

GEOSHARE: Geospatial, Open-Source Hosting of Agriculture, Resources and Environmental Data

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What is GEOSHARE?

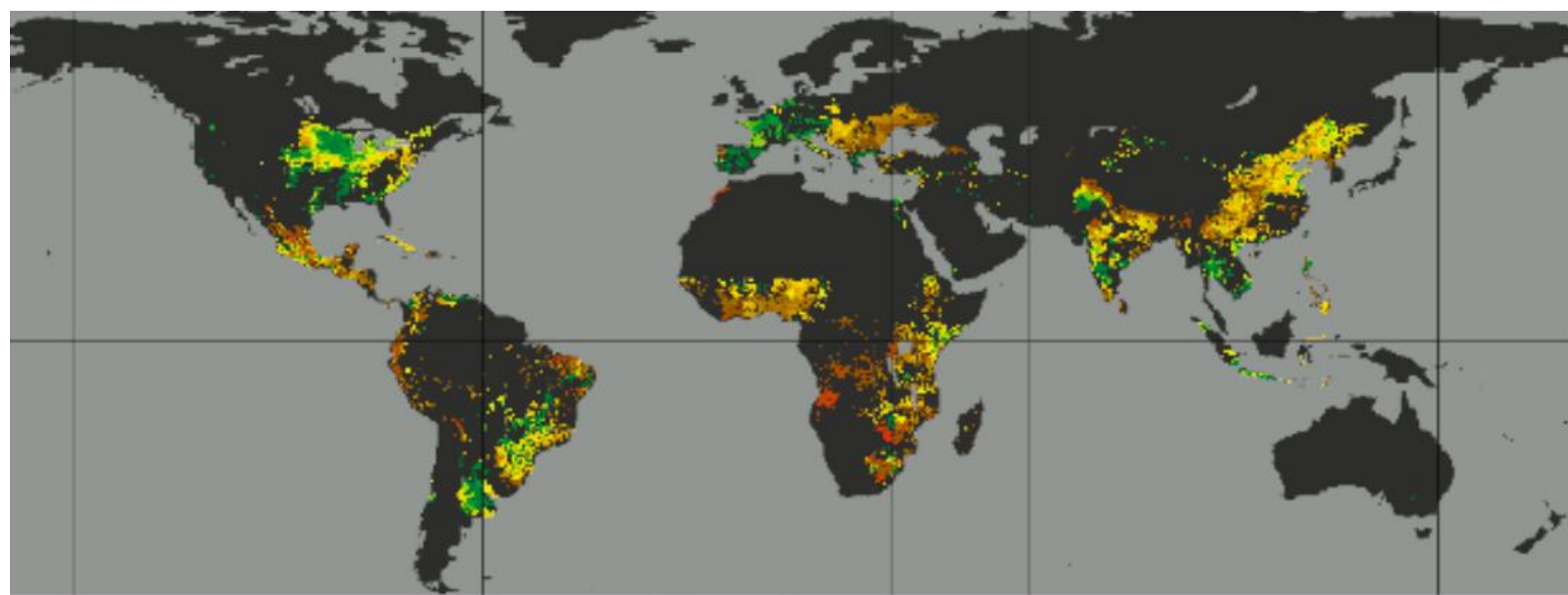
Mission: GEOSHARE develops maintains a freely available, global, spatially explicit database on agriculture, land use, and the environment accompanied by analysis tools and training programs for new scientists, decision makers, and development practitioners.

Vision: We envision a vibrant global network contributing to this shared infrastructure, enhancing capacity for analysis in developing countries, and applying these geospatial tools to guide decision making related to food security, land use, environmental sustainability and poverty reduction.

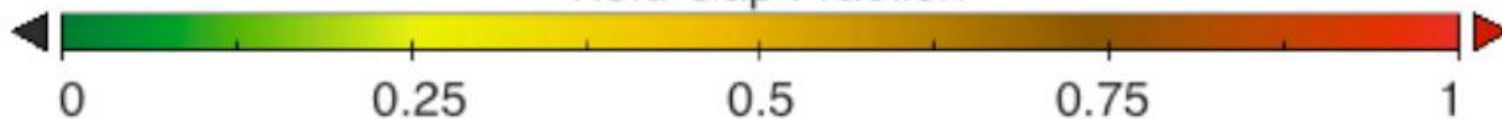
Motivation for GEOSHARE

- Feeding 9 billion people in 2050 in the face of a changing climate, while preserving the environment and eliminating extreme poverty, is one of the most important challenges facing us today.
- Agriculture is at the heart of this challenge:
 - Farming/land use change account for quarter of global GHG emissions
 - Land-based activities are very sensitive to climate change
 - Agriculture remains the predominant source of income for the world's poorest households and is therefore central to poverty reduction
- Key questions facing decision makers all require time series, spatial data:
 - Potential for boosting yields to meet projected growth in global demand
 - Optimal use of REDD+ funds to limit deforestation and sequester carbon
 - Impact of water scarcity on agricultural output
 - Impact of climate change on global agricultural productivity
 - Impacts of increasing climate extremes on vulnerability of the worlds' poor

Spatial detail is key in identifying yield gaps for crops (e.g., maize circa 2000)



Yield Gap Fraction

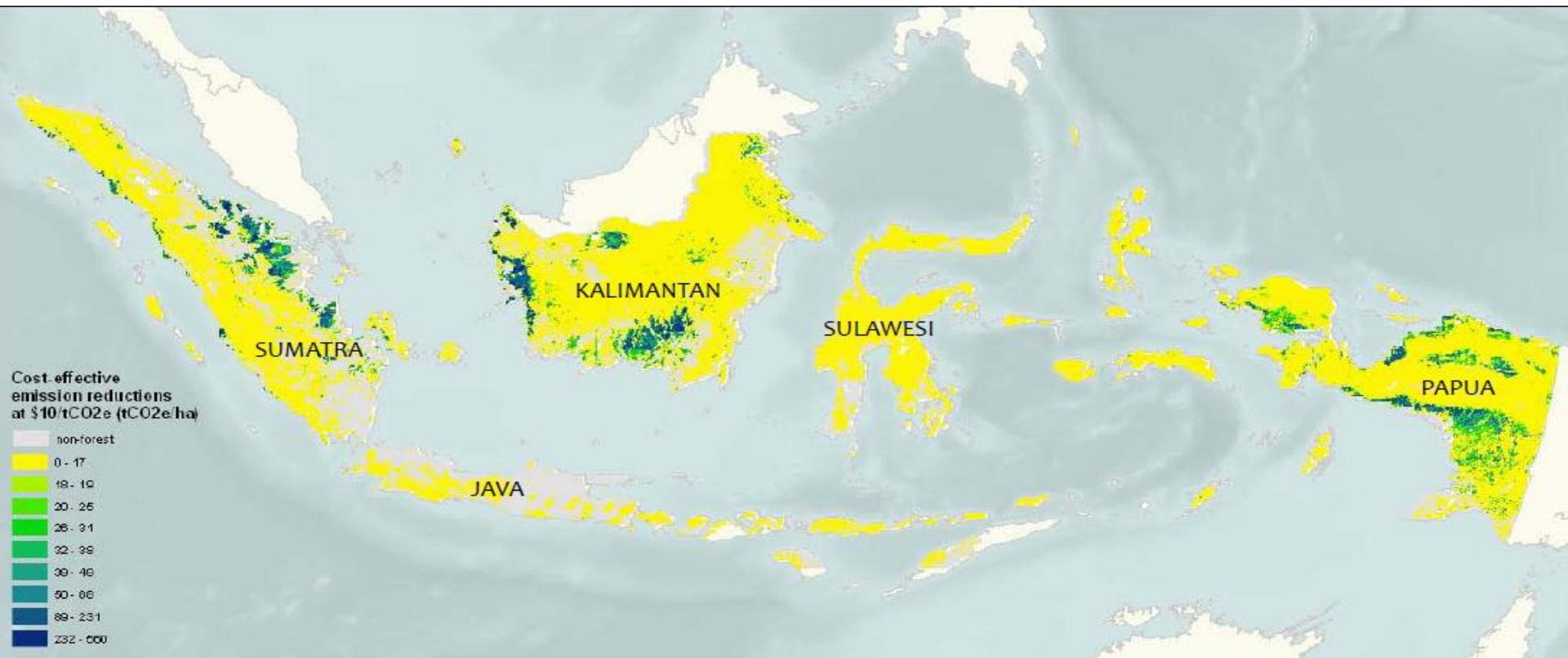


$$\text{Gap} = (1 - \text{Actual yield} / \text{Climatic potential yield})$$

So 0 = on the production frontier, 1 = no productivity

Source: Licker et al. (2010)

Time series spatial data are being used to design REDD payments in Indonesia

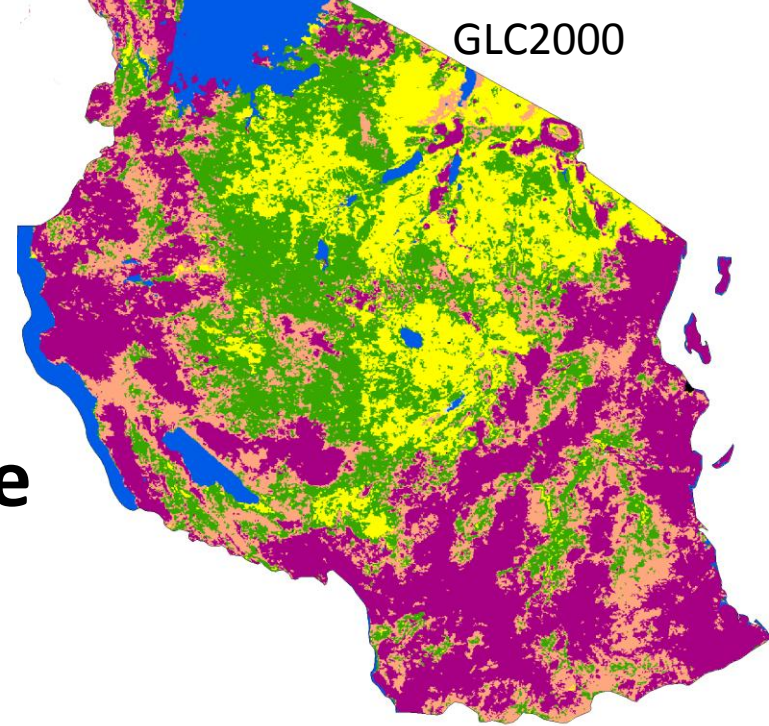


Land-cover response to carbon price of \$10 tCO₂e paid for emission reductions below business-as-usual levels. Darker blue represents greater voluntary abatement of emissions from deforestation in response to incentive payments.

Source: Busch et al. (2011: in preparation), *Climate and revenue benefits of economic incentives to reduce emissions from deforestation in Indonesia*

However, despite improving satellite data, there remain huge discrepancies in our understanding of land cover

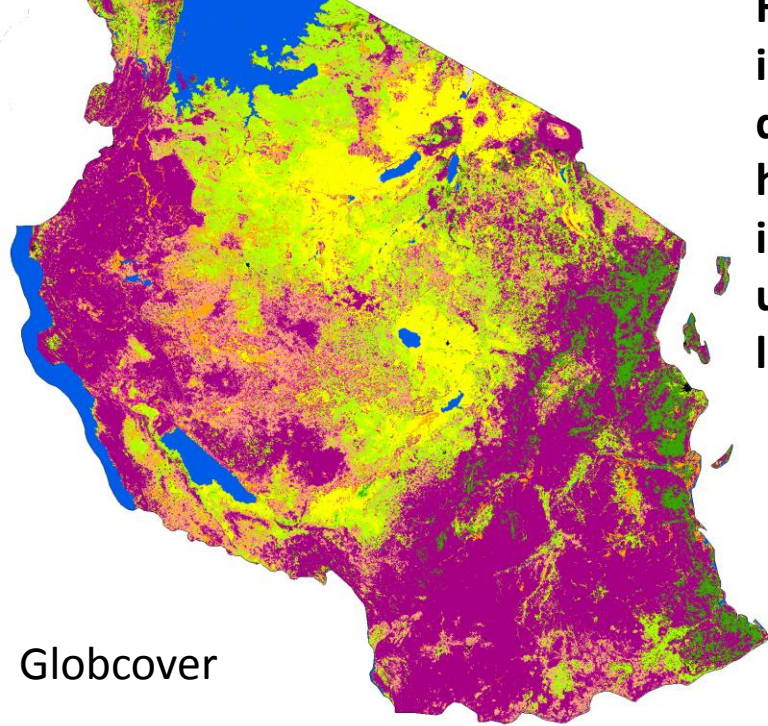
GLC2000



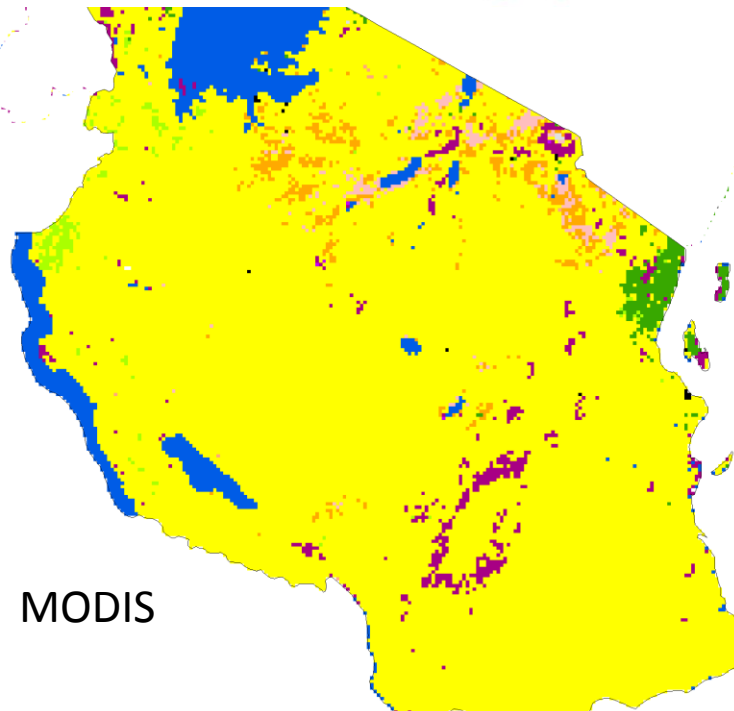
Alternative views of Tanzania

Provided by Stanley Wood

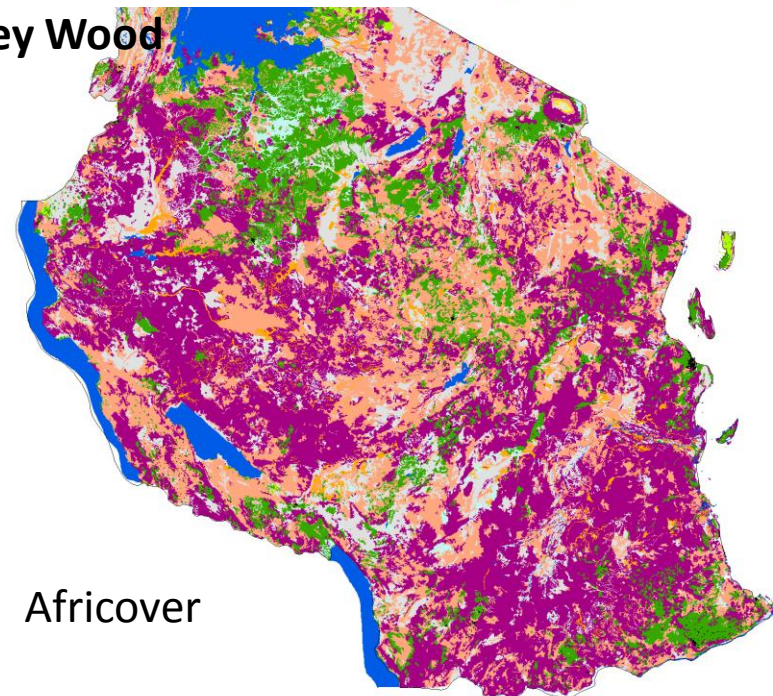
-  Crop
-  mixed crop
-  shrubs
-  savannah
-  grassland
-  forest
-  unvegetated/error
-  urban
-  Water



Globcover



MODIS



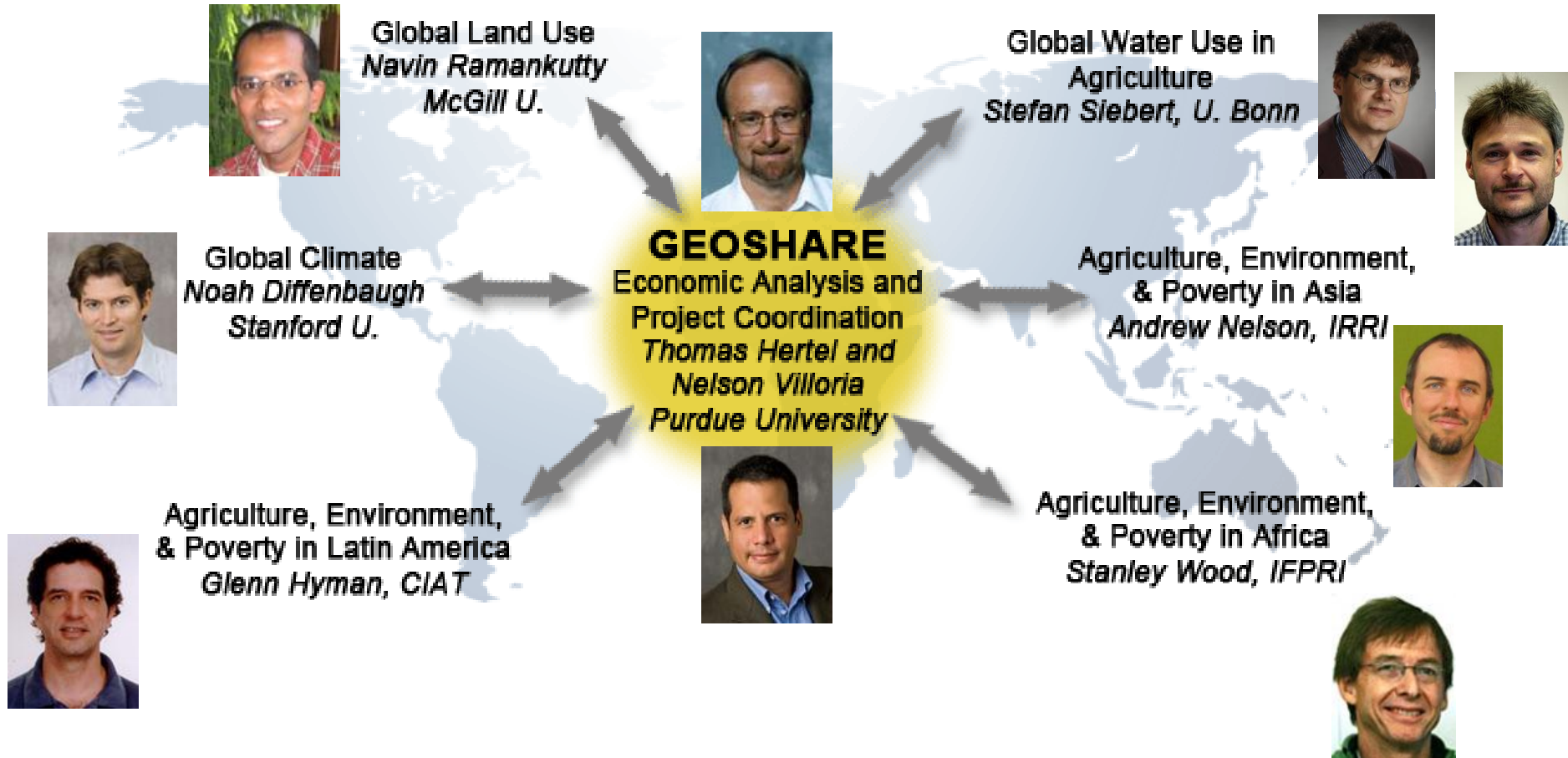
Africover

Our Diagnosis*

- The data currently available to understand how global and local phenomena affect the agriculture-environment-poverty nexus are insufficient to advance needed discovery and enable effective decision making.
- Most geospatial datasets for agriculture are limited:
 - Regional or national in scope instead of global
 - If global, then mutually incompatible, one-time efforts, lacking inter-operability
 - If they publicly available, specialized knowledge and costly software licenses significantly limit access
- This lack of information has greatly inhibited the ability of scientists, practitioners and policy makers to address the socio-economic and environmental impacts of contemporary policy issues related to poverty reduction and the long run sustainability of the world food system.

* Original proposal sponsored by the UK Foresight Programme. Available at <http://www.agecon.purdue.edu/foresight/>

GEOSHARE features a scalable structure with regional and global nodes



Purdue HubZero architecture: Rudi Eigenmann (ECE), Carol Song and Lan Zhao (ITAP), Chris Miller (Library Science).

GEOSHARE Objectives

- *Provide a* globally consistent, temporally opportune, and locally relevant *database* for better decision making.
- *Assist decision makers*, policy analysts and researchers seeking to use geospatial data and analysis tools to inform activities relating to agriculture, poverty, land use and the environment.
- *Build capacity* throughout the world in individuals who can effectively bridge disciplines to make decisions and to identify solutions to complex resource use and development problems using geo-spatial data and analysis tools.

Data needed to understand tradeoffs between agriculture and the environment

Resources:

- Land (soil)
- Water
- Solar radiation
- Germplasm
- Energy
- Assets
- Population

Economic and institutional factors:

- Land tenure
- Market Access
- Credit Availability

Environmental and socio-economic outcomes:

- Poverty Alleviation
- Landscape protection
- Soil degradation
- Carbon fluxes
- Biodiversity



Management:

- Planting/harvest dates
- Irrigation
- Fertilization
- Plant protection
- Labor
- Mechanization



Marketed products:

- Food
- Fiber
- Fuel
- Timber
- Carbon credits

Progress Report: GPRI seed grant for PCCRC-hosted workshop

- Workshop objectives:
 - Exchange of information among leading researchers about what data availability, research and policy questions to be addressed using this global data base infrastructure
 - Refine technical and operational details of *GEOSHARE*
 - Introduce the project to potential sponsors, discuss institutional design and long run sustainability issues
- Outcomes:
 - Enlarged team, refined role for HubZero architecture
 - Funded Pilot Project: UK and US funding
 - Response to USAID Higher Education RFA
 - White Paper to be presented to OECD next week

Pilot Project

- Funding from three sources:
 - UK Department For International Development: \$ 440k
 - UK Department for Environment, Food and Rural Affairs: \$ 100 k
 - USDA's Economic Research Service: \$100 k
- Proof of concept:
 - two regional case studies to support decision makers in Asia and Africa
 - Integrate regional and global data bases
 - Delivery data and decision tools through HubZero infrastructure
- Donor's forum in 2014:
 - Demonstrate success of proof of concept
 - Secure long term funding for GEOSHARE