

### Our Highest Priority

- Despite significant growth in food production over the past half-century, one of the most important challenges facing society today is how to feed the world's population in the coming decades.



### Intersecting Challenges

- Global population
  - Currently growing at 140/minute
  - Predicted to be 8 billion by 2030
  - 9 billion by 2050





### Intersecting Challenges

- Agriculture will need to increase production by between 70-100% to meet this rising need by 2050 (FAO, 2009)



### Intersecting Challenges

- More than 1 in 7 people today still do not have access to sufficient protein and energy from their diet, and even more suffer from some form of micronutrient malnourishment



### Intersecting Challenges

- The world's middle class is also expected to double over the same period
- Higher purchasing power = higher consumption & greater demand for processed food, dairy, meat, fish



### Intersecting Challenges

- At the same time, food producers are experiencing increasing competition for land, water and energy



### Intersecting Challenges

- Many current farming practices damage the environment & are major sources of greenhouse gases
- In many regions, available farmland is shrinking, and what remains faces some form of degradation



### Intersecting Challenges

- Overarching all these issues is the threat of the effects of substantial climate change & concerns about how mitigation and adaptation measures may affect the food system



### Intersecting Challenges

- We now face a 3-fold challenge:
  - Match the rapidly changing demand for food from a larger and more affluent population to its supply....
  - And do so in ways that are environmentally and socially sustainable....
  - And ensure that the world's poorest people are no longer hungry



### Intersecting Challenges

- This triple challenge requires action throughout the entire food system
  - Changes in the way food is produced, stored, processed, distributed and accessed
  - Changes as radical as those of the Industrial Revolution and the Green Revolution





### Intersecting Challenges

- We all agree that food production worldwide will have to increase substantially in coming decades
- Gaining consensus on how to achieve this has been more elusive – many differing viewpoints

### Sustainable Intensification (SI)

- What has emerged is a relatively new paradigm called '*Sustainable Intensification*'
- Def. - Producing more food from existing farmland in ways that place far less pressure on the environment and that do not undermine our capacity to continue producing food in the future



### **Sustainable Intensification (SI)**

- This definition has attracted a lot of criticism as **being too narrowly focused on production, or representing a contradiction terms** ("A Wolf in Sheep's Clothing? Analysis of Sustainable Intensification of Agriculture", Collins, 2012)
- To some, the term SI is an oxymoron, as most agriculture intensification to date has been associated with increased pressure on the environment and natural resource base

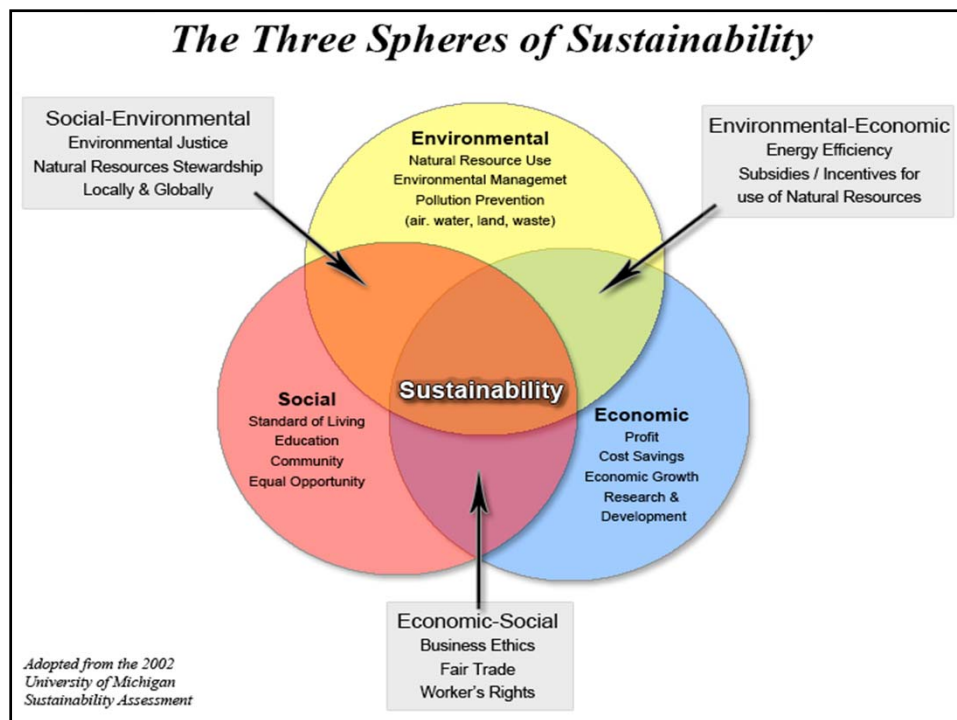
### **Sustainable Intensification (SI)**

- What is 'Sustainable / Unsustainable?
- What does it mean with respect to smallholder farmers in Southeast Asia?



## Sustainable Intensification (SI)

- What is 'Sustainable' / 'Unsustainable'?
- Unsustainable – something cannot go on the way it has been going on indefinitely. Why? Because it is consuming or destroying resources or conditions it depends upon, so collapse or radical change is inevitable.



### Sustainable Intensification (SI)

- What would a 'Sustainably Intensified' food system look like in 2050?



### Sustainable Intensification (SI)

- Scenario: It is now 2050. We are looking back over the past 35 years and identifying key agriculture practices, innovations, policies, research, etc., adopted by the global food system that allowed us to increase agric. productivity, while not increasing our impact on the environment or degrading the natural resource base. In other words, we have achieved SI.
- Brainstorm: Create a list of practices, policies, innovations, etc., that allowed us to do this.

### Sustainable Intensification (SI)

- **Brainstorm:** Create a list of practices, policies, innovations, etc., that allowed us to move closer to SI in our global food system.

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_
- 4) \_\_\_\_\_
- 5) \_\_\_\_\_

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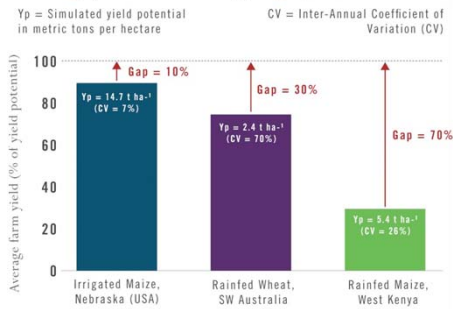
How well can Sustainable Intensification (SI) address the “Perfect Storm” of challenges we face?



## Implementing Sustainable Intensification (SI)

- Closing the 'yield gap'

### Yield gaps in three cropping systems



Source: DWF1 (2013); adapted from van Ithersum, Cassman, Grassini, et al. (2013)



## Implementing Sustainable Intensification (SI)

- Closing the 'yield gap'
- Increasing production limits





### Implementing Sustainable Intensification (SI)

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- **Reducing food waste**



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- **Changing diets**



### Implementing Sustainable Intensification (SI)

- Closing the 'yield gap'
- Increasing production limits
- Reducing food waste
- Changing diets
- **Expand sustainable aquaculture**



### Implementing Sustainable Intensification (SI)

- Improved risk management
- Better water & nutrient management
- Re-think biofuel policy
- Improved market participation by smallholders
- Animal welfare standards
- Improved nutrition
- Big data
- Improve input/output efficiency
- Strengthening extension services
- Precision electronic technologies
- Gender roles
- Conservation & use of biodiversity

### Implementing Sustainable Intensification (SI)

- SI in practice is often too narrow in its focus on production, lacking sufficient attention to issues of access, equity and empowerment in food systems (Loos, et al., 2014)
- Conway's theory of SI: Framed as underpinned by (4) pillars: Productivity, Resilience, Stability and Equitability (2012)

### Implementing Sustainable Intensification (SI)

- Productivity – increases in agricultural yields
- Resilience – attention to reduction of system risk posed by shocks and stressors
- Stability – constancy of increases in food availability
- Equitability – enhanced food & nutritional outcomes for all

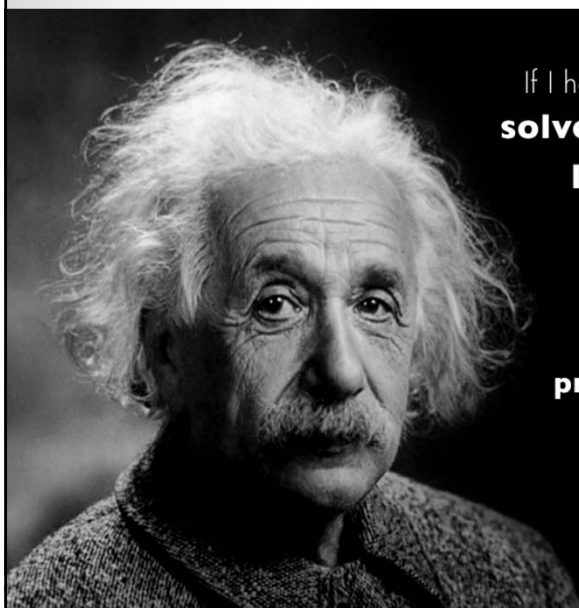
*\*When all four pillars are strong, sustainable agricultural systems abound.*

### Important Questions: Future of Global Agriculture

- The goal of the agriculture sector is no longer simply to maximize productivity, but to optimize it across a far more complex landscape of production, rural development, environmental and social justice outcomes (Godfray, et al., 2010; Sachs et al., 2010)



### Important Questions: Future of Global Agriculture



If I had an hour to  
**solve a problem** and my  
**life depended** on it,  
I would use the  
first 55 minutes  
determining the  
**proper questions to ask.**

Albert Einstein

coschedule.com

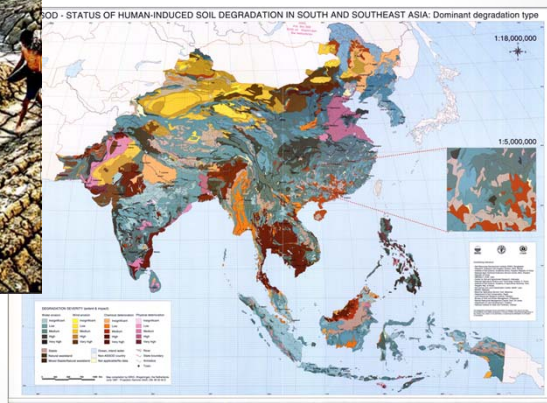


### Important Questions: Future of Global Agriculture

- Top 100 questions that, if addressed, would have a significant impact on global agricultural practices worldwide, while improving synergy between agricultural policy, practice and research



Jules Pretty, et al., 2010.  
Int. Journal of Agric.  
Sustainability



### Important Questions: Future of Global Agriculture

- Premise: Agric. research and development should be relevant to the needs and issues of farmers and agriculturalists in different parts of the world, creating proactive rather than reactive responses to these complex challenges
- Rigorous 'horizon-scanning approach' use by multi-disciplinary team of experts from the world's major agric. organizations
- Aim: use sound scientific evidence to inform decision making and guide policy makers in the future direction of agricultural research and policy support and practice

### Important Questions: Future of Global Agriculture

- Four overarching sections, reflecting the stages of the agricultural production system:
  - 1) Natural resource inputs
  - 2) Agronomic practice
  - 3) Agricultural development
  - 4) Markets and consumption

### Important Questions: Future of Global Agriculture

#### 1) Natural resource inputs

- Climate, watersheds, water resources & aquatic ecosystems (1-7)
- Soil nutrition, erosion and use of fertilizer (8-14)
- Biodiversity, ecosystem services and conservation (15-22)
- Energy, climate change and resilience (23-33)



## Important Questions: Future of Global Agriculture

### 2) Agronomic practice

- Crop production systems and technology (34-41)
- Crop genetic improvement (42-46)
- Pest and disease management (47-52)
- Livestock (53-58)



## Important Questions: Future of Global Agriculture

### 3) Agricultural development

- Social capital, gender and extension (59-63)
- Development and livelihoods (64-72)
- Governance, economic development, power and policy making (73-78)



## Important Questions: Future of Global Agriculture

### 4) Markets and consumption

- Food supply chains (79-87)
- Prices, markets and trade (88-94)
- Consumption patterns and health (95-100)



## Important Questions: Future of Global Agriculture

### Possible outcomes from engaging the question list:

- Increased information flow and dialogue among and between stakeholders
- Guide research teams, funding bodies and organizations looking to prioritize their efforts
- Create a standard for evidence-based policy and program development



### Conclusions

- SI as a 'Theory of Change', a framework, a process of inquiry & analysis; not a recipe or clearly defined set of principles
- Both words in the phrase SI need to carry equal weight
- SI is not a movement or grand socio-political vision; it is one component for a larger global food system strategy
- Sustainable food security requires action on multiple fronts

### Conclusions

- SI should be decoupled from specific production targets; it is about *optimizing* productivity & a range of outcomes
- Societies need to negotiate what outputs/outcomes from the system they want to intensify production of, & develop metrics to measure progress against targets
- Much can be done with existing knowledge, but also a need for more research that takes a more systemic approach to food production (ie. greater understanding of how elements of complex systems interact)

## Conclusions

- There are major opportunities for improving environ. and productivity outputs simultaneously in agric. systems w/ low levels of production
- More work is needed to ascertain what mix of policies is needed to transform thinking about SI into practice
- While there is need for more scientific knowledge, it must be recognized that *values* shape stakeholders' attitudes to the food system & their views on what the way forward should be

*Thank You!*



"Imagination is more important than knowledge."  
- Albert Einstein