



**National
Council for
Climate Change,
Sustainable
Development
and Public Leadership
(NCCSD)
INDIA**



NCCSD

As the outcome of the deliberations that took place during an International Conference on "Global Warming, Agriculture, Sustainable Development & Public Leadership" organized at the Gujarat Vidyapith – Ahmedabad in March 2010 by the International School for Public Leadership (ISPL), it was felt that a special organization needs to be created to follow up on the ideas. Accordingly the "National Council for Climate Change, Sustainable Development and Public Leadership" (NCCSD) was established and registered under the Bombay Charitable Trust Act 1950 Rule-29-No. E/19344/Ahmedabad as Public Trust on 17th September 2010.

PRIORITIZING AGRICULTURE IN UNFCCC GLOBAL MEET

- NCCSD promotes Sustainable and Climate Resilient Agriculture with the involvement of Public Leadership.
 - The President of NCCSD is Justice B P Singh, Formerly Judge, Supreme Court of India.
 - NCCSD is registered with the UNFCCC as an Observer NGO and with Government of India and State Governments in India as a NGO.
- NCCSD Participated in Doha – COP-18 by Organizing a Side Event on "Practices and Policies to Mainstream Agriculture as an Integrated Adaptation and Mitigation Tool".
 - The most important observation was that although agriculture is discussed in many forums, it is not credited for its most significant role in Carbon capture- particularly in the deliberation of Parties nor was any significant discussion/decision taken in this regard. NCCSD has taken up this issue with UNFCCC for further focus in International deliberations centered on;
 - Agriculture as a major tool to
 - a) provide sustainable livelihood to hungry millions
 - b) meet the challenge of food security &
 - c) perform as an integrated tool to mitigate global warming and adapt through robust productivity systems.

The last one is most important which needs to be focused in deliberations – at National and International Level.

NCCSD wishes to highlight the fact that
- agriculture-vegetation is the most



Council Members

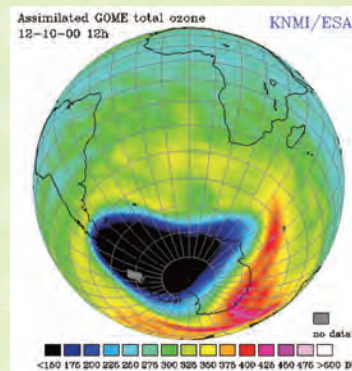
important and effective nature's tool to mitigate global warming due to its unique photosynthesis process

- There is no other known natural or artificially designed technology to absorb CO₂ from atmosphere. Agriculture further converts CO₂ into productive use by synthesizing glucose and adding fertility to soil by carbon sequestration.
- In fact reduction in area under agriculture due to non-agricultural activities like expansion of Urban Areas, Industrial Township, infrastructure Development – Road Railways or Mining – reduce absorption of CO₂ from atmosphere and directly enhances its accumulation in the atmosphere.
- Such activities have double adverse impact as they reduce CO₂ absorption from existing areas and enhance CO₂ as they generate

harmful gases due to their own activities. All these enhance Global Warming.

- On the other hand, agriculture is treated as "Net emitter" of GHG, when it actually acts opposite!!
- Agriculture should be "Mainstreamed as an integrated tool for adaptation" by UNFCCC in its deliberations.
- While there may be a debate or difference on reduction of GHG emission, there is no difference of opinion on the issue of providing world food security and food to hungry millions. The only way to do this is by bringing focus on agriculture and mobilize all resources – financial, knowledge and make available across the developing world and also by increasing the area under agriculture. This will enhance photosynthesis by vegetation which absorb CO₂ from atmosphere and mitigate global warming.

GLOBAL WARMING



Climate Change is caused by Natural Forces and Human Oriented Activities

SUSTAINABLE DEVELOPMENT

Sustainable livelihood means....

- Provide enough to all to live or exist,
- It should not become less and
- There is gradual increase in income for better quality of life.

Climate Smart and Sustainable Agriculture

Despite change in climate and its adverse impact on crops/animals, income to farmers should not decrease.

It provides opportunities to have multiple source of income from agriculture and animal husbandry - milch cattle and poultry. So when one fails, other supports.

It provides opportunity to young members of family to acquire multiple skills, support for setting up microenterprise locally, based on demand and supply situation. It provides safety net at the time of natural calamities – by way of crop insurance – for crops & animal husbandry along with employment in community projects.

Climate smart agriculture involves :

- Crop pattern based on soil health & moisture analysis to support crops which can be sustained.
- Weather advisory – long term- medium term – short term inputs.
- Immediate Agro – advisory after unexpected weather changes have occurred for timely corrective action to prevent crop loss.

TALUKA ACTION PLAN (LOCAL LEVEL)

- This is in existence – but in a general way
- Taluka level Action Plan for Agriculture is a pre-requisite for making agriculture sector – climate resilient and sustainable as districts have (in Gujarat- India and elsewhere) more than one agro climatic zone.
- At the outset, taluka level plan has to be prepared under expert guidance. Even this can be started with a water shed area with involvement of all stakeholders.



- The most important part of this plan is to give every Taluka a growth target. That is to be sustained despite vagaries of weather and its adverse impact.
- Most countries of the world have the capacity, knowledge – research and experiences but same is not uniformly distributed.
- Infact, this must be made available to each village / farmer by developing local level action plan involving farmers, their leaders and local government functionaries with a special focus to help the poor farmer use the knowledge and to women farmers with appropriate inputs recognizing the invaluable role they play. The Important parameters



Experts Meet

are: Production plan for agriculture sector as a whole. Need for quality inputs and their availability. Schematic needs – integrating existing schemes of Rural Development Department and Agriculture Department, and Minor Irrigation Department.

- Identification of below poverty line people and provide support individually for sustainable livelihood opportunities from local agriculture through micro enterprise and employment opportunities.
- Bridge the gaps at local level between average & optimum productivity of crops and milk yields.
- To provide animal health card to each & every animal holder. Both with scientific guidance - written instructions.
- To provide Soil Health Card to every farmer.
- To encourage convergence of efforts of all local level programmes and agencies towards this end.
- In the Farmers Interaction Meet with Experts organized by NCCSD held at Navsari Agricultural University in July, 2013 it was revealed only 40% of farmers are aware of impact of climate change and remedial measures.
- In the Pilot project of Anand and Mandvi Block of Gujarat – by NCCSD, it was revealed that gap between average farmers and modern farmers in terms of productivity in different crops is upto 35%. Main reasons are : not following smart agriculture practices and lack of quality inputs – particularly seeds.



Farmers Meet – Anand (Gujarat)

PROTECTED AGRICULTURE

Actually this is the possible way to insure farmers against adverse impact on agriculture and provide higher income through better yield. This is already under implementation, but needs to be propagated. It does involve a higher capital investment, however Bankers' support and market links are important prerequisites.

SOIL HEALTH CARD

Impact of Climate Change on Soil/Land

It is now increasingly realized that the impact of climate change is on Mother Earth the land or its content - the soil.

- The increase in temperature is absorbed by soil
- Lack of rainfall or less rainfall reduces its moisture content
- Heavy rain or floods impair its upper crust

All these affect the fertility of soil and its capacity to sustain even existing crop- pattern. These in turn affect productivity with low yield or crop failure. This is the cause of decline in food production and endangers food security to hungry millions

It is realized that analysis of soil chemical content and micronutrients, soil health reveals its need of nutrition to be supplemented by organic or/ and inorganic manure – so that it can generate appropriate yields and can sustain the fertility of soil – along with Soil Management.

Further, Soil Health & Moisture Analysis can

(7) Crop wise fertilizer recommendation based on soil analysis report
(For Individual field)

Season/ Crop	Department's General Recommendation for fertilizer (N:P:K/Hectare)	Recommendation based on soil analysis			
		FYM (Ton/H)	Nitrogen (Kg./H.)	Phosphorus (Kg./H.)	Potash (Kg./H.)
1. Monsoon					
Banana	180: 90: 180 (Gr./Plant)	15	200	90	180
Jowar (Poddar)	75: 40: 0	15	85	40	0
Paddy (Early)	80: 30: 0	12	90	30	0
Paddy (Medium)	100: 30: 0	20	110	30	0
Paddy (Late)	120: 30: 0	20	130	30	0
Tabacco (Monsoon)	180: 0: 0	25	200	0	0
Til (Semi Winter)	20: 25: 0	10	55	25	0
Til (Semi Winter)	12: 12: 0	10	12	12	0
Hybrid Bajra	80: 40: 0	25	90	40	0
2. Winter					
Wheat	120: 60: 0	25	130	60	0
3. Summer					
Summer Bajra	120: 60: 0	25	120	60	0

SOIL HEALTH CARD
AGRICULTURAL DEPARTMENT
GUJARAT STATE

Soil Health Card No. : SHC00027842

(1) Farmer's Name : Mr. Parshottambhai Hirabhai Patel
(2) Village : zaroia Taluka : Borsad District : Anand
(3) Account No.: 280
(4) Land/Soil detail as per account :

Sr.No.	Survey No.	Area (Hector)	Soil Type
1			
2			
3			

(5) Soil Fertility Status based on the analysis of the village soil.

Sr.No.	Fertility	Nitrogen	Phosphorus	Potash
1	Low			
2	Medium			
3	High			

(6) Soil Analysis Detail of individual field : Survey No. : 1004-2

Sr. No.	Detail	Result	Explanation of the result
1	pH Value (Soil reaction)	7.20	Normal
2	EC (Electric Conductivity) (millimhos/cm)	0.49	Normal
3	Organic Carbon (%)	0.26	Low
4	Available Phosphorus P2O5 (Kg/ha)	43.00	Medium
5	Available Potash K2O (kg/ha)	254.00	Medium

pH
Acidic <6.5
Normal 6.5 to 8.2
Basic > 8.2 (Gypsum to be used)

EC (Electric Conductivity)
Safe < 1.0
Saline 1.0 to 3.0
Harmful > 3.0

Soil Health Card – Gujarat

indicate the crops it can sustain. All crops cannot be grown everywhere. Every land has its distinct soil health and that indicates fertility and capacity to sustain crops.

Hence, Soil health & Moisture analysis is the key to provide guidance about sustainable crops that specify survey number in the arena of climate change as it provides:

- (a) alternative crops that can be grown – along with details of average price of same in local market
- (b) the gap in nutrients in soil to maintain fertility.

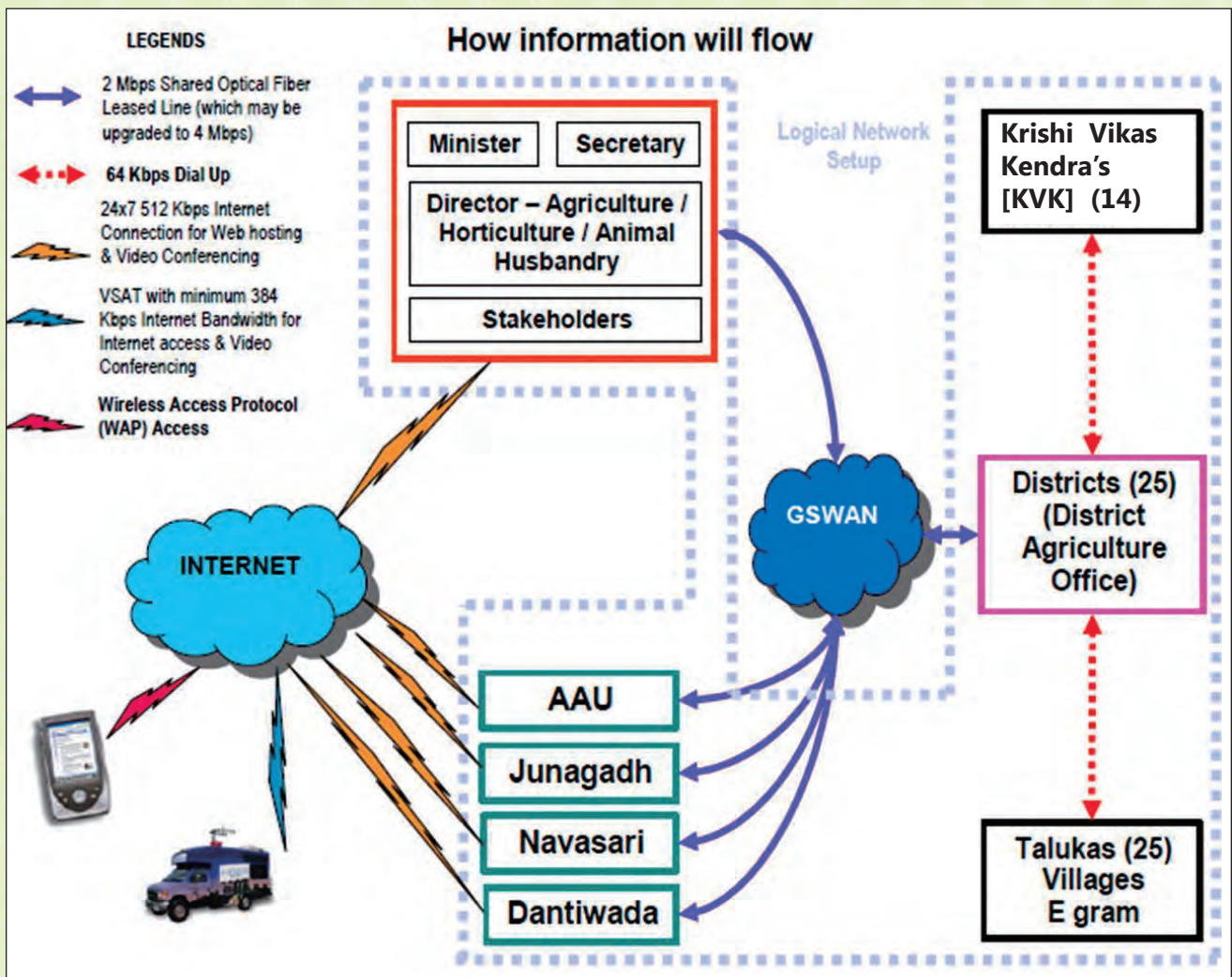
This can be initiated at village/block based. But in reality land texture and structure varies across survey numbers in a village. Hence it has to be individual survey number-based for individual farmer. In that way individual farmer can be guided – by written guidance – which most farmers act on.

WOMEN FARMERS

Women play important roles in agriculture production. These roles pertain to all aspects of crop production / protection, management of livestock, farm animals / husbandry and fisheries but are treated as “workers” and not farmers.

In recent times, women are increasingly replacing men in all farm activities – they are now new farmers – no longer with partial responsibility and are required to take all on farm decisions as men go out to urban centre/off farm urge for employment. This is in addition to routine domestic and family functions (house-keeping, cooking, children up bringing etc). This signifies a major shift in the roles and responsibilities.

Efforts to build capacities of women in agriculture are, however, constrained by the fact that agriculture tools, equipment and extension



communication strategies are predominantly men – centred.

The needs is to ensure that women are adequately trained to take on farm decision, made available appropriate tools and techniques that optimize on time and reduce stress while handling them.

SMALL FARMERS

Attention of Extension team is on progressive farmers who are generally big farmers. Small holders own majority of land in many countries. In India 80% of farm holding are by small farmers. They need to be provided focused attention as individual family unit on:

- Soil Health Analysis Growth Card
- Crop related guidance including market price & quality of product in demand
- Adaptation measures needed for changed climate and provide information related to its impact
- Link to supply chain for inputs and demand chain for their products; direct disbursement of subsidy including free inputs, and provide link with Banks – Finance.
- Implement door-step approach to farmers at village in pre-monsoon for crop guidance.
- Monitor and inspect spurious seeds and fertilizer-mix and pesticides.



Meeting of Women Farmers at MGLI, Ahmedabad



SGSY Training Programme for Self Help Groups

This can go a long way in developing sustainable agriculture all around and not confined to rich.

RURAL YOUTH

Rural youth across the world are becoming increasingly restless. They look forward to higher income at a rapid pace which agriculture most often does not provide and in the context of climate change sometime lend farmers into debt due to crop failure.

One major adverse impact on rural youth is they are misdirected by groups which encourage internal violence, spread of terrorism and grab income of others through brutality. In India, this is prevalent in some districts and is known as "Naxalism". Hence youth has to be

- Oriented to scientific agriculture
- Educated in multi-skills



Mr. Gondaliya Sanjay in his Agri Business Centre

- Moved to set up micro enterprise or agro service centre
- Adopt modern agriculture, protected agriculture through green house or otherwise
- This has to be with addition of modern infrastructure in village which includes round the clock Electric Power Supply.

APPLIED BIODIVERSITY

Farmers will be able to perform their “center stage role” better when assisted with precise information about roles of bio diversity for sustainable agriculture – Biodiversity need not be confined to forest area.



Mr. Laheri Suraj in his Emu Farm

WHAT IS BIODIVERSITY?



The term ‘Biodiversity’ stands for the wide variety of forms of life present on the Earth. All plants, animals, micro-organisms and their genetic composition are part of biodiversity. Biodiversity also refers to the biological variability in association with the ecosystems they live in.

Herbal Medicinal Plants

Brahmi

(Botanical Name: *Bacopa Monnieri*)

Promotes clarity in thought. Increase calmness, memory, concentration and learning.



Ashvagandha

(Botanical Name: *Withania Somnifera*)

Helps in increasing stamina and energy. Decreases anxiety.



Aamla

(Botanical Name:
Phyllanthus Emblica)

Is a rich source of Vitamin C.
Helps in improving body's
immune system.



Neem

(Botanical Name:
Azadirachta Indica)

Keeps the skin healthy.
Helps in decreasing skin
diseases.



Khatti Bhindi

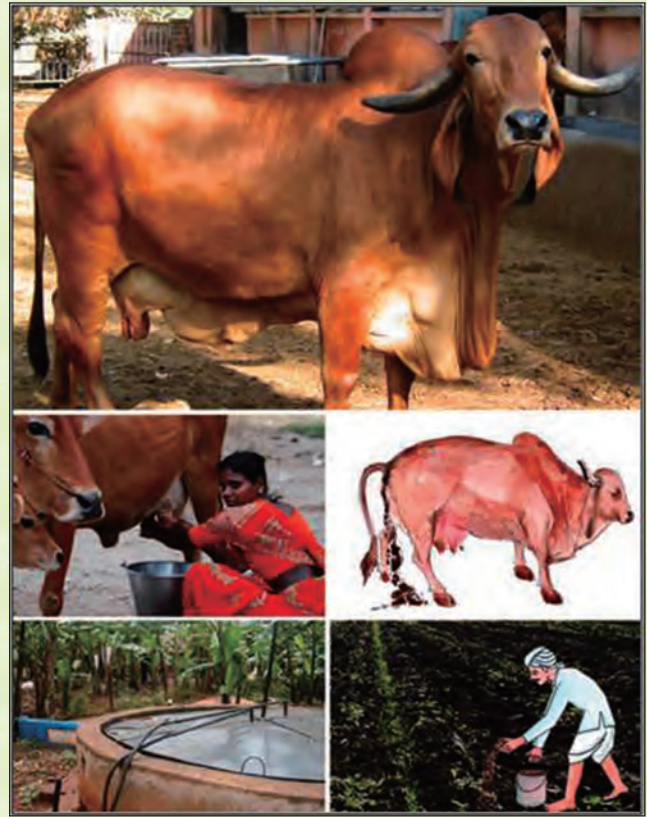
Helps in digestion,
decreasing diabetes &
blood pressure



• Kathiyawadi Horse



Kathiawadi Horses are a breed originating in Gujarat, India, which resemble Marwari horse and the Arabian horse from which they descended. Kathiawadi was originally bred as a desert war



horse for use over long distances, in rough terrain, on minimal rations. They are currently used as mounted police horses and also for military purposes and in sports.

• Gir Cow

Gir breed Cows date back at least 5000 years as one of the few original Zebu or Indus breeds. They are hardy and can withstand weather extremes. On the other hand hybrid cows cannot adapt to extreme changes in local conditions. This lesser adaptability leads to less productivity of milk. Gir cows have long intestines. This aspect is believed to help yield better quality milk with high mineral content compared to hybrid and other cows. The dung and urine of local breed cow is useful to maintain fertility of soils.

• Mixed Cropping

Mixed Cropping is growing a variety of crops and plants together.

Mixed cropping imitates nature and does not allow domination by particular pest. It helps maintain a dynamic control on pests by



promoting natural enemies, that is – predators and parasites of pests simultaneously.

On the other hand a lesser diversity of plants may attract only a few predators and parasites. This may allow the populations of plant eating insects grow significantly.

Some examples of successful mixed cropping in Gujarat are:

Sesame with cotton and other pulses; Maize with Drilled rice crop, Pigeon Pea with Drilled rice crop, Maize with Soya bean.

Intercropping is a form of mixed cropping.

For example, plant corn in one row and beans in the next reduces the chances of any single pest taking over the field. Additionally, intercropping controls weeds because weeds

cannot find enough space to grow and spread. It also keeps the soil healthy through a wide variety of nutrients that are released by the plants into the soils.

ORGANIC FARMING

A study by Rodale Institute- United State of America has established that organic farming can play a very important role. In one example of organic farming, a 23-year experiment by the Rodale Institute compared organic and conventional cropping systems in the United States found that organic farming increased soil carbon by 15-28 percent and nitrogen content by 8-15 percent.

The researchers concluded that if the 65 million hectares of corn and soybean grown in the United States, were switched to organic farming, a quarter billion tons of carbon dioxide (or about 4 percent of annual U.S. emissions) could be sequestered. (Source: Cittion: Lotter D.W. 2003, organic agriculture J Sustain Agric 21)

Organic farm products provide attractive market price, but a “word of caution” is that not all farm lands are suitable for organic farming and not all organic farm products attract better price in the market.



CONTINGENCY PLAN

As a part of preparing farmers for unforeseen weather changes 'Contingency Plan' is the need of the time. It needs to develop simulation model and instant advise particularly when there is heavy rainfall, flooding, heat or cold wave. Similarly for delay in monsoon, delay in intervals or no rain specific crop advisory is needed.

It involves interaction of farmers with experts, their own ways - to decide on their own on such circumstance.

NCCSD is implementing a programme in three districts of Gujarat i.e. Anand, Navsari & Kutch under the project of 'Meeting Challenge of Climate Change through Integrated Mitigation & Adaptation for Sustainable Agriculture: through community based locally adapted strategies & Leadership' supported by Central Research Institute for Dryland Agriculture (CRIDA)- Indian Council of Agricultural Research (ICAR), Government of India.

CLIMATE RESISTANT AGRICULTURE - RAJASTHAN & ANDHRA PRADESH

Prof. M S Swaminathan, the veteran scientist has set up Swaminathan Research Foundation which is working on climate resilient agriculture on many part of our country.

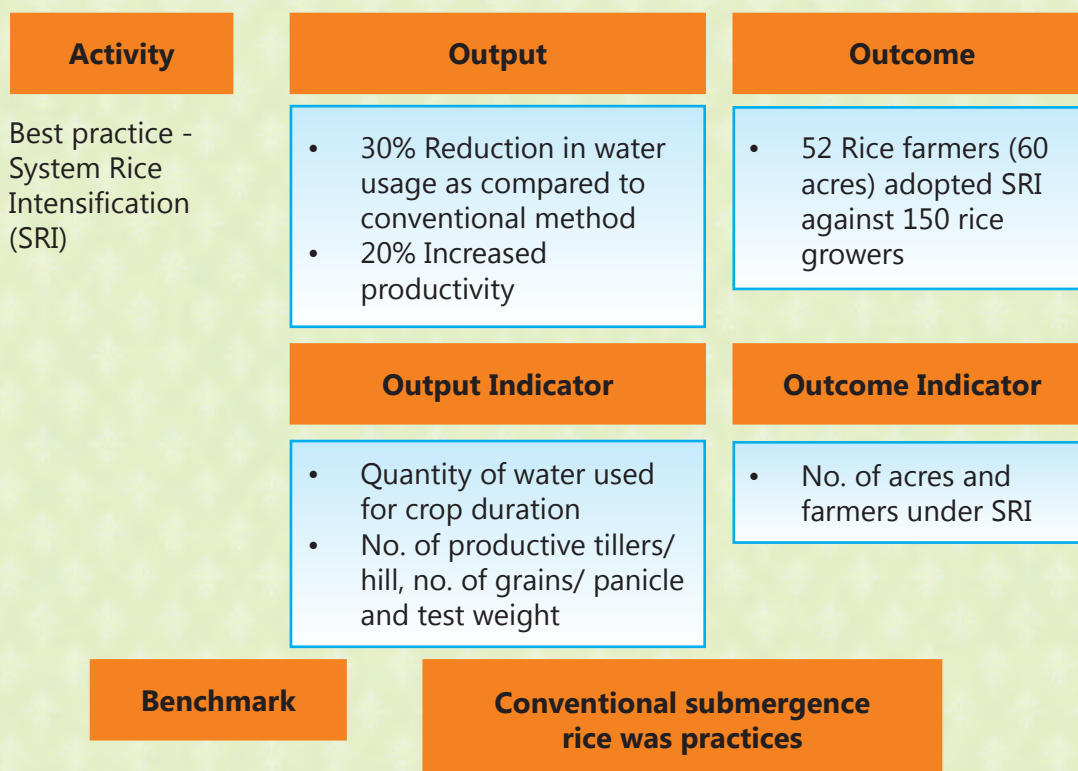
Examples - its projects in Rajasthan, Andhra Pradesh and Tamilnadu.

Mangrove Conservation

- Started in Tamil Nadu in 1996
- Extended to all the major mangroves of the east coast of India

Tamil Nadu	2 Sites
Andhra Pradesh	2 Sites
Orissa	2 Sites
West Bengal	1 site

Hypothesis – Land Use: Updated village level and use maps and option sets for rainfall scenarios (drought, normal, excessive) provide information for appropriate agronomic practices to stabilize yield from rain fed farming; greater food and / or economic security.



Hypothesis – Water: Community's access to weather monitoring and prediction data combined with community managed water resource systems can lead to greater water use efficiency and improve adaptive capacities.

Activity	Output	Outcome
Lining of Harren, awareness & capacity building	<ul style="list-style-type: none"> • Year – 2007 • 780m lined channel (Harren) constructed • 24acre area brought under irrigation • 41 farmers irrigated wheat crops, 6 times / crop 	<ul style="list-style-type: none"> • Group of farmers evolved norms for efficient water use
	Output Indicator	Outcome Indicator
	<ul style="list-style-type: none"> • Length of water channel lined • Area brought under irrigation and No. of irrigation provided 	<ul style="list-style-type: none"> • Ability to manage the irrigation channel by functional group • Increase in water productivity • Time saved for irrigation

Benchmark	<p>During 2006, 0 m lining, 39 farmers irrigated wheat crop in 20 acre area by using 6 irrigation</p>	<p>Rainfall 2006 – 1158mm 2007 – 566mm 2008 – 672mm</p>
------------------	--	---



Before restoration of Mangroves - 1998



After restoration of Mangroves - 2004

Development of restoration method : Pichavaram, Tamil Nadu, India

- Reserve Forest in 1897; managed by Forest Department - British and Indian
- Working plans available since 1897; degradation started 1930s
- Attempts to restore them could not yield much result
- Started working on restoration in 1993 - 55% degraded

BIO-TECHNOLOGY

- Biotechnology plays a vital role in developing crops which are climate resilient
- Genetically Modified (GM) seeds are under cloud but crops like BT cotton gave excellent results and thereafter no major headway has been made
- Biotechnology needs to be used in overall agriculture i.e. seeds, chemical, fertilizers, organic fertilizer and pesticides, even water management.
- It has a key role to solve development issue (a) for rapid development (b) provide sustainable livelihood to small farmers (c) meet challenge of food security (d) provide food at reasonable price to hungry millions.
- The case in India is of B T cotton which has increased yield, reduced cost and country's cotton production has increased phenomenally. In Gujarat cotton production has increased from 20 lacks bales to 80 lacks bales and productivity equals world's highest yield.
- A word of caution – this needs to be done after field trial to ensure introduction of varieties which do not have adverse impact on human being or soil. And of course seeds need to be available to framers easily, at a reasonable price.

KNOWLEDGE ECONOMY

Application of knowledge is the key to bring about rapid growth and to usher in sustainable development, says Prof. Mukul Asher, Professor of Public Policy, National University of Singapore.

The term knowledge Economy (KE) reflects the importance of knowledge for development process. It involves countries, organizations and people to acquire, create, disseminate and use knowledge more effectively for greater economic and social development. It includes application of successful technology of one field to another field. It provides more efficient ways of producing goods and services and delivering them more effectively and at affordable price to a greater number of people. It includes developing a market mechanism strategy for remote – rural areas – within a country and merging it into global market.

It requires transfer of Knowledge Economy from advanced countries which are generating most of this knowledge to developing countries, which need it because of their limited awareness, poor economic condition and weak institutions and within developing countries from its manufacturing center to agriculture sector. Knowledge revolution has a major role to play in meeting the challenge of global warming and development of agriculture and through that sustainable development.

APPLICATION OF KNOWLEDGE ECONOMY TOOLS IN AGRICULTURE INCLUDES

- Provision of information to the farmer about farm prices by use of ICT mobile phone, TV & Radio news bulletins & web-based technologies.
- Specific product feature choice and requirements of the market (example of straight chilies, reddish, tomatoes) being more preferred than their ordinary counterparts so that farmers can plan accordingly to secure premium prices.
- Introduction of village level micro irrigation plans for Contour banding, Gully plugging, check dams and village ponds and farm ponds based data from satellite imagery watersheds as it is already done in Gujarat, India.
- Development and use of cheap mass produced sensor technology that can detect spoilage in food stored, particularly perishable food.

- Mapping increase in salinity, affected and eroded land, wasteland and wetlands and agricultural land reduced due to urbanization.
- Aerial seeding in margin areas of desert and sea coastal.

DEVELOPMENT OF WASTE LAND

Bringing non-cultivable wasteland, cultivable fallow land and marshy areas under vegetation cover by taking a cue from successful experiments in India and abroad. India has vast tracks of such lands on margin areas of deserts and inland saline areas. Each land area should have its own strategy for land use and soil management, based on scientific agriculture and precision farming.

It is necessary to take up this task on a massive scale. However, farmers cannot afford to invest in such waste land. A rough estimate of the cost of developing one hectare of land is about INR 2,00,000/- to INR 2,50,000/-. It is, therefore, necessary to bring in public private partnership (PPP) to sustain such projects. It can create huge employment opportunities and go a long way in meeting food security challenge of hungry millions apart from creating vegetative cover which will absorb CO₂ from atmosphere and make soil fertile with right agronomic practices.

COLD DESERT

Self Sustaining Village – Nang, Ladakh, Jammu & Kashmir

Army needed regularly a huge quantity of vegetable daily at Ladakh – where it has a big base. The DRDO with Dr. Pillai CEO, DRDA took an open initiative to green Ladakh that is a barren land, with community efforts and involving Armed forces with local population.

Kutch District



May – 2006

August – 2006

August – 2007



Rain Water Harvesting Structures

- The Field Research Laboratory (FRL) (DRDO) introduced the village co-operative as a vehicle
- Activities undertaken were
 - Water Harvesting (3 reservoirs)
 - Afforestation in 25 ha. waste land
 - Potato seed Production for Leh
 - Greenhouse Cultivation in the valley
 - Introduction of improved Agro-technology &
 - Machinery
- Within two years, with these initiatives annual income from Rs. 2200 to Rs. 4400 per family per season
 - Large Scale Afforestation
 - Valley is covered with snow in winter but is lush green in summer Fresh Vegetables Armors Co-operatives supply vegetables worth over INR 1,00,00,000 Annually to army.



Cold Desert Ladakh



Cold Desert Ladakh

- Surplus Production 50% beyond army requirements now used locally

USE OF WETLAND

Wetland is an area of land, where soil is saturated with moisture, permanently or seasonally or covered by shallow water.

Wetlands are useful for:

- food source and resource recycling, Predominant occupation of two-third of working population for their livelihood residing in coastal areas.
- Scientific research & Educational initiatives.
- Recreational activities and Nature Services
- In terms of products, they are source of fish crops, vegetable & rice crops, medicinal plants and other organic products.

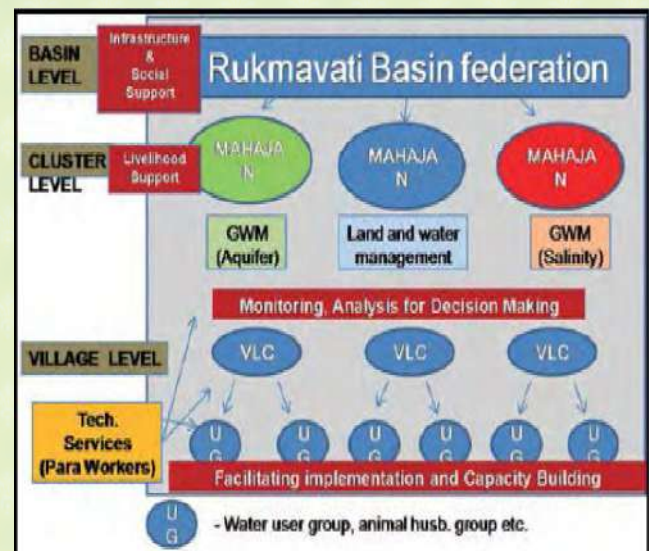


East Kolkata Wetlands

East Kolkata Wetlands (EKW) through its bheries / fisheries caters to the food, sanitation and livelihood security of its nearly a lakh inhabitants by recycling 980 million Lrs of ewage per day with a detention period of 30 days. About 150 tonnes of vegetables, 10500 tonnes of table fish per day in addition to nearly 11 Mt tonnes of rice per year. This intricate link of eco system productivity based on recycling and livelihood has created a favorable market echanism that rewards conservation initiatives. This is called the Bio rights framework and is a model that can be suitably adapted in systems with comparable profiles of form and function. South Asian Forum for Environment (SAFE) led by Dr. Dipayn Dey has played catalyst role in this entire development.

RIVERBASIN MANAGEMENT

River is an important physical agent that plays very vital role in distribution of water and maintaining equilibrium of water in hydrological cycle. The area from where river collects water is termed as watershed or catchment area. The whole unit can be defined as basin where set of physical processes are interlinked with each other and maintain relationships between biological and non biological components. It is well known truth that any major civilization has developed around river or in other wards within balanced watershed region due to healthiness of natural resources. Management of such basin



is not only important for mankind only but also to maintain healthiness of environment of a particular region. Shri K. C. Shroff, Veteran NGO, initiated this through Shree Vivekanand Research & Training Institute (VRTI) in Rukmavati River basin which is in an arid area in State of Gujarat, India.

Approach

There are three phases of the entire project such as Planning phase, Implementation phase and Monitoring phase. Two approaches integrated and participatory adopted to execute the project. Mechanism of river basin management by institutionalization process started with planning phase itself. That can be judged through a capacity building of rural youth and constitution of river basin management committee of stakeholders. Main activities during the implementation phase involved water harvesting and management, Soil moisture conservation, soil reclamation etc.

Expected results

The main outcomes are:

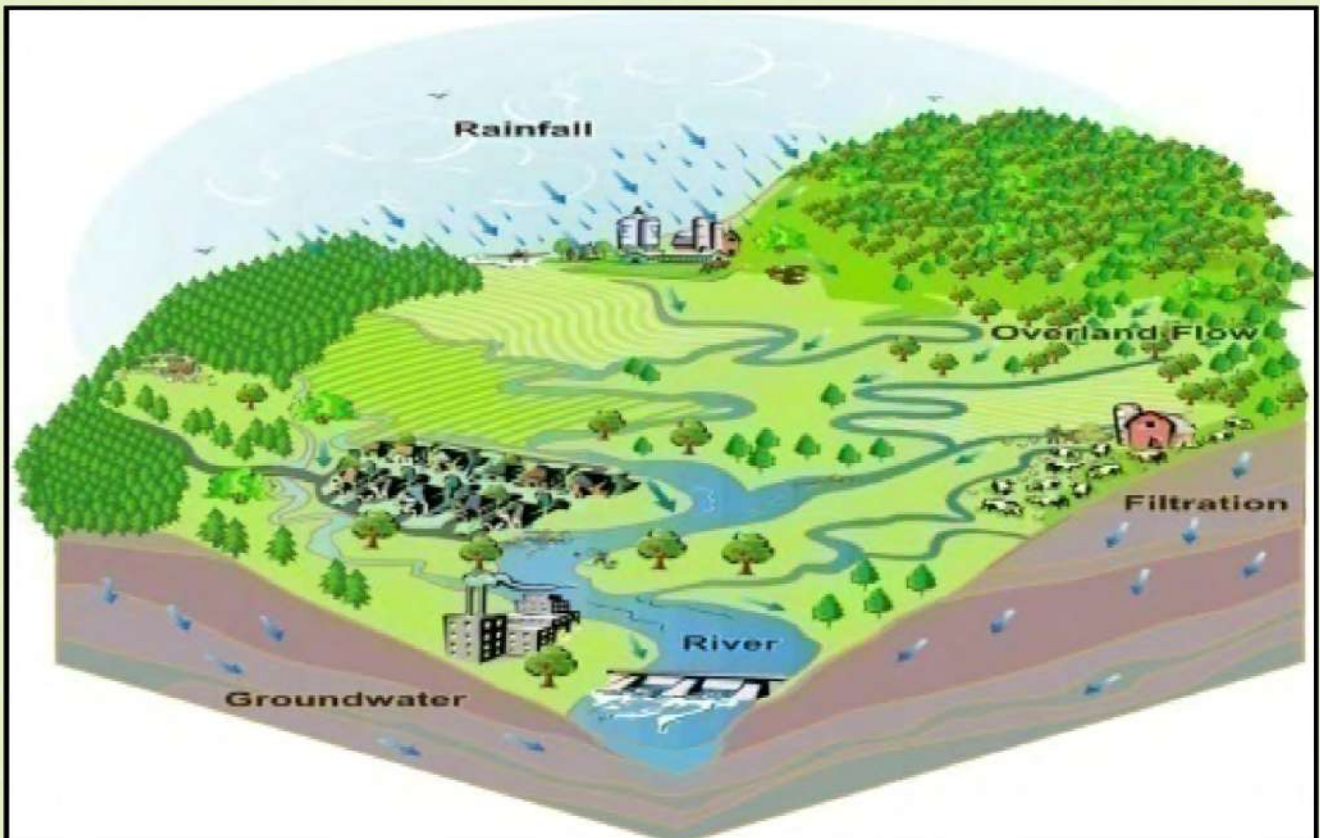
- Self sustainable river management institution

that have two units such as decision making unit and service providing unit.

- Improvement of water quality as per drinking and irrigation norms
- Each village of the basin will be self reliant on their drinking water, fodder and food requirement
- Improvement in crop productivity thereby improving soil quality.
- Greenery in the wasteland and forest area of the basin



Overflowing Koday Check Dam in Basin Area – Kutch



COMMUNITY BIO-GAS PLANT

The cow-dung and agriculture waste are the major cause of Methane, hence agriculture is blamed for GHG emissions.

The Chhota Udepur, a remote Tribal Taluka of Gujarat, India saw a major community initiative in which about 3 to 4 slurry was utilized appropriately. Its network of gas pipelines was laid for supply of gas to all of households. A Community biogas plant set up after interaction with village community. The State Government provided financial assistance through a registered cooperative society in the village. Animal holder paid price for cow dung per kg. per month Rs.200/- for gas connection - 70 householders. A Vermicompost bed has been set up and slurry used for it. Liquid slurry is not marketable but when it is converted into vermicompost can be transported to urban centers in bags after meeting local demand. Thus it becomes marketable product, which is the key to success of the project.

The gobar and agri waste emanates methane which affects environment, but converted into Biogas, has a different value and is a solution to the problem. The Shroff Foundation Trust took this initiative with convergence of government departments with participation of local community. In fact such efforts need to be incentivized as we have agro waste and cow dung in all our villages which are inefficiently used.

URBAN AGRICULTURE

There is need to promote Urban Agriculture

- Practically majority of urban households have some open land.



Biogas Project – Chhota Udepur – Gujarat, India

- Even in the multistoried building, residents like to plant trees, grasses and ornamental plants in their apartments.
- But there is a gap about knowledge of agricultural practices, about plants they should grow and how to treat them. There are no urban agriculture extension centers or even Agro Service centers where such guidance could be available along with basic inputs of seeds, fertilizers, farm equipments etc.
- People end up buying high cost for ornamental plants with high mortality and then periodically replace them.
- Kitchen garden could be promoted to meet the requirements of vegetables and wherever more open areas are available, suitable local horticulture and floriculture plants can be grown.
- There is a need to take urgent initiative on urban front. This will go a long way in enhancing green cover in urban centres and reducing CO₂ level in atmosphere.

WEATHER FORECASTING

It is important to realize that erratic weather changes have already brought huge adverse impacts on the entire Agriculture sector, Crops – Horticulture, Livestock and Poultry – birds and Fisheries. But this can be mitigated by (a) advance information about possible changes by FM Radio & TV (b) Agro-Advisory - followed by information of impending weather forecast and un-usual pattern now available but is provided at only provincial level. It should also be provided at the local level.

In the Farmers Interaction Meet with Experts during National Conference organized by NCCSD at Anand Agricultural University – March, 2013,





it was revealed that only 10% of farmers have access to weather forecasting.

It is the need of hour to communicate to farmers about:

- Possible rainfall pattern-long term
- Mid-season correction, if any in same
- Weekly forecast
- More specific forecast on day to day basis for unseasonal or heavy rain, high wind velocity, frost and spell of heat and cold.
- Agro-Advisory can be developed by simulation model and communicate to farmers in time to time. Only this can prevent the crop failure.
- While many of advance countries do have technology and communication system, most of developing countries do not have this. There is, therefore, need for knowledge transfer with international cooperation in this regard.

SPECIAL PLANTS



Bamboo - Sindhudurg, Maharashtra, India



Soil Erosion and degradation of land are on increase in India losing 5,334 million tonnes of soil annually due to erosion. There are plants which control soil erosion – one such plant is Vetiver. It has capacity to reduce erosion and improve soil texture - trapped top soil 40cm in 30 months. Preparation of a raised-bed banana plantation along with using vetiver to reduce root disease and excessive soaking during heavy rains. The other similar plants are Bamboo, Mangroves and like.

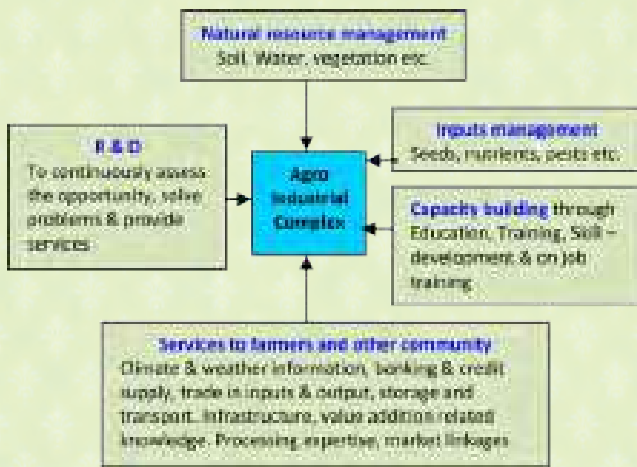
AGRO INDUSTRIES IN VILLAGES

We have rapid industrialization - in fact very good growth in agro industries, but it is only in urban centers. But if agro industries can be based in villages, that can play a major strategic role by providing local employment, better price to agri produce and support wealth creation and economic growth in areas that have been affected by internal conflicts, natural catastrophes or out-migration resulting from uneven development.

It reduces migration, especially of young unskilled



Vetiver – Maysore, Karnataka, India



labour. It can also reverse migration trends by offering new employment opportunities. It can alleviate social pressures and demands on public services within the city.

GRASS LAND DEVELOPMENT

INTERNATIONAL EXPERIENCE - CONSUMPTION OF CO₂ PER HECTARE

- If a hectare of soil 33.5 cm deep, with a bulk density of 1.4 tonnes per cubic metre is considered, there is a soil mass per hectare of about 4,700 tonnes (Tony Lovell)
- If appropriate management practices were adopted and these practices achieved and sustained a 1% increase in soil organic matter (SOM), then 47 tonnes of SOM per hectare will be added to organic matter stocks below the soil surface.
- This 47 tonnes of SOM will contain approximately 27 tonnes of Soil Carbon (I.e. 47 tonnes at 58% Carbon) per hectare.
- In the absence of other inputs this Carbon may only be derived from the atmosphere photo-synthetic process. To place

approximately 27 tonnes of Soil Carbon per hectare into the soil, approximately 100 tonnes of carbon dioxide must be consumed out of the atmosphere by photosynthesis.

- A 1% change in soil organic matter across 5 billion hectares (estimated waste land in the world) will sequester 500 billion tonnes of Physical CO₂.

Source - (Tony Lovell – Soil Carbon P/L Australia)

TRANSFORMATION OF DAHOD-GUJARAT

Dahod is a remote tribal district in Gujarat, India with a most difficult terrain. Prior to 1974, it was the poorest district in the country and drought prone.

- The tribal villagers migrated every year after monsoon
- The irrigation coverage was just about 5% in reality compared to 10 % on records.
- Agriculture yields were poorest with predominance of Maize crop and milk production lowest despite high cattle population.
- Literacy rate was very low.
- The undulating terrain was barren land with hardly any tree cover, no forests in the designated lands or any other form of cultivation.
- Most of its forest land is without tree cover
- No horticulture, vegetable or floriculture

In 2010

- The same desolate area achieved food security, the housing conditions improved
- School enrolment and attendance increased manifolds
- 68000 ha of land were brought under irrigation. 17000 wells re-charged and the irrigation coverage rose to around 30 %
- 700 community water resources developed & were managed by 325 village level irrigation cooperative societies.
- 2,700 village institutions - users groups managed their affairs & assets
- 65 rivers and rivulets were made perennial through series of structures connected to lift irrigation system and the migration dropped to 10-15 %



- Cropping pattern changed with introduction of horticulture - mangoes, floriculture, roses and vegetable crops. six crore trees planted with 50 % survival at long run
- About 25,000 farmers opted for horticulture with average income of Rs.50,000/- with continuous increase in income of poor families also.

Socio-economic-ecological impact - the Sustainable Development was achieved by initiative taken by Jagavats of Sadguru Development Foundation promoted by Shri Arvind Mafatlal in the early seventies. Their efforts were converged with the Government programmes and promoted local level initiatives and leaders to manage their own affairs. The end result is an increase - continuous increase in income of families, food security, nutritional security, financial security, fodder and timber are available in their vicinity along with water. Reduction of pressure on forest, reduction in drop out in school, higher education for the girl child and a healthier life, stable/ pucca house, drastically change in number and days of migration, empowered and confident community, transferred into a drought proof area.



Before

After



Before

After

NEW EXTENSION APPROACH

REACH OUT TO FARMERS - KRISHI MAHOTSAV APPROACH – THE GUJART EXPERIENCE.

COMMUNICATION - WRITTEN

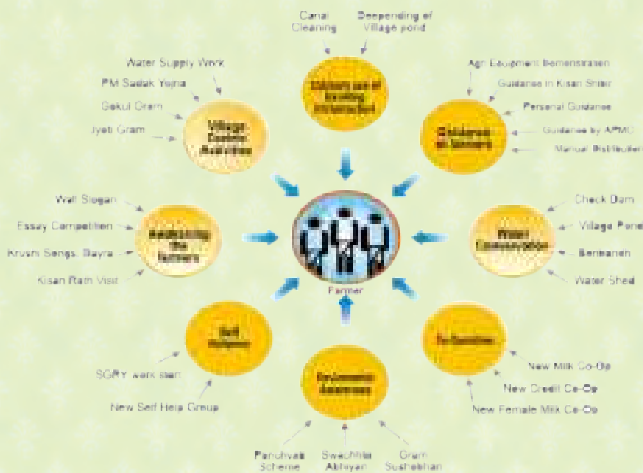
1. Provide Soil Health & Moisture Analysis Card to each and every farmer at his door step

- Written in a form of card about his land with soil health and moisture analysis and indicative of
 - Fertilizer quantity and mix needed
 - Nutrient need – both by indicating what is deficient and
 - Based on soil, chemical and moisture content, Crop that the land can sustain and capacity soil to grow alternate crops.
 - Average market price of suggested crops – last five years. Gujarat provided such cards to all its farmers.

2. By direct contact with farmers at village level.

- Face to face meets at village level. One month prior to crop season, both in Kharif and Rabi and later on during the crop season in monsoon and winter.
- Team includes Agri scientists along with Agri Extension Officer/ Village Level Workers. Agricultural produce market committee representatives and input dealers with locally elected leaders and progressive farmers. They must visit each and every village of a taluka- one month prior to sowing.
- During the crop season, contact has done by VLW and Extension Officers to update farmers
- F.M radio can provide district and taluka specific information on its bulletin.

This brought dramatic change in crop pattern in Gujarat - India. Farmers started selecting crops which were sustained by their soil. Gujarat had minus agriculture growth prior to 2004 due to recurrent drought and crop failure. Despite of similar weather condition, growth rate in agriculture increased up to 9% per annum, that has been sustained and farmers have almost doubled their income.



New Extension Approved – Gujarat - 1

LEADERSHIP FOR GREENER AGRICULTURE

Global warming is a threat, but it can be converted into an opportunity. It is possible to create a win-win situation for all, if all efforts are channelized for sustainable development with greener agriculture at its centre. The unique aspect of this initiative is that it has to be a bottom-up approach at grass-root level and using modern technology with information communication techniques adapted to local needs - irrespective of the fact they may differ from tehsil to tehsil or even from village to village through and locally developed acceptable Action Plan based on all different dimensions mentioned above.

The key to meet the challenge of Global Warming is LEADERSHIP, which has to become motivated and committed for promotion for sustainable development through greener agriculture. It needs to have goal and role clarity, adopt detailed planning and implement the strategy based on knowledge economy.

The leadership at all levels - village, taluka, district, state and centre. The Chief Ministers and even Prime Minister- needs to be ignited and motivated to focus on farmers. This includes: Non elected leaders, owners entrepreneurs, managing directors of companies, NGOs, civil servants, VLW, Taluka Development Officer, Collector and the Chief Secretary of State governments and Cabinet Secretary of Union Government, the



Farmers First – 2

educational leaders (teachers, research scientists, Vice Chancellors and students) the spiritual leaders and the international organizations.

Such transformation meets the challenges of poverty and global warming which seems to be insurmountable. But in reality, this is not so. It requires determined and persistent efforts to overcome these obstacles. If all of us act together with a common goal in mind, there will be all round prosperity, despite the adverse impact of global warming.

Countries-government-all over world will have to view the impact of Climate with grave concern, the Change which is creeping in rapidly-with dangerous consequences to habitat - its stability. This modern war is on "Nature's Front" and nuclear weapons or army is no solution. The solution lies in bringing bank balance in nature's forces the atmosphere, the sun, the earth, the water and vegetation. The solution lies at local level. Our endeavor should be to overcome this challenge - convert it into an opportunity.



Leadership Development Training Programme

COUNCIL MEMBERS

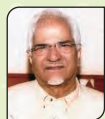


**NCCSD's President
Hon'ble Justice B P Singh**, formerly Judge, Supreme Court of India and President of The Environmental & Consumer Protection Foundation (ECPFO), New Delhi.

Patrons of the Council



Dr. M. S. Swaminathan, M.P.



Prof. Nathu Puri, Chairman, Puri foundation for Education in India,



Shri Kantisen Shroff, the Veteran NGO,



Shri Parshottam Rupala, Member of parliament



Dr. Y. S. Rajan, the distinguished Scientist, ISRO



**Council Members
Shri Ashwin Shroff**, Chairman, Vivekanand Research Training Institute (VRTI), Kutchh & Chairman & Managing Director Excel Industries Ltd, Mumbai



Er. Anuj Sinha, Formerly Head - Vigyan Prasar, New Delhi



Prof. Mukul Asher, LKY School of Public Policy, Singapore



Dr. Govind Hariharan, Chair and Professor, Coles college of Business, Kennesaw State University, Kennesaw, USA



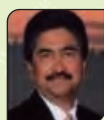
Shri V V Sadamate, Formerly Advisor (Agriculture)– Planning Commission of India, New Delhi



Shri S. K. Nanda IAS, Additional Chief Secretary, Government of Gujarat, Gandhinagar



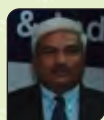
Dr. A. R. Pathak, Vice Chancellor, Navsari Agricultural University, Navsari, Gujarat



Shri Bharat Patel, CEO at BP Energy & Environmental Consultants, LLC, New Jersey, USA



Mr. Vijoy Kumar, Formerly Chairman, Uttar Pradesh Electricity Regulatory Commission, New Delhi



Shri Ashwini Puri, Puri Foundation for Education in India, Gandhinagar



Shri Narayan Patel, NCCSD, Gujarat



Dr. Dipayan Dey, Chair, South Asian Forum for Environment (SAFE), West Bengal



Dr. Sanjay Deshmukh Professor, Life Science Department, Mumbai University, Mumbai



Dr. R. V. Rao, Director, IDPS, Vishakapatnam



Dr. Mohamed Behnassi, Associate Prof. of Ibn Zohr University of Agadir, Morocco



Dr. V. P. Dimri, Distinguished Scientist, Council of Scientific and Industrial Research (CSIR), Bangalore



Dr. Kinkini Dasgupta Misra, Scientist-E, Head, Vigyan Prasar, New Delhi



Dr. Ravish C. Maheshwari, Former VC, Sardarkrushinagar-Dantiwada Agriculture University



Dr. Arunachalam, Principal Scientist (Forestry) Division of Natural Resources Management Indian Council of Agricultural Research, New Delhi



**Executive Chairman
Dr. Kirit N Shelat, IAS (Rtd)** and formerly Principal Secretary, Government of Gujarat



**Honorary Secretary
Dr. R Gopichandran**, Director, Vigyan Prasar



**Joint Honorary Secretary
CDR Ashish Mittal**, Indian Navy, New Delhi



Shri Shalin Shah NCCSD, Ahmedabad



Contact Us

DR. KIRIT N. SHELAT, IAS (RTD)

Executive Chairman

**National Council for Climate Change Sustainable Development
and Public Leadership (NCCSD)**

Patel Block, Rajdeep Electronic's Compound, Near Stadium Six Road, Navrangpura, Ahmedabad-380 0014

Phone/Fax: (00 91 79) 26421580 • Mobile: 091 9904404393

Email: drkiritshelat@gmail.com, Website: www.nccsdindia.org