Approaching Toward Research-Policy Nexus: A Case How Global Environmental Changes and Food System (GECAFS) Enhance Research Capacity in the Indo-Gangetic Plain (IGP)

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For what and whom? What was the purpose of providing research support to policy and who was intended to benefit?

Sustainable domestic food security through our own indigenous production is the prime importance in Pakistan's agriculture. But, it is seen that the productivity levels of crops are generally low. There are wide gaps in yields of crops at the farms of progressive and subsistent growers. The prospects for increase in area are limited. The Ministry of Food, Agriculture & Livestock is making strenuous efforts to raise productivity levels but the developments in agriculture would not be sustainable without addressing the issue comprehensibly. We have number of policies like fertilizer policy, support price policy, procurement policy, land use policy, etc., but lacking any coherent agriculture policy which cover the all the aspects holistically to make all efforts systematic and directional.

Similarly in 2005, National Food Safety Policy and Strategies for Implementation was announced. The main objectives of this policy are to develop and promote the concept of food safety so as to reduce the burden of food borne diseases. Also to make available the adequate trained manpower both for research and operational aspects to meet requirement of food industry for better processing at international standards. We also have Pure Food Ordinance 1960, Pure Food Rules 1965, and others to ensure the supply of quality food in the market. However, the current food safety legislation and policy do not address the growing threats posed by global environmental changes on food safety. Another dilemma of the food sector is that we have not any national food policy that covers the all range of food system activities practice in the country.

Thus, frequent extreme climatic and environmental events placed national to local food availability, access, and utilization at stake. In Pakistan, number of studies was carried out on the Indus Basin's agriculture, water resources, and its socio-economic conditions, but to study the whole food system activities i.e., production, distribution, processing, and consumption and its vulnerability to global environmental change on the livelihood was not done before.

Therefore, Global Change Impact Studies (GCISC) was founded under the aimed to monitor the current and the likely future global trends in areas such as climate, water, food, agriculture, environment, biodiversity, health and energy etc., and scientifically determine their impacts on Pakistan. The Centre is also working on enhancing the awareness of the scientific community, the policy planners and the public in the country about Global Change and related activities.

The Agriculture Section in GCISC is engaged in the study of likely impacts of climate and technological change, both positive and negative, on agricultural production and to identify appropriate measures for coping with the negative impacts. This is being done, through developing and testing crop simulation models and following system analysis approach with a view to assist the national planners in developing and incorporating suitable strategies in the national development plans. Agriculture section is also studying integrated food system in Gujrat District to understand interaction between food system and global environmental change with the help of GECAFS's initiative on IGP. This research helped to enhance adaptive capacity of food system in the face of current and future changes.

On the other hand, GECAFS-IGP research is based on the three main issues. Firstly, how will GEC affect the vulnerability of IGP food systems. Secondly, how might IGP food systems be adapted to cope with GEC so as to enhance food security. Lastly, how would various adaptation options for IGP food systems feedback on environmental and socioeconomic conditions (figure 1).

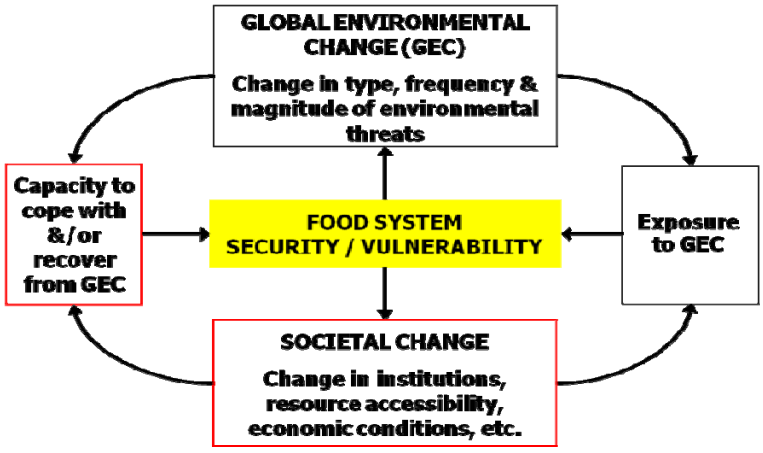


Figure1: Factors determining the vulnerability of IGP Food Systems to GEC.

Source: GECAFS Report 5 IGP Science Plan and Implementation Strategies

For this GECAFS research has developed a framework to integrate the many research projects investigating GEC impacts on food systems. This integration concept allows GECAFS-IGP researchers to better understand the vulnerability of the food system (as a whole) to GEC, rather than just the impacts of GEC on production. GECAFS-IGP research needs to be set within clearly defined, plausible scenarios of biogeophysical and socioeconomic conditions. These scenarios helped to develop Decision Support approaches that helped assessed potential regional- and national-level policy options.

The policy or decision maker who is related to planning for national food security needs information about the whole food system rather than segregated information. It becomes very difficult for a policy maker to compile the information completely and accurately in short time as he has to do many other tasks. Thus, a complete picture of food system with all its components, drivers, and key determinants is essential for an effective policy making related to food security. For studying this type of linkages within a food system, a team of

researchers is important to understand and develop a framework or a matrix and relate it with important challenges like global environmental and climate changes. Thus GCISC-GCAFS is not only working to created the skilled scientists that understand linkages in the food system and develop frameworks, but also provide information holistically to policy and decision makers for rational policy making.

Of what? What parts of the policy system were targeted and what research was relevant?

First in March and then in November 2002, two workshops on issue identification and research discussion meeting were held at Delhi for Indo Gangetic Plains with in GECAFS framework without participation of Pakistan. The main objective of these workshop or meeting was to establish clear priorities for policy-relevant research, identify principal potential collaborators and to recognize marked socioeconomic and biophysical differences across the IGP region.

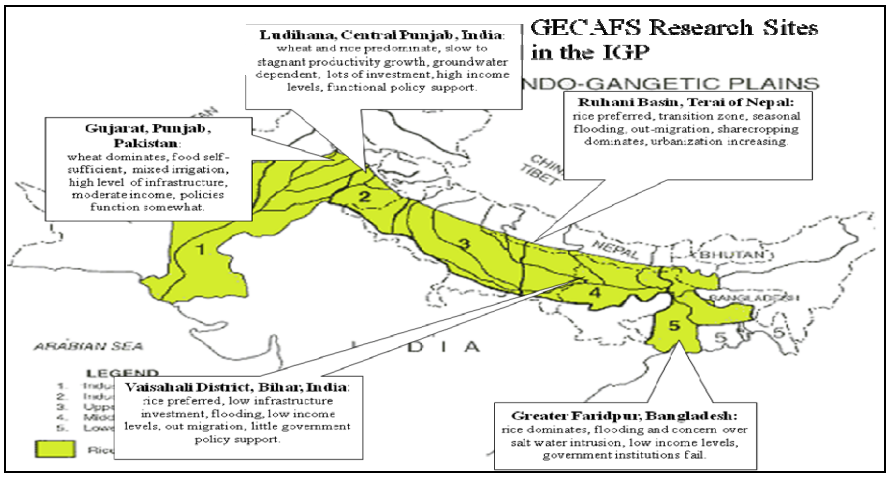


Figure2: GECAFS's Research Sites in the IGP

Next, to identify the different methods and approaches to address the GECAFS research questions and potential regional and international collaborators a workshop was held in Kathmandu, Nepal in April 2003. From Pakistan side Dr. Amir Muhammad, Rector, National University of Computer and Emerging Sciences, Dr. Zahid Hussain, Director, Water Resources Research Institute (WARI) , Dr. Asad Sarwar Qureshi, Acting Director, International Water Management Institute (IWMI) participated. All three are the eminent scientists of Pakistan and it was most appropriate persons to attend the GECFAS's research methodological agenda setting workshop. For example, the participation of Dr. Amir Muhammad helped GCISC to engage with the activities of GECAFS on foods system and its vulnerability to GEC specifically related to Pakistan.

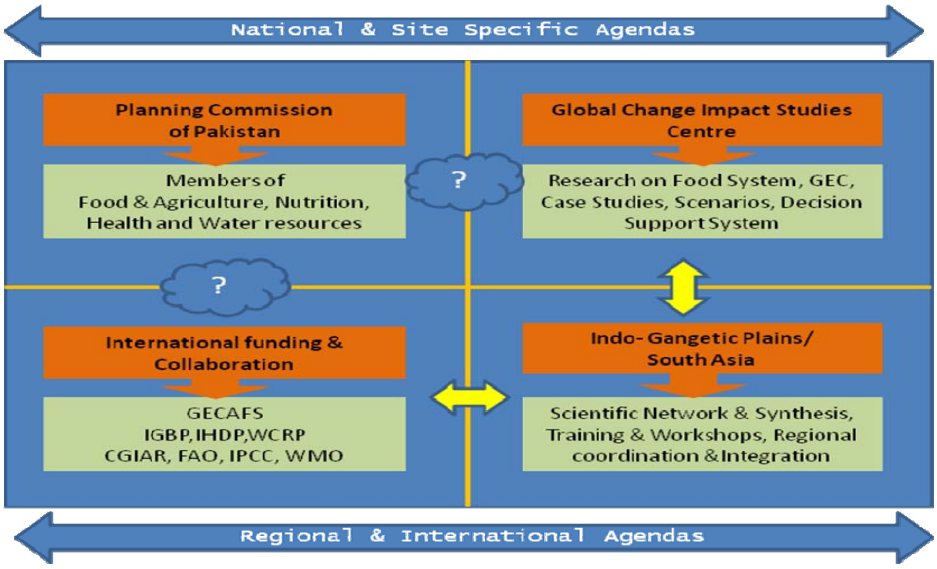
However, it would have been better to invite some related member form Planning Commission of Pakistan in this research planning workshop to get hand on information about research-policy gaps, as the Planning Commission of Pakistan plays an effective role as the apex planning and coordination body of the country.

Box 2: The Planning Commission of Pakistan.

In the Planning Commission, the prime minister is the chairman, apart from the Deputy Chairman, will comprise at least nine members including Secretary Planning and Development/ Member Coordination; Chief Economist; Vice Chancellor/Director Pakistan Institute of Development Economics; Member, implementation and Monitoring; and Members for Social Sector; Science and Technology; Energy; Infrastructure; and Food and Agriculture. Full-time Members will be placed, which are the professionals of eminent stature preferably Ph.Ds and with at least 25 years of experience in the relevant field. The Planning Commission also engaged consultants and advisors for specified assignments. It is envisaged that Planning Commission are working under the overall direction of the Policy Board to be chaired by the Prime minister and including the Deputy Chairman, Ten Federal Ministers to be nominated by the Prime Minister, and Members of the Planning Commission.

The member in Planning Commission act as a think tank to the Government to provide intellectual leadership at national level for all planning matters especially overall economic and social development policies. For example member agriculture provides intellectual guidance on policy issues concerning agriculture, inputs for preparation five years plan, Public Sector Development Program and Annual Plans. Similarly member Water resources, Environment and Nutrition are important target policy makers for Food System and Global Environmental Changes studies for GECAFS.

Figure3: GECAFS's linkages in Indo Gangetic Plains



From 2005 to 2009, under different projects GECAFS conducted research on Food System and GEC related issues with collaboration of Global Change Impact Studies Centre from Pakistan on IGP site 1. A briefing seminar on research activities of GECAFS and future agenda setting was held in Feburary, 2009 at Delhi. One of the invitee was Kauser Abudullah Malik, ex member Food and Agriculture of Planning Commission (he was then member when meeting first scheduled in December, 2008). But due to poor political

condition of Pakistan and India, we were not able to attend the meeting and missed the opportunity to get valuable comments from experienced policy maker.

Though, there was no formal seminar or workshop held to interact with policy and decision makers at local, provincial and National level in Pakistan (IGP site 1) about GECAFS-GCISC research and its preliminary results. But, during a survey in relation to undergoing research project "Improving Policy Response to Interactions between Global environmental Change and Food Security across Indo-Gangetic Plains" there was comprehensive discussion during and after the interviews with related government department/ministries, research organizations, universities and NGO,s. This enables us to share the concept and research about GEC and its impact on whole Food System. This little effort might trigger the thinking in minds of many.

Who and how? Who provided the research support and how did they do it?

In early 2005, our centre, Global Impact Studies Centre (GCISC) started working with Global Environmental Changes and Food System (GECAFS) during the meeting at Dhaka, Bangladesh. This meeting was aimed to identify the pilot areas in each basin and for Indus basin district Gujrat was taken. The district was located in ChajDoab, on the basis of their ability to reflect closely the overall situation of the IGP region in Pakistan.

My first participation with GECAFS was to identify the case study site and develop its rationale and brief description. We also characterized the food system, identified most important food activities and noted research gaps in it. We surveyed the site and collected data on food system activities, determinants, and outcomes. This study became the baseline for the new project titled 'Improving policy response to interaction between global environmental changes and food security across Indo-Gangetic plain'. In this project we conducted the detail interviews with high official and identified numerous institutional constraints in the understanding of food system to improve the food security under GEC.

In IGP, GECAFS implemented scientific agenda according to these four stages; (i) five case studies, each addressing the food systems questions relating to GEC vulnerability and impacts, adaptation options and feedbacks at district level; (ii) regional scientific networking linking GECAFS studies with other relevant research in the region and internationally; (iii) regional synthesis and integration to add value to individual research endeavors; and (iv) building science-stakeholder interfaces linking national researchers with policymakers, the private sector, civil society and representatives of regional food security programs.

Box3: Network of Scientist across IGP

United Kingdom:
John Ingram, Polly Erickson

***IGP Site 1 (Pakistan)**:*
Dr. Sajidin Hussain, Nazim Ali, Kashif Majeed Salik, M. Arif Rashid Goheer, Dr. Mohsin Iqbal.

IGP Site 2 (Punjab, India):
Rajindar Sidhu, Kamal Vata.

IGP Site 3 (Nepal):
Ajaya Dixit, Madhukar Upadhya.

IGP Site 4 (Bihar, India):
Shiraz Wajih, Gyaneshwar Singh

IGP Site 5 (Bangladesh):
Ahsan U. Ahmed, Khandaker Munim, Sk. Ghulam Hussain

GECAFS-IGP helped also in building regional capacity in both science and policy making. Science capacity build by the networking of scientists across the region and across disciplines to jointly address common research issues, inception workshops run by GECAFS science officers to bring regional researchers up to date on latest GECAFS methods, linking regional researchers with scientist world-wide through the GECAFS international research networks, and meetings with regional policy makers so that the science community are more aware of the key issues facing policy makers and the constraints under which they have to work. Policy capacity enhanced by involving the local and national policy makers in scenarios exercise to raise their awareness of GEC issues and the consequences of given scenarios for development, working with policy makers to interact research findings in the context of policy formulation, and providing decision support tools to help with analyzing tradeoff between socioeconomic and environment goals for given adaptation options.

Box 1: GECAFS-GCISC collaboration, activities and outcomes

Year	***Project/Workshop***	***Activity/Outcomes***
2005	*Indo-Gangetic Plain Workshop 3 part 1, Dhaka, Bangladesh*	• *Site Selections for Indo-Gangetic plains (IGP)* • *Introduction to Food System and Global Environmental Change (GEC)*
2005	*GECAFS Indo-Gangetic Plains BFP Grant Meeting Kathmandu, NEPAL*	• *Outline different methods for assessing the vulnerability of food systems to water management and water stress-related problems* • *Preliminary versions of the food systems matrix* • *Site characterization initials*
2006	*Basin Scale analysis of the vulnerability of Food System to Global Environmental Change*	• *Development of Food System matrix* • *Report on 'Vulnerability of Food System to Different Stressors'* • *Report 'Characterization of Food System, District Gujrat, Pakistan'*
2007	*Improving Policy Response to Interactions between Global Environmental Change and Food Security across Indo-Gangetic Plains*	• *Policy analysis for different sectors related to Global Environmental Changes* • *Conducted primary and secondary survey on IGP site1:District Gujrat* • *Conducted interviews to different institutions at district, provincial level*
2008	*Global Environmental Change and Food System (GECAFS), Oxford*	• *GECAFS Report No.5 'Indo-Gnagetic Plain: Science Plan and Implementation Strategy*
2008	*Attended the 'Food Security and Environmental Change: Linking science, development and policy for adaptation, an International Conference', 2-4 April 2008, University of Oxford, UK*	• *Presented poster on 'Food System Vulnerability to Global Environmental Change (GEC) in Indo-Gangetic Plains: a Case Study of Gujrat District in Punjab, Pakistan'.*
2009	*Enhancing Regional Expertise and Collaboration to bridge the Research-Policy Divide for Priority Problems and Developing Advance Thinking about the Research Policy Nexus. Australian National University, Canberra, Australia.*	• *AusAID Australian Leadership Awards Fellowships Program*

Context? What contextual factors were important?

Growing understanding of knowledge about different things revealed that many things still challenges us; among them climatic factors is important one. Food, fiber and shelter were the basic human necessity from beginning still under the mercy of nature. Scientific progress had answered successfully many threats through development of dams for proper irrigation to inlands, high yielding varieties and other efficient ways to produce more. Environmental and climate changes put mankind great famine, hunger and malnutrition and now become great challenges in present century. The GEC includes changes in the physical and biogeochemical environment, either caused naturally or influenced by human activities such as deforestation, fossil fuel consumption, urbanization, land reclamation, agricultural intensification, freshwater extraction, fisheries, over-exploitation and waste production. GEC issues particular relevance for the IGP include variable water availability, changes in snow/glacier melt, rising GHG emissions, seasonal flooding, groundwater depletion, drought and sea level and salt water intrusion.

Food production is mainly dependent upon land and water resources. More than 90 percent of rice and 43 per cent of wheat in the world is produced and consumed in Asia. The rice-wheat system, one of the major cropping systems of the South Asia and parts of East Asia, requires special management. Due to management differences and traditional cultural cultivation practices, the productivity of the rice-wheat system is stagnating and its sustainability threatened.

According to the IPCC Technical Paper on Climate Change and Water(2007), Asia is the region where water distribution is uneven and large areas are under water stress. Decreasing trends in annual mean rainfall were observed in arid plains in Pakistan, parts of northeast India. Similarly, water shortages in Pakistan, India, Nepal and Bangladesh have attributed to issues such as rapid urbanization and industrialization, population growth and inefficient water use that are aggravated by changing climate and its adverse impacts on demand supply and water quality. Glacier melt in the Himalayas is projected to increase flooding, rock avalanches from destabilized slopes, and affect water resources within next two to three decades. This will be followed by decreased river flows as the glaciers recede.

Irrigated agriculture in Pakistan is at a critical juncture due to waterlogging and salinity, low delivery efficiency, low cost recovery, productivity, etc. It requires solutions to maintain the resource base, to improve agriculture productivity and sustain irrigated agriculture in Pakistan. Irrigation is central to Pakistan economy, accounting for 90 percent of agricultural production, with gross commanded area of 16 million hectare.

Efficient management of water resources is key element for the development of irrigated agriculture in Pakistan. Despite heavy budgetary inputs in irrigated agriculture and well endowed natural resources, growth performance is far less against population growth. Policy makers are of the view that Pakistan's agriculture requires new strategies to enhance input efficiency and maintain and improve the quality of the resources base and to get the irrigation system out of crises.

South Asia is expected to be vulnerable to GEC due to its large population, predominance in agriculture and its limited resource base. GEC will impact many aspects of IGP's food system as limited awareness by many policy-makers of the GEC issues reduces the capacity to consider GEC concerns in the refinement of existing policies and development of new policies aimed at addressing food security, environmental protection and conservation and economic development.

There is hardly any long term food related policy formulation in Pakistan and if happened it has never been implemented. There is usually a practice of short term policy measures with limited vision and consultation. One of the high official have a point of view about food security as only is a wheat security by neglecting the other aspect of food system. So to address the food availability, access and utilization in holistic way in food system were neglected. This was the reason we do not have any national food policy.

Recently, Pakistan faced acute shortage of wheat, a staple food for most of our population mainly due to impact of climatic factors. This shortage raises the food prices through false market speculations which result in hoarding and smuggling of wheat resulting restlessness among the masses. Studies showed that poor distribution network, increased processing costs of wheat and other cereal along with inadequate planning for worse scenario were the major causes. This situation became more adversely affected by low production of wheat due to extreme climatic factors like flood and drought.

Therefore, several challenges that have now emerged are being addressed for Pakistan food security. These include increasing water scarcity, degradation of land resources (water logging and salinity), inefficient use of agricultural inputs (specially unbalanced application of fertilizer and inefficient water application), ineffective transfer of technology to the farmers, lack of coordination between research and extension, post-harvest losses, and marketing infrastructure. Pakistan will need to increase its production of major agricultural products (food, feed, fiber, sugar, edible oil, meat, milk, poultry, and fish) to feed its growing population and also generate some modest surpluses for export by 2030. This would need to be done with lesser land and water resources than are available for agriculture today.

Outcome? What was the outcome?

Major outcome of GECAFS research agenda in IGP is the development of network of scientist across the IGP region (as shown in box 3) and across the disciplines, inception workshops to update researchers on GECAFS methodologies and meeting regional policy makers.

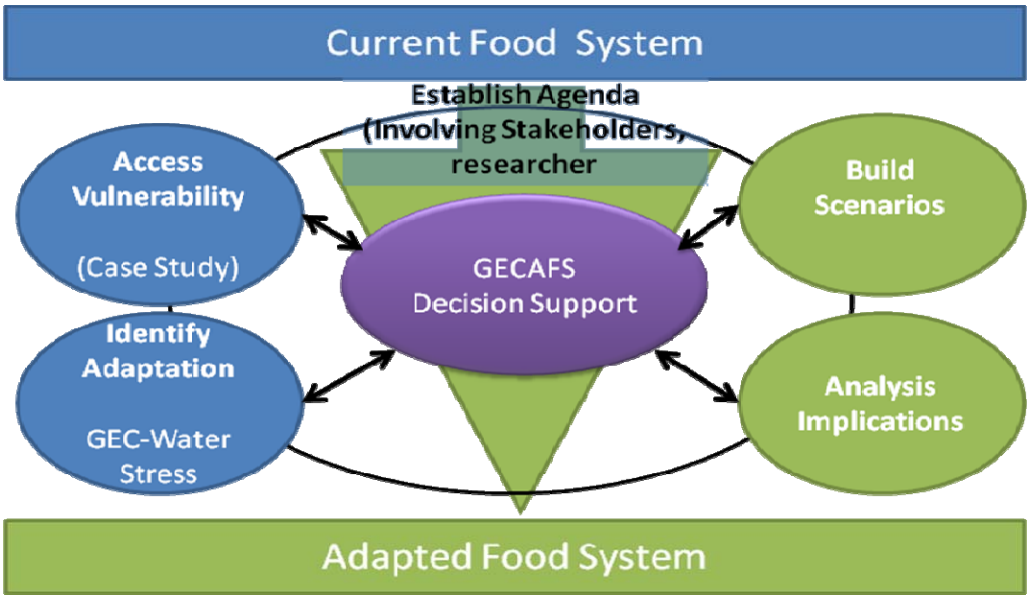


Figure 4: Various component of GECAFS Research (Blue: Completed agenda; Green: Future Agenda)

Some of the other major outcomes of these projects include the reorganization of the need for agronomic, economic, financial risk analysis of food production, conjunctive use of ground and surface water, enhancement of regional scientists in environmental and climate change studies on crop yield, and also other socio-economic factors effecting food security of the country.

GECAFS is successfully completed its half agenda as mentioned in the above figure number 4. The studied were completed on food system characterization, its vulnerability to climate and environmental phenomenon like water shortages, floods, droughts and identification of adaptation strategies. But development of socio-economic, bio-physical and climatic scenarios and its implications to food system in the future was still need to be studied. Similarly combining all the outcomes and results and incorporate in to some decision support tool is still under process.

Box 4: Mile stones of Global Change Impact Studies Centre (GCISC) research with GECAFS.

- *Indo-Gangetic Plain 1: Site Identification- Gujrat*
- *IGP Site 1 Characterization*
- *Food System Matrix and Characterization*
- *Comprehensive primary and secondary data collection of District Gujrat (IGP site 1)*
- *Two draft reports:*

  1) Characterization of Food System, District Gujrat, Pakistan

  2) Vulnerability of Food System to Different Stressors
- *Indo-Gangetic Plain Science Plan and Implementation Strategy*
- *Institutional Survey at District, Provincial and National level*

Thus, understanding of the global environmental change and its impact on food system and in the future a decision support system provide an information base for policy makers to develop national food policy, which is not yet formulated. For example in the two drafts report mentioned in the box 4, the complete food system activities like production, processing, distribution, and consumptions, its socio-economic and bio-physical drivers change. In the second report social, economic, and bio physical vulnerability of food system were studied under different stressors. It was studied that what were the water related stresses on food utilization, access, production and distribution and how much food system is sensitive, vulnerable and adaptive capacity in Gujrat District. In the end the strength, weakness, opportunities, and threats (SWOT analysis) of food system in district Gujrat was also carried out. These all studies helped to understand the food system and its vulnerability to Global Environmental Change at district level, but through this methodological approach these results can be replicated to other districts of the province for better understanding the food activities holistically.

The GECAFS IGP studies would also helped leaders at regional platform such as South Asia Association for Regional Corporation (SAARC) for setting regional agendas of food, agriculture, water, etc.

Our research related to production aspect of food system helped the understanding of policy makers/planners during consultation process of policy formulation. This work also depicted on the recommendations of Task force on Food Security in October, 2008.