SCIENCE FORUM 2018

CGIAR Independent Science and Partnership Council

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Win more, lose less:

Capturing synergies between SDGs through agricultural research

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Panelist Comments

Crop productivity and agrobiodiversity

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CIMMYT

Appreciation

- Careful collection and review of a wide range of relevant data, insights and conclusions
- Found very little link between productive major staples, biodiversity and malnutrition
- Show that wanting something to be true – based on popular belief - does not make it true
- Highlight different context and covariates of individual studies; danger of taking a conclusion out of its context, or keeping eyes shut of results that do not align with hypothesis
- Encourage us to assess agricultural interventions *viz* other interventions to achieve objectives

Interpretation and Conclusions (DeFries, 2018)

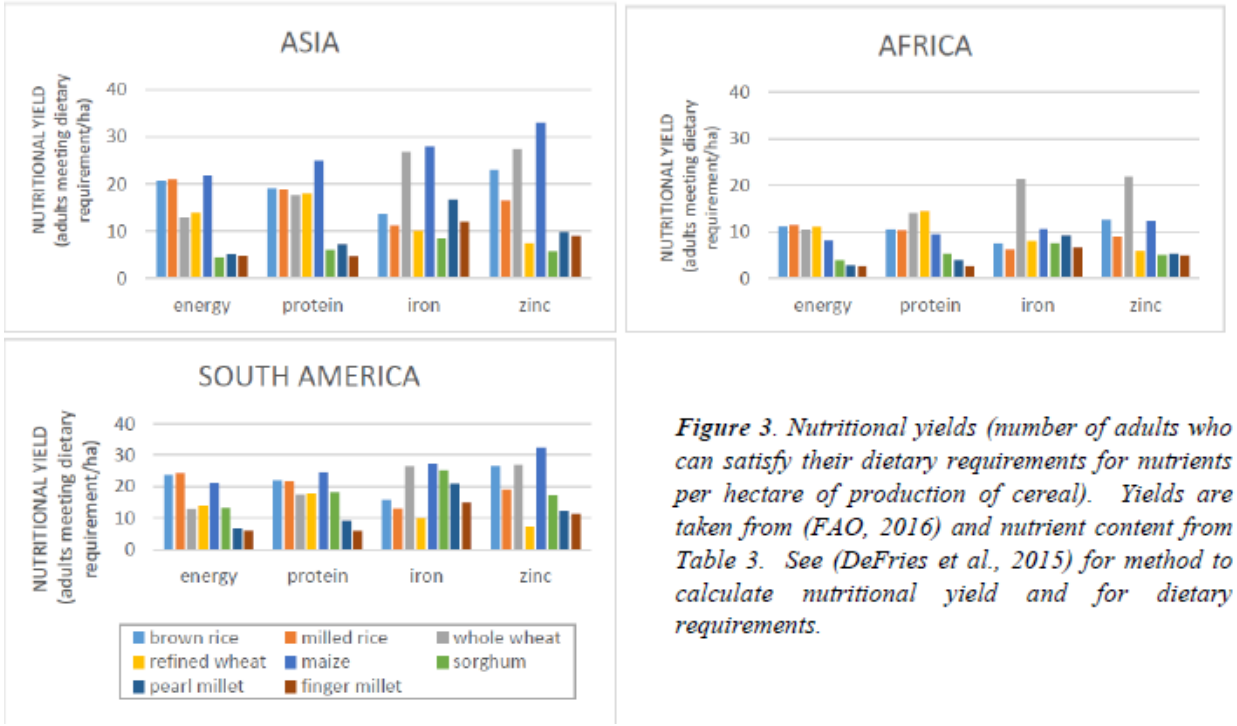


Figure 3. Nutritional yields (number of adults who can satisfy their dietary requirements for nutrients per hectare of production of cereal). Yields are taken from (FAO, 2016) and nutrient content from Table 3. See (DeFries et al., 2015) for method to calculate nutritional yield and for dietary requirements.

Fig 3: Nutrient yields of millets and sorghum are indeed **less** than nutrient yields of whole wheat and maize.

Conclusion sustained by the data: "Whole wheat and maize sustain dietary requirements for more people per area"

Higher nutrient concentrations are achieved with low yields (US grain yields)

- Maize 10.7 t/ha
- Millet 1.8 t/ha
- Sorghum 4.6 t/ha

If we increased yields of millet and sorghum, nutrient concentration would reduce as for any other crop.

Interpretation and Conclusions

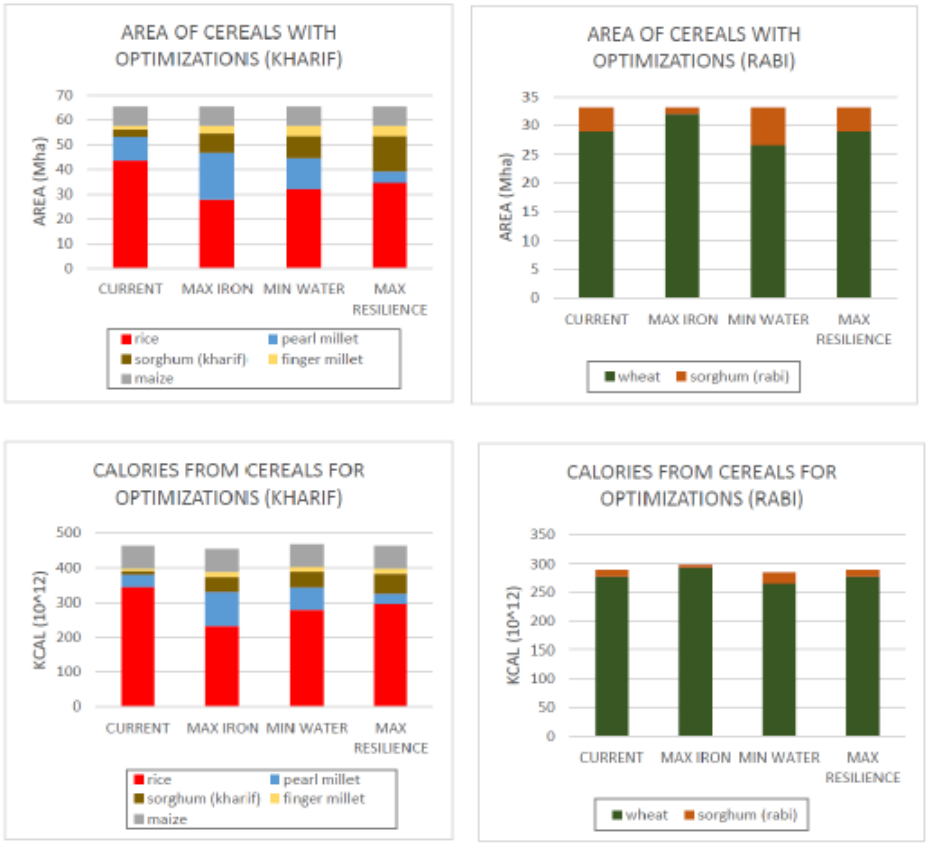


Figure 8. Proportions of cereal production for three scenarios (maximum iron production, minimum water requirement, and maximum climate resilience) based on allocation of rice, pearl millet, finger millet, and sorghum for kharif (monsoon season) and rabi (winter season).

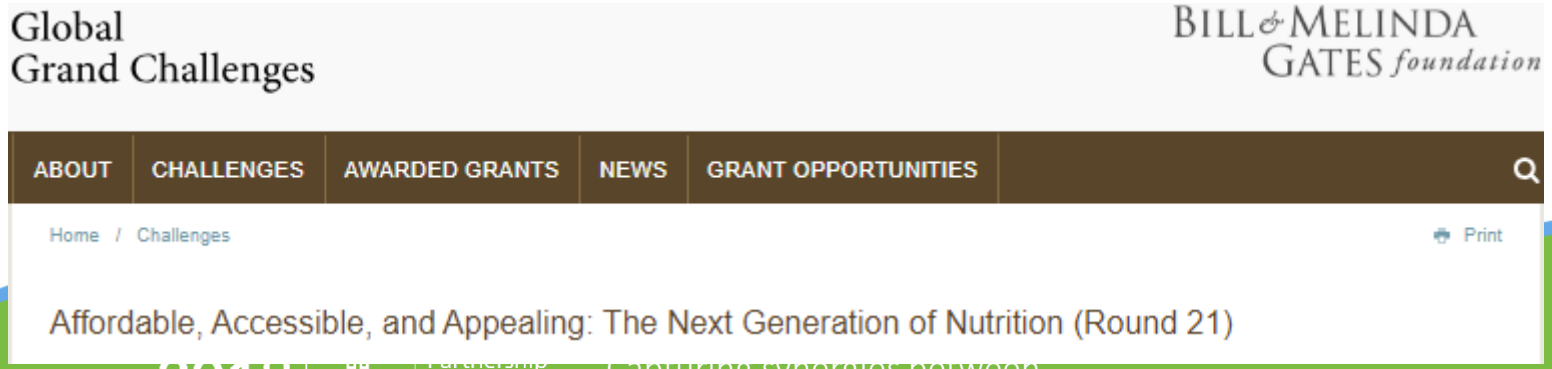
Fig 8: "Investment in sorghum and millet" to maximize advantages for nutrition and climate resilience"

Appropriate conclusions:

- The case can be indeed made for "sorghum and millet to replace some rice area in India"
- However, the same case could be made for "maize to replace some rice area in India".
- "Sorghum to replace some wheat area in India" has outcomes very similar to the baseline.

Other issues

- **BIG question:** “What is needed to change consumer preferences / habits?”
  - DeFries states “Indian households could overcome nutrient deficiencies within their food budgets by diversifying their diets towards coarse cereals, pulses, and leafy vegetables and away from rice.”
- **Generalization is challenging:** Diversity of consumers and life circumstances >> context-specific interventions
  - Cultural, socio-economic context
  - Farmers, rural landless poor, urban poor
  - Men – women – children
- **Comparing interventions:** “Increase farmers’ income to improve nutrition” (M. Qaim @ ISPC)



CIMMYT interventions

- **Climate resilient crops** that combine high yield and resilience: heat tolerant wheat, drought, heat and water-logging tolerant maize

- **Biofortification**: combine high nutrients and high yields: High Zn wheat, high Zn maize, High ProVit A maize

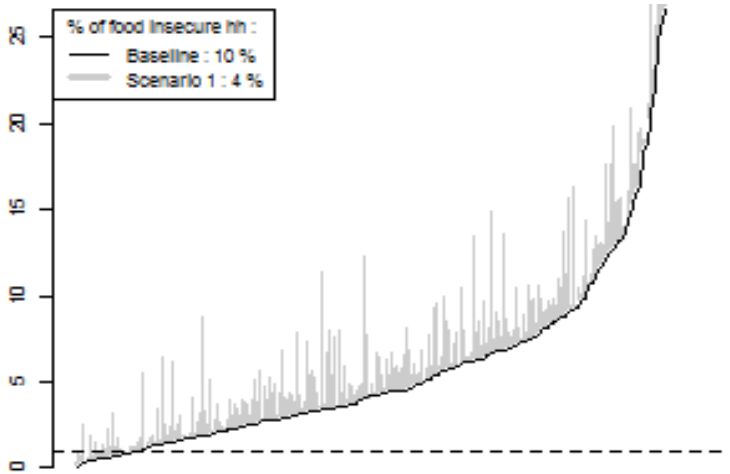
- **Systems based approaches; working in collaboration with multiple commodities:**

    - CIMMYT today invests as much in **farmer-acceptable sustainable intensification approaches** as in crop breeding; optimizing sustainability, food security, incomes, nutrition
    - In South Asia, **diversifying cropping systems**: maize-wheat-legumes-vegetables to replace rice-wheat; indeed no stove pipes

- **Research focus in major crops**:

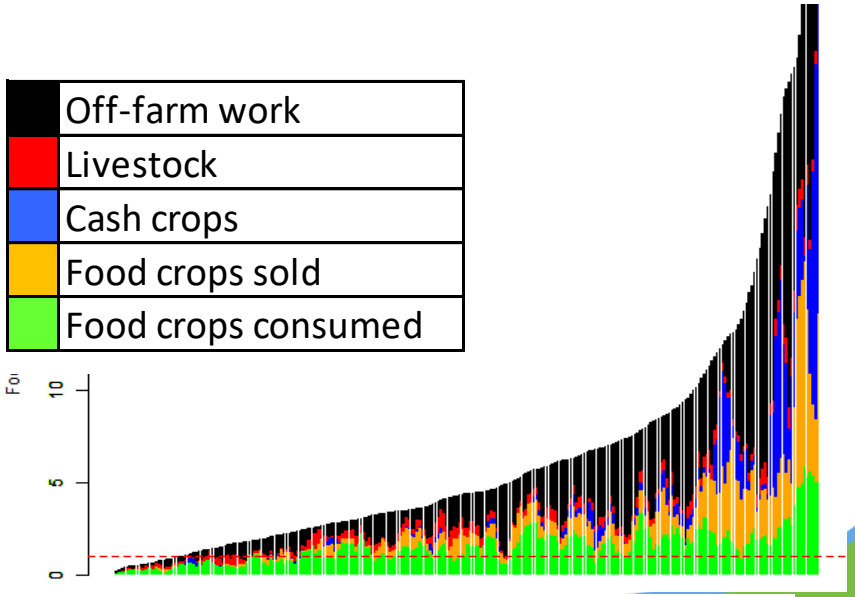
    - It is not about keeping the green revolution-type interventions going
    - Addressing distinct threats: climate change, newly virulent pest and diseases, malnutrition, water and fertilizer use efficiency, further use of genetic diversity
    - Maize, rice, wheat: hugely important and impactful crops > ROI

Testing interventions for their food security (or nutrition) impact



Contribution to food security (or nutrition) as a function of size of land holding (x axis)

Key: Is a different approach acceptable to, and adoptable by farmers?



Size of land holding

Summary

- Need for scientific rigor in view of popular press/beliefs: interpretation that is supported by data; generalization is challenging
- Assess likeliness of success of possible interventions
- Define pathway to and adoptability of proposed change, and regularly test hypothesis
    - Low-income consumers: availability and accessibility of affordable, nutritious foods
    - Special focal group for nutrition: women and children
    - Understand farmers' decision making what crops they grow
    - Policy makers: analyze and highlight unintended impact of subsidies / lack of policy decisions
- Consider that other, non-farm based interventions may be more effective
- Research focus in major crops is different than 50 years ago
    - Resilience in production, food price stability, water and fertilizer use efficiency, human nutrition, genetic diversity, continuing demand increase
    - Hugely important and impactful crops – ROI