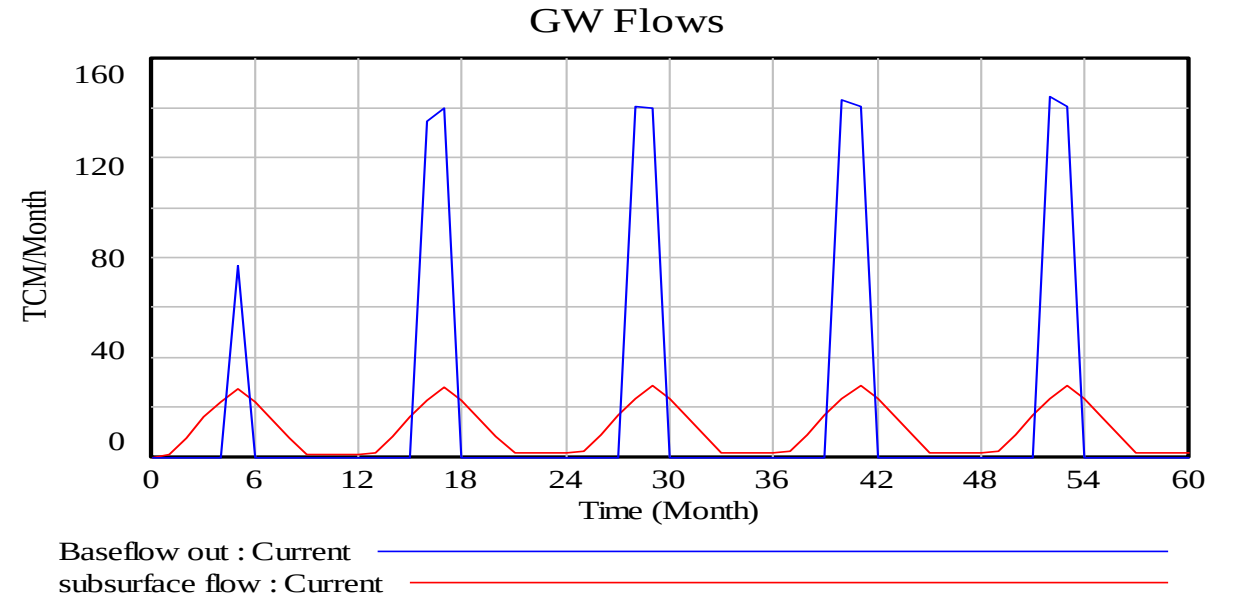
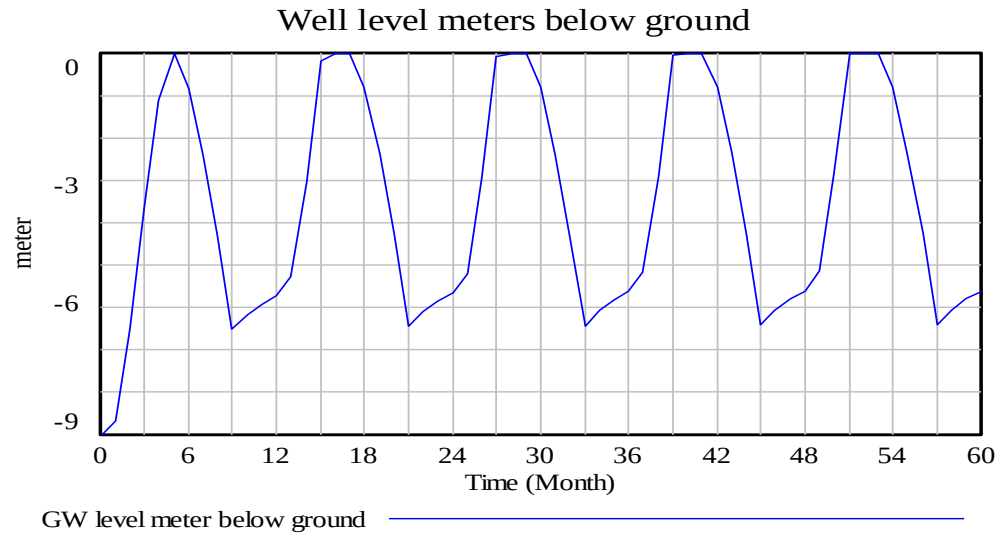
Our focus is creation of farm ponds in agriculture rich zone 2

Social and economic aspects



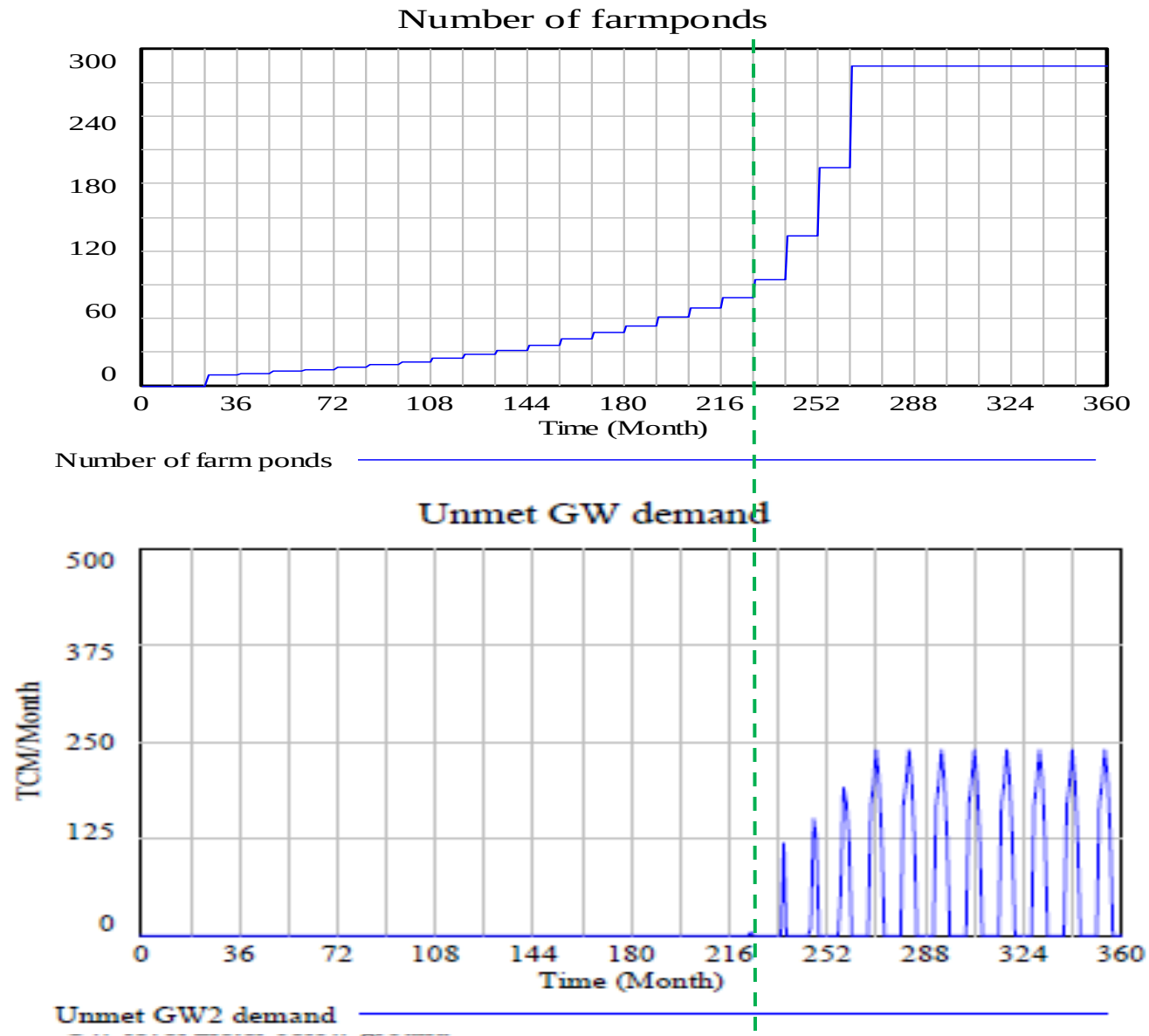
Scenarios

- Baseline scenario with no farmponds
 - Well behavior and GW flows consistent with field observations

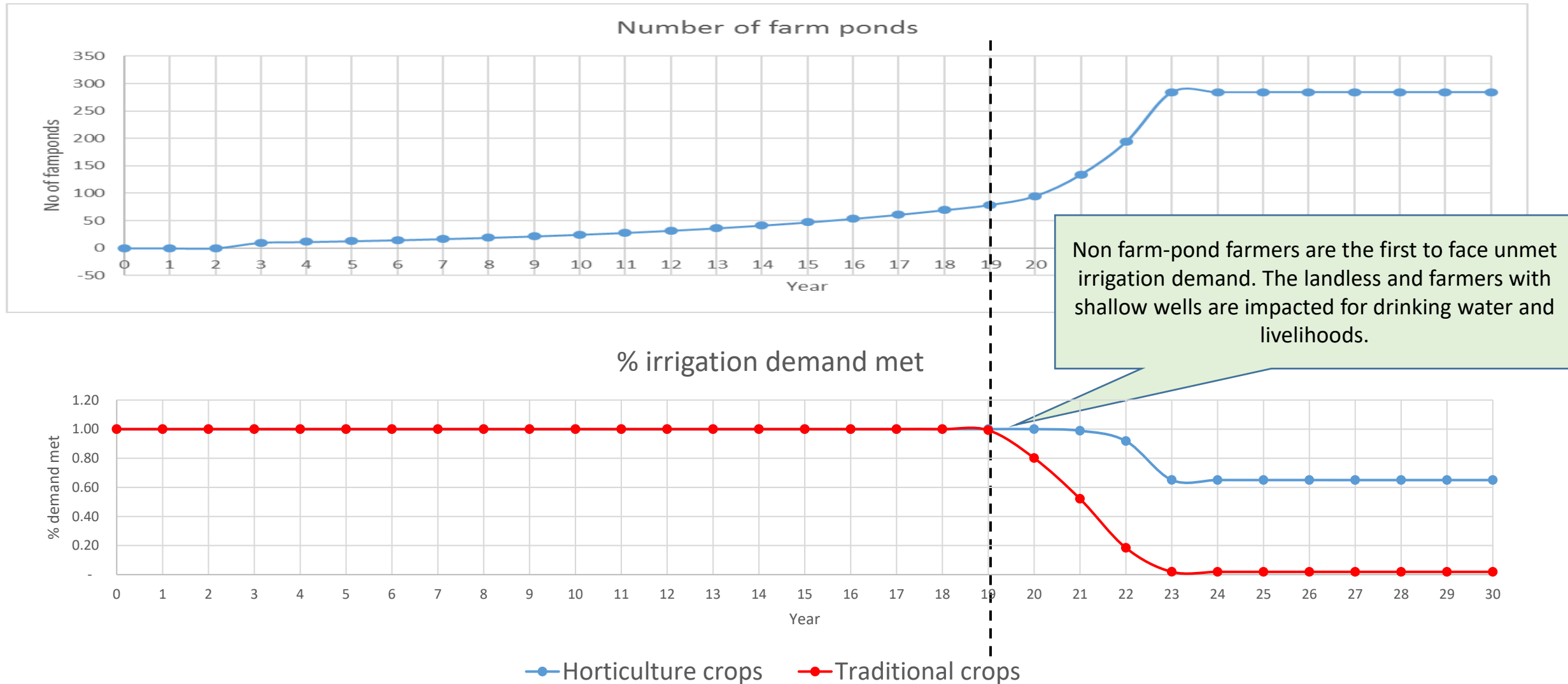


- Introducing Feedback Loops and introduction of farm ponds

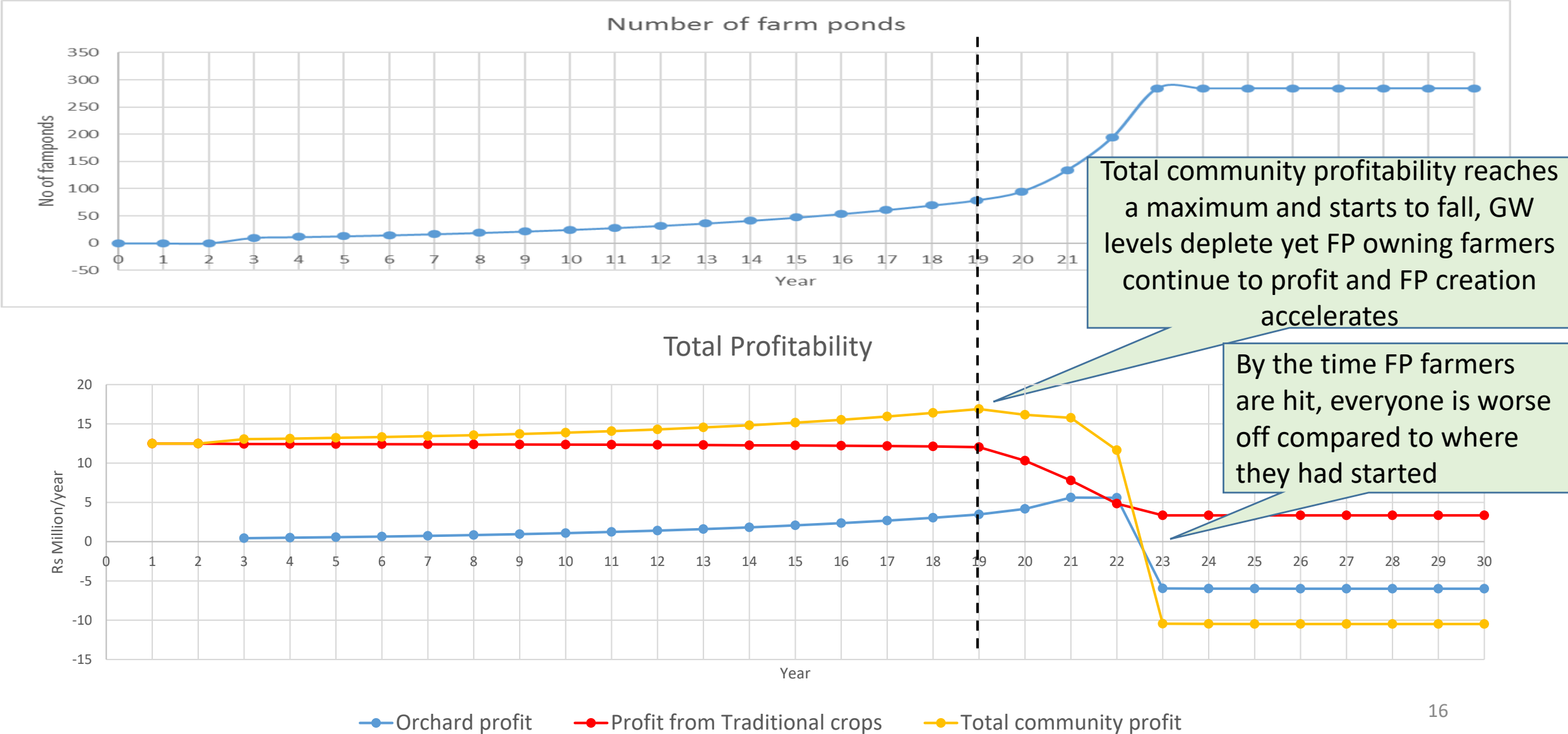
Results: Hydrological impact



Results: Economic and social impact



Results: Economic and social impact



Conclusion

- Farmpond: contentious topic with strongly polarized stakeholders' views
- Possible to compute a band of operation within which farm ponds can be beneficial without being unsustainable
- Necessary to regulate this limit of farm pond use. System does not self regulate. Profitable for individuals to invest in farm ponds even as community loses as a whole, ultimately leading to the **tragedy of the commons**
- Important implications for government programs such as the National Horticulture Mission which subsidize horticulture and creation of groundwater filled farmponds

Thank you



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