The South/ Southeast Asia Research Initiative (SARI)
Update and Meeting Objectives

Krishna Prasad Vadrevu
NASA Marshall Space Flight Center
• Background to the SARI initiative

• Meeting Objectives
How it started - strong interest in a SARI from local scientists

Jan-10-13th, 2013-Regional Science Meeting, Coimbatore

Total participants = 120

US - 18 researchers
Nepal-3; Srilanka-2; Myanmar-1; Afghanistan, Myanmar, Bangladesh-1 each
Pakistan, China invited but could not attend - Visa issues

India - University Researchers, Government, Non-Government, NGO’s
Meeting Summary - Need for SARI

NASA The Earth Observer

March/April 2013

SARI - Goal

SARI is NASA LCLUC Program funded regional initiative

To develop an innovative research, education, and capacity building program involving state-of-the-art remote sensing, natural sciences, engineering and social sciences to enrich LCLUC science in South/ Southeast Asia.
Involving National Researchers and Practitioners – Universities, Institutes and Operational Agencies;

Strong emphasis on **Applied Research** with regional / national societal applications and benefits.

Facilitate strengthening regional/national projects through co-design and collaborations;
SARI Regional Needs Meetings funded by NIES, Japan and several international/regional partners.
Collaborations are the Key!
October, 2017

- Total Meeting Participants = 140
- Training Participants = 90
- 3-Day Meeting
- 3-Day Training
- including tea/ coffee breaks + lunches
22 different institutions/ programs - Collaborations are the key to success!
Agriculture and Food Security

- Landscapes In Flux: The Influence of Demographic Change and Institutional Mechanisms on Land Cover Change, Climate Adaptability and Food Security in Rural India

- The Future of Food Security in India: Can Farmers Adapt to Environmental Change?


Urban

- Urban Growth, Land-Use Change, and Growing Vulnerability in the Greater Himalaya Mountain Range Across India, Nepal, and Bhutan

Human Health

- Understanding the Role of Land Cover/Land Use Nexus in Malaria Transmission Under Changing Socio-Economic Climate in Myanmar
2015-2016 LCLUC South Asia Projects

Forests

- Spatiotemporal Drivers of Fine-Scale Forest Plantation Establishment in Village-Based Economies of Andhra Pradesh
- Consequences of Changing Mangrove Forests in South Asia on the Provision of Global Ecosystem Goods and Services
- Complex Forest Landscapes and Sociopolitical Drivers of Deforestation - The Interplay of Land-use Policies, Armed Conflict, and Human Displacement in Myanmar
- Impacts of Afforestation on Sustainable Livelihoods in Rural Communities in India
- Tropical Deciduous Forests of South Asia: Monitoring Degradation and Assessing Impacts of Urbanization
South/Southeast Asian countries are growing rapidly in terms of population, industrialization and urbanization. One of the key challenges in the region is food security. Although total food production and productivity has increased in the region because of additional land area converted to agricultural land use during 1960’s to 2000 and improved varieties and crop management, growth rate of food production in recent times has slowed down, mostly due to loss of agricultural lands related to increasing urbanization and industrialization and less optimal use of available technology. Further, the weather and climate systems in the region, driven primarily by monsoon variability are characterized by extreme weather events, resulting in droughts or flooding which can impact agricultural production. In this region, monitoring the agricultural crop production in a timely manner is essential to predict and prepare for disruptions in the food supply. Further, improved and up-to-date information on agricultural land cover and associated land use practices can help in understanding the role and response of the agricultural sector to environmental change and for improved land management and planning.

Despite the progress in remote sensing and geospatial technologies, little emphasis has been placed on developing robust methods for operational mapping/monitoring of cropped areas and forecasting crop production. In most countries of South/Southeast Asia, the mapping efforts have focused on the classification of land cover types and generalize cropland areas into a single or limited number of thematic classes. Crop-specific LULC information is currently limited to very few countries in

http://explore.tandfonline.com/cfp/est/tres-remote-sensing-in-asia-cfp

Eds: Krishna Vadrevu, Vinay Dadhwal, Garik Gutman and Chris Justice

Deadline: December 31st, 2017
Landsat images for the whole country of Myanmar Images from Landsat 8 for the period of January-March, 2015.
SARI forthcoming meetings (2017-2018)

- **2017** - SARI LCLUC regional meeting in Thailand
  - Meeting: July 17-18-19
  - Training: July 20-21-22

- **2018** - LCLUC and Emissions Meeting in Laos
  - Dates: TBD
  - Training

- **2018** - LCLUC in Mountain Environments, Bhutan
  - Dates: TBD
  - Training
Agriculture Sector and Meeting Objectives
Agricultural land use in South/SE Asia

Significant increase in Agricultural Land Area (x 1000ha) in Several South and Southeast Asian Countries

Vadrevu et al., 2017, ERL (in press)
Long-term Food Security is a major concern for the region;

Agricultural production and land use is changing
- Crop water requirements;
- Extreme events (flooding and drought (almost every year!))
- Adaptation options needs to be explored to address food security questions

RS data needed to monitor agriculture (within season) and forecast crop production (integrating Landsat+ Sentinel + other high resolution data);

Transitioning from research to operational products
- 3-year research projects (eg: 6-different teams working on Rice mapping in Mekong; coordination required and transitioning from research to operations;
  - Crop type and area statistics
  - Production estimates
  - Yield forecasting
    - GEOGLAM working on some of the above activities.
1997-2016 - possible because of strong validation data at a plot scale from Farm service bureau; such data may not be available in S/ Seast Asia
Key Attributes

- Up-to-date land cover maps and especially cropland area statistics;
- Crop type and condition;
- Production and yield.

After 45 years since first Landsat launch, above variables are still not operational in several countries!
Mapping challenges! - Terrace farming in Shan State, Myanmar
Timing of sowing, harvesting, growing status, crop growth anomalies, crop calendars, crop damage w.r.t flooding, inundation, drought, disease, pest infestations, agrometeorological parameters, soil moisture, ET, improved rainfall estimates, land suitability, agroecological zoning status, nutrient status, crop residue mapping, disturbances, etc.
Several countries in the region still lack spatial data infrastructure!
Meeting Objectives

- Review existing methodologies, sources of data relating to operational mapping/monitoring of crops in SARI region.
- Gather information, share experiences, identify needs and priorities;
- Provide a forum for collaborations among the various initiatives/institutions relating to remote sensing of agriculture.
Meeting Sessions

- **Session-1** - Global/ Regional Programs/ Products
- **Session-2** - Computational Tools and Decision Support Systems for Agricultural Research
- **Session-3** - Biophysical Parameter Retrievals, Crop Type, Area and Yield Mapping/ Monitoring
- **Session-4** - Regional Land and Agricultural Mapping/ Monitoring Activities

**Panel Discussion (Day-2)**: User community needs;

**Discussion Session (Day-3)**: Research needs and priorities.
International Journal of Remote Sensing
Submit your papers to this special issue on Remote Sensing of Agriculture in South/Southeast Asia
Deadline: 31 December 2017

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Eds: Krishna Vadrevu, Vinay Dadhwal, Garik Gutman and Chris Justice
Deadline: December 31st, 2017
Dates: July 17-19th, 2017

Venue: Chiang Mai, Thailand.

Training: 20-22nd, 2017

Themes: LCLUC relating to (1) agriculture and water resources, 2) biomass burning, including land-atmosphere interactions, 3) urbanization, and 4) land use in coastal zones and estuaries, and 5) land use in forests and mountain regions

www.lcluc.umd.edu
Welcome to SARI

The goal of SARI is to develop an innovative regional research, education, and capacity building program involving state-of-the-art remote sensing, natural sciences, engineering and social sciences to enrich Land Cover/Land Use Change (LCLUC) science in South Asia. Our objectives are twofold. First, we aim to advance LCLUC science in the region. Second, we endeavor to strengthen existing and build new collaborations between US and South Asia researchers in the areas of LCLUC research. To address LCLUC science, SARI will utilize a systems approach to problem-solving that examines both biophysical and socioeconomic aspects of land systems, including the interactions between land use and climate and the interrelationships among policy, governance, and land use. A central component of this initiative will be the use of geospatial data from both remotely sensed and in situ sources and models. To strengthen the theoretical underpinnings of LCLUC science in the South Asian region, SARI will facilitate:

a) new partnerships with space agencies, universities and non-government organizations;
b) novel and regionally-appropriate methodologies and algorithms for LCLUC products;
c) data sharing mechanisms;
d) leadership training;
e) international workshops to identify regional priorities, discuss and share scientific findings;
f) capacity building programs; and
g) international student/researcher exchanges, including among LCLUC scientists in the region.

SARI will serve as a facilitator and catalyst for LCLUC research in South Asia. The outputs will be beneficial to the U.S., South Asia and international researchers and will serve as a model for interdisciplinary research that links LCLUC science with NASA assets.