

Food Security and Climate Change: Building Adaptation Strategies for Bangladesh

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Problems in the Context of Agriculture and Food Security

- Agricultural yields are highly dependent on agricultural inputs including performance of land and soil and availability of water
- A number of policies and programmes are already in place to increase productivity to ensure food security of the country
- Many interventions have already brought changes in agricultural practices, use of water and biomass
- Climate change and extreme weather events will put additional stress on natural resource base and agricultural yield will be reduced in future
- Building adaptation strategies based on present learning is necessary

Objectives and Potential Users

- Enhance understanding of implications for national and international policy making on land use change and food security in Bangladesh
- Enhance understanding on implication on water use and biomass production due to land use changes
- Contribute to a synthesis paper on rural development land use change for food security, water and biomass, and (inter) national policy making
- Help to build Adaptation Strategies for Bangladesh in the context of Food Security and Climate Change
- Share with relevant stakeholders, including policy makers and practitioners

Methodological Framework

■ Top-down Approach

- Collection of data (agriculture, forest etc) from National Sources (agricultural census and statistics, bureau of statistics, etc) by administrative district
- Analyse data to identify land use changes over time and space
- Climate Change Scenario and Impacts
- Overlay with existing and future problems related to climate to find possible area for bottom up analysis

■ Bottom-up Approach

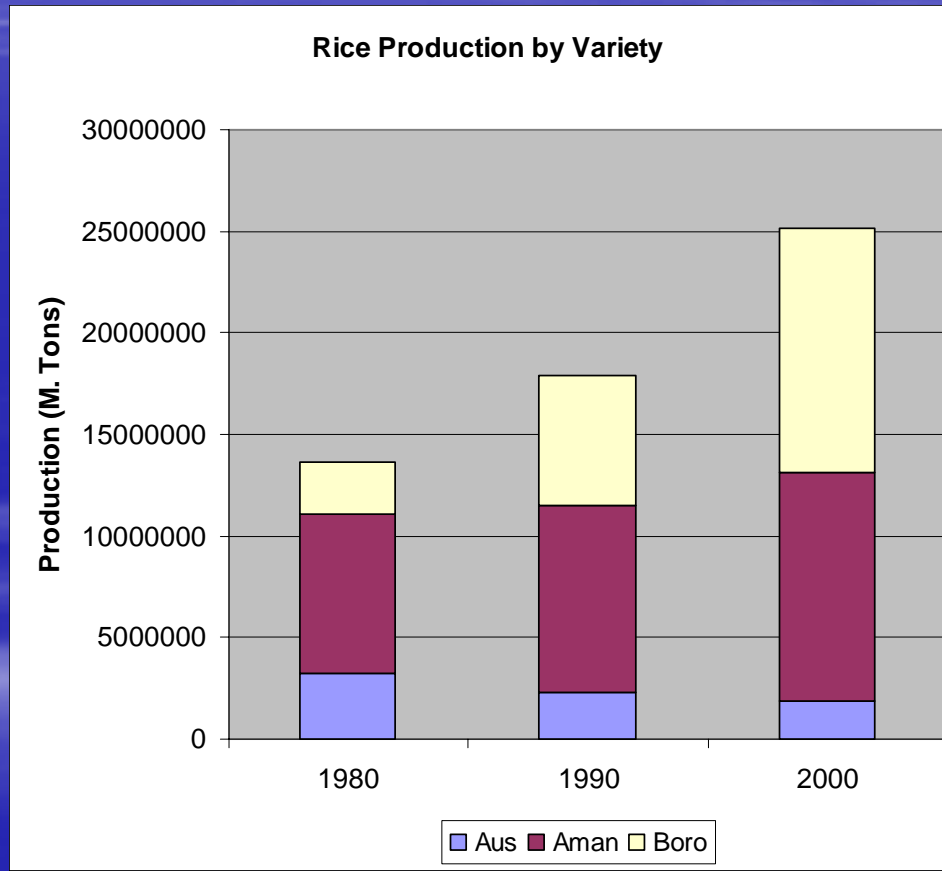
- Understand location and context specific changes and coping mechanisms and their implications (good, bad etc.)
- Participatory Rapid Appraisal (PRA)
- Compilation and synthesis of findings to build adaptation strategies

Tools for Assessment

- Top-down Approach
 - Relational Database System
 - Geographic Information System
- Bottom-up Approach
 - Reconnaissance survey and observational visits
 - Discussion with individuals
 - Focus Group Discussion (FGD)

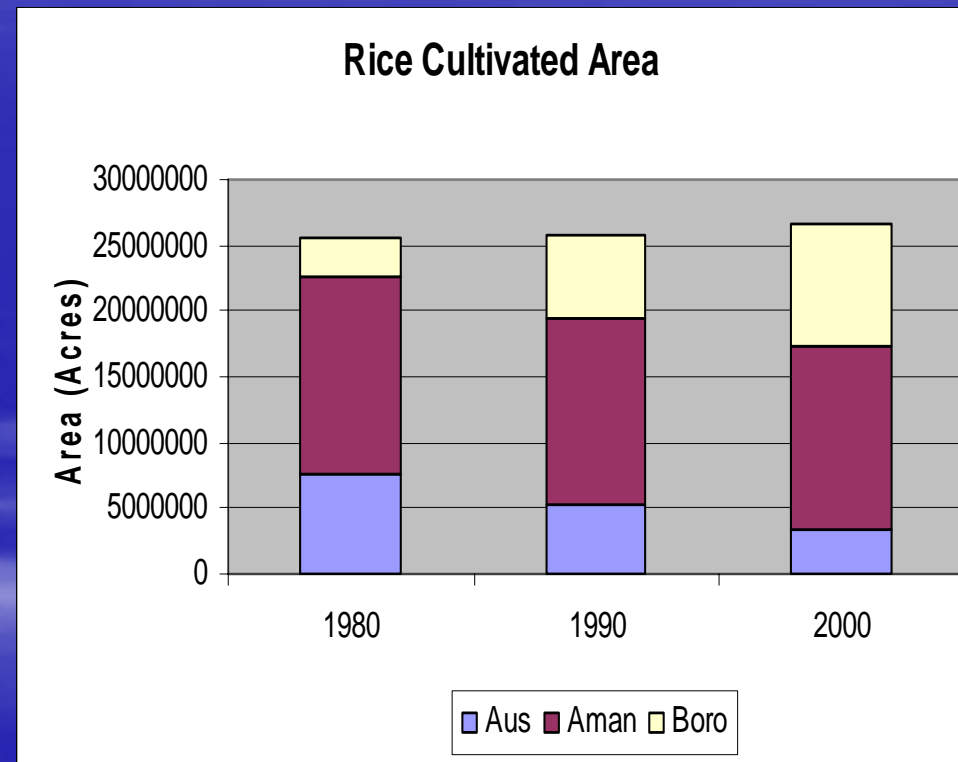
Study Results: Changes in Production

- Overall production of rice has increased from 13.66 million to 25.10 from 1980 to 2000
- Population has increased from 90 to 129 million from 1980 to 2000
- Country became food-grain self-sufficient due to increased production
- Contribution of High Yielding Variety (*Boro*) is significant



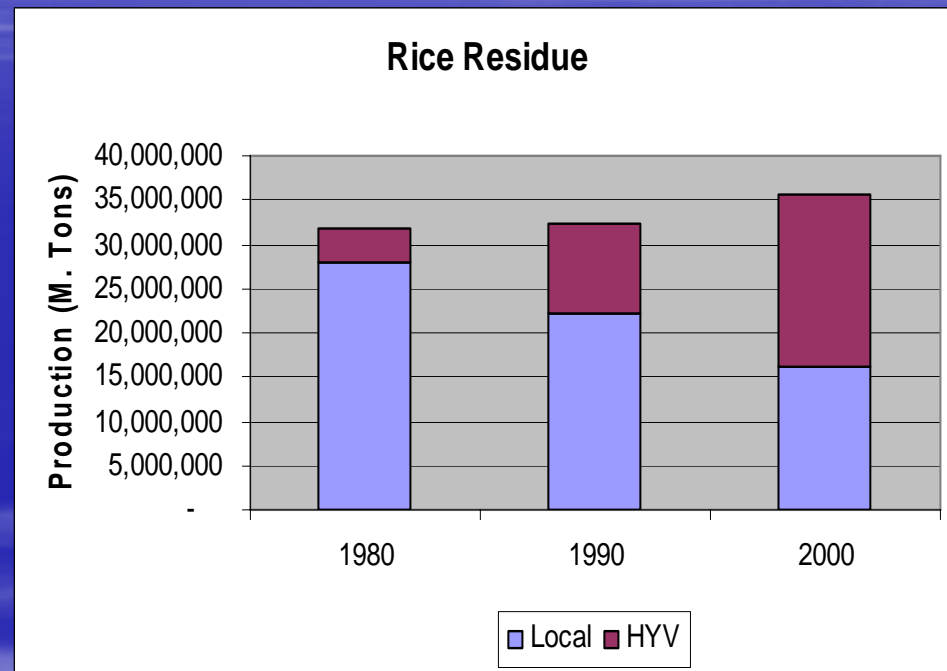
Study Results: Changes in Area

- Agricultural land area of the country is declining at the rate of 200 ha/day
- Overall cultivated area has increased due to increased cropping intensity (176 in 2001)
- Cultivated area under High Yielding Variety (boro) has increased significantly
- Significant decrease is observed in Aus cultivation

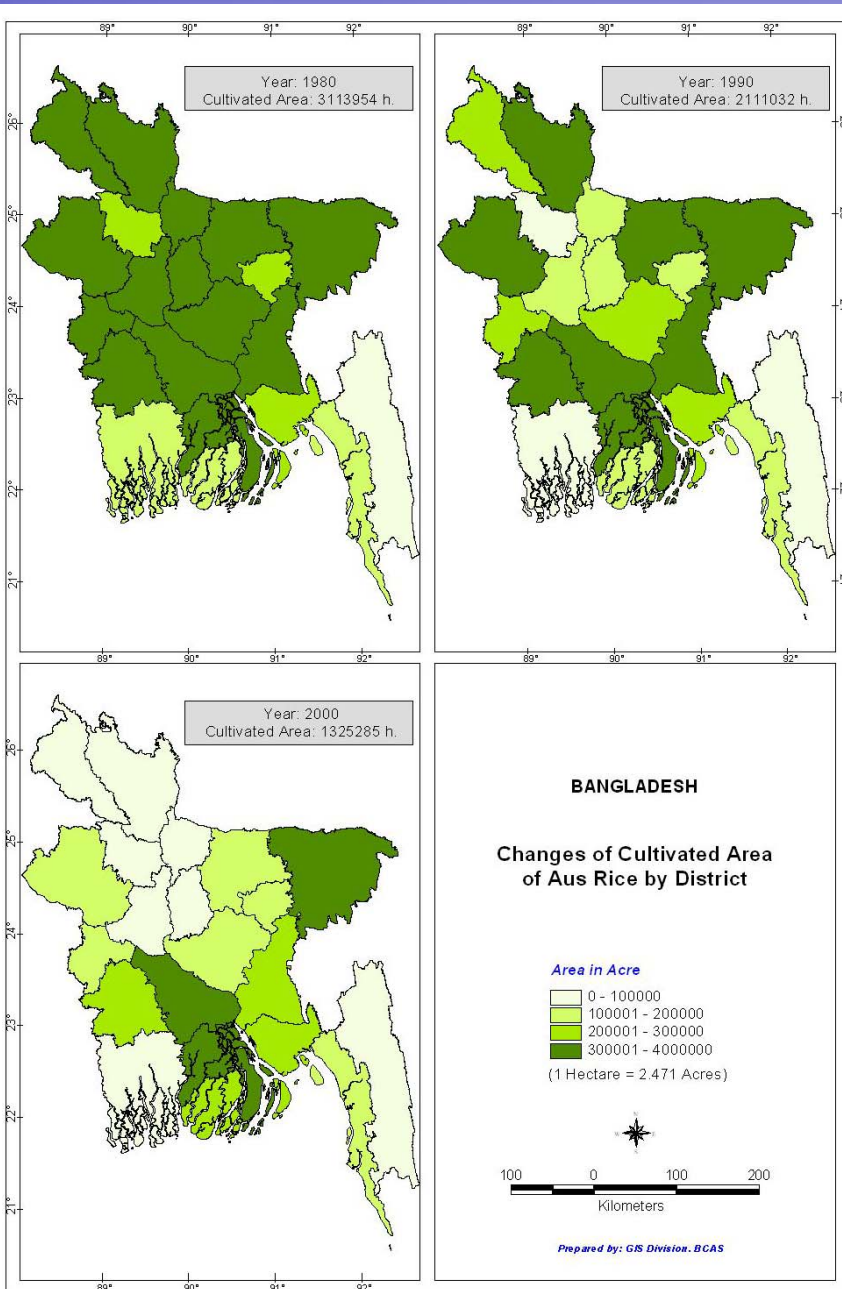


Study Results: Changes in Biomass Production

- Production from local variety has declined
- Production from high yielding variety has increased
- Total residue from rice production has increased but is not doubled as production
- Less replenishment of soil micro nutrient from biomass
- Crop biomass is using as fodder and fuel in rural area

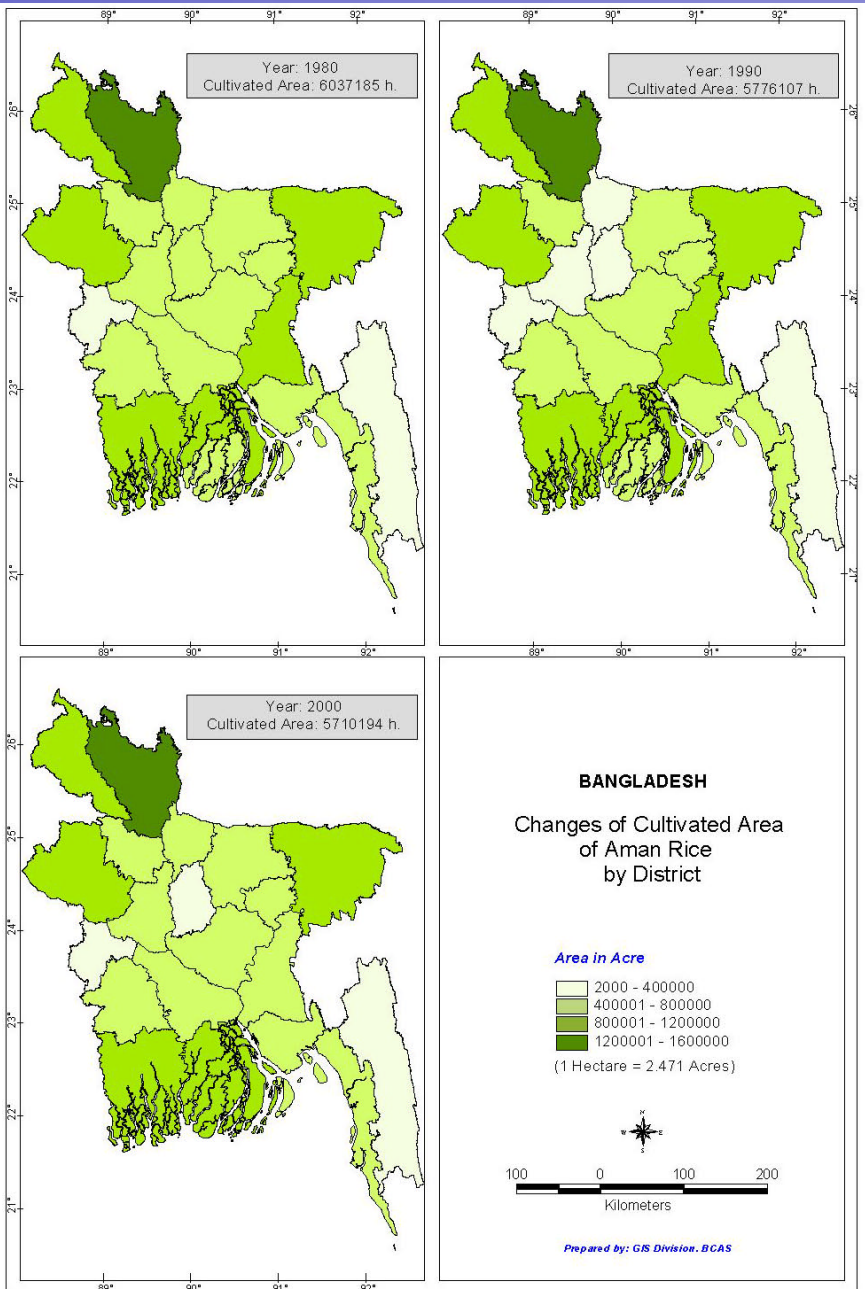


Study Results: Changes in *Aus* Cropped Area



- Aus cropped area has declined over the years
- In 1980, it was 3.11 Mha and became 2.11 Mha in 1990
- In 2000, it was only 1.33 Mha
- Major changes noticed in northwest and central regions

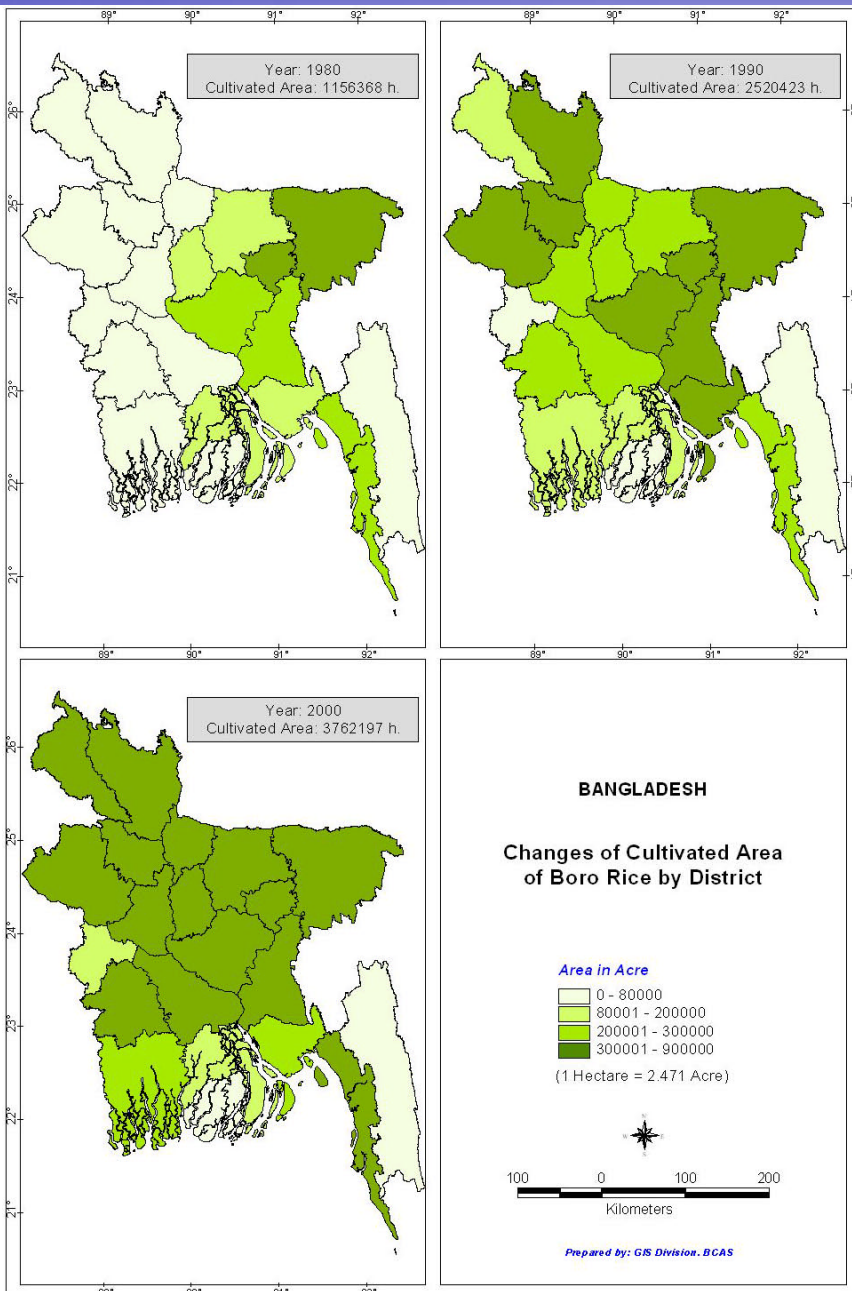
Study Results: Changes in *Aman* Cropped Area



- *Aman* cropped area has not declined significantly over the years
- In 1980, it was 6.03 Mha and became 5.77 Mha in 1990
- In 2000, it was only 5.71 Mha
- Changes noticed in northwest and north-central regions

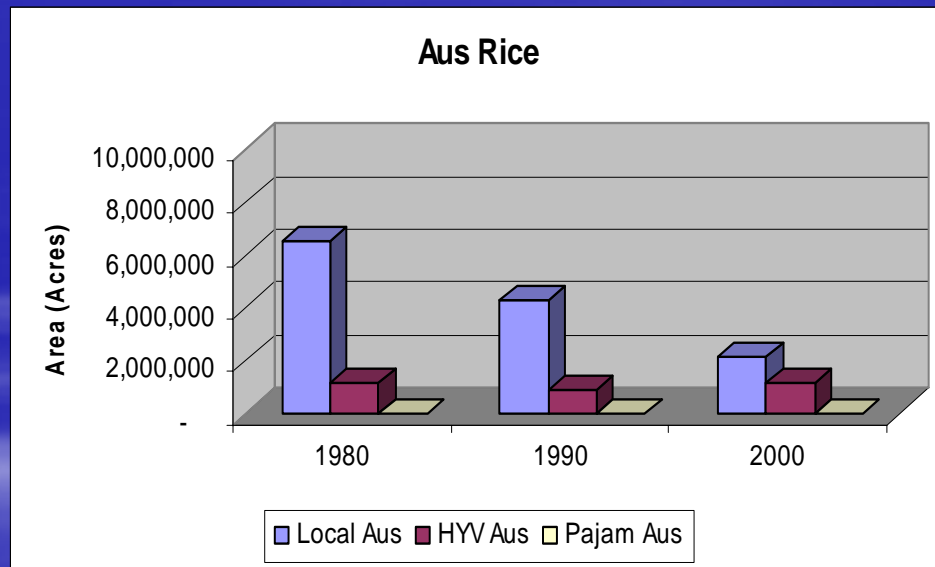
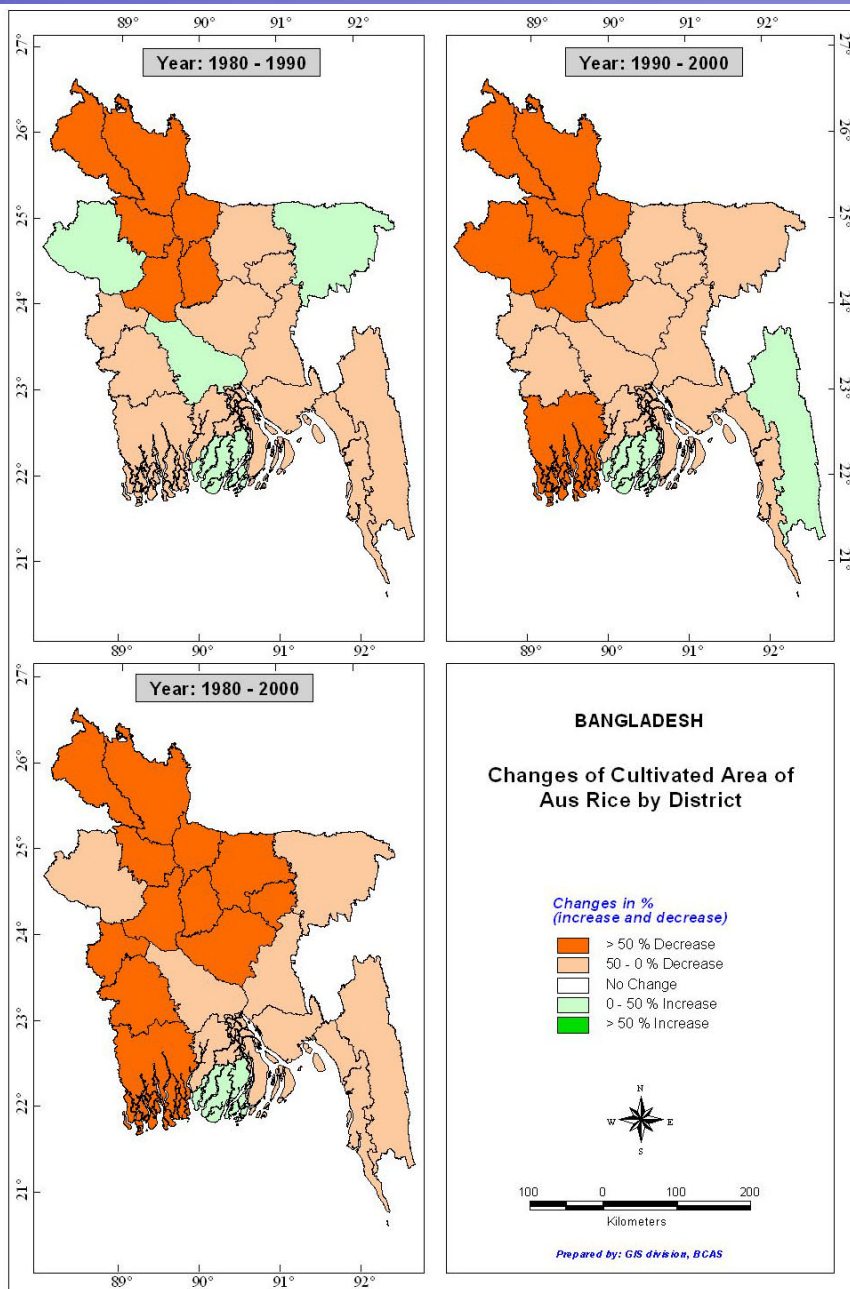
Study Results: Changes in *Boro* Cropped Area

- *Boro* cropped area has increased significantly over the years
- In 1980, it was 1.15 Mha and became 2.52 Mha in 1990
- In 2000, it became 3.76 Mha
- Major expansion occurs in northwest and southwest regions



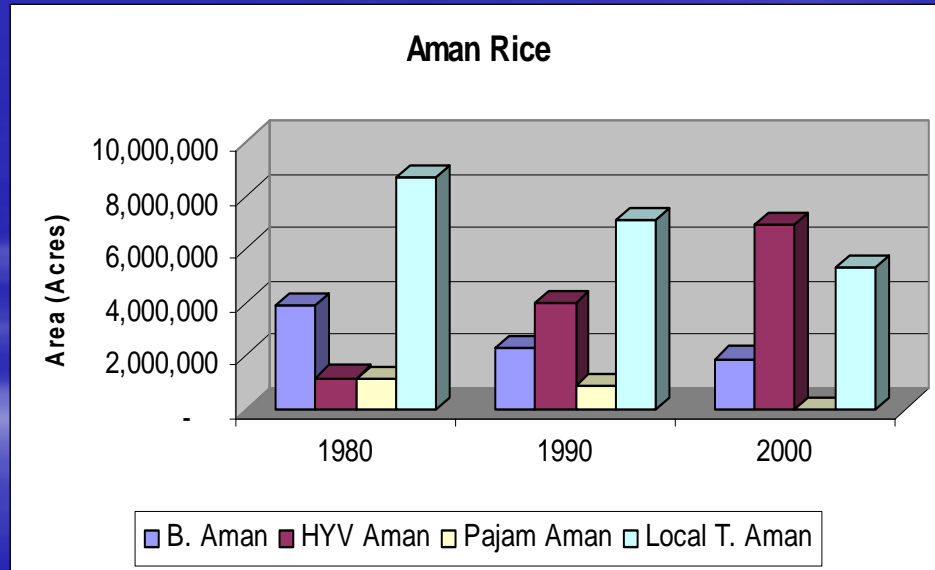
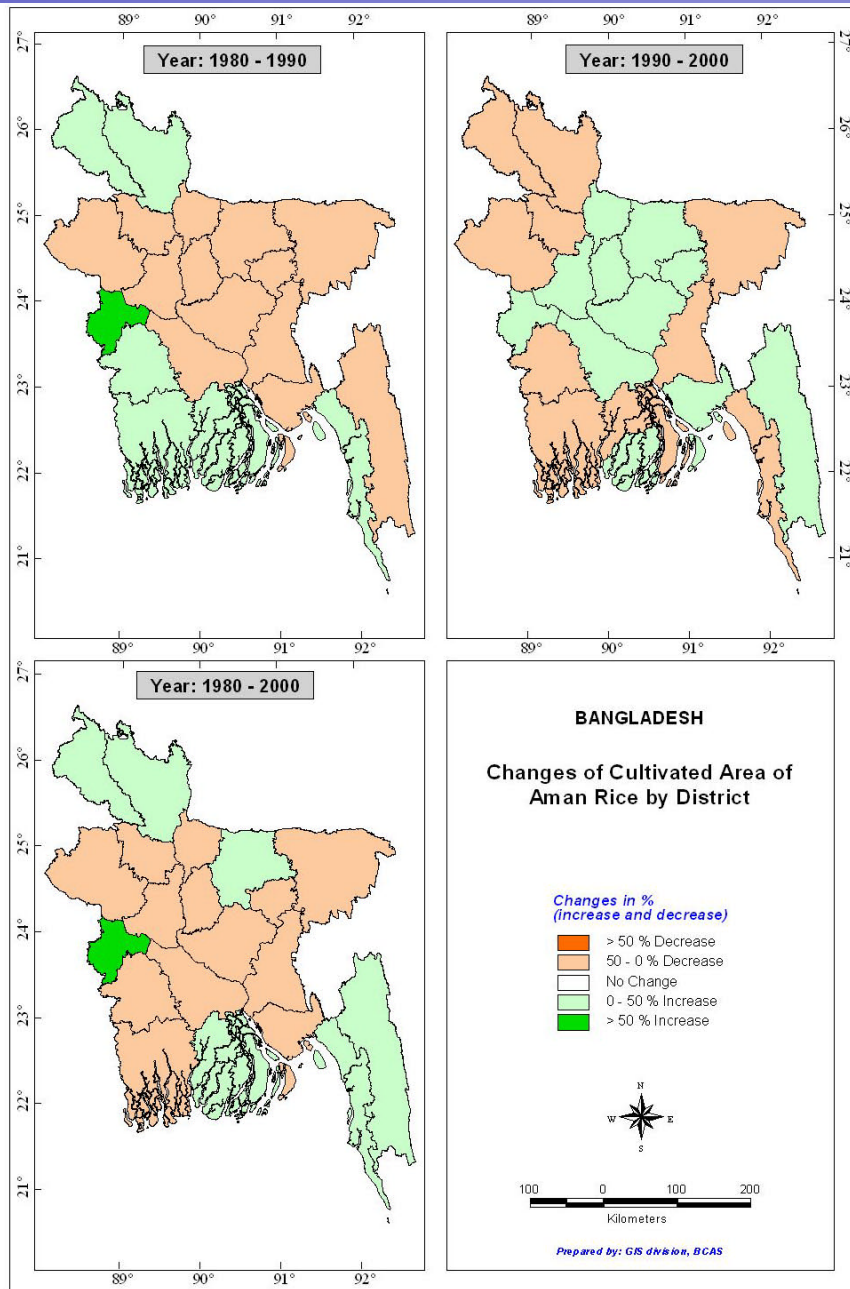
Study Results: Changes in *Aus* Cropped Area

- *Aus* cropped area under local variety has decreased significantly over the years
- But high yielding variety of *Aus* has increased



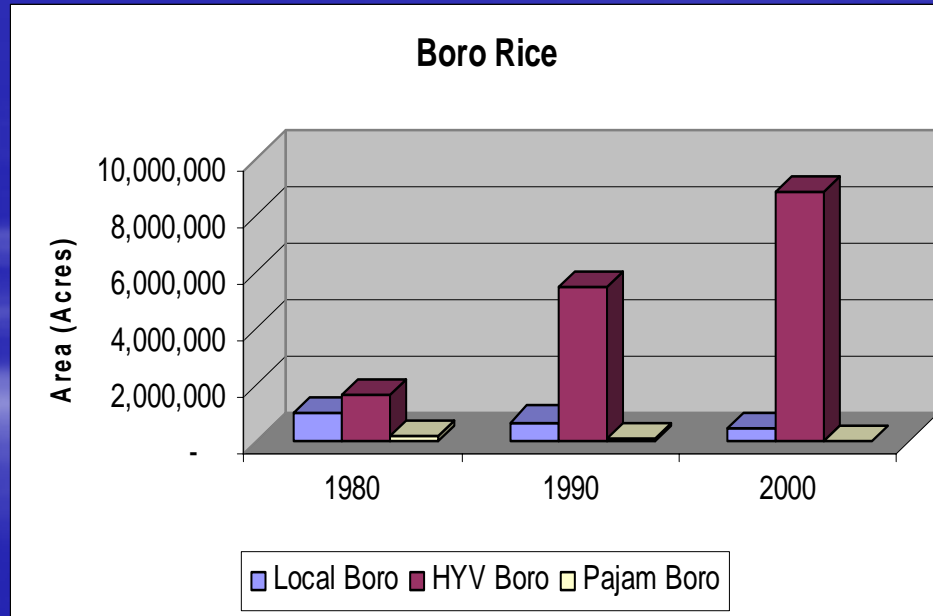
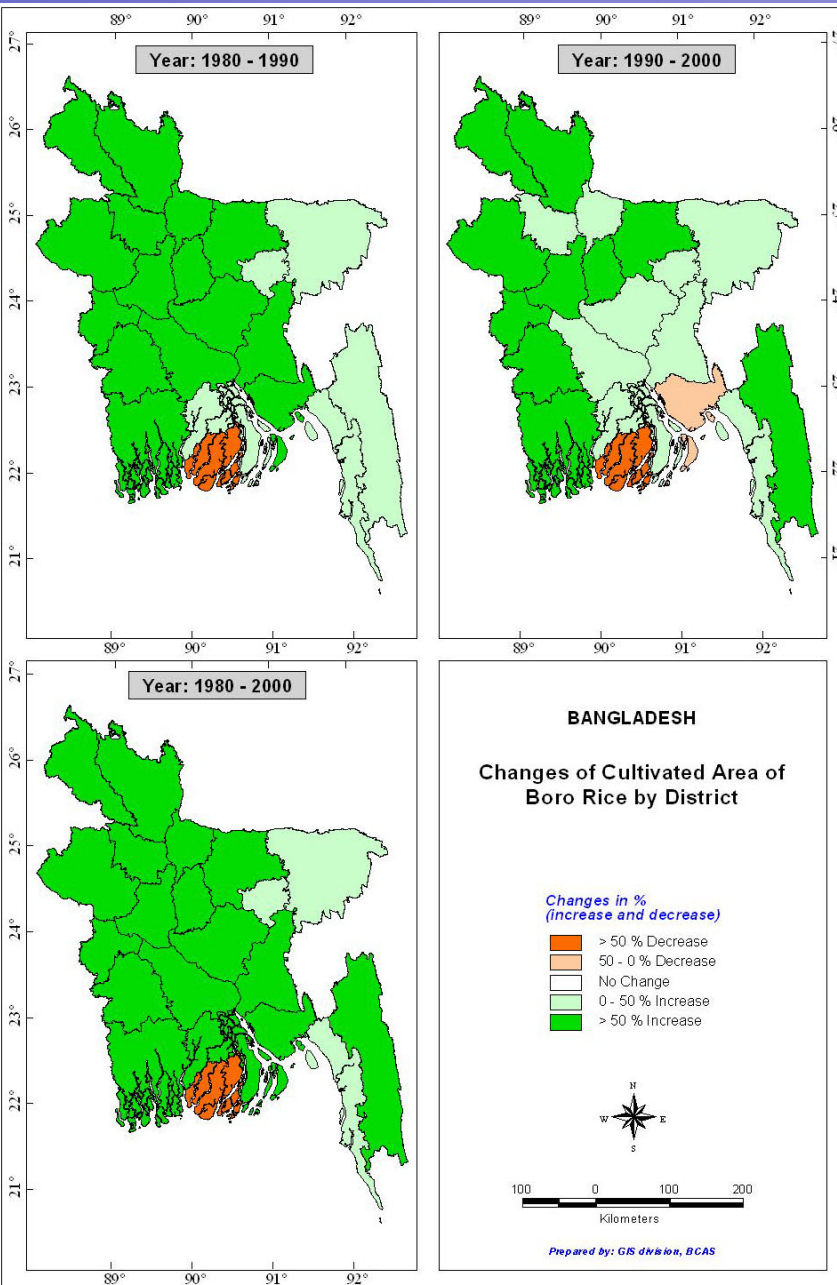
Study Results: Changes in *Aman* Cropped Area

- *Aman* cropped area under broadcast, local transplanted pajam variety has decreased over the years
- But high yielding variety of *Aman* has increased



Study Results: Changes in *Boro* Cropped Area

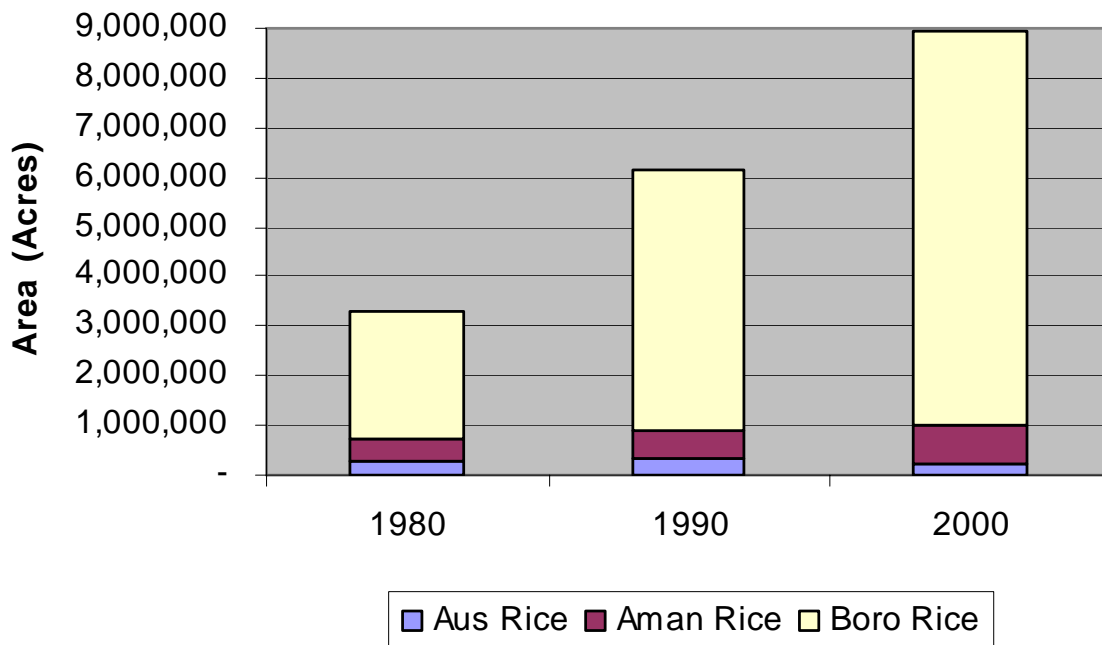
- *Boro* cropped area under local and pajam variety has decreased over the years
- But high yielding variety of *Boro* has increased



Study Results: Changes in Irrigated Area

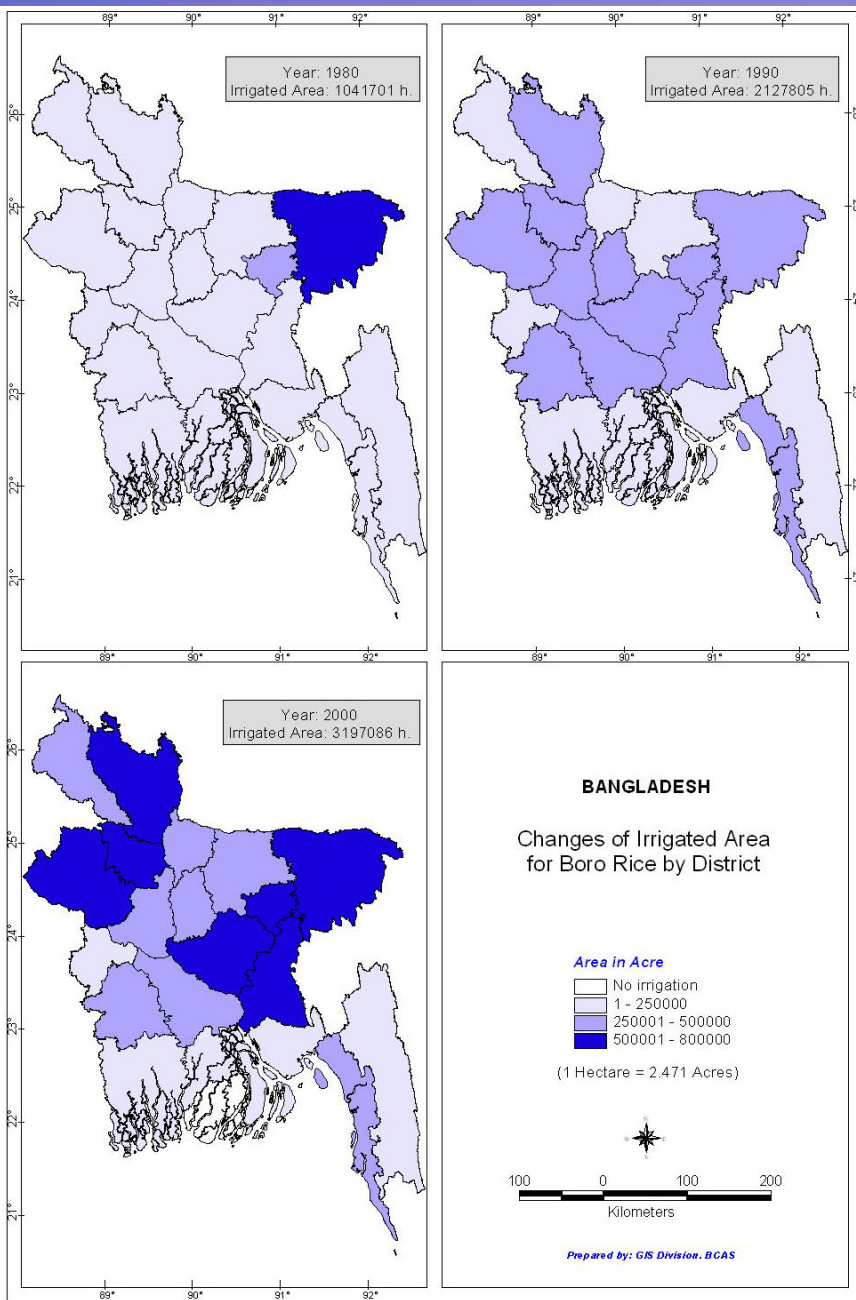
- Over the last 20 years, there has been a three-fold increase in the area of land irrigated

Irrigated Area

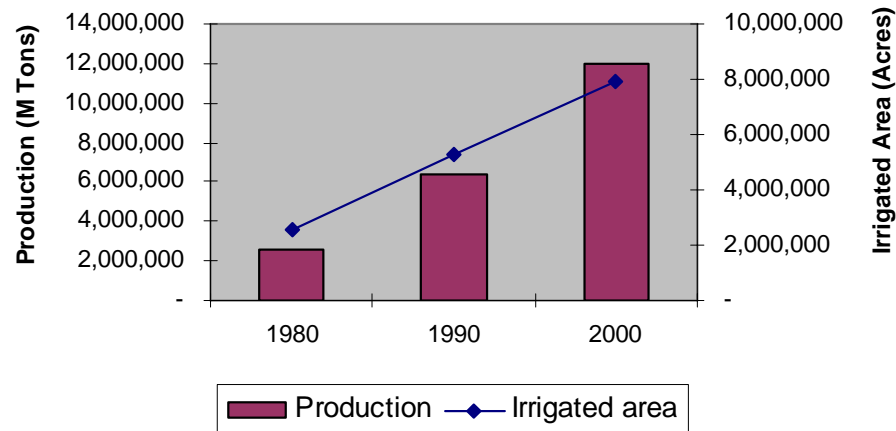


Changes in Irrigated Area for *Boro*

- Irrigated area under *Boro* Rice has increased significantly compared to other rice crops
- Major increases noticed in northwest, northeast and central regions

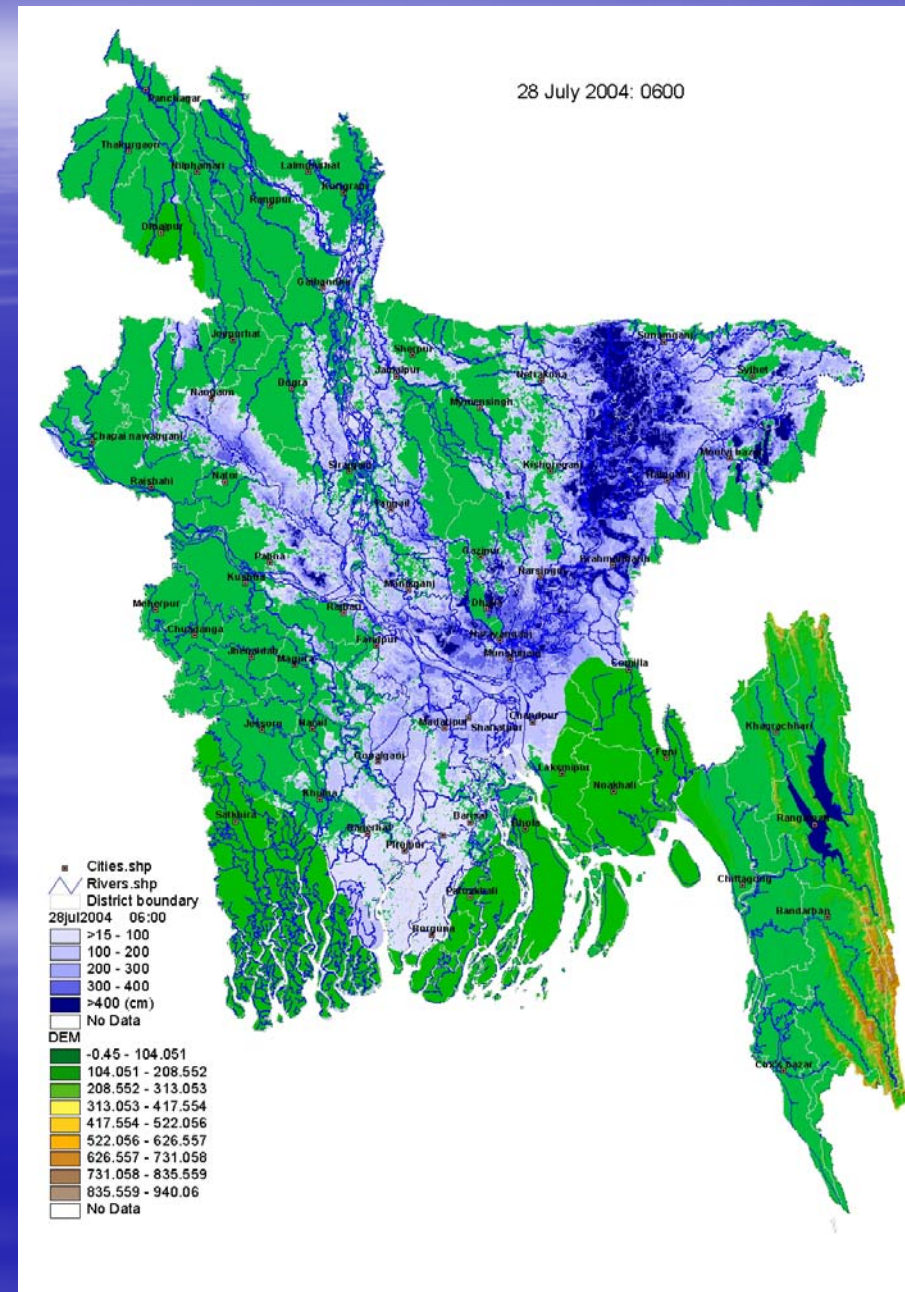
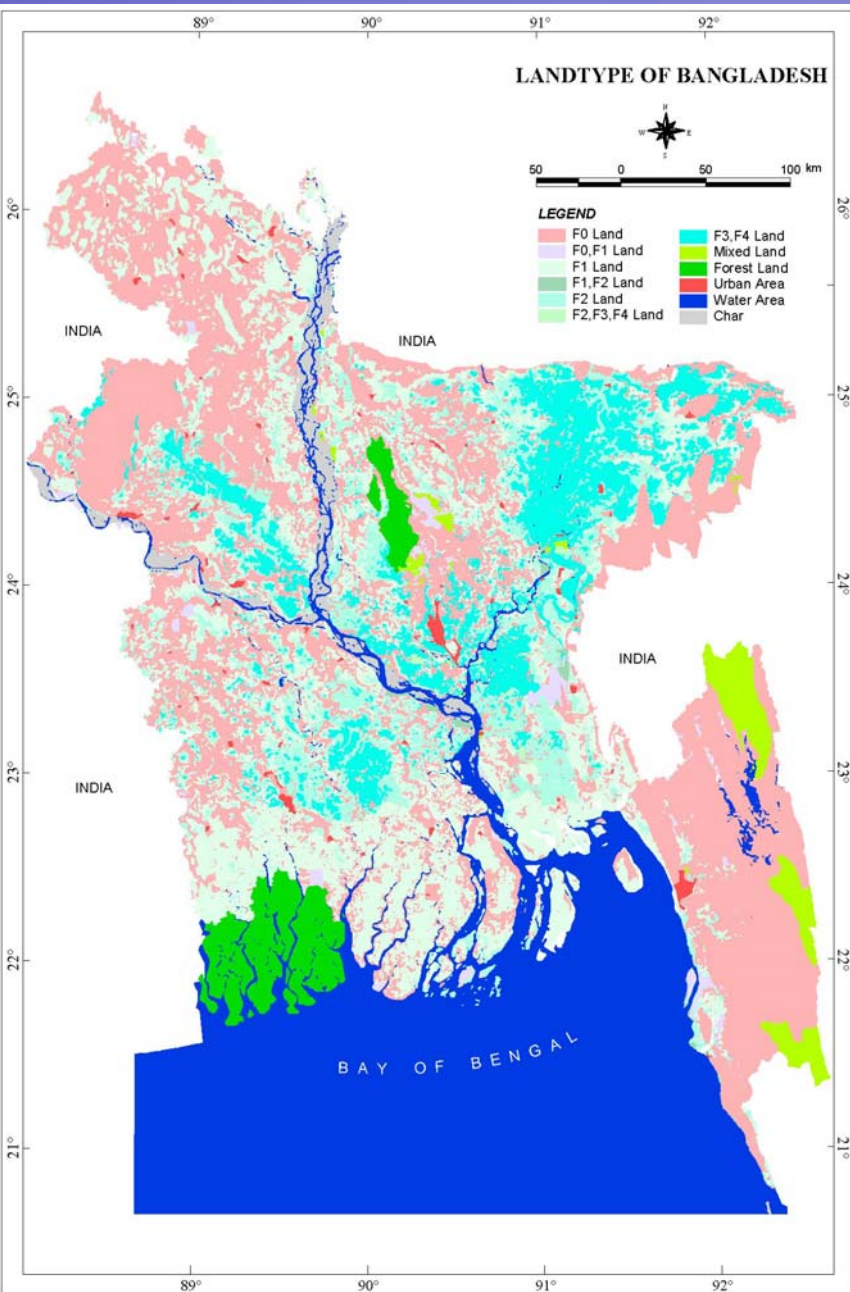


Boro Rice

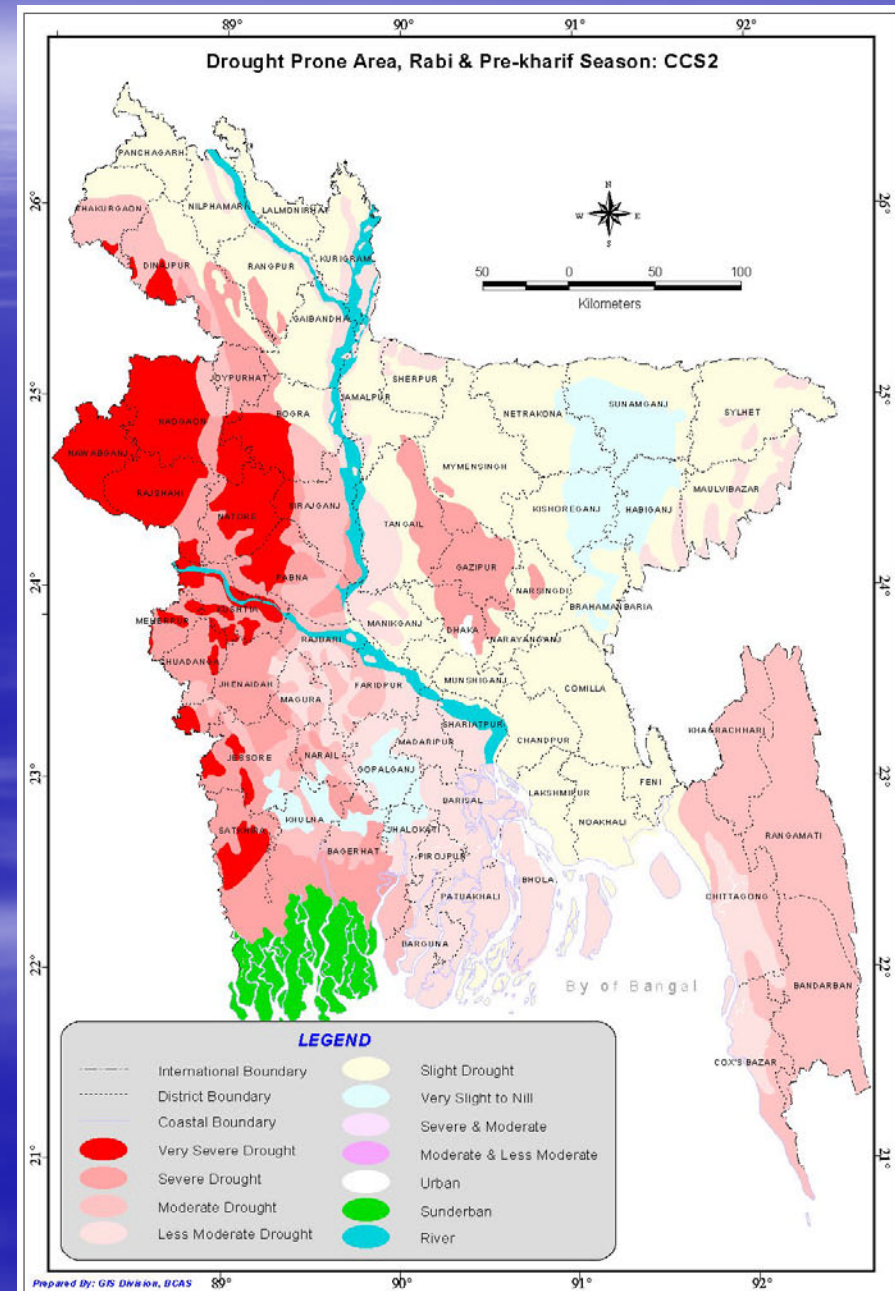
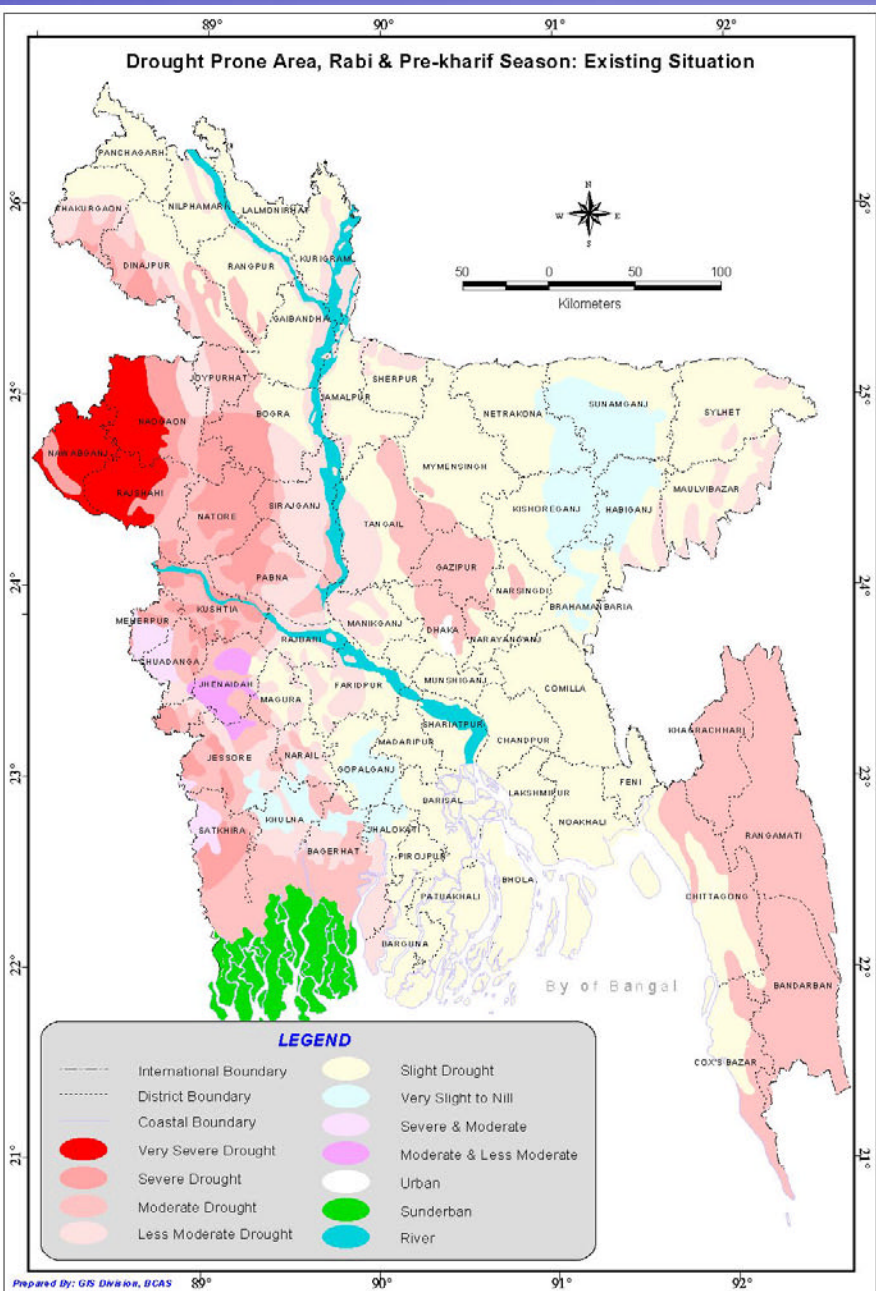


Changes in Natural Physical System due to Climate Changes

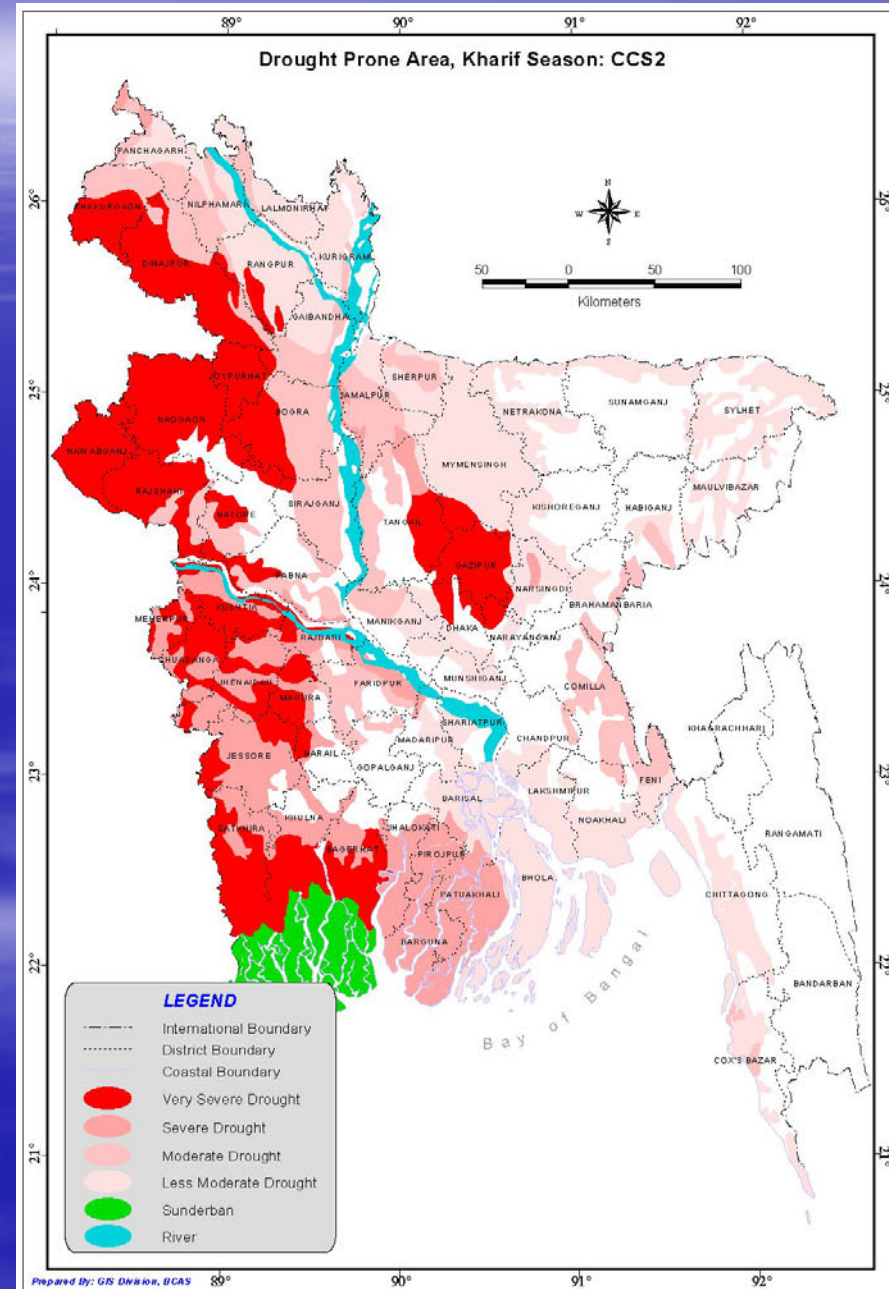
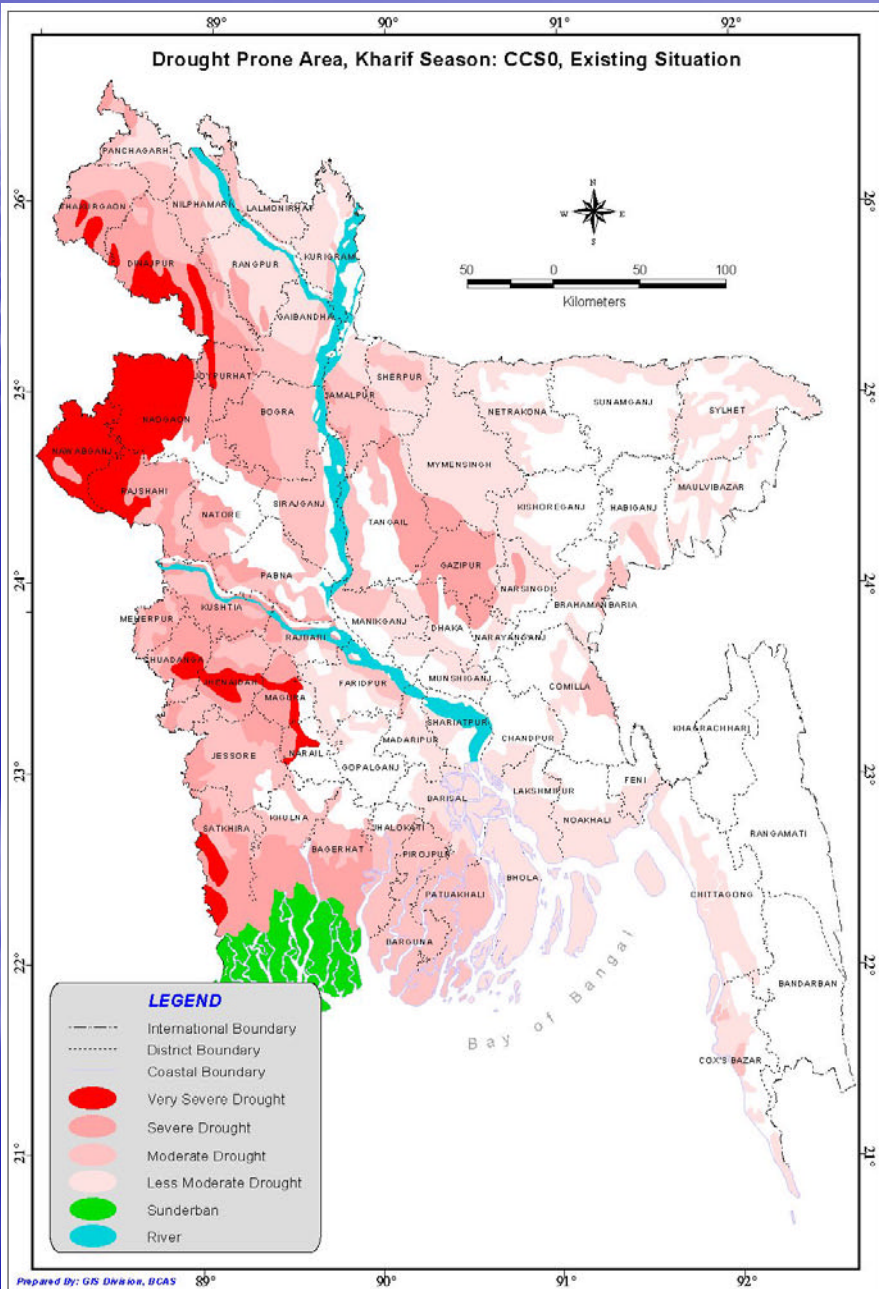
Changes in Flood Regime: spatial and temporal aspects



Changes in Drought: spatial and temporal aspects



Changes in Drought: spatial and temporal aspects



Changes in Drought: spatial and temporal aspects

Potential impact of sea-level rise on Bangladesh



Today

Total population: 112 Million

Total land area: 134,000 km²

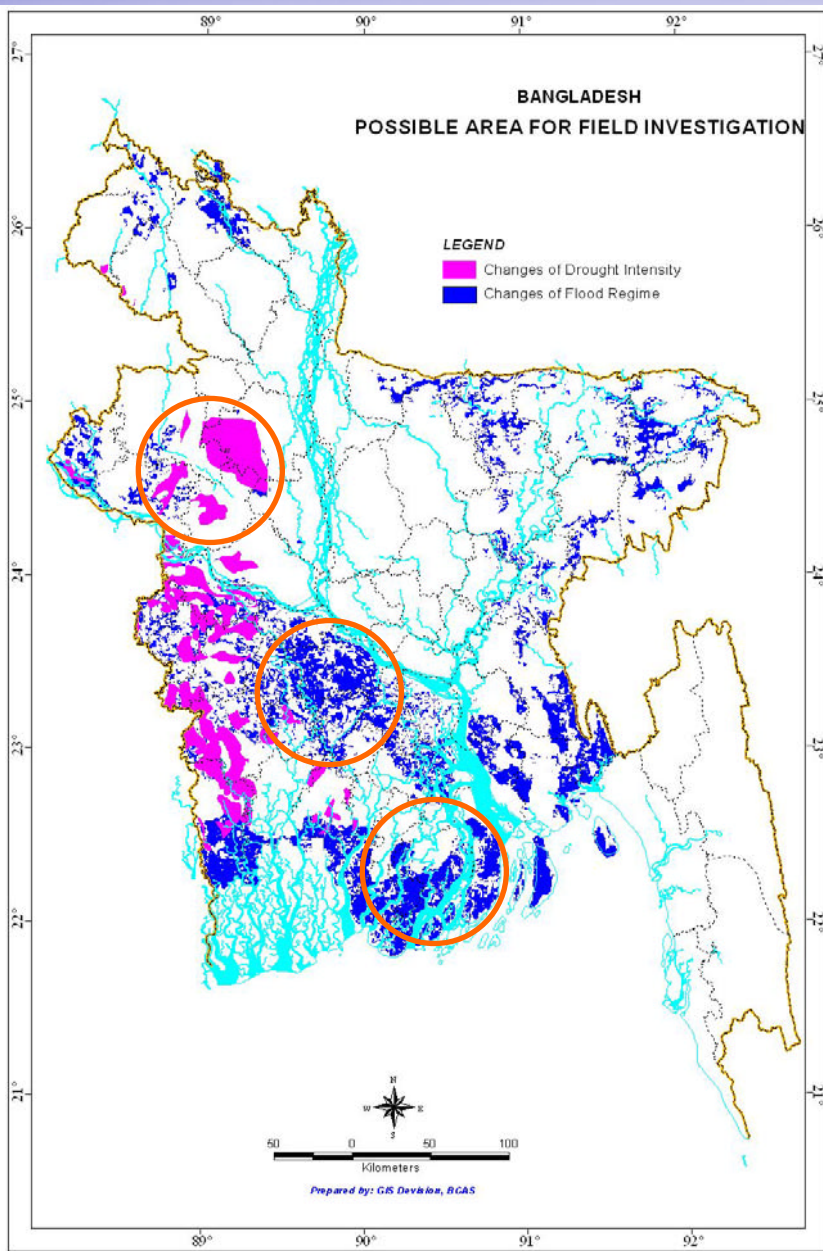


1.5 m - Impact

Total population affected: 17 Million (15%)

Total land area affected: 22,000 km² (16%)

Possible Area for Field Level Investigation



- Northwest region for drought
- Central region for flood
- Coastal region for salinity and coastal flood

Strategies to Cope with Problems

Vulnerability Context	Coping strategies/ technology	Changes in practice/ situation	Use of Biomass
Drought Prone	Irrigation	Modified drought intensity Promoted high yielding variety Increase cropping intensity	Cattle feed Packing materials Rural households use cow dung, leaves for cooking purpose
Drought Prone	Plantation	Reduce heat spell Increase woody biomass production	
Drought Prone	Promotion of horticulture	Diversify crop production	Use of rice straw for cooking purpose

Strategies to Cope with Problems

Vulnerability Context	Coping strategies/ technology	Changes in practice/ situation	Use of Biomass
Flood Prone	Water infrastructure (embankment)	Reduce flooding and risk to production Diversification of agriculture Promote high yielding variety	Crop residue used for cattle feed Jute stick and rabi crops residue for cooking Vary according to family wealth status
Flood Prone	Floating Agriculture (outside embankment)	Promote alternative livelihoods	

Strategies to Cope with Problems

Vulnerability Context	Coping strategies/ technology	Changes in practice/ situation	Use of Biomass
Salinity (severe)	Embankment	Promoted Shrimp cultivation Increased salinity Replaced rice crop and lead to fuel crisis Increase in unemployment Increase in drinking water problems	Rural household collect wood from the Sundarban forest or buy fuel from market
Salinity (moderate)	Embankment	Cultivation of high yielding crop Shrimp cultivation Suspect to become severe saline prone and shrimp will replace existing rice crop area	Use of rice straw for thatched roof Cattle feed Use leaves, tree branch, cow dung for cooking purpose

Concluding Remarks

- Changes occur in the agricultural system in Bangladesh to ensure food-grain self sufficiency
- It has compromised with other sectors, particularly sectors dependent on water and use of biomass for rural activities
- Changes are emerging and a number of pilot scale activities are on-going
- Coping strategies show that a number of changes in production systems and at user level have occurred
- Top down analysis and finding from bottom-up will allow for the contribution to discussions and policy making in Bangladesh
- Build agricultural sector adaptation in the context of climate change and food security

Thank You