Global Environmental Change

….over-exploitation of the natural resource base
….loss of biodiversity
….disruption to biogeochemical cycles and other aspects of Earth system functioning
….climate change
….potential increase in hydro-meteorological extreme events

✓ All affect agriculture, rural livelihoods and food security
✓ All driven by food system activities
✓ All world-wide, interacting phenomena
✓ Complex and varied international science agenda

Food Security

…. exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life. *(FAO,1996)*

…. is based on three components: (i) food availability; (ii) food access; and (iii) food utilisation.

…. depends on more than agricultural production

…. is diminished when food systems are stressed

Developing Interdisciplinary Research Approaches
to advance science and address policy

I. Conceptual & methodological research on <u>generic</u> topics

- Food Systems Concepts
- Vulnerability Concepts
- Scenario Methods
- Decision Support Concepts

II. Policy-relevant research at <u>regional</u>-level

- Impacts
- Adaptation
- Feedbacks

based on science and policy issues identified in regional projects ⇄ based on improved conceptual understanding and methods

NATURAL ENVIRONMENT RESEARCH COUNCIL
E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

GECAFS International Project Office, Environmental Change Institute,
Oxford University Centre for the Environment, South Parks Road, Oxford OX1 3QY, UK
info@gecafs.org www.gecafs.org Tel: +44 1865 285176 Fax: +44 1865 285534

GECAFS
Global Environmental Change and Food Systems

Earth System Science Partnership

Global Environmental Change and Food Security in the Indo-Gangetic Plain

- How will global environmental change (GEC) affect the vulnerability of food systems across the IGP?
- How might food systems be adapted to cope with GEC so as to enhance food security?
- What will be the environmental and socioeconomic consequences of different adaptation pathways?


climate change and weather extremes


food marketing and trade


religious and social function

GECAFS-IGP research is identifying the social and geographical distributions of vulnerability of the region's food systems to GEC in the context of other stresses.

www.gecafs.org

Research Goal

To determine strategies to cope with the impacts of global environmental change on food systems across the Indo-Gangetic Plain and to assess the environmental and socioeconomic consequences of adaptation.

GECAFS Indo-Gangetic Plain Research Questions

Western region

- *high productivity – food surplus region*
- *high investment in infrastructure*
- *major use of fertilisers and ground-water for irrigation*
- *in-migration of labour*

How will climate variability affect change in water demand in IGP food systems?

Conditions & Scenarios

How will changed water management affect rural livelihoods, intra-regional trade, GHG emissions and water tables?

Current Food Systems → **Adapted Food Systems**

How can changes in water management (e.g. though policy instruments and/or agronomic aspects) reduce vulnerability of rice-wheat productivity to climate variability?

Eastern region

- *low productivity – food deficit region*
- *poor infrastructure and low inputs of fertilizer and water*
- *high risk of flooding*
- *out-migration of labour*

How will climate variability affect vulnerability of resource-poor farmers to flooding?

Conditions & Scenarios

How would diversification effect rural incomes, labour migration, water quality and regional biodiversity?

Current Food Systems → **Adapted Food Systems**

What are the market opportunities, social constraints and technical options for diversifying crops (e.g. aquaculture) to make more effective use of flood and groundwater?

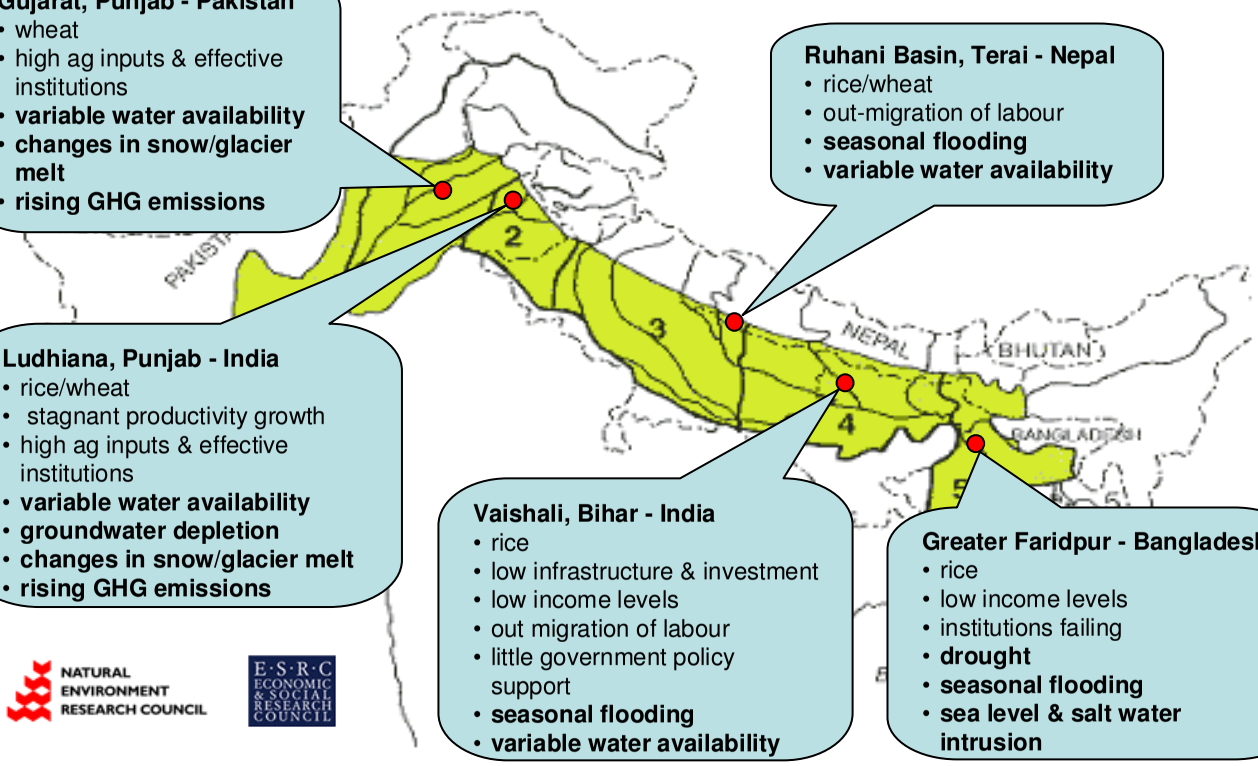
Research Approaches

(i) five Case Study Districts; (ii) Regional Scientific Networking;
(iii) Regional Synthesis and Integration; and (iv) Science-Stakeholder Interfaces

These five case study districts are the anticipated initial sites for the CGIAR Challenge Programme "Climate Change, Agriculture and Food Security".

Gujarat, Punjab - Pakistan
- wheat
- high ag inputs & effective institutions
- **variable water availability**
- **changes in snow/glacier melt**
- **rising GHG emissions**

Ruhani Basin, Terai - Nepal
- rice/wheat
- out-migration of labour
- **seasonal flooding**
- **variable water availability**



Ludhiana, Punjab - India
- rice/wheat
- stagnant productivity growth
- high ag inputs & effective institutions
- **variable water availability**
- **groundwater depletion**
- **changes in snow/glacier melt**
- **rising GHG emissions**

Vaishali, Bihar - India
- rice
- low infrastructure & investment
- low income levels
- out migration of labour
- little government policy support
- **seasonal flooding**
- **variable water availability**

Greater Faridpur - Bangladesh
- rice
- low income levels
- institutions failing
- **drought**
- **seasonal flooding**
- **sea level & salt water intrusion**

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DFID Department for International Development

CGIAR Challenge Program on WATER & FOOD

APN

Names and contact details of regional collaborators are listed in GECAFS Report No. 5 "IGP Science Plan and Implementation Strategy".